Supplement 1
September 2011

Abstracts

ESICM LIVES 2011
24th Annual Congress

Berlin, Germany
1–5 October 2011

This supplement issue of the official ESICM/ESPNIC journal *Intensive Care Medicine* contains abstracts of scientific papers presented at the 24th Annual Congress of the European Society of Intensive Care Medicine.

The abstracts appear in order of presentation from Monday 3 October to Wednesday 5 October 2011.
The same abstract numbering is used in the Congress Final Programme.

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ECCRN European Critical Care Research Network — European Society of Intensive Care Medicine

Abstract submitted and selected under label ECCRN. Displayed as e-poster on dedicated screen at ESICM booth for whole duration of congress (ICC, Lobby Level).

Abstract selected for the Abstract Award Winning Session. Displayed as paper poster at the Awarded Posters Corner for whole duration of congress (ICC, Exhibition & Poster Area).

Oral Sessions
Ventilatory synchronicity & weaning: 0001–0005

0001

NEURALLY ADJUSTED VENTILATORY ASSIST (NAVA) IMPROVES THE MATCHING OF DIAPHRAGMATIC ELECTRICAL ACTIVITY AND TIDAL VOLUME IN COMPARISON TO PRESSURE SUPPORT (PS) UNDER NON INVASIVE VENTILATION

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INTRODUCTION. Neurally adjusted ventilatory assist (NAVA) is an assisted ventilatory mode based on the use of the electrical activity of the diaphragm (Eadi). With NAVA, Eadi triggers and cycles off the ventilator, thus improving patient-ventilator synchrony in patients both intubated [1] and under non invasive ventilation (NIV) in comparison with pressure support (PS).

OBJECTIVES. In each PS cycle, tidal volume (VT) results from the contribution of patient's inspiratory effort and ventilator fixed pressurization level (PSL). As in NAVA delivered inspiratory pressure is proportional to Eadi amplitude throughout inspiration, we hypothesized that NAVA allows a better matching between VT and Eadi.

METHODS. Prospective crossover study comparing PS and NAVA during NIV (20 min each). PS was set by the clinician while NAVA gain (proportionality factor between Eadi and delivered pressure) was set to obtain peak airway pressure (Ppeak) equal to total inspiratory pressure in PS (PSL + PEEP). For each respiratory cycle Eadi maximal value (Eadi max), VT, Ppeak and mean airway pressure (Pmean) were recorded. Mean ventilator respiratory rate (RR) was also determined. Comparisons between PS and NAVA were carried out by paired *t* tests. To assess the correlation between VT and Eadi max, a linear regression (Rlin) was performed for every patient under both conditions. Results are given as mean ± SD. For patients with a significant Rlin under both conditions, correlation coefficients (R^2), slopes and intercepts were compared with paired *t* tests. The ratio between VT and Eadi max was also calculated for each breath in each patient under both conditions and 5–95% range (Range 90) was assessed. The smaller the Range 90, the better the correlation between Vt and Eadi max. Range 90 between NAVA and PS were compared by paired Wilcoxon test, and presented as the median [IQR] for all patients.

RESULTS. 13 patients (age 71.6 ± 9.4 years, SAPS II 33 ± 7), 6/13 patients with COPD, 2/13 with mixed obstructive and restrictive disease. Ventilator settings: FIO_2 35 ± 13%, PEEP 5.9 ± 1.3 cm H_2O, PS 10 ± 2 cm H_2O. NAVA gain 0.55 ± 0.28 μV/cm H_2O, trigger NAVA 0.5 μV. Eadi max, Ppeak, Pmean, VT and RR were not significantly different between PS and NAVA. Rlin was significant for seven patients in PS, and for all patients in NAVA. R^2 was higher in NAVA than in PS: 0.36 ± 0.24 versus 0.04 ± 0.04 ($p = 0.01$). The slope was higher in NAVA than in PS: 8.1 ± 4.8 versus 0.3 ± 2.0 ($p = 0.002$). The intercept in NAVA was lower than in PS: 276 ± 157 versus 493 ± 108 ($p = 0.002$). For NAVA, the median [IQR] Range 90 was 14.3 [8.3–50.8] versus 45.0 [13.4–153.9] for PS ($p = 0.04$).

CONCLUSIONS. In patients undergoing NIV, the matching between Eadi and VT was tighter under NAVA compared to PS. As Eadi is likely related to inspiratory demand, these results suggest that NAVA delivers a more physiological ventilatory support. The clinical impact of these findings warrants further investigation.

REFERENCE. 1. Piquilloud, et al. Intensive Care Med. 2011;37:263.

0002

DOES A WEANING PROTOCOL FACILITATE LIBERATION FROM MECHANICAL VENTILATION IN TRACHEOSTOMIZED BRAIN-INJURED PATIENTS?

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INTRODUCTION. Although a life-saving intervention, mechanical ventilation is apt to unwanted side-effects and complications and should be interrupted as soon as possible. In acutely brain-injured patients, delaying weaning and liberation from mechanical ventilation increase the rate of ventilator-associated pneumonia, septic complications, and mortality. In neurologic and neurosurgical intubated patients, a systematic assessment of the patient's potential to be weaned off the ventilator has been demonstrated to reduce the risk of re-intubation following extubation failure, compared to the sole physician's clinical judgment.

OBJECTIVES. We undertook this multicentre randomized controlled trial to evaluate whether a systematic approach to weaning is superior to the physician's judgment in preventing weaning failure occurring within 48 h, in neurologic patients undergoing mechanical ventilation through a tracheotomic cuffed tube.

METHODS. Seventy-six neurosurgical and neurologic tracheotomized patients receiving mechanical ventilation were randomized to receive either protocolized weaning protocol (intervention group, IG) or a liberal weaning process according to the attending physicians' clinical judgment (control group, CG). Although in this last group the decision was left entirely to the discretion of the physicians, all the information collected and recorded for the IG were also available. The criteria for protocol failure were defined a priori. Patients were considered successfully weaned if they were not reconnected to the ventilator in the following 48 h.

RESULTS. We included 38 patients in both groups. The average age of the patients enrolled was 54 ± 15 in IG, and 43 ± 17 in CG ($p = 0.001$), while the ratio between female and male was 11/27, and 17/21, respectively. The SAPII score at ICU admission was 41 ± 12 for IG, and 36 ± 17 for CG ($p = 0.082$). On study enrolment, the GCS was 9 ± 1 and 9 ± 2, for IG and CG, respectively ($p = 0.14$). There was no significant difference with respect to weaning failure (7/38 in IG, 9/38 in CG); the days spent on mechanical ventilation were also no different between the two groups (17 ± 9 and 16 ± 8 days, for IG and CG, $p = 0.66$, respectively); the overall length of hospital stay was 22 ± 8 days in IG and 23 ± 9 days in CG ($p = 0.64$).

CONCLUSIONS. In tracheotomized brain-injured patients receiving mechanical ventilation arranging physiologic and clinical data in a systematic fashion by means of a written flow chart does not offer any advantage, as opposed to the sole clinical judgement.

0003

NON INVASIVE DETECTION AND QUANTIFICATION OF PATIENT-VENTILATOR DISHARMONY WITH THE SURFACE ELECTROMYOGRAPHIC ACTIVITY OF EXTRADIAPHRAGMATIC INSPIRATORY MUSCLES

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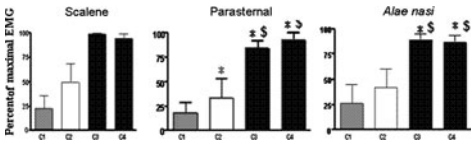
INTRODUCTION. Mechanical ventilation requires an optimal adequacy between the inspiratory effort of the patient and the assistance delivered by the ventilator. The absence of such adequacy defines the patient-ventilator disharmony. When severe, this disharmony is associated with increased length of mechanical ventilation. There is currently no simple and noninvasive method to detect patient-ventilator disharmony.

OBJECTIVE. Our study aimed at determine if the surface electromyographic (EMG) activity of extradiaphragmatic inspiratory muscles whose activity increase during loads application to the respiratory system could be a simple bedside tool to assess patient-ventilator harmony.

METHODS. Prospective study conducted in nine adult medical intensive care unit (ICU) patients intubated and mechanically ventilated in pressure support mode (PS). Were recorded the EMG activity of the scalene, parasternal, and Alae Nasi as well as the dyspnea-visual analogic scale (VAS), and the ATICE comfort score. Patients were studied under various ventilator settings in order to describe four conditions: C1 (PS ≥ 15 cm H_2O and expiratory trigger [ET] < 25%), C2 (PS ≥ 15 and ET ≥ 25), C3 (PS < 15 and ET < 25) and C4 (PS < 15 and ET ≥ 25).

RESULTS. Recording the surface EMG activity of the scalene, parasternal, and Alae Nasi muscles was feasible in all the patients. Decreasing the level of assistance by reducing the PS level (C3 and C4) or by increasing the ET level (C2 and C4), was associated with a significant proportional increase in the EMG activity of three muscles ($p < 0.05$, see figure), and was also associated with a significant increase of the dyspnea-VAS level ($p < 0.05$). In addition, there was a strong correlation between the EMG activity of the three muscles and dyspnea-VAS ($R^2 > 0.71$, $p < 0.05$).

CONCLUSIONS. The EMG activity of the scalene, parasternal and Alae nasi muscle parallels the level of assistance provided by the ventilator as well a the intensity of dyspnea. The surface EMG activity of extradiaphragmatic inspiratory muscles could provide a simple noninvasive and objective tool to help the clinician to optimize ventilator settings in order to reduce patient-ventilator disharmony.



Maximal EMG activity of scalene, parasternal and Alae Nasi in the four conditions. *$p < 0.05$ with C1 and $p < 0.05$ with C2

0004

EADI MONITORING DURING T-TUBE TRIAL IN PATIENTS WHO ARE DIFFICULT TO WEAN FROM VENTILATOR SUPPORT

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BACKGROUND. An assessment of mechanical lung function before extubation is essential, considering that a controlled ventilation can cause, in a short time, a severe injury of the diaphragm muscle. Aim of this analysis is to observe the modifications of a new index (EE = electrical effort) during a T-Tube Trial.

METHODS. We performed a 30 min T-tube test in 11 patients. We identified two populations, those who finished the T-tube trial (success patient) and those who failed the trial (failure patient). We registered for every patient vital parameters (heart rate, blood pressure), mode of ventilation, respiratory rate, EAdi, lung function (blood gas analysis, peripheral oxygen saturation) and alertness of the patient (motor activity assessment scale). The airway pressure, respiratory rate, flow and EAdi were acquired from the ventilator using the Servo-i commercial software *NAVA Tracker*. The EAdi signal was then integrated over time to obtain a new index: the electrical effort (EE, V*sec). In this preliminary evaluation we focused on respiratory rate (RR) and electrical effort (EE). We analysed these parameters in eight different periods: before disconnecting the patient from the ventilator (PRE_M), during last minute before disconnection (PRE_L), the first minute after the disconnection (D_F), the mean value during the whole disconnection (D_M), last minute before the reconnection (D_L), first minute after the reconnection ($POST_F$), the mean value during the whole reconnection period ($POST_M$) and last minute before the end of the registration ($POST_L$).

RESULTS. Seven patients finished the T-Tube Trial, whereas four patients failed. The respiratory rate (RR) showed an increase after the disconnection in both populations. In failure patient it decreased after reconnection quicker than in those who succeeded the T-tube test ($p < 0.05$) (Fig. 2). During the first minute of disconnection we observed an increase—but not a significant one—of the EAdi *sec signal (EE) in all the 11 patients. The EE index increases constantly during the whole T-tube test in the patients who failed the trial, until they were reconnected. On the contrary, patients who successfully finished the trial showed, after a first increase, a stabilisation of the EE index (Fig. 1).

CONCLUSION. Taking into account the very small sample of this study, the main finding is that the behaviour of the electrical effort index (EE) may help in identifying patient who will fail the t-tube trial.

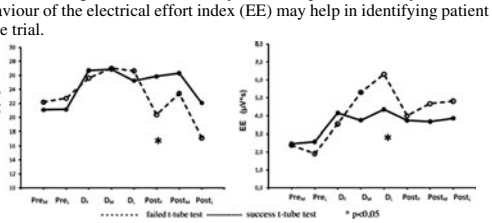

Fig. 1

0005

INCIDENCE OF INEFFECTIVE EFFORTS IN MECHANICALLY VENTILATED CRITICALLY ILL PATIENTS

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INTRODUCTION. Studies have shown that ineffective efforts (IEs) are a common problem during assisted mechanical ventilation and are associated with increased morbidity. In these studies this type of asynchrony was evaluated at ideal experimental conditions and during short periods of time (up to 30 min) making the reported incidence and the associated clinical consequences questionable

OBJECTIVES. The aim of our study was to assess the incidence of IEs during long periods of assisted mechanical ventilation in the "real life" ICU setting.

METHODS. Consecutive critically ill patients requiring mechanical ventilation for more than 24 h were screened for eligibility. Patients were included in the study if they were placed on assisted mechanical ventilation and expected to remain on assisted modes for the next 24 h. IEs were continuously evaluated using the PVI monitor (YRT, Winnipeg, Canada), a validated tool for IEs detection using a signal generated from flow, volume and airway pressure. Up to three 24 h periods of recordings during the first week on assisted mechanical ventilation were obtained. For a given period of time, IEs index was calculated by dividing the number of IEs (inspiratory and expiratory) by the total number of breaths (triggered mechanical breaths and IEs) and expressed as percentage. Severe asynchrony was defined as IEs index >10%. Both IEs index per hour and per epochs of 5 min were calculated. For each patient the epochs of 5 min intervals in which IE index was >10% were recognized and used to estimate the time spent with severe asynchrony during the course of assisted mechanical ventilation.

RESULTS. 98 patients were studied. The median duration of recording was 25 h (range 5–76 h), yielding a total of 2,886 h of recordings and 4,333,566 analyzed breaths [median 35,131 breaths per patient (range 6,554–142,853)]. Overall median IEs index per hour was 1.51% (IQR 0.57–3.05%), varying considerably between and within patients (mean coefficient of variation 130%, range 3–520%). In the majority of patients numerous clusters of severe asynchrony were observed; 62.25% of patients exhibited IEs index per hour >10% during at least 1 h of recording. The patients spent 4.93% (1.40–16.12%) [median (IQR)] of their time on assisted modes with severe asynchrony.

CONCLUSIONS. Patient-ventilator asynchrony of the type of ineffective efforts is a common but highly variable phenomenon. The incidence of IEs varies considerably within patients during the course of mechanical ventilation. Estimation of this asynchrony based on short observation periods may not be reliable making, thus, correlation with clinical outcomes questionable.

Hypothermia in cardiac arrest survivors: 0006–0010

0006

THERAPEUTIC HYPOTHERMIA AFTER OUT-OF-HOSPITAL CARDIAC ARREST IN FINNISH ICUS. THE FINNRESUSCI STUDY

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INTRODUCTION. Temperature targeted hypothermia (TTH) has improved outcome in out-of- hospital cardiac arrest (OHCA) patients with shockable rhythms (VF/VT) [1, 2]. However, the use of TTH has been recommended in all the patients chosen for active intensive care in updated resuscitation guidelines regardless of inadequate level of evidence [3]. Incidence of ventricular defibrillation (VF) has decreased during the past years in Finland, which may increase to use TTH in patients with non-shockable rhythms [4].

OBJECTIVES. We aimed to evaluate postresuscitation care, implementation of TTH, and outcome of ICU treated OHCA patients in Finland. Our secondary aim was to determine population based incidence and distribution of shockable and non-shockable rhythms of OCHA patients treated in ICUs.

METHODS. A prospective cohort study in 21 closed multidisciplinary ICUs in 20 hospitals in Finland. All OHCA patients admitted to ICUs in Finland were included this study during one-year period between March 2010 and February 2011. Data were collected prospectively using daily CRFs.

RESULTS. 580 patients treated after OHCA during 1 year were included to study. In total 312 (53.8%) had shockable rhythms (VF/VT), giving population based incidence 5.8/100,000. With non-shockable rhythms (ASY/PEA) presented 252 (43.4%) giving incidence 4.7/100,000. Without TTH were treated 279 (48.1%) and with TTH 301 (51.9%) patients. Data of primary rhythm is missing in 16 patients. Distribution of primary rhythms, ROSC-times and hospital mortality are presented in the table.

OHCA patients in Finnish ICUs

	VF/VT	PEA	ASY
n (%)	312 (53.8%)	115 (19.8%)	137 (23.6%)
TTH	225 (72.1%)	23 (20%)	48 (35%)
Without TTH	87 (27.9%)	92 (80%)	89 (65%)
ROSC median (IQR) minutes TTH	21.0 (16.0–28.5)	20.5 (15.8–26.5)	25.0 (18.3–31.8)
ROSC median (IQR) minutes without TTH	14.0 (10.0–23.0)	16.0 (10.0–24.0)	19.0 (10.0–25.0)
Age median (IQR) years TTH	62.0 (55.0–68.0)	60.0 (52.0–66.0)	62.5 (50.8–71.0)
Age median (IQR) years without TTH	72.0 (59.5–79.0)	67.5 (55.3–77.8)	64.0 (53.0–73.0)
Hospital mortality n (%) TTH	61 (27.1%)	12 (52.2%)	31 (64.6%)
Hospital mortality n (%) without TTH	35 (40.2%)	62 (67.4%)	53 (59.6%)

CONCLUSIONS. In this multicentre nationwide prospective observational study the use of TTH to OHCA patients from VF was rather well implemented in Finland. Of VF patients with ROSC between 10 and 35 min only 21.7% (26.8% of all with VF) were treated without TTH. Outcome of patients with non-shockable rhythm was not improved with the use of TTH (28.4% treated with). The incidence of ICU treated OHCA ventricular fibrillation (VF) seems to be decreasing as compared to previous reports [4].

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0007

AUDITORY EVOKED POTENTIALS PREDICT AWAKENING FROM POST-ANOXIC COMA AND THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. Awakening from post-anoxic coma is increasingly observed. Adequate prediction of neurological recovery after cardiac arrest (CA) and therapeutic hypothermia (TH) is thus an essential component of post-resuscitation care. Hypothermia alters prognostic accuracy. In this setting, we recently showed that electroencephalographic (EEG) study might improve outcome prediction.

OBJECTIVES. Here, we examined whether single-trial EEG analyses of auditory evoked potentials (AEPs) improve outcome prediction of post-anoxic coma. We primarily investigated the early predictive value of auditory processing to standard versus deviant sounds (i.e. the mismatch negativity, MMN).

METHODS. AEPs were recorded twice: during TH and immediately after re-warming in normothermic conditions (NT). We characterized responses to standard versus deviant sounds using voltage measurements at 19 electrodes over the scalp (voltage topographies), positioned according to the 10–20 international system. We first analyzed the difference in neural responses to standard sounds versus three deviant sounds ("deviant" = sound change in duration, location or pitch). For each subject, MMN was assessed by discriminating single-trial brain responses to standard versus deviant sounds. Discrimination was evaluated for each of the three types of deviants by computing the Area under the Receiver operating curve (AUC). Outcome prediction was obtained by comparing AUC values obtained during TH and NT. MMN analysis was automatic and blinded to patient outcome.

RESULTS. 21 patients with comatose CA treated with TH (33°C, 24 h) were studied. Change in the AUC value of MMN during TH versus NT was the most accurate predictor of awakening from coma. An improvement in AUC values from TH to NT was always observed in survivors (100% positive predictive value for successful awakening, Fig. 1). All non-survivors had a decrease in the AUC value between the two recordings (100% specificity for poor outcome).

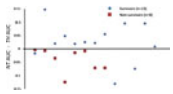

Figure 1

CONCLUSIONS. Early quantitative and automatic assessment of MMN is a strong predictor of outcome after CA and TH. An improvement in the discrimination of single EEG trials from standard versus deviant sounds was 100% predictive of successful awakening from post-anoxic coma.

REFERENCE 1. Tzovara A., Murray M.M., Plomp G., Herzog M.H., Michel C.M., De Lucia M. Decoding stimulus-related information from single-trial EEG responses based on voltage topographies. Pattern Recognition (in press).

0008

FEASIBILITY OF XENON IN COMBINATION WITH THERAPEUTIC HYPOTHERMIA AFTER OUT-OF-HOSPITAL CARDIAC ARREST

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INTRODUCTION. Post-cardiac arrest brain injury is the leading cause of in-hospital deaths after out-of-hospital cardiac arrest (OHCA) and it is estimated to account for 68% of all OHCA deaths [1]. Currently, therapeutic hypothermia is the state-of-the-art and also the only treatment capable to significantly decrease mortality and improve neurological outcome after OHCA [1]. Preclinical studies have consistently revealed that xenon has a powerful synergistic neuroprotective effect when combined with hypothermia [2–5].

OBJECTIVES. The purpose of this report is to demonstrate the feasibility of xenon in combination with therapeutic hypothermia in OHCA patients.

METHODS. Twenty-six adult patients admitted to the emergency room due to OHCA with ventricular fibrillation as initial cardiac rhythm were enrolled. After obtaining a written informed assent from the next of kin or the patient's legal representative within 4 h after arrival to the hospital patients were randomized into two treatment groups: (1) standard hypothermia treatment for 24 h with target temperature of 33°C (n = 14), (2) xenon inhalation with target concentration of 40% combined with standard hypothermia treatment for 24 h (n = 12). A PhysioFlex closed-system ventilator (Dräger, Lübeck, Germany) was used for xenon administration. Patients were treated and monitored according to Utstein style and to the latest recommendations by the International Liaison Committee on Resuscitation (ILCOR).

RESULTS. All twelve xenon patients were successfully treated with the combined therapy and have not suffered any suspected unexpected serious adverse reactions. The mean duration of xenon administration was 25.5 (SD 1.1) hours and the mean end-tidal concentration of xenon was 47.0 (2.3)%. The mean consumption of xenon was 59.4 l.

Feasibility data

	Xenon + Hypothermia n = 12	Hypothermia n = 14
Age (years), mean (SD)	60.4 (12.2)	59.8 (11.3)
Bystander resuscitation, n (%)	6 (50)	10 (71)
Acute coronary syndrome, n (%)	3 (25)	5 (36)
Resumption of spontaneous circulation (minutes), mean (SD)	21.5 (6.6)	22.0 (6.7)
Time to target temperature (minutes), mean (SD)	324 (74)	334 (71)
Left ventricular ejection fraction%, mean (range)	40 (20–60)	40 (20–60)
Suspected unexpected serious adverse reactions, n (%)	0 (0)	0 (0)
Mean arterial pressure during study treatments (mmHg), mean (SD)	81 (7)	83 (6)
Status epilepticus, n (%)	3 (25)	4 (29)

CONCLUSIONS. Xenon in combination with therapeutic hypothermia appears feasible in patients with OHCA. This study continues and may prove whether xenon is neuroprotective in humans and able to improve neurological and overall outcome of OHCA patients.

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GRANT ACKNOWLEDGMENT. (1) Academy of Finland; (2) Clinical Research funding (EVO) of Turku University Hospital.

0009

AN EXTREMELY RAPID AND SAFE WAY TO INDUCE HYPOTHERMIA IN POST-RESUSCITATION PATIENTS

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INTRODUCTION. Mild therapeutic hypothermia (MTH) is nowadays an established treatment to improve neurological outcome in patients after successful resuscitation. Preclinical data strongly suggest that timing and speed of induction of MTH are related to reduced secondary brain damage and improved outcome. Our department has extensive experience with MTH since 1998 with 50–100 MTH procedures per year.

OBJECTIVES. As part of a multicentre trial, we tested the application of MTH induced via the Velomedix Inc. automated peritoneal lavage system (APLS).

METHODS. The research ethics committee approved the multicenter study protocol. Consecutive eligible patients were included after informed consent by proxy. Patients with previous abdominal surgery were excluded. A multi-lumen peritoneal lavage catheter was inserted through a peritoneal access port (EndoTip, Karl Storz), thus allowing continuous peritoneal lavage with cooled Lactated Ringer's solution. This was done by using the Velomedix® APLS, aiming at a rapid induction and maintenance of MTH at 32.5°C. We compared the speed of induction with our standard method, using cooled saline IV infusion and cooled blankets, and with values mentioned in the literature.

RESULTS. Thirteen APL patients (M/F; n = 11/2) were included with the age of 61 ± 15 years (mean ± SD) and a BMI of 27 ± 3 kg/m^2. Cooling started within 177 ± 51 min after arrival at the hospital. All patients reached core target temperatures of 32.5°C within 25 ± 17 min after insertion of the catheter, with a slope of 7.4 ± 5.0°C/h. This cooling rate was much faster compared to most published data and our control group (0.75 ± 0.55°C/h; n = 99; $P = 0.009$). During the 24 h maintenance phase mean core temperature was 32.4°C (range 32.3–32.6°C), indicating steady maintenance and none of the APL patients showed overshoot of hypothermia. However, 24% of the control patients displayed core temperatures below 31°C. Furthermore, compared to APL patients the rewarming phase in control patients was three-times longer (446 ± 206 vs. 1121 ± 954 min, respectively; $P < 0.0001$). Neither shivering nor complications related to the insertion or use of the lavage catheter were observed.

CONCLUSION. Using the Velomedix® APL system in patients after successful resuscitation, MTH target temperature of 32.5°C is rapidly, unprecedented in clinical studies. Furthermore, in selected patients no complications were observed. This opens the way to investigate the beneficial effects on neurological outcome and survival of ultra-rapid cooling compared to standard cooling in controlled trials in various patient groups.

0010

ULTRA-RAPID COOLING IN PATIENTS WITH WITNESSED CARDIAC ARREST: RESULTS OF THE CAMARO TRIAL

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INTRODUCTION. Induction of mild hypothermia (32–34°C) in the hours after cardiac arrest improves neurological outcome. Earlier and more rapid induction of hypothermia may further improve outcome. Furthermore, many side effects of hypothermia occur in the induction phase, and achieving more rapid cooling may decrease the risk of such side effects. Finally, there is evidence suggesting that hypothermia applied before a coronary intervention can reduce myocardial infarct size.

OBJECTIVES. (1) To assess feasibility, safety and cooling speed of a novel cooling device, automated peritoneal lavage, which uses continuous flushing of the peritoneal cavity with ice-cold fluids to induce and maintain hypothermia. (2) To assess neurological outcome at 6 months in patients with witnessed CA treated with this device, and compare these outcomes to the published literature.

METHODS. Hypothermia was induced using an automated peritoneal lavage system (APLS), manufactured by Velomedix Inc, Palo Alto, USA. The aim is to enroll 70 patients with witnessed cardiac arrest, 50 with an initial rhythm of VT/VF and 20 with asystole or PEA. Seven centers are participating in this study, which is part of preparations for a larger trail to apply this new technology in awake patients with acute ST wave myocardial infarction (STEMI), with the aim of using hypothermia to reduce myocardial infarct size.

RESULTS. So far 45 patients with witnessed cardiac arrest have been enrolled. Average time to temperature <34°C was 5.12 min, representing an average cooling rate of 14°C/h. To our knowledge this is significantly faster than any cooling rate reported in the literature so far. 20 patients underwent a coronary intervention for STEMI under hypothermic conditions; infarct size data on these subjects will also be presented at the ESICM congress. A temperature of 32.5°C was maintained for a period of 24 h in all patients using the APLS system, which was followed by slow and controlled re-warming. No device or procedure related complications have occurred so far in our study. At the time of this abstract writing outcome data were available for 23 patients with an initial rhythm of VT/VF. Of these 23, 26% (n = 6) have died, while 74% (n = 17) had a complete neurological recovery (CPC 1). Thus, so far our results show the best neurological outcomes in VT/VF arrest reported in the literature.

CONCLUSIONS. Automated peritoneal lavage is a safe and effective method of rapidly inducing and maintaining controlled hypothermia in patients with cardiac arrest. Cooling rates observed in our study are extremely rapid and the method appears to be safe. The high rates of favorable neurologic outcome in our study may indicate additional benefits of rapid cooling, either from faster delivery of treatment or reduction of side effects by shortening of the induction phase of cooling.

GRANT ACKNOWLEDGMENT. This study was funded by the manufacturer of the APLS device.

New insights into the pathophysiology of sepsis: 0011–0015

0011

HYDROGEN SULPHIDE RESTORES ATP AVAILABILITY BY INCREASING THE EXPRESSION OF A-TUBULIN AS A REGULATOR OF VOLTAGE DEPENDENT ANION CHANNEL (VDAC) AND REDUCES ORGAN DAMAGE CAUSED BY PNEUMOCOCCAL PNEUMOSEPSIS IN RATS

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INTRODUCTION. Mitochondrial dysfunction is one of the sequelae of sepsis. Hydrogen sulphide (H_2S) was shown to protect mitochondria from ischemia reperfusion injury. The mechanism of this protective effect of H_2S is not entirely known, but may involve voltage dependent anion channel (VDAC), which is an important regulator of ATP transport out of the mitochondria.

HYPOTHESIS. H_2S reduces organ damage by improving mitochondrial respiration and increasing ATP availability in a rat pneumosepsis model.

METHODS. After intratracheal challenge with 5.9×10^6 colonizing forming units (CFU) of *Streptococcus pneumoniae*, rats were sedated, connected to a mechanical ventilator and infused with H_2S donor NaHS (2 mg/kg/h, n = 8 per group). Infected and uninfected controls received saline. ATP concentrations and ATP/ADP ratios were measured in liver freeze clamp biopsies and by measuring oxidative phosphorylation in isolated mitochondria ex vivo. The expression of VDAC and α-tubulin in mitochondrial fractions were measured by Western blot and the results are expressed as ratio to prohibitin. Organ injury was determined by measuring protein leak and edema of lung and kidney (mean ± SEM).

RESULTS. Pneumonia resulted in local and distant bacterial outgrowth with 36% positive blood cultures and increased lung and kidney wet weight and protein leak, which were associated with reduced mitochondrial oxygen consumption (16 ± 1 vs. 24 ± 4 nmol/min/mg) and a decrease in ATP concentration (4 ± 2 vs. 25 ± 5 pmol/mg protein) and ATP/ADP ratio (1 ± 0.4 vs. 10 ± 0.4), while expression of VDAC (2.8 ± 0.5 vs. 1.7 ± 0.1) and α-tubulin (1.5 ± 0.4 vs. 0.7 ± 0.1) were increased ($p < 0.05$ for all). Infusion of H_2S reduced lung and kidney wet weight and protein leak. H_2S reversed the fall in oxidative phosphorylation (20 ± 0.5 O_2 nmol/min/mg), as well as of ATP concentration (15 ± 4 pmol/mg protein) and ATP/ADP ratio (2 ± 0.4), by increasing expression of α-tubulin (2.0 ± 0.1, $p < 0.05$ for all), which can induce closure of VDAC. Expression of VDAC was non-significantly decreased to 2.1 ± 0.3.

CONCLUSIONS. H_2S reduced pulmonary and distant organ injury during pneumosepsis, by improving ATP availability, which may be regulated by mitochondrial upregulation of VDAC regulator α-tubulin.

0012

ROLE OF PI3KGAMMA IN THE REGULATION OF ADHESION AND JUNCTION MOLECULES LEADING THE PULMONARY INFLAMMATION AND PERMEABILITY DURING SEPSIS

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INTRODUCTION. Sepsis is a leading cause of death in intensive care units, which often progresses to multiple organ failure [1]. Lungs are often the first organ to succumb to septic damage, where pulmonary accumulation of inflammatory cells is implicate in mediating increased endothelial permeability leading to edema [2]. Our previous study established phosphoinositide 3-kinase gamma (PI3Kgamma) as a key molecule in the pathogenesis of septic infection and demonstrated that the inhibition of its kinase activity reduces lung damage, in part through the improved neutrophil migration to the site of infection [3].

OBJECTIVE. The aim of this study is to clarify the specific role of PI3Kgamma in the regulation of the cell adhesion molecules, adherens and tight junction proteins, involved in the mechanisms of pulmonary leukocyte migration and endothelial permeability during sepsis.

METHODS. PI3Kgamma wild-type (WT), knockout (KO) and kinase-dead (KD) mice were randomized to undergo either cecal-ligation and perforation (CLP)-induced sepsis or a sham laparotomy. After 18 h, lungs were collected and underwent either fixation in OCT or tissue homogenization. Lysate of lung homogenate was used for western blot analysis of ZO-1, phosphorylated and total VE-cadherin, ICAM-1, and VCAM-1, and fixed lung sections were used for immunofluorescence analysis of ZO-1 and ICAM-1.

RESULTS. In WT mice CLP-induced sepsis, known to induce pulmonary edema and inflammation [3], induced a significant down-regulation of ZO-1 ($p = 0.001$) and VCAM-1 ($p = 0.001$) expression and increased expression of ICAM-1 ($p = 0.02$) and pVE-cadherin ($p = 0.02$) with respect to sham controls. Furthermore, these alterations in ICAM-1 and ZO-1 were confirmed by IF. In contrast, there were no significant alteration observed in ZO-1, pVE-cadherin, ICAM-1 or VCAM-1 following CLP in both PI3Kgamma KO and KD mice.

CONCLUSION. Our data demonstrate that mice lacking PI3Kgamma kinase activity are safeguarded from alterations in the tight junction molecule ZO-1 and the adherens junction protein VE-cadherin, which likely contributes to their protection against septic-induced lung edema[3]. Moreover, the expression of the inflammatory adhesion molecules ICAM-1 and VCAM-1 are uniquely preserved following CLP in the absence of PI3Kgamma activity, which is associated with reduced pulmonary inflammation and leukocyte requirement [3]. Therefore, PI3Kgamma appears to contribute to septic-induced lung damage and dysfunction through a kinase-dependent modulation of permeability and inflammatory adhesion molecules.

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0013

RESISTANCE OF ALVEOLAR MACROPHAGE TO ENDOTOXIN TOLERANCE IS NOT «ENDOTOXIN» SPECIFIC

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INTRODUCTION. Endotoxin tolerance (ET) was initially discovered as a decrease in fever response after iterative encounter with "bacterial pyrogens" [1]. The concept of endotoxin (lipopolysaccharide, LPS) tolerance is illustrated by a decrease production of proinflammatory cytokine by monocytes and macrophages in response to LPS. Moreover, LPS is not the only component able to induce tolerance in mononuclear phagocytes [2] but other pathogen associated molecular patterns (PAMPs) can lead to the same phenomenon.

OBJECTIVES. To assess the potential tolerance of alveolar macrophages (AM) in response to iterative in vitro stimulation with LPS or other Toll-like receptor (LTR)-agonists (TL2-, TLR3- and TLR9-agonists) and to study the response to the same (homotolerance) or different (crosstolerance) agonist.

METHODS. We studied in vitro primary AM from BALB/c mice. AM were submitted to 2 successive 24 h stimulations by different TLR-agonists (*Salmonella abortus equi* LPS, Pam3CSK4, CpG, Poly I:C), TLR4-, TLR2-, TLR9- and TLR3-agonists, respectively. TNF production was assessed after the second stimulation as readout.

RESULTS. We confirmed the absence of tolerance of AM to LPS, previously reported in an ex vivo model [3]. Interestingly neither TLR2 nor nine iterative stimulation was able to induce a homotolerance by AM. A first stimulation by TLR3 agonist was even responsible of a priming of AM to a second stimulation by poly I:C. Cross-stimulations showed a priming effect when LPS, Pam3CSK4 or poly I:C were used as the first TLR-agonist whatever was the second stimulation. CpG induce a priming effect for TLR4- and TLR2-agonists but not for poly I:C.

CONCLUSIONS. AM are resistant to develop endotoxin tolerance either ex vivo [3] or in vitro, and more widely to any "TLR-agonist tolerance". A priming effect was even often observed during cross-stimulations underlying the singularity of AM in response to PAMPs and suggesting the influence of the lung microenvironment.

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GRANT ACKNOWLEDGMENT. This work was supported by the "Chancellerie de Paris-Legs Poix".

0014

TIME-DEPENDENT ALTERATIONS OF VEGF AND ITS SIGNALING MOLECULES IN ACUTE LUNG INJURY IN A RAT MODEL OF SEPSIS

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INTRODUCTION. Sepsis in human is a disease state associated with a generalized activation and expression of inflammatory signaling pathways [1]. Molecular mechanisms of sepsis-associated acute lung injury (ALI) are poorly defined. Vascular endothelial growth factor (VEGF), a potent inducer of endothelial cell growth in vitro and angiogenesis in vivo, plays a crucial role in a variety of disease conditions through the promotion of angiogenesis and by its vaso-permeability effects [2]. Since VEGF is a potent vascular permeability and mitogenic factor, it might contribute to the development of ALI in sepsis.

OBJECTIVES. It is essential that the specific role of factors that regulate pulmonary vasculature in sepsis-associated fatalities be delineated.

METHODS. We used LPS-induced endotoxemia in a rat model, to study the time-line or chronological sequence of VEGF expression pattern, and its basic signaling machinery in lung tissues. Moreover, the extent of LPS-induced lung injury was assessed by histology, blood gas analysis and by determining pulmonary wet to dry weight ratio and bronchoalveolar lavage fluid (BALF) albumin level. In the second part of this study, we assessed the effects of blockade of Flt-1 on the plasma and pulmonary levels of key target molecules.

RESULTS. Levels of pulmonary VEGF and its angiogenic-mediating receptor, Flk-1, were down regulated by LPS in a time-dependent manner; Levels of plasma VEGF and its permeability-mediating receptor, Flt-1, in contrast, was up regulated with time. In addition, blockade of Flt-1 could improve the down-regulated pulmonary VEGF level and attenuate the elevated plasma and pulmonary levels of TNF-α, followed by improvement of arterial oxygenation and wet-to-dry weight ratio of the lung. Expression of signaling, pro- and or apoptotic factors after LPS administration were as follow: phosphorylated Akt, a downstream molecule was down regulated time-dependently; endothelial nitric oxide synthase (eNOS) levels were significantly reduced; pro-apoptotic markers Caspase-3 and Bax were up regulated, whereas, levels of Bcl-2 were down regulated.

CONCLUSIONS. VEGF may play a role through the expression of Flt-1 in LPS-induced ALI. Moreover, down regulation of VEGF signaling cascade may account for LPS-induced apoptosis and impaired physiological angiogenesis in lung tissues, which in turn may contribute to the development of ALI induced by LPS.

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GRANT ACKNOWLEDGMENT. This work was supported by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science, Sports and Culture of Japan.

0015

DETRIMENTAL EFFECTS OF ARGINASE-1 DEFICIENCY ON THE MICROCIRCULATION AND NO PRODUCTION DURING SEPSIS

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INTRODUCTION. Sepsis is characterized by a disturbed arginine (ARG)-Nitric Oxide (NO) metabolism and impaired microcirculation. Increased ARG catabolism by arginase-1 is considered an important contributor to decreased ARG availability for eNOS-derived NO production and, therefore, probably the main cause of microcirculatory dysfunction. To better understand the role of enhancing ARG availability in sepsis, we tested the impact of manipulating the arginase-1 (Arg-1) activity by studying an endothelial-specific Arg-1-deficient mouse (Arg-1-KO).

OBJECTIVE. To investigate whether endothelial Arg-1 deficiency results in enhanced intracellular NO production and improved microcirculation during endotoxemia.

METHODS. Arg-1-KO mice received either a continuous intravenous endotoxin (LPS, 200 μg total) or a sterile saline infusion for 18 h, after which mice were sacrificed, and blood and tissue were sampled. Amino-acid concentrations in plasma and tissue were measured by HPLC. For model verification, basal plasma ARG levels were compared to concentrations in wild-types (WT). Side stream darkfield-imaging was used to evaluate the microcirculation in jejunal villi. Images were analyzed with AVA 3.0 by two independent investigators.

RESULTS. Endotoxin infusion into Arg-1-KO mice did not influence plasma ARG, citrulline (CIT) or ornithine (ORN) concentrations, but intracellular Arg and ORN concentrations were significantly decreased compared to control mice (ARG; 193 vs. 587 nmol/g tissue, $p < 0.05$; ORN; 88 vs. 166 nmol/g tissue, $p < 0.05$), whereas CIT concentrations were similar to control. Total and perfused vessel density, the microvascular flow index, the number of perfused small vessels (small $\leq$ 10 μm) and total number of perfused vessels were all significantly decreased in the LPS group compared to control. Furthermore, the heterogeneity index was increased in the LPS group (0.30) compared to control (0.08, $p < 0.01$).LPS infusion resulted in significantly decreased jejunal eNOS mRNA expression compared to control ($p < 0.05$) and a trend towards enhanced iNOS expression ($p = 0.057$). In addition, LPS infusion resulted in significant enhanced jejunal Arg-2 expression ($p < 0.01$). Basal plasma ARG concentrations were significantly increased in Arg-1 KO control (150 μmol/L) compared to WT mice (70 μmol/L, $p < 0.001$).

CONCLUSIONS. Endothelium-specific deletion of Arg-1 doubles circulating ARG levels, but does not protect against deterioration of the intestinal microcirculation and eNOS expression, or increased iNOS and arginase-2 expression during endotoxemia. These results underscore our earlier findings that arginine supplementation does not protect against deleterious effects of endotoxemia. Furthermore, tissue ARG levels do not reflect the tissue capacity to produce NO. The increased expression of Arginase-2 apparently does affect tissue Arg levels, but whether it affects NO synthesis remains to be investigated.

GRANT ACKNOWLEDGMENT. Elli Lily Sepsis Elite Award 2008, ISF Award 2010.

Patient safety outside ICU: 0016–0020

0016

IMPACT OF INTRA-HOSPITAL TRANSPORT IN VENTILATED CRITICALLY ILL PATIENTS

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Intra-hospital transport (IHT) of critically ill patients is routinely required for diagnostic or therapeutic procedures in daily practice. Complications in IHT may be life threatening [1].

OBJECTIVES. To describe IHT related adverse events (AE) in ventilated critically ill patients: (1) incidence of AE related to the first IHT (2) description of targeted AE, evolution of SAPS II post-IHT, outcome in ICU.

METHODS. 6252 ventilated patients (invasive mechanical ventilation) from a multicentric (12 ICU) database were prospectively considered. Statistical analysis included: (1) description of demographic and clinical characteristics of the cohort, (2) identification of risk factors for IHT and construction of a propensity score to be transported, (3) matched exposed/non exposed study to compare IHT related AE (IHT to operating room excluded).

Matching criteria: propensity score, length of stay (LOS) and confounding factors on day before IHT. A written procedure but no check-list was available for IHT at each ICU location.

RESULTS. IHT was required for 28.7% patients. 3,006 IHT were performed for 1,782 patients (1–17 IHT/patient). Transported patients had higher SAPS II (52 ± 19.2 vs. 49.4) at admission, higher ICU LOS (12 days [6; 23] vs. 5 [3; 11] and higher ICU mortality (31.4% vs. 28.7%), $p < 10^{-4}$). 37.4% patients exhibited complications post-TIH. Risk factors associated with IHT included in the propensity score were: origin (transfert) and type of patients, diagnosis at admission and SAPS II. 1,782 transported patients were matched with 4,460 non transported patients. After adjustment transported patients were at higher risk of AE (OR 2,1, IC 95% [1.7–2.3], $p < 0.0001$), i.e. pneumothorax (OR 3.2, IC95% [1.7–6.4], $p = 0.0005$, atelectasis (OR 3,4, IC95% [1.6–7; 2], $p = 0.001$), ventilator associated pneumonia (OR 1,5 IC95% [1.1–2.0] $p = 0.001$), hypo (OR 2 IC95% [1.3–2.9], $p = 0.0008$) and hyperglycemia (OR 2,5 IC95% [2.1–3], $p < 10^{-4}$). Transported patients had a significant longer post-IHT ICU LOS with non significant mortality rate (OR = 0.9, IC 95% [0.7–0.9], $p = 0.9$).

DISCUSSION. Conditions (planned vs. emergency IHT), medical supervision (senior vs. junior), context (off-hours, workload, ICU occupancy) and effective impact of IHT in patient's management are limiting factors for direct IHT imputability in targeted AE occurrence. However, these data highlight the potential consequences of IHT rising the need for a benefit/risk evaluation and preventive measures (check-list).

CONCLUSION. IHT is a procedure at risk for AE in ventilated critically ill patients justifying a dedicated policy in a continuous quality improvement program.

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0017

THE IMPACT OF THE RAPID RESPONSE TEAM (RRT) ON PATIENT OUTCOME

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INTRODUCTION. Despite conflicting evidence, RRTs are widely used in several countries. In the USA, it has become one of the quality indicators.

OBJECTIVES. To determine the impact of RRT on severity of illness at ICU admission and hospital mortality of patients transferred from the hospital ward to the ICU. We hypothesized that early ICU admission from the ward and ICU care associated with RRT will improve survival.

METHODS. This retrospective study was performed at one of the Mayo Medical Center, Saint Marys Hospital, Rochester, MN. Patients transferred to the ICU from the hospital ward were included. The hospital has been staffed 24 h a day at least by residents and fellows and attending staff in the ICU. The RRT was introduced to the hospital in September 2006 and disseminated to the whole hospital by March of 2007. The pre-RRT period included the time from August 2003 to September 2006 and the RRT period from April 2007 to September 2009. Comparison was made between the pre-RRT and RRT periods. APACHE III predicted mortality was used in the multiple logistic regression analysis for hospital mortality. P values < 0.05 were considered statistically significant.

RESULTS. A total of 4890 patients, 2,466 pre-RRT and 2,424 RRT, were included in the study. The pre-RRT patients were sicker, mean acute physiology score 48.3 versus 45.7, mean APACHE score 63.2 versus 60.9, and predicted mortality 25.1% versus 23.0%. The ICU and hospital mortality were similar between the two groups. When adjusted for severity of illness, RRT was associated with increased mortality, odds ratio (95% confidence interval) 1.273 (1.089–1.490), p value 0.002.

CONCLUSIONS. RRT facilitates early transfer of patients from the hospital ward to the ICU. However, the hospital mortality has not improved.

0018

A COMPARISON OF LOCAL AND PROPOSED NATIONAL 'NHS' EARLY WARNING SCORING SYSTEMS

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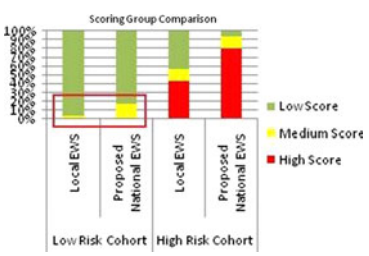
INTRODUCTION. UK hospitals are advised to use early warning scores (EWS) to monitor all adult patients however they are given autonomy to construct there own scoring systems. Thus, numerous local scoring systems are used with different parameters and weighting. Few of these local systems have been formally validated. Recently this disparity was recognised by the Royal College of Physicians and a task force has been commissioned to create a standardised 'NHS' EWS (NEWS). A preliminary scoring system and trigger numbers have now been released awaiting stakeholder review.

A national scoring system is likely to impact hospitals in several ways. As well as the logistics of implementing a new system it may effect critical care resource allocation. If the new scoring system triggers too easily it will increase referrals to the critical care team which may overstretch current service provisions. However, if it better identifies deteriorating patients it will benefit patient safety and may even reduce pressure as patients will treated promptly preventing further deterioration. Predicting the impact of the new system will allow for preparation to ensure effective implementation. In light of this a cohort study was carried out to compare the current EWS and the proposed 'NHS' EWS in a UK general hospital.

METHODS. Observation recordings from a high risk cohort of thirty patients taken at the time of a referral to critical care were collected over a four-week period. An equivalent number of observations were collected from randomly chosen low risk patients on general wards. Current EWS and NEWS were generated for both. The average scores and the numbers in each scoring group were compared.

RESULTS. The greater disparity in average score for the high risk cohort compared to the low risk cohort indicates that the new scoring system may pick out deteriorating patients with greater accuracy. However, when scoring groups were analysed, over five times as many patients in the low risk group would have required medical review according to the proposed national scoring system (highlighted in red box).



Scoring Group Comparison

CONCLUSIONS. The new scoring system may contribute towards patient safety. However, it is also likely to increase the work load of medical teams. An increase in inappropriate referrals may negatively impact upon staffs attitudes towards EWS. Further research and consideration will support effective adoption of the new national EWS at a local level.

0019

A SURVEY OF PATIENTS UNDERGOING HEAD COMPUTED TOMOGRAPHY SCANS WHILST ON A MIXED SURGICAL/MEDICAL INTENSIVE CARE UNIT IN A TERTIARY CARE LONDON TEACHING HOSPITAL

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INTRODUCTION. Head computed tomography (CT) is a frequently employed diagnostic tool in critically ill adults but exposes patients to the risks involved with intra-hospital transport and utilises valuable staff resources. There are a wide range of clinical situations where head imaging may be deemed appropriate in prognostic and therapeutic terms but frequently yield negative results and do not lead to any change in ongoing management.

OBJECTIVES. We aimed to survey the use of head CT in our own institution to establish the service burden, indications for ordering CT head scans and any changes in patient management after results were obtained.

METHODS. All patients who had a CT head whilst on intensive care at St. Thomas's Hospital, London between April 2008 and July 2010 were identified retrospectively. The intensive care unit takes a mix of medical and surgical patients (no neurosurgery). Data was collected using an electronic patient record system and a standardised proforma was used to categorise the data.

RESULTS. 356 head CT scans were carried out on 309 patients representing 12.9% of total admissions to ICU. 33% of all CT scans demonstrated an acute abnormality.

Reasons for requesting a head CT

Indication for request	Number of CT scans performed	Percentage of abnormal scans for each request reason %
New focal neurology	107	23.4
Reduced level of consciousness (nil focal)	70	15.1
Unresponsive after discontinuation of sedation (nil focal)	53	12.9
Confused/agitated (nil focal)	48	8.3
Seizure	34	5.9
Other	44	9.1

Evidence of a direct change in management as a result of CT imaging was found in 29% of all cases. This was not exclusively as a result of an abnormal CT result. 19% of the scans were performed outside normal working hours and lead to a direct change in management in 40% of cases.

CONCLUSIONS. Previous studies have attempted to determine if clinical findings can predict abnormal CT results without success. Our study had similar results and supports the view that clinicians should have a low threshold for CT head imaging. The significant proportion of CT imaging taking place out of hours at our institution may indicate the need to review criteria for ordering a scan during this period. Given the frequency of this investigation on ICU the use of a dedicated portable head CT scanner may improve standards of care and also have economic advantages.

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0020

INTRAHOSPITAL CRITICAL CARE TRANSFERS: ARE WE TAKING THEM SERIOUSLY ENOUGH?

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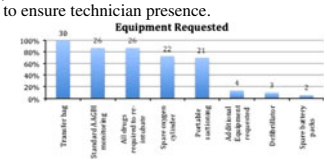
INTRODUCTION. Despite evidence showing a high incidence of complications during intrahospital critical care transfer [1], UK national guidelines have yet to be published. We report current practice and adverse event rates in a tertiary referral centre in the UK.

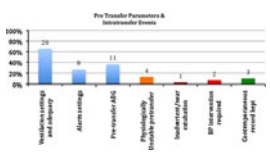
OBJECTIVES. (1) To determine current practice in critical care intrahospital transfer. (2) To reveal the incidence of complications.

METHODS. A proforma was designed with reference to ANZCA [2] standards. The monitoring period was from 17/11/2010 to 28/1/2011. The proforma was divided into two parts. The critical care technician accompanying the transfer completed the first part prospectively. The second part was collected retrospectively by analysing data from the computer record.

RESULTS. There were 30 intrahospital transfers. The minimal grade of doctor was Specialty Registrar year 3 (ST3). Mean transfer time was 41 min. All transfers recorded were between 0800 and 2000 hours to ensure technician presence.



Variability of transfer equipment requested



Pre-transfer checks/instability; problems; records

The results demonstrate there is poor clinical assessment of the patient and ventilator/alarm settings pre-transfer, and poor documentation of the transfer. There is a varied practice in choosing pre-transfer equipment. Only a small number of transfers (13%) were performed on unstable patients. There was a 10% adverse event rate, which is lower than published data [1, 2].

CONCLUSIONS. Despite relatively experienced doctors with experienced staff accompanying, there still remains a measurable adverse event rate in critical care patients. A clear policy and formal staff training is needed to optimise safety and minimize the attendant risks associated with intrahospital transfer.

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Indicators for organ dysfunction in the perioperative environment: 0021–0025

0021

PREDICTORS OF ACUTE KIDNEY INJURY AFTER CARDIAC SURGERY. ANALYSIS OF ARIAM REGISTRY OF CARDIAC SURGERY

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INTRODUCTION. The development of AKI is a serious complication related to mortality in postoperative patients after cardiac surgery.

METHODS. Observational, prospective and multicentric study of patients after major cardiac surgery (pacemaker implantation excluded) included in ARIAM registry of Andalusian community from March 2008 to January 2011. We analyzed factors related to development of AKI in postoperative period (defined as Creatinine >2 mg/dl). Qualitative variables are shown as percentage and quantitative as mean and standard deviation. We used Chi square test or student *t* as necessary and multivariate logistic regresión to define independent predictors of AKI development.

RESULTS. We analyzed 4,690 patients from 13 hospitals, with 63 ± 12 years and 60.3% were male gender. Prevalence of diabetes was 31.4% and high blood pressure 61%. Surgery was urgent in 12.7%. Euroscore at admission was 5.8 ± 3.1. 10.8% of patients developed AKI during ICU length of stay, and these patients had higher mortality [p = 0.0001. OR 3,9 IC95%(3–4.9)].

Bivariate study revealed some factors related to development of AKI, such as: Age (p = 0.0001), weight (0.029), EFLV (p = 0.0001) y on pump time (p = 0.0001), urgent surgery (p = 0.0001. OR 2,9 IC95% 2.3–3.6), diabetes (p = 0.028. OR 1,2 IC95% 1.02–1.52), high blood pressure (p = 0.001. OR 1,4 IC95% 1.1–1.7), congestive heart failure (p = 0.0001. OR 1,6 IC95% 1.3–1.9), COPD (p = 0.0001. OR 1,6 IC95% 1.2–2.1), pulmonary hypertension (p = 0.0001. OR 1,78 IC95% 1.3–2.2), Chronic renal failure (p = 0.0001. OR 5,4 IC95% 3.9–7.4), no previous treatment at home (p = 0.04. OR 0,62 IC95% 0.3–0.9), anticoagulants (p = 0.0001. OR 1,5 IC95% 1.3–1.9), diuretics (p = 0.0001. OR 1,9 IC95% 1.6–2.3), Angiotensin enzyme inhibitors (p = 0.0001. OR 1,4 IC95% 1.1–1.7) and protamin (p = 0.0001. OR 2,1 IC95% 1.4–3.2).

Multivariate analysis are shown in Table 1:

Multivariate analysis of AKI development

	Sig	OR	CI 95% (inf–sup)
Urgent surgery	0.0001	2.61	1.9–3.4
Age	0.0001	1.03	1.02–1.05
Angiotensine enzyme inhibitors	0.007	1.4	1.1–1.8
On pump time	0.0001	1.009	1.007–1.011
COPD	0.023	1.4	1.05–2.01

CONCLUSIONS. Development of AKI in early postoperative cardiac surgery has a prevalence of 10.8% and is related to mortality. Age, COPD, treatment with angiotensive enzyme inhibitors, urgent surgery and time on pump are independent risk factors of AKI development.

GRANT ACKNOWLEDGMENT. ARIAM Secretary.

0022

EARLY LACTATE CLEARANCE AS A RELIABLE PREDICTOR OF INITIAL POOR GRAFT FUNCTION AFTER ORTHOTOPIC LIVER TRANSPLANTATION

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INTRODUCTION. Nowadays, liver transplantation has evolved as an effective therapeutic modality for patients with end-stage liver disease. Early graft function after liver transplantation is an important prognostic marker for the individual outcome. Initial poor graft function (IPGF) may be related to the quality of the donor organ which is potentially associated with secondary complications. For this reason, to identify a simple and reliable early indicator of IPGF could contribute to the improvement of outcomes after liver transplantation.

OBJECTIVES. The purpose of this study was to examine the utility of early lactate clearance as a predictor for IPGF of liver transplantation.

METHODS. This was a prospective observational study of 222 patients referred to surgical intensive care unit after OLT. The IPGF group consisted of patients with alanine aminotransferase (ALT) and/or aspartate aminotransferase (AST) above 1500 IU/L within 72 h after OLT. Early lactate clearance was defined as following: lactate at SICU presentation (hour 0) minus lactate at hour 6, divided by lactate at SICU presentation. Model for end-stage liver disease (MELD) score, Child-Pugh score and laboratory data including AST, ALT, total bilirubin (TB) and prothrombin time (PT) were recorded at SICU presentation and compared between non-IPGF group and IPGF group. Receiver operating characteristic (ROC) curves were plotted to measure the performance of the early lactate clearance, MELD score, Child-Pugh score, TB and PT.

RESULTS. IPGF occurred in 45 of overall 222 patients (20.3%). The early lactate clearance in non-IPGF group was significantly higher than that in IPGF group (43.2 ± 13.8% vs. 13.4 ± 13.7% $P < 0.001$). The optimum cut-off value for early lactate clearance predicting IPGF was 24.8% (sensitivity 95.5%, specificity 88.9%). The area under the curve of the ROC was 0.961, which was significantly superior to MELD score, Child-Pugh score, TB and PT. Patients with early lactate clearance ≤24.8% had higher IPGF rate (OR = 169) and higher risk of in-hospital mortality (OR = 3.625).

CONCLUSIONS. Early lactate clearance could serve as a prompt and accurate bedside predictor for IPGF. Patients with early lactate clearance less than 24.8% are associated with higher incidence of IPGF.

0023

PROGNOSTIC VALUE OF THE CENTRAL VENOUS-TO-ARTERIAL CARBON DIOXIDE DIFFERENCE (PCO_2GAP) AT ICU ADMISSION AFTER HIGH-RISK SURGERY

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INTRODUCTION. Multiple organ failure is a major cause of postoperative death in high-risk surgical patients. Early identification of persistent tissue hypoperfusion is therefore of particular importance.

OBJECTIVES. To evaluate the prognostic value of the PCO_2gap, a global index of tissue perfusion, in patients after major surgery.

METHODS. A one-year observational study of 115 patients admitted in the ICU after major surgery. In all, measurements of the PCO_2gap, central venous oxygen saturation ($ScvO_2$), serum lactate, and conventional haemodynamic and biological parameters were obtained at admission (H0) and every 6 h until 12 h. Postoperative complications, the need for vasopressors, duration of mechanical ventilation, length of stay and mortality up to 28 days were characterized using standard definitions.

RESULTS. A total of 57 patients (50%) developed postoperative septic complications, including 28% of pneumonia and 15% of intraabdominal abscess. Hospital mortality was 8%. Vasopressors were needed in 47% of patients. Patients who developed complications were more severely ill on ICU admission: SAPS II, 25 ± 10 versus 19 ± 10 ($P = 0.017$); SOFA, 7.4 ± 4.5 versus 2.1 ± 2 ($P < 0.001$).

There was a significant difference in PCO_2 gap (8.1 ± 3.2 mmHg vs. 5.5 ± 2.8 mmHg, $P < 0.001$), $ScvO_2$ (76.5 ± 6.4% vs. 78.9 ± 5.8%, $P < 0.001$) and serum lactate (1.89 ± 1.52 mmol/L vs. 1.25 ± 0.7 mmol/L, $P < 0.001$) between patients with and without complications. After multivariate analysis PCO_2 gap and serum lactate, but not $ScvO_2$, were associated with postoperative complications ($P < 0.001$ and $P = 0.018$, respectively). Area under the ROC curves were 0.66 (95%CI 0.55–0.76) for lactate, 0.57 (95%CI 0.46–0.68) for $ScvO_2$ and 0.85 (95%CI 0.77–0.93) for PCO_2 gap, with 6 mmHg as the best threshold value for discriminating patients with and without complications.

Patients with a PCO_2 gap > 6 mmHg (68%) had longer durations of both mechanical ventilation ($P = 0.047$) and hospital stay ($P = 0.007$), and higher mortality rate ($P = 0.056$).

CONCLUSIONS. In addition to strategies directed to maintain adequate of O_2 supply to tissue O_2 demand, early detection of an enlarged PCO_2 gap might be useful to detect persistent tissue hypoperfusion, especially when optimization of O_2-derived parameters has been reached.

0024

VITAMIN D LEVELS BEFORE AND AFTER CARDIOTHORACIC SURGERY AND CORRELATION WITH OUTCOME

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INTRODUCTION. Low vitamin D (VitD) levels are associated with increased all-cause and cardiovascular mortality in patients scheduled for coronary angiography [1] and in the critically ill [2].

OBJECTIVES. Aim of this study was to determine the prevalence and consequences of VitD deficiency in patients scheduled for cardiothoracic surgery (CTS) and to investigate if VitD levels are influenced by the procedure.

METHODS. In a prospective observational cohort study performed from March 2009 until March 2010 in a 20-bed ICU, we measured 25-hydroxyvitamin D (25OH-D) one day before surgery and on ICU admission. vitamin D status was defined as: adequate: >75, insufficient: 50–75, deficient: 25–50, severely deficient: <25 nmol/L (to convert values to ng/ml, divide by 2.50). We compared hospital mortality between VitD cohorts and preoperative values with VitD on ICU admission.

RESULTS. 495 patients were included. Their mean age was 67 years, 27% was female, 46% received CABG only, 30% heart valve surgery and 19% a combined procedure. Mean Euroscore was 5.2. The prevalence of VitD deficiency preoperatively was 55% (Fig. 1). Mean VitD before surgery was 49.6 ± 26.1 nmol/L and afterwards 40.3 ± 18.7 nmol/L ($p < 0.001$, paired *T* test), as a result 71% were deficient after surgery. Hospital mortality tended to be higher in the preoperative deficient patients compared to those with preoperative VitD > 50 nmol/L (5% vs. 2%, p = 0.07, Chi Square test).

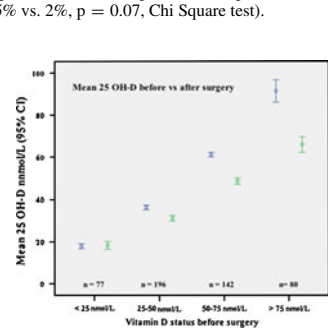

Fig. 1

CONCLUSIONS. VitD deficiency was present among more than half of patients referred for CTS. VitD levels significantly dropped during surgery, possibly due to dilution or as a consequence of the inflammatory response. This might partly explain the reported high incidence of deficiency in critically ill patients. However, since VitD deficiency seems to be related with worse outcome, preoperative correction of VitD deficiency seems an attractive subject of future studies.

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0025

GLOBAL GENE EXPRESSION PROFILING REVEALS KEY PATHWAYS ASSOCIATED WITH THE HOST RESPONSE TO CARDIAC SURGERY AND CARDIOPULMONARY BYPASS

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INTRODUCTION. Leukocyte activation is an important cause of organ dysfunction after cardiac surgery, but the key molecular pathways involved are not completely understood [1, 2].

OBJECTIVES. To document sequential changes in global gene expression and identify key pathways involved in the host response to elective cardiac surgery.

METHODS. Following ethics committee approval and informed consent, 25 Caucasian patients (19 male) scheduled for elective cardiac surgery involving cardiopulmonary bypass (CPB) were recruited (age 66, 43–86 years). Peripheral blood leukocytes were collected and RNA rapidly stabilised at the bedside using the leukoLock system (Ambion) for three time-points: before induction of anaesthesia, after admission to the Intensive Care Unit and 24 h after surgery. The quality of the RNA yield was checked using a 2,100 Bioanalyzer (Agilent) and whole genome gene expression analysed using Illumina Human WG6 V3 and Human HT12 V4 arrays interrogating around 48,000 transcripts. GeneSpring v 11.05 (Agilent) was used for data analysis. Statistical analysis was performed by selecting the genes that displayed a P value corrected for false discovery rate (Benjamini and Hochberg) of less than 0.05. A list of genes differentially expressed by at least twofold was generated for each time point.

RESULTS. Gene ontology analysis of pathways differentially expressed at both time-points showed a predominance of pathways related to the immune response, T-cell receptors and regulation of apoptosis. Significant pathways analysis using the molecular database MSigDB showed the involvement of 6 pathways: TGFBR, BCR, IL1, IL2 and TCR signalling. All regulate B lymphocyte activation and proliferation through tyrosine kinase (PTK) and downstream activation of MAP kinases, including ERK, JNK and p38. The Alkaloid Biosynthesis pathway that is involved in DNA and protein repair was also identified. Genes associated with epigenetic regulation of DNA (HIST2H2AC, HISTH2BD) were up-regulated (>2-fold change, $p < 0.05$).Biological association network analysis identified MAPK14, PPARG, MMP9 and ITGAM as important gene nodes.

CONCLUSIONS. Key pathways involved in the host response to cardiac surgery include those related to the immune response and apoptosis, supporting previous reports. Tyrosine kinase signalling pathways are a prominent feature of leukocyte activation after cardiac surgery. A novel observation was the up-regulation of genes involved in epigenetic regulation.

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GRANT ACKNOWLEDGMENT. Intensive Care Society, "Young Investigator Award" and HCA International.

0027

EDARAVONE, A RADICAL SCAVENGER, SUPPRESSES MICROGLIAL ACTIVATION AND CONSEQUENTLY INHIBITS PERIKARYAL AND AXONAL DAMAGE FOLLOWING GLOBAL CEREBRAL ISCHEMIA INDUCED BY CARDIAC ARREST AND RESUSCITATION IN RATS

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INTRODUCTION. Neuronal ischemia activates microglia, which induce cytokines and produce reactive oxygen species (ROS) and consequently cause neuronal damage. Although axons are closely related to neuronal function and as vulnerable as neuronal perikarya to ischemia [1], attention has focused almost exclusively on the damage of neuronal perikarya in acute cerebral ischemia. Dewar et al. [2] have emphasized that "total brain protection," in which not only neuronal perikaryal but also axonal protection against cerebral ischemia, is important to explore clinically effective neuroprotective drugs against cerebral ischemia.

OBJECTIVES. We investigated microglial activation, the time course and the severity of neuronal perikaryal and axonal damage following global cerebral ischemia by cardiac arrest and resuscitation (CAR), and whether edaravone, a clinically available radical scavenger in Japan, exerted the total brain protection in rats.

METHODS. Male Sprague–Dawley rats (200–300 g) were assigned to one of five groups. Sham group, Isc1 and Isc2 groups where rats were subjected to 5 min CAR, and Edv0 and Edv60 groups where rats were subjected to 5 min CAR and treated with intravenous administration of 3 mg/kg edaravone immediately or 60 min after CAR, respectively. 1 week (sham and the Isc1 groups) or 2 weeks after (Isc2, Edv0, and Edv60 groups) the insult, the brain sections were prepared. The number of the survival neuronal cells in each group determined by Cresyl-violet staining and microtubule associated protein 2 (MAP2) immunohistochemical staining was compared. Activated microglia and axonal damage were detected by immunohistochemical staining of ionized calcium binding adaptor molecule 1 (Iba-1) and accumulation of β-amyloid precursor protein (βAPP), respectively. All data were expressed as mean ± SEM. Statistical comparison among the groups was performed by Dunn test followed by Kruskal–Wallis statistic. $P < 0.05$ was considered statistically significant.

RESULTS. Significant neuronal perikaryal damage and marked microglial activation were observed in the hippocampal CA1 region with little axonal damage 1 week after CAR. 2 weeks after CAR, the perikaryal damage and microglial activation were unchanged, but obvious axonal damage occurred not only the CA1 region and the cerebral cortex. Administration of edaravone not only immediately but also 60 min after CAR significantly mitigated the microglial activation, the perikaryal damage, and the axonal damage.

CONCLUSIONS. Our results indicate that global cerebral ischemia causes microglial activation, consequently neuronal cell body and axonal damage, and the axonal damage develops slower than the perikaryal damage, and that edaravone can protect both perikarya and axons after CAR probably by suppressing microglial activation in rats.

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Advances in neuro-intensive care: 0026–0030

0026

ANATOMICAL BASIS OF PAROXYSMAL SYMPATHETIC HYPERACTIVITY

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INTRODUCTION. Paroxysmal sympathetic hyperactivity (PSH) is observed in a subset of patients with moderate-to-severe traumatic brain injury (TBI) and has been associated with poor outcomes, yet the anatomical basis of PSH is poorly understood.

OBJECTIVES. Based on work in ischemic stroke, we hypothesized that PSH is produced by traumatic lesions to the subcortical white matter connecting the right insular cortex to the diencephalon. We evaluated white matter integrity using magnetic resonance diffusion tensor imaging (DTI).

METHODS. A prospective cohort of adult patients who were unresponsive 7–21 days following TBI were enrolled in the study and evaluated for signs of PSH, which was defined as three or more of the following: (1) temperature > 38.5°C, (2) heart rate > 130 beats/min, (3) tachypnea, (4) agitation, and (5) dystonia (rigidity or decerebrate posturing), with at least one episode per day for a minimum of 3 days. All subjects concurrently underwent multimodal MRI, which included quantitative DTI (fractional anisotropy [FA]) analyzed in 20 selected white matter tracts. Data are reported as mean [±SD] unless otherwise indicated, with "R" signifying right side and "L" signifying left side.

RESULTS. Out of 102 patients, 16 met criteria for PSH. Patients who had PSH were significantly younger (mean age, 26 [±7] years versus 38 [±16] in the non-PSH group, ($P < 0.01$) and had a lower admission GCS, 4 [±2] versus 7 [±4] ($P < 0.001$). The Marshall scores calculated from the admission cranial CT were similar between groups; 2.5 [±0.7] versus 2.3 [±0.9], ($P = 0.25$). There was a similar delay between date of injury and date of MRI between the PSH group and the control group; 24 [±9.3] versus 20 [±9.5] days ($P = 0.08$). An equivalently small percentage of patients died in the ICU, specifically 13% in each group. In the PSH group, lower FA values were noted in several regions including the brainstem (anterior $P = 0.03$, posterior $P = 0.02$), the body ($P = 0.04$) and splenium ($P < 0.01$) of the corpus callosum, cerebral peduncles (R $P = 0.02$, L $P = 0.02$), the posterior limb of the internal capsule (R $P = 0.01$, L $P < 0.01$), the external capsule (R $P = 0.03$, L $P < 0.01$), and the corona radiata (R $P = 0.05$, L $P = 0.04$).

CONCLUSIONS. In patients with PSH, injury to white matter tracts is diffuse and without regard to laterality. The white matter tracts most significantly injured appear to correspond with those areas which are at risk for diffuse axonal injury. Based on these findings and contrary to our hypothesis, it seems that PSH is a marker of severity of injury rather than a syndrome arising from a discrete lesion.

0028

BRAIN AQUAPORINS (AQPS) EXPRESSION IS ASSOCIATED WITH SEXUAL DIMORPHISM DURING HYPONATREMIC ENCEPHALOPATHY

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INTRODUCTION. A number of important risk factor for hyponatremic encephalopathy has been described, including sex (women in reproductive age), several hormones such as vasopressin and estrogen, and also hypoxia. These factors could lead to a higher incidence to brain hyponatremic damage in women in reproductive age. AQPs are water-transporting protein, and AQP4 is the most abundant isoform in the blood–brain barrier (BBB). AQP4 is considered as a critical modulator for both water and ion homeostasis in brain. Estrogens tend to impair brain adaptation to hyponatremia affecting the expression of AQP4 [1]. In this study we determine the expression of AQP4 in the brain in a hyponatremic encephalopathy experimental model.

METHODS. Experiments were performed on male and female Wistar rats (FFyB Laboratories, UBA, Buenos Aires) weighing 200–250 g. The animals were divided in four groups. Control normonatremic female (Group A, $n = 8$) and male (Group B, $n = 8$) and hyponatremic female (Group C, $n = 8$) and male (group D, $n = 8$). Acute hyponatremia was induced in groups C and D by the administration of subcutaneous vasopressin in conjunction with intraperitoneal (IP) glucose/H_2O 5%. 4 h after the IP administration of glucose/H_2O in subgroups C and D, the animals were sacrificed and the brain immediately removed. Trunk blood was collected to measure plasma sodium concentration. Brain tissue was prepared either for western blot analysis to show the presence of the AQP4 protein or for immunohistochemical investigation on paraffin sections. The data are expressed in mean ± SD

RESULTS. Male and female rats from C and D groups had significantly reduced plasma sodium levels (mEq/L): 109.4 ± 12.7 compared to control rats 141.1 ± 2.1. No differences in plasma sodium were observed between both hyponatremic groups: 111.5 ± 13 (male) versus 112.5 ± 13 (female). Semiquantitative Western blot analysis showed that brain non-glycosylated form of AQP4 had a similar expression in male and female normonatremic and hyponatremic rats. While, glycosylated form of AQP4 showed a significantly increase only in female hyponatremic rats. Immunohistochemistry studies detected AQP4 expression at the BBB (endothelium and astrocytes foot processes). Hyponatremic females rats have shown an increased in the expression of AQP4 at both place respect to female controls. Hyponatremic males rats expressed AQP4 only at endothelium level. No difference was detected in males hyponatremic rats respect to male controls. However, the AQP4 expression in male controls was significantly decrease respect to female controls.

CONCLUSIONS. Our results suggest that the AQP4 expression in brain present a sexual dimorphism. This condition could be responsible for the poor outcome observed in women with hyponatremic encephalopathy.

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0029

BRAIN LACTATE METABOLISM IN HUMANS WITH POOR-GRADE SUB-ARACHNOID HEMORRHAGE

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INTRODUCTION. Brain energy metabolism in humans with acute cerebral disease is complex. Glucose is the major substrate for the brain. However, a large body of evidence suggests that endogenous lactate, produced by aerobic glycolysis, is an important substrate for neurons and that lactate metabolism is central for regulation of neuroenergetics after injury [1].
OBJECTIVES. To examine brain lactate metabolism in patients with poor-grade aneurysmal subarachnoid hemorrhage (SAH).
METHODS. Regional brain metabolism was studied in patients with coma after SAH monitored with cerebral microdialysis (MD) and brain tissue oxygen ($PbtO_2$). Extracellular concentrations of lactate, pyruvate and glucose were sampled hourly using MD. Elevated MD lactate (>4 mmol/L) was dichotomized as "hyperglycolytic" (MD pyruvate >119 mcmol/L) versus "non-hyperglycolytic" (MD pyruvate ≤119 mcmol/L). $PbtO_2$ was measured in parallel and categorized as "hypoxic" ($PbtO_2 < 20$ mmHg) versus "non-hypoxic" ($PbtO_2 \geq 20$ mmHg).
RESULTS. A total of 3004 samples from 31 poor-grade SAH patients (age 52 ± 10 years, duration of monitoring 5 ± 2 days) was analyzed. Brain extracellular lactate and pyruvate were frequently elevated (47 and 57% of samples, respectively). Reduced $PbtO_2$ was observed in 15% of samples, and 31% of MD glucose samples were below normal levels (<1 mmol/L). Elevated MD lactate samples (n = 1424) were associated with normal $PbtO_2$ (86% of samples) and normal-to-elevated MD pyruvate (79% of samples), suggesting activated aerobic glycolysis as the main source of increased extracellular lactate. We analyzed the relationship between brain energy metabolism and 30-day mortality. Compared to survivors (19/31; 62%), non-survivors had higher MD lactate (3.6 ± 0.9 vs. 5.1 ± 0.7 mmol/L, p = 0.01), lower $PbtO_2$ (30.5 ± 4.5 vs. 21.7 ± 10.7 mmHg, p = 0.001) and MD lactate elevations were more often associated with brain hypoxia (9 vs. 28%, p = 0.002). In survivors, most MD lactate elevations were related to increased glycolysis (88 vs. 13% in non-survivors, p = 0.07). Six-month outcome in survivors was examined using the modified Rankin score (mRS, Table 1). In patients with good recovery, brain lactate elevations were associated with cerebral hyperglycolysis (97 vs. 30% in those with poor recovery, p = 0.007) and MD pyruvate was higher (134.5 ± 26.8 vs. 108 ± 20.4 mcmol/l, p = 0.04).

6-month outcome and lactate metabolism

Variable	Good recovery (mRS 1–3) n = 12	Poor recovery (mRS 4–5) n = 7	P value
MD lactate	3.5 ± 1.4	3.6 ± 0.7	0.78
Elevated MD lactate >4 mmol/L	29 (11–65) %	24 (2–66) %	0.45
Hypoxic	11 (4–17) %	4 (1–53) %	0.46
Hyperglycolytic	97 (87–100) %	30 (10–74) %	0.007
$PbtO_2$, mmHg	30.9 ± 5.0	29.3 ± 3.5	0.60
$PbtO_2$ <20 mmHg	5 (4–14) %	7 (4–10)	0.93
MD pyruvate, µmol/L	134.5 ± 26.8	108 ± 20.4	0.004

CONCLUSIONS. Brain lactate is frequently elevated in patients with poor-grade SAH. Extracellular lactate increase is mainly due to aerobic cerebral hyperglycolysis rather than brain hypoxia/ischemia. Cerebral hyperglycolysis was associated with better prognosis. Our data suggest that the injured human brain may use endogenous lactate as an alternative energy substrate.
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GRANT ACKNOWLEDGMENT. Supported by a Grant from the European Society of Intensive Care Medicine (ECCRN Clinical Research Award 2010).

0030

EFFICIENCY OF NEUROMUSCULAR ELECTRICAL STIMULATION TO PREVENT ICU-ACQUIRED WEAKNESS IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Intensive care unit-acquired weakness is frequent in patients with prolonged mechanical ventilation and is associated with significant morbidity and impaired quality of life. Early mobilization is proposed to prevent ICU-acquired weakness but "rehabilitation teams" represent significant resources. Neuromuscular electrical stimulation (NMES) has been successfully used in several populations. Recent data in ICU patients are promising but there is no study clearly demonstrating that NMES may prevent or treat ICU-acquired weakness.
OBJECTIVES. The purpose of this study was to evaluate the potential of quadricipital NMES in patients with prolonged mechanical ventilation to prevent muscle strength loss.
METHODS. We included patients expected to stay on mechanical ventilation at least 48 h after consent was obtained. Patients received daily 60 min of quadricipital NMES on one leg in a randomized order during 10 days, then on both legs during 10 additional days. Non voluntary muscular strength assessment was performed on both legs with magnetic stimulation at inclusion and at day 5, 10 and 20. A complete evaluation of the voluntary muscular strength including MRC scores and handgrip force evaluation was done as soon as the patient could collaborate. The primary outcome was the strength loss between inclusion and day 10 in the leg with and without NMES. We analyzed separately patients with early versus late NMES application (NMES initiated more than 7 days after intubation).
RESULTS. We present here preliminary results of fifteen patients included in the study. Eleven have completed the protocol at day 10 and five at day 20. The first results tend to show a better conservation of the involuntary muscular strength of the stimulated limb for the group of patients (n = 6) who received early NMES ($DeltaTwitch_{D0D10} = 1.48 \pm 2.04$, p = 0.13), but no difference were present in patients (n = 5) with late NMES ($DeltaTwitch_{D0D10} = -0.28 \pm 0.93$, p = 0.54). The voluntary muscular strength of the stimulated limb were significantly higher for all evaluated patients whatever the duration of mechanical ventilation before NEMS initiation (p = 0.049).
CONCLUSIONS. Preliminary results demonstrate a trend for muscle strength preservation with early NMES in mechanically ventilated patients. The optimal modality of this treatment (number and duration of NEMS, settings) remains unknown. Early application of NMES has the potential for preventing ICU-acquired weakness and is not time consuming.
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Poster Sessions
Antibiotics resistance in the ICU: 0031–0042

0031

VALIDATING THE DIAGNOSIS OF CENTRAL VENOUS CATHETER BLOOD-STREAM INFECTIONS (CVC-BSIS) IN ICUS IN ENGLAND

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INTRODUCTION. The 'Matching Michigan' project in England [1] aims to replicate in English intensive care units (ICUs) the mean reduction in central venous catheter blood stream infections (CVC-BSIs) achieved in Michigan, USA [2]. Local clinical leads from 227 ICUs across England contributed data to a centralised database using a web-based programme and standardised definitions. We now report on the reliability of detection and reporting from this national collaboration.
OBJECTIVES. To measure variations in blood culture sampling rates between ICUs, compare the judgement of local clinicians with external clinical reviewers using criterion-referencing; and to derive estimates of reliability of local reporting for the whole collaboration.
METHODS. A representative sample of ICUs were invited to participate. ICUs were asked to provide a list of all blood cultures (BCs) performed over 3 months. Case records were then requested for between 5 and 20 patients with positive BCs, given prior institutional approval. Information was extracted from the case notes during on-site visit by one reviewer using objective criteria. Each case was then discussed with the second (blinded) reviewer within a few days of the visit.
RESULTS. Of 45 ICUs, only two responded to an initial generic email invitation. Personal contact elicited a positive response from 28, of whom 17 participated (1 PICU, 2 University, 14 adult general). Of the non-participating ICUs, ten did not respond, three refused citing clinical workload, four cited inadequate administrative support, and seven could not obtain authority to permit access to medical records in time for this review. These 17 ICUs performed 2357 BCs during 17020 patient days and 10601 CVC-patient days; 328 (13.9%) BCs were positive (ICU range 5.7–23%). The BC: patient days ratio was 2357/17020 = 13.8 BCs/100 patient days (range 4.8–39.6) and the CVC utilization ratio was 0.62 (range 0.42–0.78).
Case note review was conducted in 177 patients with positive BCs; in 123 (69%) a CVC was in situ within 48 h of the positive culture. External adjudication agreed with local adjudication in 167 instances (overall correct classification 94.3%); 20 were declared as CVC-BSIs and 157 as non-attributable. External review reclassified seven cases as non-attributable, three as attributable.
CONCLUSIONS. The agreement between local clinicians' and external adjudicators' diagnosis of CVC-BSIs was high for these participating ICUs. However, both BC sampling frequency and CVC utilisation ratio varied widely. The method did not permit review of non-participating ICUs.
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0032

POLYMYXIN B: FRIEND OR FOE?

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INTRODUCTION. Despite the proven nephrotoxicity of Polymyxin B in the past it has been reintroduced for the treatment of Multidrug resistant gram negative micro organisms because of the limited development of new antimicrobials. Acute kidney injury (AKI) associated with the use of Polymyxin B particularly in septic patients with already compromised renal functions is the greatest hindrance in its clinical use.
OBJECTIVES. We evaluated the impact of Polymyxin B on the kidney function and outcome in patients in a tertiary Intensive care unit (ICU).
METHODS. In this 2 year retrospective study in a tertiary critical care unit commencing in 2008, we included patients above 18 years of age receiving Polymyxin B for the treatment of MDR gram negative infections. Patients receiving Polymyxin B for at least three consecutive days, with serum creatinine measurements available before, during and after the therapy were included. The patients with baseline creatinine >4 mg/dl, undergoing dialysis at the beginning of the antibiotic therapy, with prerenal acute kidney injury, with obstructive renal failure or those receiving concomitant nephrotoxic drugs were excluded from the study. Demographic profile, renal function tests (RFTs) before, during and after treatment with Polymyxin B, hospital stay and outcome (recovery vs. death) records of all patients meeting the inclusion criteria (n = 48) were analyzed. Comparison of the parameters was done between patients without (n = 30) and with AKI (n = 18; defined by the RIFLE classification) at the start of therapy. Unpaired Students *t* test and Fisher's exact test were used for statistical analysis using SPSS (ver.12).
RESULTS. Patients with baseline AKI had a significantly higher APACHE II and predicted mortality rate at admission versus the controls (14.3 ± 1.16 and 23.7 ± 2.7 vs. 10.4 ± 0.76 and 13.1 ± 1.4; P < 0.01; mean ± SEM, respectively). At the end of therapy with Polymyxin B, 73.3% control patients developed AKI while 27.7% of patients in the AKI group had normalization of RFTs. Further there was no significant difference in the length of hospital stay (23.9 ± 3.1 vs. 30.5 ± 4.1; P = 0.13) and overall mortality (44.4% vs. 36.7%; P = 0.76) between patients without and with AKI, respectively.
CONCLUSIONS. Polymyxin B causes derangement of RFTs but does not prolong length of stay or worsen outcomes in the setting of a tertiary critical care unit with judicious use of medication, strict monitoring of RFTs, dose modification according to creatinine clearance and aggressive fluid management.
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0033

CARBAPENEM-RESISTANT *ACINETOBACTER BAUMANNII* IN INTENSIVE CARE UNIT: INCIDENCE, RISK FACTORS, COURSE AND OUTCOME

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INTRODUCTION. *Acinetobacter baumannii* is a potent nosocomial pathogen in critical care units world wide. Carbapenems have been widely used to treat serious multidrug-resistant *A. baumannii* infections; however, incidences of carbapenem-resistant *A. baumannii (CR-AB)* are rising in several parts of the world.

OBJECTIVES. To determine the incidence, ICU course and outcome of patients with CR-AB infection admitted to ICU and to identify the risk factors associated with carbapenem resistance.

METHODS. A retrospective cohort study was conducted in eight bedded medical and neurology ICUs of a tertiary care hospital in New Delhi, India. All patients who were admitted to these ICUs during the study period from May 2008 till December 2010 and whose cultures grew *A. baumannii* were included for the analysis. Susceptibility testing was performed according to the Clinical Laboratory and Standards Institute (CLSI) recommendations. Patients were divided into two groups and compared based on the presence of carbapenem resistance. Primary outcome measure was ICU mortality and secondary outcome measures were need for organ support and ICU length of stay. Logistic regression analysis was done to identify risk factors associated with carbepenem resistance.

RESULTS. A total of 80 isolates of *A. baumannii* were analyzed. Most of the isolates were from the respiratory tract secretions. Among the 80 isolates tested 64 (80%) were carbapenem resistant. Only recent hospitalization ($p = 0.019$) and vasopressor support ($p = 0.012$) was associated with presence of carbapenem resistance (Table 1). CRAB required other organ support more frequently too, but the difference was not statistically significant (Table 1). Higher ICU mortality in patients with CRAB infection was seen but it did not reach statistical significance.

TABLE 1 COMPARISON OF TWO GROUPS

Parameter of interest	Carbepenem sensitive (n = 16)	Carbepenem resistant (n = 64)	P value
Mean age, years	55.8 ± 21.3	61.7 ± 18.7	0.273
Mean APACHE II score	17.3 ± 7.7	20.9 ± 7.6	0.093
Recent hospitalization	4 (25%)	37 (57.8%)	0.019*
Need for mechanical ventilation	8 (50%)	48 (75%)	0.051
Need for vasopressor support	5 (31.3%)	42 (65.6%)	0.012*
ICU stay, days	15 ± 16.1	19.5 ± 23.2	0.463
ICU mortality	4 (25%)	26 (40.1%)	0.248

CONCLUSIONS. We observed that there is a high incidence of CR-AB infections in critically ill patients. Recent hospitalization was an important risk factor for carbapenem resistance. Even though there was a trend towards higher ICU mortality and need for organ support in patients with CRAB infection, it did not reach statistical significance.

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0034

ACTUAL USE OF LINEZOLID IN THE ICU: CHARACTERISTICS AND ADVERSE EVENTS: MULTICENTER SPANISH STUDY (MESLIN)

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OBJECTIVES. To characterize the main indications of the patients in which Linezolid (LNZ) used, in several Spanish ICU.

METHODS. Multicentral retrospective observacional study conducted at 13 Spanish ICU from June 2008 to June 2009. Patients were analyzed and they received at least 48 h of empirical or directed treatment with LNZ in ICU. Statistics studies were: Chi square, Fisher test, Mann–Whitney test and Kruskal–Wallis test.

RESULTS. We included 418 patients (pts). Medical history were: 45% hipertension, 22% diabetes, 22% smoking %,13% CPOD, 6.5% betalactamics-allergy 63.6% pts presented an infection before the ICU admission. The origin of the infection was: community 20.2%, nosocomial 31.9% and in ICU 47.9%. The main focus was pulmonary 47.7%. Mean APACHE II was 19.9 (DS 7.2), mean SOFA 7.2 (DS 3.7), the average organ failures were 2.7 (DS 1.2), 32% sepsis. 28.2% severe sepsis and septic shock 39.8, 84% pts received antibiotic before the beginning of the LINZ, mean 2.1 (DS 1.7). In 97.6% pts LINZ was begun in ICU, being the majority an empirical indication opposite to directed (70.6% vs. 29.4%).LNZ was used in monotherapy in 8.4% pts while 91,6% were combinated (average of antibiotics used 2.4). The principal indications in empirical use were: initial treatment 54%, rescue 44% and allergy 1.7%. The clinical evolution was: cured 47.8% improvement 22%, failure 22%, infection recurrence 1.2% and indeterminately in 6.5%. Causes of change LNZ-treatment were: end of the treatment 57%, des-escalate (DES) 21.6%, worse evolution 8.2%, primary resistance 7.2%, acquired resistance 1.2%, adverse reaction 1.9%. The causes of DES were: 32.7% to withdraw LINZ, 30.7% reduce spectrum, withdraw line together with another antibiotic 18.8%, not change 17.8%. There were 16 (3.8%) pts with adverse effects (AE), the most frequent was thrombopenia 11 (2.6%). Treatment duration was not related to the appearance of AE (p 0.421). They were more frequent in pts with acute renal failure (RR 2.97 (1.05–8.39)) and liver failure (p 0.001). The global mortality in ICU was 39% and the mortality related to the use of LINZ was 16%, but in 12.4% of patients there was realized limitation of the vital support.

Analysis of mortality (logistic regression)

Variables	OR	CI 95%	p
Age > 60	1.9	1.18–3.13	0.020
Sex: men	1.1	0.50–1.55	0.090
Severe sepsis	1.8	1.00–3.55	0.048
Septic shock	2.8	1.55–5.99	0.0001
Adverse effects	1.5	0.38–3.98	0.049
Worse evolution	3.15	1.14–8.72	0.001
Primary resistance	2.2	1.32–3.98	0.026
Motive: rescue	20.7	4.60–93.72	0.0001

CONCLUSIONS. The patients with LNZ were very severe ones, with multiple previous antibiotic, main for nosocomial sepsis and empirical therapy. The rate of AE were low and was no related to outcome. The use in rescue therapy was associated with higher mortality.

0035

K. PNEUMONIAE PRODUCING KARBAPENEMASE INFECTIONS IN CRITICAL CARE PATIENTS: PREVALENCE AND RISK FACTORS

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OBJECTIVE. To determine prevalence and risk factors of infections due to *K. pneumoniae* producing karbapenemase (KPC) in critical care patients.

DESIGN. Retrospective, cohort study.

SETTING. Twelve-bed general intensive care unit (ICU) in a University Hospital.

METHODS. All patients who required mechanical ventilation (MV) for >48 h were eligible during a 20-month period. Univariate analysis was used to determine variables associated with the first episode of KPC *K. pneumoniae* infection in ICU.

RESULTS. A total of 263 patients were included. KPC infections were diagnosed in 23 (8.7%) patients and included 18 (6.84%) bloodstream and 5 (1.9%) respiratory infections. KPC was isolated at mean (SE) 16 (2.3) ICU day. Compared to patients who had non multidrug resistant (MDR) bacterial infections, patients with KPC presented significantly worse baseline APACHEII [16.13 (1.2) vs. 12.9 (2.0) $p = 0.02$] and SOFA [9.087 (0.6) vs. 6.4 (1.0) $p = 0.009$] scores, had received previously karbapenemase more frequently (87% vs. 40% $p = 0.0032$) and for longer periods (days) [8.8 (1.8) vs. 1.75 (0.6) $p = 0.0004$], had undergone more often tracheostomy (43.8% vs. 5% $p = 0.0056$) and had been treated more frequently with steroids (mcg of hydrocortisone equivalent) [853 (181) vs. 416 (216) $p = 0.02$]. MV duration (days) in patients with KPC infections and in non-MDR patients were 39 (5) and 19 (4), respectively ($p = 0.005$). Overall ICU mortality was 23.6% whereas mortality in patients with KPC infection was 52% ($p = 0.005$).

CONCLUSION. KPC infection is an emerging problem which might be more common in patients with severe critical illness or previous use of karbapenemase. These points should be especially considered in planning effective policies for preventing nosocomial infections.

0036

IMPACT OF HAART IN HIV POSITIVE PATIENTS ADMITED TO INTENSIVE CARE UNIT

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INTRODUCTION. The incidence of HIV infection in our population is 42 cases per million inhabitants per year. The antiretroviral therapy changed the mobility and mortality in this patient, HIV positive patients has better type life. More studies are necessary of the patients with HAART therapy which are admitted to ICU.

OBJECTIVES. We want to study the impact of highly active antiretroviral therapy (HAART) in the prognosis of patients infected with Human Immunodeficiency Virus (HIV) admitted to the ICU.

METHODS. Retrospective study. We analyzed HIV+ patients admitted to an ICU of 36 beds between January 2005 and December 2009. We compared demographic characteristics, admission diagnosis, length of stay and mortality in ICU.

RESULTS. 105 patients were admitted with HIV during the study period. 70.5% were men, mean age was 41 ± 8.57 years. The APACHE II scale was 20.9, the mean ICU length of stay was 8.7 ± 9.9 days and mortality was 28.6%. 52 patients (49.5%) had received HAART. Patients treated with HAART were significantly older (43.5 ± 9.2 years vs. 38.7 ± 7.2, $p < 0.05$), had a higher CD4 count (363.1 ± 191.3 ± 324.9 vs. 381.2/mL, $p < 0.05$) and a lower viral load (1.9 ± 1.9 copies/mL vs. 5.58 ± 2.8, $p < 0.05$). The non-HAART patients had higher rate of alcoholism (78.6% vs. 21.4%, $p < 0.05$). 59.7% of readmissions caused by infectious diseases occurred in non-HAART group (40.3% in HAART group, $p < 0.05$). Non significant differences were found between APACHE II in both groups (HAART: 20 ± 7.70, non-HAART: 21.66 ± 8.84), hemodynamic support (HAART: 49% vs. non-HAART: 51%, $p = 0.92$), renal support (HAART: 56.3% vs. non-HAART: 43.8%, $p = 0.56$) or respiratory support (HAART: 44.1% vs. 55.9% non-HAART, $p = 0.133$). There was also no statistically significant differences in mortality (HAART: 28.84% vs. non HAART: 28.30%, $p = 0.951$), but the mean length of stay in ICU was significantly higher in patients who did not receive treatment at the time of admission (10.9 ± 11.3 vs. 6.36 ± 7.56 days, $p < 0.05$). In addition, 100% of patients requiring readmission were non-HAART.

CONCLUSIONS. HAART treatment at the time of ICU admission isn't a predictor of mortality. Non-HAART patients have a significantly higher risk of admission in ICU for an infectious cause.

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0037

INFECTION CAUSED BY (E)-4-HYDROXY-3-METHYL-BUT-2-ENYL PYROPHOSPHATE (HMB-PP) PRODUCING PATHOGENS INCREASES RISK OF DEATH ON THE ICU

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INTRODUCTION. Vγ9/Vδ2 T cells are a minor subset of T cells in human blood and differ from other T cells by their immediate responsiveness to microbes. Vγ9/Vδ2 T cells interact with monocytes and become activated by microbial-derived HMB-PP, an essential metabolite produced by a large range of pathogens, which in turn leads to substantial cytokine secretion and the generation of inflammatory response [1].

OBJECTIVES. To investigate if HMBPP+ve infections carry higher risk of death in ICU patients.

METHODS. Retrospective analysis of data collected in the clinical information system of a university and a non-university hospital between 2009 and 2010. Microbiology data was retrieved from the respective databases and paired with patient level data. Microbiologically significant infection was defined as organism concentration $>10^5$ CFU. For statistical analysis Mann–Whitney U test and Chi-square test was used.

RESULTS. We identified 3186 patients with 409 positive microbiology cultures. HMBPP+ve pathogens were identified in 227, HMBPP−ve in 182 occasions. Significantly higher ICU mortality was observed with HMBPP+ve infections 60/227 HMBPP+ve versus 33/182 HMBPP−ve, respectively, $p = 0.047$.

TABLE 1

	APACHE II	LOS	Ventilator days	Inotropic support (days)
HMBPP+ve	18 (9)	7.9 (14)	3 (6)	1 (3)
HMBPP−ve	16.5 (8)	6.9 (11)	3 (6)	0.5 (3)

Data presented as median and (interquartile range). No significant differences in APACHE II, length of stay, length of advanced respiratory and cardiovascular support was observed.

CONCLUSIONS. This report is the first to confirm that infection caused by HMBPP+ pathogens carrys higher risk of death in ICU patients. This was not attribute to baseline differences as demonstrated by similar APACHE II scores in the HMBPP+ve and −ve group. The exact mechanism behind this phenomenon is unclear, but it has been postulated that a rapid and HMB-PP-dependent crosstalk between the patients Vγ9/Vδ2 T cells and autologous monocytes results in the immediate production of inflammatory mediators. Disproportionate monocyte-$\gamma\delta$ T cell crosstalk may result in excessive production of inflammatory mediators, possibly explaining why episodes of HMB-PP+ve sepsis are associated with increased risk of death. Further studies are warranted to investigate this pathway.

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0038

MULTIDRUG-RESISTANT *KLEBSIELLA PNEUMONIAE* OUTBREAK IN A CRITICAL BURN UNIT

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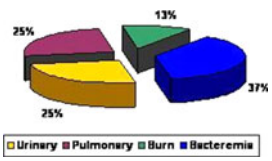
OBJECTIVES. The aim is to make a descriptive study of an outbreak of multidrug-resistant (MDR) *Klebsiella pneumoniae* in a critical burn unit.

METHODS. We have done a retrospective study in a critical burn unit with ten beds, between March 2008 and July 2009. We analyzed the medical records of all patients colonized or infected with multidrug-resistant *Klebsiella pneumoniae*, admitted during this period. We defined as MDR when they were resistant to aminoglycosides, levofloxacin, and piperacillin-tazobactam and furthermore when they were producers of extended spectrum beta lactamases. Demographic data, total body surface area (TBSA), depth, mechanism and location of burn, days of mechanical ventilation (MV), average stay, severity scores (SOFA ABSI, APACHE II) and mortality were collected.

RESULTS. Multidrug-resistant *Klebsiella pneumoniae* was isolated in 26 of the 89 patients admitted (29%) to our unit during this period. In the rest of the year 2009, we only isolated eight cases. We have done a genotypic study in all isolates, where we have observed the same genotype of klebsiella. The mean age was 55.4 ± 19.6 years. 86.6% were men. The total burned body surface (TBSA) medium was 27%. 53.8% of patients had full thickness burn, 30.7% deep partial thickness burn, 3.8% superficial partial thickness burn and 11.5% epidermal burn. The mechanism of burn was flame in 53.8%, explosion in 26.9%, electricity in 3.8% and scald in 3.8%. The most common location was in the upper limbs with 80%, followed by head/neck in 68.9%, lower limbs in 57.6%, chest in 46.1%, back in 46.1%, and bottom at 11.5%. 69% of patients needed mechanical ventilation, with an average duration of 32.7 ± 24.9 days. The average stay was 41 ± 31.9 days. APACHE II was 14.7 ± 6.1, ABSI 8.3 ± 2.4 and SOFA at admission of 4.3 ± 2.8. The mortality was eight patients (31%). Of the colonized patients, 8 (31%) had primary infection by multidrug-resistant *Klebsiella pneumoniae*.



Source of infection

CONCLUSIONS. Our study shows that patients with infection or colonization with multidrug-resistant *Klebsiella pneumoniae* were mostly middle-aged men with deep burns, flame and preferably in upper limbs and face and neck. Based on the genetic profile, we can say that transmission in this outbreak occurred horizontally.

0039

MANAGEMENT OF MULTIPLE PATHOGENS WITH A BLA-NEW DELHI METALLO-CARBAPENEMASE GENE IN A CRITICAL CARE UNIT: A CHALLENGE

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INTRODUCTION. We report a rare case of Klebsiella pneumonia, *Stenotrophomonas maltophilia* and Acinetobacter *baumannii* strain with bla-New Delhi metallo-carbapenemase gene harboring in a adult patient who returned from India, requiring advanced respiratory support.

OBJECTIVES. Bacteria carrying bla (NDM-1) are highly resistant to nearly all available beta-lactam antibiotics and many classes of antibiotics. Prompt identification of these bacteria and implementation of strict infection control measures to prevent their transmission is of strategic public health importance.

METHODS. A 50 years old gentleman developed progressive ascending muscle weakness which involved respiratory muscle resulting in respiratory failure demanding ventilator support whilst on holiday in India. Patient was transferred to general critical care unit (GCCU) at university hospital in UK after 3 months being on ventilator in India. He had been already diagnosed with multiply bacteria resistant to treatment including multi-resistant klebsiella. He was known diabetic on metformin and insulin. Nerve conduction study (NCS) in UK confirmed Guillain–Barré syndrome. Further blood cultures during his GCCU stay grew Klebsiella, *Stenotrophomonas maltophilia* and *Acinetobacter baumannii* strain harbouring the NDM-1 metallo-β-lactamase were multiresistant to many class of antibiotics. Patient was on ventilator support for 100 days in GCCU. He required strict isolation in GCCU due to considerable risk of cross infection to other patients and public health issues.

CONCLUSIONS. This patient is the first reported case of bla-New Delhi metallo-carbapenemase gene multiple resistant pathogens in UK requiring advanced respiratory support. The challenge of nursing safely and preventing cross infections in GCCU was a daunting task for the teams concerned. Guidelines to prevent infection transmission were minimising the amount of traffic going into the patient's room, strict hand washing on entering and leaving ward, monitor antibiotic usage as the use of broad-spectrum agents is likely to predispose to the colonisation. Wearing personal protective equipment (PPE), like gloves, a gown, scrubs and full face visor were mandatory. Single use equipment were used as far as possible. Rooms that have housed positive patients must be terminally cleaned and fogged.

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0040

POSSIBLE RISK FACTORS OF ACQUIRING A MULTIDRUG RESISTANT ORGANISM INFECTION AND THE ROLE OF THE APPROPRIATE INITIAL EMPIRIC ANTIBIOTIC THERAPY IN THE MICU

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INTRODUCTION. Most multidrug resistant organism (MDRO) outbreaks occur in the critical care setting and involve resistance to multiple classes of antimicrobial agents.

OBJECTIVES. The objective of this study was to compare the characteristics of MDRO carrying patients with those without MDRO, in a medical ICU (MICU). In order to characterize the risk factors and clinical outcome of MDRO.

METHODS. This retrospective study was done in the MICU of Winthrop University Hospital between January and May 2010. MDRO patients were defined as those who had a positive culture from any of: blood, sputum, urine or tissue culture for multidrug (resistance to >2 antibiotic classes). MDRO included: *Acinetobacter baumannii, Stenotrophomonas maltophilia, Escherichia coli*, *Enterococcus faecium* (VRE), *Staphylococcus aureus (MRSA)*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, or *Proteus mirabilis*. Only MDRO isolated >24 h after ICU admission and ±10 days after MICU discharge were included, and duplicates were excluded. Patient characteristics, comorbid illness, duration of total hospitalization, duration of MICU stay, days of antibiotics and mortality were also recorded.

RESULTS. Of the 313 patients that were cultured, MDRO were found in 130 (41.5%), while 183 (58.4%) patients did not have MDRO. With univariate analysis, the clinical factors predicting MDRO were: infection and cardiac disease as a cause of admission, days in hospital, days in MICU, days on ventilator, tracheostomy, prior hospitalization, prior antibiotic use, immunosupression, hyperlipidemia and use of vasopressor. However, with multivariate analysis, only infection ($p = 0.0167$, OR = 2.2), respiratory dysfunction ($p = 0.032$, OR = 2.3), days in hospital ($p = 0.0044$, OR = 1.1) and immunosupression ($p = 0,019$, OR = 2,2) were significant independent clinical risk factors for acquiring MDRO. The microorganisms that were significantly ($p = 0.0001$) involved in the MDRO group were *Pseudomonas aeruginosa*, *Klebsiella pneumoniae, Enterococcus faecium* (VRE), *Staphylococcus aureus (MRSA)*. No statistically significant difference was observed between MDRO positive and MDRO negative patients in mortality rate. A possible explanation is the use of appropriate empirical antibiotic therapy (matching in vitro susceptibility for the isolated pathogen) in 106 out of 130 (81.5%) of MDRO positive cases. Seventy-four patients out of the 106 (68.9%) patients received antibiotics within 24 h of onset of infection. These antibiotics were meropenem, linezolid, tigecycline, vancomycin, daptomycin. Quinolones were excluded as first line antibiotics. The possible number of days of acquiring a MDRO infection while in the hospital was 8 days.

CONCLUSIONS. Knowing the risk factors that may cause MDRO infection and administering timely and appropriate initial empiric antibiotic therapy could possibly have an advantage in reducing mortality rates for patients with MDRO pathogens in the MICU.

0041

PREVALENCE OF OSELTAMIVIR-RESISTANT 2009 H1N1 INFLUENZA VIRUS AMONG PATIENTS WITH PANDEMIC 2009 H1N1 INFLUENZA INFECTION IN NRITLD, TEHRAN, IRAN

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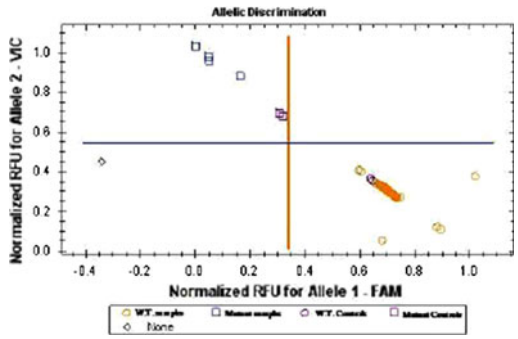
INTRODUCTION. Oseltamivir-resistant cases were reported during the 2009 pandemic influenza outbreak and therefore, Widespread emergence of oseltamivir-resistant 2009 H1N1 virus is imaginable.

OBJECTIVES. Underlying medical conditions like Immunosuppression increase the chance of oseltamivir resistance.

METHODS. In a retrospective cross-sectional study, respiratory tract specimens of confirmed cases of 2009 H1N1 influenza referred to the Masih Daneshvari Hospital was analyzed for presence of H275Y mutation.

RESULTS. From November 2009 through March 2010, oseltamivir-resistant 2009 H1N1 infection was observed and confirmed in 4 patients (including two immunocompromised patients) by performing H275Y mutation molecular testing.



H275Y mutation

CONCLUSIONS. Close monitoring of resistance to neuraminidase inhibitors is essential in tertiary care centers. The H275Y Mutation (oseltamivir-resistant genotype) could appear in the absence or presence of selective drug pressure

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0042

CULTURE AND SENSITIVITY PATTERN IN INTENSIVE CARE UNIT IN A SECONDARY LEVEL HOSPITAL IN INDIA

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INTRODUCTION. The best way to treat a serious infection is to choose an antibiotic depending on culture and sensitivity report. The emergence of multiple-drug resistant pathogens in patients represents a new challenge for the critical care physician [1]. In the therapy of sepsis, initial empiric therapy may be ineffective if the responsible pathogen is not susceptible to available therapy. With the introduction of newer antibiotics and their widespread use the resistance pattern of the organisms changes. We analysed more then 100 cases of positive cultures to see the trend of sensitivity and resistance to the newer and older antibiotics.

OBJECTIVES. To evaluate the sensitivity pattern of bacterial pathogens in Intensive care unit of secondary level hospital in India.

METHODS. Isolates of the patients from clinical specimen from blood cultures, surgical site swabs, urine samples and bronchoscopy samples were analysed in present study of all the pts admitted to our intensive care unit, during December 2009 to December 2010. Patients more than 18 years of age and of both the sexes were included in this study. Retrospectively, detailed culture reports were pulled out from the microbiology department of the hospital. Species identification and susceptibility testing was performed by biomeurix. The results were analysed to see the organisms and their sensitivity pattern to the enlisted antibiotics. A comparison was made among the resistance of three newer antibiotics (Imipenem, Meropenem and Piperacillin and tazobactam) with older antibiotics (Quinolones, Chloramphenicol and Tetracycline).

RESULTS. Out of a total 252 culture reports. The number of positive blood, urine and bronchoalveolar lavage culture reports were 45 and 50 and 12, respectively. The common organisms in decreasing trend isolated from blood were *E. coli*, *S. aureus*, *Pseudomonas aeruginosa* and *Acinetobacter*. Whereas in urine *E coli*, *Klebsiella pneumoniae* and *S. aureus* were found. And from BAL were acinetobacter sp., percentage of cultures resistant to Imipenem, meropenem and piperacillin and tazobactam were 21, 40 and 35%, respectively. Around 20% of the imipenem resistant organisms were sensitive to either of Quinolones, Tetracycline, Chloramphenicol. Whereas, in case of meropenem, piperacillin and tazobactam this percentage was around 30 and 18%, respectively.

CONCLUSIONS. Carbapenem resistance seems to be increasing, possibly due to their increased use. Nearly 25% of the organisms were resistant to newer antibiotics. Significant numbers of these organisms are sensitive to older antibiotic.

REFERENCES. 1. Raghunath D. Emerging antibiotic resistance in bacteria with special reference to India. J Biosci 2008;33:593–603. 2. Vincent JL, et al. International study of the prevalence and outcomes of infection in intensive care units. JAMA 2009; 302(21):2323–9.

BSIs diagnosis & treatment: 0043–0055

0043

DRESSING DISRUPTION IS A MAJOR RISK FACTOR FOR CATHETER-RELATED INFECTIONS IN ICU PATIENTS

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INTRODUCTION. Major catheter-related infection (M-CRI) is mainly avoidable in ICU. Dressings is one of the major means to reduce infections by the extra-luminal route. The importance of dressing disruptions in the occurrence of M-CRI has never been studied in a large cohort of patients.

METHODS. A secondary analysis of a randomized multicenter trial [1] was performed in order to determine the importance of dressing disruption on the risk for development of catheter-related bloodstream infection (CR-BSI). A multilevel mixed-logistic model was used to assess risk factors of disruptions. A marginal Cox model introducing dressing's disruptions as time-dependent variables was used to assess risk factors of M-CRI, CRBSI and colonization.

RESULTS. Among 1,419 patients (3,275 arterial or central-vein catheters) included we identified 296 colonized catheters, 29 M-CRI and 23 CR-BSI. Of the 11,036 dressings changes, 7,347 (67%) were performed before the planned date because of soiling or undressing. Dressing disruption occurred more frequently in diaphoretic patients with higher Sequential Organ Failure Assessment (SOFA) scores and was less frequent in males and patients admitted for coma. Subclavian access protected from dressing disruption. Dressing cost (especially staff cost) was inversely related to the rate of disruption. The number of dressing disruption was related to increased risk for colonization of the skin around the catheter at removal ($p < 10^{-4}$). The risk of M-CRI ($p = 0.025$) and CR-BSI ($p = 0.002$) increased by more than 3-fold, after the second dressing disruption, independently of other risk factors of infection.

CONCLUSIONS. Disruption of catheter dressings was common and was an important risk factor for catheter related infections. These data support the preferential use of the subclavian insertion site and enhanced efforts to reduce dressing disruption in post-insertion bundles of care.

REFERENCE 1. Timsit JF, et al.. JAMA 2009;301:1231.

GRANT ACKNOWLEDGMENT. French Ministry of Health (PHRC 2005.

0044

ELIMINATING CATHETER RELATED BLOODSTREAM INFECTION ON THE INTENSIVE CARE UNIT: NOT A MYTH!

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INTRODUCTION. Since the introduction of the Central Venous Catheter (CVC) bundle on our 10-bedded Critical Care Unit we showed a continuous and sustained reduction in Catheter Related Blood Stream Infection Rate (CRBSI) [1].

OBJECTIVES. We analysed the factors behind this reduction.

METHODS. Retrospective audit on the rate of CRBSI for a 3 months period before the implementation of the CVC bundle provided baseline data. Prospective rolling audit was carried out after the CVC bundle was introduced in clinical practice. Robust educational program was rolled out during the implementation phase for medical and nursing staff. In January 2009 we changed our CVCs to antiseptic-impregnated catheters and in January 2010 we have introduced pre-prepared CVC insertion packs (AGB Plus, Arrow). Compliance data was collected based on the information recorded in our clinical information system (CIS, CareVue, Philips). Monthly compliance data was presented at the audit meetings and also posted on the noticeboard.

We collected data on mean dwell time, number of CRBSIs, site of infection and whether the patient left the unit with a CVC line in situ. For statistical analysis Chi-square test and Wilcoxon test were used.

RESULTS. Our main results are summarised in Tables 1 and 2. We have seen a significant increase in the compliance with the bundle and it resulted a significant and sustained reduction in CVC related infection rate and number of patients transferred to the ward with CVC lines (all $p < 0.05$). Mean dwell time showed a non-significant increase over time. All infected lines were inserted to the jugular vein.

TABLE 1

Year (quarter)	CVC days	Lines (n)	Mean dwell time (days)	Bundle compliance	CRBSI (n)	Infection rate/1000 catheter days	Patients transferred to the ward with CVC in situ
2006 (Q4)	503	114	4.41	55%	8	15.9	61
2007 (Q4)	628	122	5.14	92%	4	6.4	52
2008 (Q1)	547	103	5.30	96%	1	1.8	42
2008 (Q2)	561	125	4.48	95%	2	3.6	43
2008 (Q3)	493	105	4.69	95%	2	4.1	39
2008 (Q4)	511	104	4.91	100%	0	0.0	23

TABLE 2

2009 (Q1)	570	123	4.63	100%	2	3.5	21
2009 (Q2)	518	83	6.24	100%	0	0	10
2009 (Q3)	537	111	4.83	100%	0	0	8
2009 (Q4)	635	127	5.00	100%	1	1.6	9
2010 (Q1)	724	117	6.18	100%	0	0	6
2010 (Q2)	451	92	4.90	100%	0	0	4
2010 (Q3)	626	103	6.07	100%	0	0	2
2010 (Q4)	621	114	5.44	100%	0	0	3

CONCLUSIONS. Our data shows that implementation of care bundles can significantly and sustainably reduce and eliminate CRBSI on the ICU in a real life setting. 100% compliance with the bundle over a sustained period seems to be necessary to eliminate CRBSI completely. The use of CIS enables us to display real-time compliance data, which reinforces this message. Interestingly, a significant drop in CRBSI rate coincided with the introduction of new CVCs and since the application of the pre-prepared CVC insertion packs we have not experienced any infections.

REFERENCE 1. Beckett, et al. Intensive Care Med. 2010;S2:S126

0045

DURATION OF ANTIBIOTIC THERAPY FOR BACTERAEMIA IN CRITICALLY ILL PATIENTS: A 14-MONTHS EXPERIENCE

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INTRODUCTION. Bloodstream infections are source of concern in intensive care unit (ICU) with significant impact upon mortality, ICU and hospital length of stay and cost[1, 2]. No randomized trial has assessed the optimal course duration of the antibiotic treatment for bacteraemia, resulting in highly variable clinical practices.

OBJECTIVES. To analyze the antibiotic management and the outcome of bacteraemias in our surgical ICU.

METHODS. Microbiologically documented bacteraemias from January 2010 to February 2011 were included (fungi and skin contaminants excluded). For each episode, the following data were collected: clinical and demographic data, microorganism and source of bacteraemia, type and duration of antibiotherapy, outcome at day 28 (survival, bacteraemia relapse). Data are presented as mean (range).

RESULTS. A total of 45 bacteraemias were recorded in 42 patients, 12 out of 45 were not treated (therapeutic limitations, death before blood culture was given positive). Microorganisms involved in the 33 remaining bacteraemias were: *E. coli* (9/33 = 27.5%), Methicillin-susceptible *S. aureus* (18.5%), *P. aeruginosa* (15%), Klebsiella spp. (9%), *P. mirabilis* (6%), *E. cloacae* (6%), Streptococcus spp. (6%), Methicillin-resistant *S. aureus* (3%), *S. maltophilia* (3%), *B. fragilis* (3%), *E. faecium* (3%). Bacteraemias sources were: primary = 21%, catheter-related = 24%, secondary to another focus of infection = 55% (including: urinary tract = 21%, respiratory tract = 16%, intracranial infection = 6%, peritonitis = 3%, soft tissue infection = 3%, endocarditis = 3%, osteosynthesis implant infection = 3%). At the time of the bacteraemia, 36.5% of the patients were in septic shock and 18% in severe sepsis. Initial antibiotherapy was effective in vitro against microorganisms in 82% of the cases and included two antibiotics in 51% of the cases. Overall median duration of antibiotherapy was 10 days (7–42), with differences regarding the source of bacteraemia: 10 days (7–15) for primary source, 8 days (7–11) for catheter-related source, and 10 days (7–42) for bacteraemias secondary to another infection focus. Half of the episodes (46%) were treated during ≤8 days, 33% during 10 days, and 15% during 15 days. Duration of antibiotherapy >15 days concerned endocarditis, cerebral empyema and osteoarticular infection. Evolution at Day 28 showed: mortality rate = 21%, no bacteraemia relapse after the end of antibiotherapy and no secondary metastatic focus of infection, one infection due to *C. difficile*.

CONCLUSIONS. 80% of the bloodstream infections were treated during ≤10 days and no relapse was observed after the end of antibiotherapy. Our team is now working on a prospective randomized trial to determine the optimal duration of antibiotic therapy for bloodstream infections in ICU patients.

REFERENCES. 1. Clin Infect Dis 2001;33:1329–35. 2. JAMA 1994;271:1598–601.

0046

CATHETER-RELATED INFECTION IN IRISH INTENSIVE CARE UNITS: A PILOT SURVEILLANCE STUDY

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INTRODUCTION. Catheter related infections (CRI) with their associated morbidity, mortality and financial costs are a significant adverse effect of central venous catheters (CVC). Surveillance as a means of CRI reduction is advocated as a healthcare quality initiative.

OBJECTIVES. To institute surveillance of CRI in Intensive Care Units (ICU) throughout Ireland for the first time, using standardized HELICS (Hospitals in Europe Link for Infection Control through Surveillance) definitions of CRI.

METHODS. All non-tunneled CVCs inserted in all patients over 18 years of age admitted to ICU for more than 48 h were included. Data were prospectively collected in nine participating ICUs over a three-month period (November 2010–January 2011) and were collated centrally by the Health Protection Surveillance Centre (HPSC).

RESULTS. Study incorporated 1209 CVCs in 614 patients. 762/1209 (63%) of CVCs were inserted in ICU and 266/1209 (22%) in the operating theatre (OT). CVC insertion sites were; internal jugular (72%), femoral (17%) and subclavian (11%) veins. 84% of CVCs insertions were elective; 13% emergent.

Seventeen CRI episodes were identified giving a national CRI rate of 2.2 per 1000 CVC days. Of these, 41% of CVCs were inserted in ICU and 41% in OT.

Of the CRIs, 16/17 (94%) were internal jugular vein, 1/17 (6%) femoral, none was subclavian. 13/17 (76%) of CRIs occurred in elective CVCs; 4/17 (24%) in emergency CVCs.

CRI rates of the participating ICUs along with the national CRI rate are demonstrated in Fig. 1.

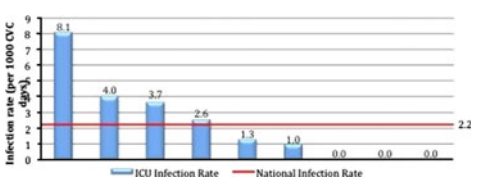

Fig. 1

CONCLUSIONS. The study demonstrated the feasibility of national audit using HELICS criteria. It showed a CRI rate of 2.2 per 1000 CVC days which, assuming full protocol compliance in all centres, compares favourably with internationally reported rates.

CVCs inserted in OT had a relatively high risk of CRI as did those inserted emergently. The subclavian vein CRI rate was low but numbers were low at only 11% of CVC insertions.

Ongoing surveillance in ICUs is warranted to further monitor the rate of CRI and to facilitate overall benchmarking and quality improvement initiatives in each of the centres involved.

GRANT ACKNOWLEDGMENT. Endorsed by the Irish Critical Care Trials Group and funded by the Health Service Executive Critical Care Program, Intensive Care Society of Ireland and Merck Sharpe & Dohme.

0047

RELATIONSHIP BETWEEN NEIGHBORHOOD POVERTY RATE AND BLOODSTREAM INFECTIONS IN THE CRITICALLY ILL

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INTRODUCTION. In the USA, residents of urban areas with high Neighborhood Poverty rates (the percentage living below the federal poverty line) are more prone to respiratory infections, tuberculosis and the common cold viruses. Few studies have examined the relationship between healthcare disparities and susceptibility to infections and related outcomes. No studies to date have examined the association of socioeconomic status and the risk of bloodstream infection in critically ill patients.

OBJECTIVES. We sought to elucidate the effect of Neighborhood Poverty rate on bloodstream infections following critical care initiation. The aim of this cohort study is to determine if higher Neighborhood Poverty rates, a well studied proxy for socioeconomic status, are associated with increased risk of bloodstream infections following initiation of critical care.

METHODS. We performed a multicenter observational study of 14,657 patients, age ≥ 18 years who had blood cultures drawn from 48 h prior to 48 h subsequent to critical care initiation. The patients were treated in 209 medical and surgical ICU beds between 1997 and 2009 in two hospitals in Boston, USA. Data sources included 1990 US Census and hospital administrative data. Census tracts were used as the geographic units of analysis. The exposure of interest was Neighborhood Poverty rate categorized as <5%, 5–10%, 10–20%, 20–40% and >40%. The primary end point was presence of bloodstream infection. The secondary outcome was all cause mortality up to 1 year. Logistic regression examined bloodstream infections and mortality. Adjusted odds ratios were estimated by multivariable logistic regression models.

RESULTS. Following adjustment for age, gender, race, patient type (medical/surgical), Deyo-Charlson Index, parenteral nutrition, hematocrit, white blood count, creatinine and blood urea nitrogen. Neighborhood Poverty rate was a strong predictor of risk of bloodstream infection with a significant risk gradient across Neighborhood Poverty rate groups as follows: (1) 5–10% OR 0.98 (95% CI 0.88–1.09; P = 0.7); (2) 10–20% OR 1.02 (95% CI 0.90–1.16; P = 0.8); (3) 20–40% OR 1.26 (95% CI 1.09–1.47; P = 0.002); (4) >40% OR 1.49 (95% CI 1.05–2.11; P = 0.03); (5) all referent to Neighborhood Poverty rate <5%.

There is no significant effect modification of the Neighborhood Poverty rate-bloodstream infection association on the basis of age or race. There was no association with Neighborhood Poverty rate and all cause mortality.

CONCLUSIONS. Increased Neighborhood Poverty rate is associated with the risk of bloodstream infection among patients who receive critical care. It is postulated that immune-system function may decrease in response to the increased psychosocial stress of poverty. Decreased immune function may be a component of the Neighborhood Poverty rate-bloodstream infection association witnessed in this study.

GRANT ACKNOWLEDGMENT. NIH K08AI060881.

0048

CENTRAL VENOUS CATHETER PORT DETERMINES RISK OF BLOOD CULTURE CONTAMINATION

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INTRODUCTION. Blood culture (BC) contamination may lead to unnecessary antibiotic administration and costs. Barrier precaution used during central venous catheter (CVC) insertion may be thought to decrease blood culture contamination, however, a recent retrospective study showed that contamination occurred twice as frequently in BCs obtained at CVC insertion (8% contaminated) when compared to peripheral venipuncture (4%). The CVC cultures in that study were obtained almost exclusively from the wire port of the CVC—the port through which the introducer wire passed during CVC insertion.

OBJECTIVES. In order to determine whether BC contamination was a result of CVC insertion procedure, and to determine whether CVC BC contamination can be reduced, this study compared BCs taken at CVC insertion from the wire port and non-wire port.

METHODS. BCs obtained at CVC insertion were analyzed prospectively for the presence of contaminants according to their source—wire lumen (from either single or multilumen CVCs) or non-wire lumen (from multilumen catheters only). Some multilumen catheters had cultures taken from both wire and non-wire ports in parallel. Contaminants were defined according to CDC criteria (principally common skin contaminants in a single culture).

RESULTS. Blood cultures were obtained on 280 occasions during insertion of 216 CVCs including 194 multi-lumen and 22 single lumen catheters (120 internal jugular, 60 subclavian and 32 femoral, 4 unknown). Of the 280 BCs, 17/120 (14%) taken from the wire port and 5/160 (3%) taken from the non-wire port were contaminated (p = 0.007). The contamination rate of BCs taken at subclavian vein insertion was lower than that of the other sites (1/74 [1%] vs. 21/206 [10%], respectively; p = 0.015, data missing on one contaminant). The BC contamination rate was higher when ultrasound (U/S) was used during CVC insertion (16/123 [13%] with U/S vs. 6/157 [4%] without U/S; p = 0.005, data missing on one contaminant). On multivariate logistic regression analysis, use of the wire port to obtain the BC (OR 5.7, 95%CI 2.0-16.4, p = 0.001) and U/S use during CVC insertion (OR 3.0 95%CI 1.0–8.7, p = 0.041) were independent predictors of BC contamination.

CONCLUSIONS. Use of the wire port to obtain BCs at CVC insertion increases the risk of BC contamination. This may be due to the wire manipulations required during CVC insertion using the Seldinger technique. If blood cultures are to be obtained at CVC insertion, they should be obtained from the non-wire port. Use of ultrasound may also increase the risk of BC contamination.

0049

TRENDS IN THE CENTRAL LINE RELATED INFECTIONS IN WINTER MONTHS IN A TERTIARY NEUROSURGICAL INTENSIVE CARE UNIT IN THE NORTH WEST OF ENGLAND IN THE LAST 2 YEARS IN COMPARISON WITH THE NATIONAL STATISTICS AND WITH THE ONGOING MATCHING MICHIGAN TRIAL: A SYSTEMATIC STATISTICAL REVIEW AND ANALYSIS

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INTRODUCTION. Central Venous Catheter related Blood Stream Infections are a significant cause of morbidity, cost and cause of concern especially in the winter months when there seems be a small percentage of rise in the number of the same.

OBJECTIVES. The aim of this audit was to look into the trends of the Central Venous Catheter related Blood Stream Infections in relation to the location of the line, where it was inserted (outside hospital, theatre, ITU), the number of days it was present in relation to the overall ITU days in that month and the reason for their removal. This was compared with the other Adult Neurosurgical units, All Adult Units in the North, National Adult Data Set, West Strategic Health Authority and with Michigan data.

METHODS. The data from the patients admitted to the Neurointensive Care Unit during the months of Dec 2009–Feb 2010 was compared with the data from Dec 2010–Feb 2011 according to the location of the line, where it was inserted (Outside hospital, theatre, ITU), reason for removal. They were also compared with the overall ITU bed days and analysed and compared with the national statistics and Michigan trial as stated in the aim of the study. Data was collected on a daily basis by one of the three mentioned authors under specific headings and then analysed at the end of each month and results compared.

RESULTS. There was a small proportion of increase in the rates of line related infections in the winter months (1.39 CVC BSI). The number of femoral lines from outside hospitals was significantly higher that others (72.7%). The infection rates were comparable with the other Intensive care units which were compared, but were higher that the Michigan Trial data. There was a gradual increase in numbers of placement of Internal Jugular and Sub-Clavian lines. Most common cause of the removal of the lines was its non requirement (68.14%). Femoral lines were the ones that were most commonly removed or replaced with suspected infection (59.09%). Further analysis and comparisons would be presented in detail at the conference.

CONCLUSIONS. With the rigorous adherence to the Matching-Michigan trial and the Hospital Infection control policy, the line related infections seem to be declining, despite there being a small rise in the winter months. With the advent of more use of Ultrasound guided technique the trend is changing towards Jugular and Sub-Clavian lines from the femoral lines. Femoral lines seem to be the most common lines seen in patients being transferred from other hospitals and the rates of their removal with suspected infections is also the highest.

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0050

MANAGEMENT AND OUTCOMES IN PATIENT WITH THORACIC MYCOTIC ANEURYSM AND GRAFT INFECTIONS

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INTRODUCTION. Infection of thoracic aorta is rare and life-threatening condition. Surgery remains the definitive treatment but still carry high mortality rate of 11–36% in the previous reports. We reviewed our experience managing patients with infections of thoracic aorta.

OBJECTIVES. We analyzed clinical characteristics, treatment of choice, early outcomes to evaluate the adequacy of our treatment.

METHODS. Retrospective and descriptive study of consecutive patients who underwent treatment for thoracic aortic infections from January 2002 to January 2011. In all cases, infection was confirmed by bacterial culture or pathologic examination. Infected aorta or graft was excised and replaced in situ with new Dacron graft after extensive debridement of adjacent infected or necrotic tissue. Coverage of the new graft with pedicled flap employed in five patients. Systemic intensive treatment for organ failure was performed including intravenous antibiotic therapy for more than 6 weeks (mean 6.9 weeks) after operative procedure.

RESULTS. 11 patients had treated for thoracic aortic infections (9 in situ grafting, 2 endovascular treatment) in a total of 359 thoracic surgical cases. The mean age was 56 years (range 31–75). Six were cases with infected aneurysm of the native aorta and five were cases with graft infection after previous implantation (mean interval 49 months). The site of infection was the thoracic aorta in seven patients and the thoracoabdominal aorta in four patients. Two patients were in sock status with cardiac tamponade or sustained VT. One patient presented with septic ARDS, and one with multiple cerebral embolism. The most common responsible microorganism was staphylococcus species in five patients (45%). The median duration of preoperative antibiotic use was 8 days. Eight patients had major postoperative complications. Respiratory failure with prolonged ventilator support occurred in three patient, renal replacement therapy was required in two patients, stroke and paraplegia each occurred in one patient. One patient with thoracoabdominal aneurysm died of multiple organ failure after septic ARDS. All of the patients with infected graft survived. Hospital mortality rate of was 9.1% (1/11).

CONCLUSIONS. Our experience suggest that radical resection of the infected tissue including the aorta is most important in the surgical treatment. Identification of causing microorganism and controlling preoperative infection status as much as possible is also important as a supportive therapy. Although surgical treatment is definitive, integrated intensive therapy is also important to overcome this critical condition.

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0051

ASSOCIATION BETWEEN ANTIBIOTIC USE AND THE DEVELOPMENT OF ICU-ACQUIRED MULTIDRUG RESISTANT BACTEREMIA

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INTRODUCTION. Over the past years there has been an increasing incidence of bloodstream infections (BSIs) caused by multi-drug resistant (MDR) bacteria in critically ill patients.

OBJECTIVES. The aim of this study was to determine the impact of previous antibiotic use on the development of ICU-acquired bacteremia and the susceptibility of the isolated pathogens.

METHODS. A prospective follow-up study was conducted in a 30-bed multidisciplinary ICU from January 2009 to June 2010, and 682 consecutive patients who were hospitalized for >48 h were eligible to participate. The exclusion criteria were prior ICU hospitalization, brain death, pregnancy, age < 18 years and the presence of bacteremia on ICU admission. The antibiotics use was documented for each patient during a 30-day period. The epidemiology of BSIs and the resistance pattern of the isolated pathogens were also recorded. Only data of the first episode of bacteremia were included in the analysis.

RESULTS. Three hundred and forty-two patients were finally included in the analysis (age 56 ± 20 years, males 67%, APACHE II score 14 ± 6, ICU stay 18 ± 17, ICU mortality 26%) and 92 (27%) of them ultimately developed BSI. Blood cultures revealed the following pathogen distribution: *Klebsiella pneumoniae* 32%, *Acinetobacter baumannii* 27%, *Pseudomonas aeruginosa* 11%, *Staphylococcus aureus* 2% and Candida species 9%. Carbapenemes, colistin, glycopeptides and aminoglycosides showed significant association with BSI development. Multivariate logistic regression analysis revealed significant association for colistin only (OR:1.9, $p < 0.05$). More specifically, colistin ($p < 0.03$), aminoglycosides ($p < 0.03$) and linezolid ($p < 0.002$) showed significant association with the development of *Klebsiella pneumoniae*, whereas carbapenemes with the presence of *Pseudomonas aeruginosa* ($p < 0.05$).

CONCLUSIONS. According to the results of the present study, the use of certain broad spectrum antibiotic agents might favor the selection pressure for the emergence of BSIs due to multidrug resistant gram negative bacteria.

0052

LINES AND LUMINA: LESS IS MORE?

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INTRODUCTION. Catheter-related bloodstream infections (CRBSIs) carry a significant morbidity and mortality, causing an estimated 28,000 deaths per year in the USA [1].
Multi-lumen central venous catheters (CVCs) offer central venous access for multiple uses through a single insertion site. Evidence suggests that additional lumina increases the risk of CRBSI [2].

OBJECTIVES. To investigate CVCs were used at Salford Royal Foundation Trust (SRFT), how many lumina were used.

METHODS. Over a 4-week period, every patient with a newly inserted CVC across three critical care areas—intensive care (ICU), surgical high dependency (SHDU) and neuroscience high dependency (NHDU)—was identified. Each day use of CVC was assessed. Administration of drugs that can only be given centrally, total parenteral nutrition, and monitoring of central venous pressure were deemed 'essential' use of a lumen. All other use was deemed 'non-essential' use.

RESULTS. Over the 4 week study period, CVCs were inserted on 62 occasions. 61 catheters were 4-lumen lines, and 1 was 5-lumina.
The following table shows the choice of lines inserted over the study period.

Table 1 Number of Lumina Used

	1 Lumina	2 Lumina	3 Lumina	4 Lumina
ICU	1 (0.03%)	5 (16%)	7 (22%)	19 (59%)
SHDU	3 (16%)	4 (21%)	6 (32%)	6 (32%)
NHDU	10 (100%	0	0	0

Based on the 'essential' criteria for lumen use, however, the required number of lumens was very different, as seen in Table 2.

Table 2 Number of Lumina Required

	1 Lumen	2 Lumina	3 Lumina	4 Lumina
ICU	16	12	4	0
SHDU	15	4	0	0
NHDU	10	0	0	0

CONCLUSIONS. Our audit shows that the number of lumina required for 'essential' use is low: indeed for the vast majority of patients required only one lumen. In no patients over the entire four-week period required were all 4 lumina used for 'essential' purposes.
These results indicate that lumina are commonly used for non-essential purposes (for example fluid administration) on both SHDU and ICU. We suggest that lumen use should be reduced, perhaps by an increase in the number of peripheral cannulae inserted. In turn we hope this will reduce the risk of CRBSIs.
To facilitate our proposed change in practice we have implemented an educational package, including a poster and a presentation to staff, explaining the merits of using CVCs with fewer lumina, alongside peripheral cannulae.

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0053

PATTERN OF PATHOGENS IN HOSPITAL-ACQUIRED BLOOD-STREAM INFECTIONS: 2 YEARS COMPARISON

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INTRODUCTION. The presence of multi-resistant pathogens becoming more and more common in intensive care unit.

OBJECTIVES. We analyzed the characteristics of the commonest multi-resistant pathogens, including their sensitivity and effect on mortality comparing year 2010 with 2008.

METHODS. We prospectively collected the results of positive microbiology blood samples sent from our surgical intensive care unit between 01 January 2010 and 31 December 2010. Sensitivity data of six most common pathogens were analysed: *Acinetobacter baumannii, Enterococcus* spp., *Staphylococcus aureus, Escherichia coli, Klebsiella* spp., *Pseudomonas aeruginosa.* These results were compared to year 2008. Multiple positive blood cultures with the same organism were taken only once for each patient.

RESULTS. We analyzed 148 positive microbiology blood samples from 2010 and 189 blood samples from 2008. The incidence of pathogens is in Table 1.

Incidence of pathogens in positive blood cultures

	2008 (n = 189)	2010 (n = 148)	2008	2010
Acinetobacter baumannii	1 (0.5%)	19 (12.8%)	MACI = 0	MACI = 19
Enterococcus ssp.	25 (13.2%)	26 (17.5%)	VRE = 0	VRE = 1
Staphylococcus aureus	9 (4.8%)	7 (4.7%)	MRSA = 6	MRSA = 5
Escherichia coli	11 (5.8%)	6 (4%)	ESBL = 0	ESBL = 2
Klebsiella ssp.	17 (9%)	6 (4%)	ESBL = 6	ESBL = 1
Pseudomonas aeruginosa	11 (5.8%)	11 (7.4%)		

MACI Multi-resistant ACInetobacter, *VRE* Vancomycin-Resistant Enterococcus, *MRSA* Methicillin-Resistant *Staphylococcus aureus*, *ESBL* Extended-Spectrum Beta Lactamase

63.6% (n = 7/11) of *Pseudomonas aeruginosa* isolates were sensitive to ciprofloxacin and only 36.4% to carbapenems or piperacillin/tazobactam in our 2010 samples. Comparing this to our 2008 samples, the sensitivities were 90.9% for piperacillin/tazobactam, 81.8% for ciprofloxacin and 72.7% for carbapenems. We found altogether 57 positive cultures of multi resistant *Acinetobacter baumannii* in year 2010: 28 from routine screening samples, 21 from abdominal samples, 15 from tracheal aspirate samples and 19 from blood samples. These cases were all sensitive to colistin (MIC 0.68 ± 0.21). Intensive care mortality of patients with positive *Acinetobacter baumannii* blood samples was found to be 57.9% (n = 11/19). In contrast, we had only one Acinetobacter isolate in 2008 and it wasn't multi resistant.

CONCLUSIONS. The antibiotic sensitivity of the commonest intensive care pathogens is changing rapidly; this should be taken into account when empirical antibiotics prescribed. The rapid emergence of multi-resistant infections warrant for prevention measures and routine microbiology surveillance.

0054

ICU ACQUIRED BLOODSTREAM INFECTIONS: EPIDEMIOLOGY, OUTCOME AND CORRELATION WITH AGE

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INTRODUCTION. Bloodstream infections (BSI) are among the most frequently encountered nosocomial infections in the Intensive Care Unit (ICU) representing an important cause of morbidity, mortality and excess cost.

OBJECTIVES. Aim of this study was to investigate the epidemiology of bloodstream infections in ICU patients and correlate incidence to patients' age.

METHODS. Historical cohort study (January 2007–December 2010) that included adult patients with ICU-acquired bloodstream infection, as identified by positive blood cultures obtained >48 hours following ICU admission. Patients were divided into four groups according to their age: Group A included young (<45 years) patients, Group B middle-aged (45–64 years), Group C old (65–74 years), and Group D very old ones (≥75 years). Young patients' group served as a reference category for the other age groups. Continuous variables are described as median (lower quartile to upper quartile). Comparative analyses were executed with Mann–Whitney Rank Sum test, Kruskal–Wallis test, or Chi-square.

RESULTS. Over this 4-year study period, 772 patients were admitted in our ICU. A total of 334 consecutive bacteremias identified in 175 patients, resulting in a calculated incidence of 31.2 episodes/1000 patients-days. Seventy-five (42.8%) of the patients suffered from multiple BSI episodes. Forty-two (12.5%) cases were polymicrobial. The most prevalent pathogens were: 296 (70.6%) included Gram negative bacilli, 96 (25.8%) Gram positive cocci (except from *Staphylococcus epidermidis*) and 14 (3.8%) fungi. Demographic and incidence data according to age group are presented on Table 1. Data are number (%) of patients (or episodes), or median value.

Table 1

	Group A (n = 15)	Group B (n = 65)	Group C (n = 53)	Group D (n = 42)	p
Age	27 (23–37)	57 (51–61)	71 (69–73)	80 (78–82)	<0.001
Gender (Male)	13 (86.7)	49 (75.4)	34 (64.1)	23 (54.8)	NS
BSI incidence/1000 patients-days	25.5	36.5	35.6	22.5	0.003
Day of BSI diagnosis	15 (6–25)	17 (8–42)	19 (9–42)	22 (11–41)	NS
APACHE II score	13 (9.5–15)	18 (13–22)	20 (16–25)	22 (16–28)	<0.001
Days of mechanical ventilation	15 (7–21)	25 (10–39)	20 (14–34)	24 (13–33)	NS
Days of central venous catheterization	17 (14–28)	33 (16–55)	22 (19–42)	33 (16–53)	NS
ICU length of stay	16 (14–28)	28 (15–44)	20 (17–37)	28 (10–41)	NS
ICU mortality	0	22 (33.8)	21 (39)	18 (42.8)	0.02

CONCLUSIONS. Over a 4-year period, BSI incidence rate in our cohort was 32.1 per 1000 patients-days. Bacteremias were polymicrobial in 12.5% of cases, with predominance of Gram negative pathogens. Duration of mechanical ventilation, central venous catheterization and ICU length of stay did not differ among study groups. However, ICU mortality was significantly higher in patients older than 45 years. Incidence of BSI was lower among very old patients when compared to middle-aged and old patients. Yet, the adverse impact of this infection was higher in very old patients.

0055

NOSOCOMIAL INFECTIONS IN EXTRA-CORPOREAL LIFE SUPPORT PATIENTS: A RETROSPECTIVE STUDY

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INTRODUCTION. Extra-Corporeal Life Support (ECLS) is a method of life support used to treat patients with severe respiratory and/or cardiac failure refractory to conventional modes of therapy [1]. Cannulation of major blood vessels is required for access and return flow through the extra-corporeal circuit. These large-bore cannulae disrupt the normal protective mechanism of the skin barrier and, as is the case with all invasive vascular devices, constitute a risk factor for nosocomial infection [2,3].

OBJECTIVES. The aim of this study was to determine types of nosocomial infection in ECLS patients, the associated micro-organism(s), patterns of resistance (if any) and the antimicrobial regimes used in prophylaxis and treatment of associated infections. The indications for and duration of ECLS were also evaluated as well as the presence of other risk factors for infection in ECLS patients.

METHODS. In this retrospective, observational study, we examined the medical records of all patients who received ECLS at our institution. The associated microbiological findings as well as antimicrobial prescriptions were analysed.

RESULTS. Data analysis revealed 17 patients over a two-year period. There was a relatively high rate of nosocomial infection, with a preponderance of blood stream infection, pneumonia and suspected catheter-related infection. Moderate rates of resistant organisms were prevalent. Of note, the initial ECLS cohort of patients in our institution (n = 4) received antibacterial and antifungal prophylaxis whilst the later cohort did not.

CONCLUSIONS. ECLS patients are a high-risk group for nosocomial infection. No international best-practice consensus guidelines exist for treatment and/or prophylaxis of infection in this patient group. Further study is warranted to evaluate the diagnosis, treatment and overall approach to the management of nosocomial infections in this cohort of patients.

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Biomarkers in the ICU: 0056–0067

0056

POOR DIAGNOSTIC VALUE OF SERUM PROCALCITONIN FOR VENTILATOR-ASSOCIATED PNEUMONIA CAUSED BY *PSEUDOMONAS AERUGINOSA*

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INTRODUCTION. Procalcitonin (PCT) is considered as a specific marker for severe bacterial infection [1]. Previous study showed that PCT level increased during initial clinical course of ventilator-associated pneumonia (VAP) and a PCT-guided strategy allowed reducing antibiotic exposure [2]. The knowledge on significance of PCT in patients with VAP is however still limited.

OBJECTIVES. The aim of the study was to compare serum PCT level in patients with early and late onset VAP and test the hypothesis that PCT didn't increase in patients with VAP caused by *Pseudomonas aeruginosa (P aeruginosa).*

METHODS. During a 4-month period, bronchoalveolar lavage (BAL) was performed in 155 mechanically ventilated patients with clinically suspected VAP. VAP was confirmed in 67 patients by quantitative BAL cultures. In all patients, serum PCT level was measured at the day of the BAL. Serum PCT levels were compared between the patients with early onset and late onset VAP, and between VAP caused by *P aeruginosa* and those caused by other bacterial pathogens. Comparisons between the groups were made by Mann–Whitney rank-sum test. Data were expressed as median and 25–75% interquartile range.

RESULTS. Among 67 patients with VAP confirmed by BAL, 20 had early onset and 47 had late onset VAP. Thirty-three of 67 patients had VAP caused by *P aeruginosa* (early onset n = 10, late onset n = 23) and 34 patients had VAP caused by other pathogens. PCT level at the day of VAP diagnosis was not different between early and late onset VAP [0.67 (0.25–8.1) ng/ml vs. 0.60 (0.23–1.5) ng/ml, p = 0.38]. PCT level was significantly lower in patients with VAP caused by *P aeruginosa* than in patients with VAP caused by other pathogens [0.30 (0.14–0.75) ng/ml vs. 1.2 (0.6–2.8) ng/ml, p = 0.001]. PCT < 0.5 ng/ml was found in 64% of patients with VAP caused by *P aeruginosa* and 18% of patients with VAP caused by other pathogens (p < 0.001).

CONCLUSIONS. PCT level was similar in patients with early and late VAP. Measurement of plasma procalcitonin appears to have poor diagnostic value for VAP caused by *P aeruginosa.*

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0057

SERUM DYSLIPIDEMIA AND HYPERGLYCEMIA AS PREDICTORS OF POOR CLINICAL OUTCOME IN SEVERE SEPSIS

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INTRODUCTION. Severe sepsis is the main reason of intensive care patients deaths for the last 20 years. Some investigators emphasize the role of stress hyperglycemia and lipid metabolism alterations in prediction of poor outcome in septic patients.

OBJECTIVES. The main aim of this study was to determine prognostic value of lipid and carbohydrate metabolism alterations in patients with severe sepsis.

METHODS. 136 surgical (non-diabetic) ICU patients with severe sepsis of different origin were included in this study. We investigated serum levels of nitric oxide and lactate, N̄-reactive protein, cytokines—IL-4, IL-8, TNF-α to determine the severity of systemic inflammatory response and sepsis. We also studied serum cholesterol, triglycerides (TG), β-lipoprotein fractions (HDL, LDL, VLDL), blood glucose levels.

RESULTS. All patients demonstrated low serum levels of cholesterol. We found out that low levels of HDL and LDL and high serum VLDL were closely connected with severity of SIRS and sepsis, increased IL-8 and decreased IL-4 serum concentrations. We also divided patients into two subgroups:

I-high TG levels (> 2,3 mmoll), hyperglycemia (blood glucose> 8,3 mmol), low levels of HDL, LDL and high VLDL; II group-normal TG, HDL,LDL, VLDL, normal glycemia. 28 day mortality rate was significantly higher in Group I-41.8%–23 (55) versus 73.1%–19(27) in Group II ($p = 0.015$, χ^2 test).

CONCLUSIONS. Serum dyslipidemia (high levels of TG, low HDL and LDL, increased VLDL) together with stress hyperglycemia can be considered as predictors of poor clinical outcome in severe sepsis.

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0058

THE POTENTIAL USE OF PRO-CALCITONIN TO IMPROVE THE CLINICAL CARE OF SEPTIC PATIENTS

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INTRODUCTION. Pro-calcitonin (ProC) based antibiotic algorithms may be used to treat sepsis in critically ill patients whilst shortening antibiotic course length [1]. Other roles may include ProC as a marker of treatment response and as a prognostic indicator [2]. Our region has limited experience of this biochemical test.

OBJECTIVES. To ascertain how the use of ProC could alter and improve our clinical care, we retrospectively reviewed a cohort of our septic patients.

METHODS. For a period of 3 months the ProC levels of septic patients were measured as a part of their routine daily blood profile. A multidisciplinary team then retrospectively reviewed each case using previously published algorithms to see how ProC may have altered our clinical care [1, 3]. Ethics approval was not required.

RESULTS. The notes of 14 patients were retrospectively reviewed. 11 were diagnosed with pneumonia, 2 with faecal peritonitis and 1 with infective colitis. Eight suffered with multiple organ failure, all with ProC levels >10 ng/ml, values consistent with septic shock.

The use of ProC may have contributed to 19 clinical decisions. In four patients it supported the empirical end to antibiotics (ProC fall by 90% of peak at end of empirical period), in five patients its use may have reduced antibiotic course length (ProC fall by 90% before end of empirical period), in five cases it would have improved diagnostic accuracy, in one case its use may have indicated ineffective treatment secondary to resistant bacteria (no improvement in ProC within first 72 h) and in four patients its use may have indicated that empirical antibiotic course length was insufficient (ProC fall by less than 90% of peak by end of empirical period).

CONCLUSIONS. In this retrospective review, ProC could have provided useful supportive information in our clinical practice. Besides guiding antibiotic therapy in an environment where drug resistant bacteria are of major concern, we found that the use of ProC may also contribute to solving diagnostic conundrums, for example, the presence of supra-infection in exacerbations of acute asthma or viral pneumonia. We conclude that ProC is potentially a beneficial tool in clinical practice, and not only to reduce antibiotic exposure.

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0059

OLD AND NEW BIOMARKERS FOR PREDICTING HIGH AND LOW RISK MICROBIAL INFECTION IN CRITICALLY ILL PATIENTS WITH NEW ONSET FEVER: A CASE FOR PROCALCITONIN

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INTRODUCTION. Fever suggests the presence of microbial infection, also in critically ill patients. Sequelae of infection are potentially serious and fear of undertreatment contributes to ordering tests and prescribing antibiotics, before results of cultures become available.

OBJECTIVES. The aim was to compare the role of old and new biomarkers in predicting microbial infection, its invasiveness and severity in critically ill patients with new onset fever.

METHODS. We prospectively studied 101 patients in the intensive care unit with new onset fever (>38.3°C). Routine infection parameters, lactate, procalcitonin (PCT), midregional pro-adrenomedullin (MR proADM), midregional pro-atrial natriuretic peptide (MR proANP) and copeptin (COP) were measured daily for 3 days after inclusion. Likelihood, invasiveness and severity of microbial infection were assessed by cultures, imaging techniques and clinical courses.

RESULTS. All patients had systemic inflammatory response syndrome, whereas 45% had a probable or proven local infection and 12% a bloodstream infection (BSI), with 20 and 33% mortality in the ICU, respectively. Only peak PCT was of predictive value for all endpoints studied, i.e. BSI, septic shock and mortality designated as high risk infection and infection without BSI, shock and mortality (low risk infection), at different cutoff values and areas under the receiver operating characteristic curves, varying between 0.67 ($P = 0.003$) and 0.72 ($P < 0.001$). For high risk infection, the combination of C-reactive protein and lactate predicted best, followed by peak PCT, in multivariable analysis. For low risk infection, PCT was the single best predictor.

CONCLUSIONS. In critically ill patients with new onset fever, plasma PCT as a single variable serves best, among old and new biomarkers, to predict high and low risk ICU-acquired microbial infection, when peaking above or below 0.65 ng/mL, respectively. We propose this value in future studies on PCT-guided empiric antibiotics in ICU-acquired fever.

0060

PCT AS A DIAGNOSTIC AND PROGNOSTIC TOOL IN BURN PATIENTS. WHETHER TIME COURSE HAS A ROLE IN MONITORING SEPSIS TREATMENT

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INTRODUCTION. Procalcitonin measurement is now routinely used to confirm bacterial infection in critically ill patients. Besides its role as a marker of infection, procalcitonin has been shown to be helpful in determining the effectiveness and appropriate duration of antibiotic therapy in critically ill patients.

OBJECTIVES. To evaluate the diagnostic and prognostic performance of inflammatory markers for septic and non septic (localized) bacterial infections in patients with severe burn injury.

METHODS. All consecutive patients with burn area >20% of body surface area admitted to our burn ICU between 2005 and 2010 were included in this study. Demographic and clinical data were recorded for each patient. Serum procalcitonin, C-reactive protein and white blood cell count were measured within 24 h after burn and daily thereafter. Each patient was examined for signs and symptoms of infection at the time of admission and daily thereafter until their discharge from the ICU or their death.

RESULTS. Data of 145 patients were evaluated (48.2 $\pm$ 18.3 years, 55% male, 38.8 $\pm$ 18% TBSA, 11.5 $\pm$ 4 APACHE II, 29 $\pm$ 10 SAPS II, 4.4(2–6) SOFA). The mortality rate of patients was 16.5%. Multiple organ failure due to septic complications was the main cause of death. Maximum procalcitonin ($p = 0.004$) was independent predictors of outcome in logistic regression analysis. PCT thresholds of 1.5 ng/ml, 0.52 ng/ml and 0.56 ng/ml had adequate sensitivity and specificity to diagnose sepsis, respiratory tract and wound infections, respectively. A decrease in PCT concentration of 7.8 ng/ml between day 1 and day 3 was associated with the effectiveness of sepsis treatment with AUC of 0.9 (95% CI 0.69–1.03, $p = 0.002$). C-reactive protein and WBC showed no significant change over the first 3 days in the patients with successfully treated sepsis ($p = 0.93$).

CONCLUSIONS. The maximum procalcitonin level has prognostic value in burn patients. PCT can be used as a diagnostic tool in patients with infectious complications with or without bacteremia during ICU stay. Daily consecutive PCT measurements may be a valuable tool in monitoring the effectiveness of antibiotic therapy in burn ICU patients.

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0061

MEASUREMENTS OF RADICAL OXYGEN SPECIES IN CSF IN RAPID DIAGNOSIS OF NOSOCOMIAL MENINGITIS

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INTRODUCTION. The diagnosis of nosocomial meningitis is difficult with classical criteria because of blood presence in cerebrospinal fluid (CSF) in traumatic or postoperative context. Most of the time, large spectrum antibiotics are started for at least 48 h before microbiological culture results.

OBJECTIVES. To measure radical oxygen species (ROS) production by phagocytes in CSF and to evaluate this parameter as a diagnosis criteria for meningeal infection.

METHODS. CSF from patients with suspected meningitis (fever > 38.2°C) in a traumatic or neurosurgical context. CSF infection criteria: >100 cell/mm^3 or >50% PMNs and positive microbiology; CSF with aseptic inflammation: >100 cell/mm^3 or >50% PMNs and negative microbiology. ROS measurements by luminometry (cumulative luminescence) after incubation with luminol (spontaneous production) and after stimulation by phorbol 12-myristate 13-acetate (PMA) (stimulated production).

RESULTS. Among 78 CSF samples, 10 were positive for meningitis diagnosis. Spontaneous and stimulated ROS production were higher in CSF with aseptic inflammation compared to CSF without inflammation (OR: 1.04 [1.02;1.06] $p < 0.01$ and 1.03 [1.01;1.05] $p < 0.01$, respectively). Only spontaneous production was significantly increased in proven meningitis in comparison with microbiologically negative CSF (OR 1.04 [1.02;1.05] $p < 0.01$). Evaluation of the test for meningitis diagnosis found an area under the ROC curve at 0.79 for spontaneous ROS production and 0.74 for stimulated production.

CONCLUSIONS. In the nosocomial context, microbiological diagnosis of meningitis was associated with high production of ROS in CSF. Such a rapid test for the diagnosis of meningitis (within minutes) seemed convenient for clinical practice, but need further validation in a large population.

0062

PROCALCITONIN FOR DIFFERENTIATION OF INFECTED FROM NON-INFECTED PATIENTS IN THE POSTOPERATIVE COURSE AT A SURGICAL ICU

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INTRODUCTION. Procalcitonin (*PCT*) was introduced primarily as a new marker for bacterial and fungal infections, severe infections with systemic response and sepsis.
In early stages bacterial and fungal infections lead to a massive increase of *PCT*. Serum concentrations of *PCT* seem to correlate with the severity of microbial invasion.

OBJECTIVES. The aim of our study is to investigate the contribution of *PCT* and conventional markers of infection for differentiation of infected from non-infected patients in postoperative course to compare the content of information of these parameters for the daily routine.

METHODS. By means of an immunoluminometric assay we have measured serum concentrations of *PCT* and conventional markers of infection (*Creactive Protein [CRP]*, *fibrinogen* and *leucocytes* prospectively in n = 423 patients [observational study], who were treated postoperatively [SICU, university hospital]. N = 132 patients had a minimum duration of 4 days and were analyzed, the others excluded because of their short stay. Data were analyzed with *linear discriminant analysis*. Patients were grouped to type of those with or without clinically and microbiologically proof of infection based on clinical course.

RESULTS. Coefficients for differentiation: Group 1/2: *Leucocytes*: 0,438/0,459; *Fibrinogen*: 1.104/1.192; *CRP*: 0.004/0.012; *PCT*: −0.019/−0.018; constant: −6.399/−8.236. *Linear discriminant analysis* facilitates to classify 68.8% of the patients to one of both groups, for the rest of the patients classification based on the analyzed parameters was not possible. Example of a patient with systemic infection and elevated infection parameters (*Leuc* 11.4/µl; *Fibr* 8,82 g/l; *CRP* 211 mg/l; *PCT* 7.04 ng/ml): probability *P(no infection) = 0.294505769 (29%); P(proofed infection) = 0.705494231 (71%).* Example of a patient with a real systemic infection and low infection parameters (*Leuc* 5.20/µl; *Fibr* 1.99 g/l; *CRP* 32 mg/l; *PCT* 0.17 ng/ml): *P(no infection)* = 0.785247036 (79%); *P(proofed infection* = 0.214752964 (21%).

CONCLUSIONS. *Discriminant analysis* is a robust statistical procedure, that allows a maximum of differentiation of groups based on their laboratory parameters, if its possible anyway. Differentiation between patients with uncomplicated postoperative period and those with proved infections based on *PCT* and conventional markers of infection is scarcely possible. The second example shows impressively how a constellation of laboratory results can mislead the clinician. We should take these facts into consideration for the assessment of postoperative laboratory results in surgical-ICU patients.

0063

USEFULNESS OF PROCALCITONIN TO SUPPORT INFECTION DIAGNOSIS AFTER THORACIC SURGERY: A PILOT STUDY

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INTRODUCTION. After thoracic surgery, both C-reactive protein (CRP) and Procalcitonin (PCT) are elevated. It has been described that in patients with postoperative infection, PCT is higher and it would be useful to diagnose infection.

OBJECTIVES. To determine whether PCT could be useful to support the diagnosis of postoperative infection in patients after thoracic surgery.

METHODS. Prospective cohort study. We included patients undergoing thoracic surgery admitted in the Critical Care Area in a 4-month period. We registered demographic data, type of surgery and duration of the intervention. Levels of CRP and PCT and clinical signs of SIRS preoperatively, and at 6, 24, 48 and 72 h following surgery were recorded. Suspicion of postoperative infection was done by attending physicians at bedside. Definitive diagnosis of infection was established in accordance with the hospital guidelines. We evaluated the relationship between the clinical suspicion of infection and the pattern of biomarkers with the subsequent confirmation of infection. Data were analyzed using *t* test or non-parametric test as appropriate.

RESULTS. 30 patients were studied. 27 were men. Age was 62.5 ± 9.3. In 24 patients a lobectomy was performed, in 2 a pneumonectomy and 4 received atypical resections. Surgery duration was 195 ± 70 min. Temperature, heart rate and respiratory rate were higher in patients where infection was suspected.

Clinical signs of SIRS

	Group	Temp. (C°)	H. rate (bpm)	R. rate (cpm)
Basal	Non In. Susp. In. Suspicion	36.3 ± 0.3 36.2 ± 0.4	76 ± 12 76 ± 10	15 ± 2 16 ± 3
Post 6 h	Non In. Susp. In. Suspicion	36.7 ± 0.6 36.6 ± 0.6	81 ± 14 89 ± 14*	20 ± 1* 19 ± 3*
Post 24 h	Non In. Susp. In. Suspicion	36.9 ± 0.5* 37.6 ± 0.5*#	83 ± 14* 100 ± 17*#	20 ± 3* 23 ± 4*#
Post 48 h	Non In. Susp. In. Suspicion	36.5 ± 0.4 37.4 ± 0.4*#	82 ± 13 106 ± 15*#	19 ± 2* 22 ± 2*#
Post 72 h	Non In. Susp. In. Suspicion	36.2 ± 0.4 37.3 ± 0.7*#	79 ± 10 103 ± 12*#	19 ± 2* 22 ± 3*#

* $p < 0.05$ for comparison versus basal value # $p < 0.05$ comparison between groups

When we analyzed patients with clinical infection suspicion, there was a significant difference in PCT values between patients with confirmed infection and patients without infection confirmation.

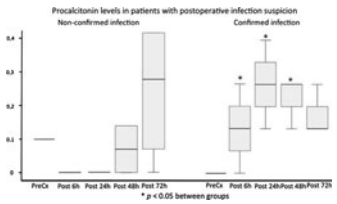

Fig. 2

CONCLUSIONS. Given the small sample size of this pilot study, our findings should be considered as a "proof of concept". We found a correlation between PCT and confirmation of infection after thoracic surgery. Because PCT tend to increase in all patients after thoracic surgery, we think it has to be solicited only in patients under clinical suspicion of infection and not like a screening test.

0064

SERIAL PROCALCITONIN MEASUREMENTS TO IMPROVE DIAGNOSTIC ACCURACY FOR SEPSIS IN EMERGENCY DEPARTMENT PATIENTS

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INTRODUCTION. More accurate diagnosis of sepsis could decrease treatment delays and prevent inappropriate therapy for conditions mimicking sepsis. A single Procalcitonin (PCT) has moderate sensitivity and specificity for diagnosing sepsis.

OBJECTIVES. To evaluate serial PCTs to improve accuracy of diagnosis of sepsis in the Emergency Department (ED). We hypothesize that PCTs measured at ED presentation (PCT1) and 6 h later (PCT2) will improve accuracy in diagnosing sepsis compared to a single PCT. We also hypothesize serial PCTs will increase Emergency Physicians' (EPs') certainty in their diagnosis.

METHODS. We enrolled a convenience sample of adult ED patients suspected of having sepsis. The first PCT (PCT1) was drawn at initial evaluation and a second (PCT2) was drawn 6 h later. Lab results and discharge summaries were reviewed to confirm diagnosis. EPs were surveyed using a visual analog scale to assess the impact of PCT1 and PCT2 on their certainty of the diagnosis. We calculated the sensitivity and specificity of serial PCTs to identify septic patients based upon PCT levels and differences between PCT1 and PCT2. Logistic regression was used to identify significant predictors of sepsis. Differences between PCT1 and PCT2 measurements and changes in physician certainty were analyzed by paired *t* test.

RESULTS. Of the 28 pts enrolled, 25 (89%) had both PCT1 and PCT2 drawn, and 23 (82%) had physician surveys completed. Septic patients had significantly higher values for PCT2 (5.5 vs. 0.15, $p = 0.04$). All patients with any PCT above 2.0 ng/dL had sepsis. Sensitivity and specificity for detecting sepsis based on PCT1 were 38.5 and 100%, and were 63.6 and 92.9%, when either PCT1 or PCT2 was elevated or there was any increase in PCT2 compared to PCT1. Logistic regression identified PCT2 as a significant predictor of sepsis ($p = 0.0268$), though the odds ratio was not statistically significant 2.654 (0.621, 11.349). Physicians considered PCT1 significantly more important than PCT2 (0.92 ± 1.9, 95% CI (0.07, 1.8)), though physician confidence in diagnosis did not change between PCT1 and PCT2 ($p = NS$). Of the five discordant patients, two were currently being treated with antibiotics and one was thought to have a fungal UTI. The remaining two had evidence of UTI or pneumonia on ED workup and were started on antibiotic therapy.

CONCLUSIONS. Serial PCT measurements can improve the diagnostic accuracy of sepsis in ED Patients. Possible confounders include prior antibiotic therapy and fungal infections.

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GRANT ACKNOWLEDGMENT. This research was funded by a seed grant from the Arizona Emergency Medicine Research Center.

0065

EARLY SERUM ENDOTOXINS LEVEL AND ORGAN FAILURE IN SEPTIC PATIENTS

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INTRODUCTION. Cellular and tissue injuries in sepsis depend on the degree of microorganism penetration and host immune response. The monocytic-macrophage line is extremely sensitive to the bacterial lipopolysaccharide, also known as endotoxin, that is a potent toxic substance produced mainly by Gram negative bacteria. This has raised the interest in measuring the endotoxin activity (EAA) by the Limulus amoebocyte lysate method in patients with severe sepsis or septic shock.

OBJECTIVES. The purpose of this study was to evaluate if the levels of EAA measured early after the appearance of clinical signs of sepsis is related to the development of organ failure and clinical outcome in no-intensive care patients.

METHODS. From March 2009 to January 2010 we studied 19 patients admitted to no-intensive care departments of a University Hospital with clinical signs of sepsis lasted <12 h. SOFA score and blood level of EAA at time of the first patient evaluation (T0) and after 6, 24 and 48 h (T6, T24, T48) were measured. The EAA levels remained blinded to the clinical staff and according to others a value <0.6 was considered normal. Intensive care unit (ICU) admission and hospital mortality were also collected in each patient.

RESULTS. At T0, 13 patients (68%) showed an EAA level higher than >0.6. In these patients, age and SOFA scores at T0, T1, T2 and T3 were similar to those measured in patients with normal EAA. The rate of ICU admission in patients with high levels of EAA (8/13, 61%) was slightly larger than in the other patients (50%, 3/6) whereas the hospital mortality was lower (23% vs. 50%; $p > 0.05$).

CONCLUSIONS. The above preliminary data indicated that EAA levels assessed early in clinical course of patients with sepsis does not seem to be related to development and the extent of organ dysfunction, need for ICU admission and hospital mortality.

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0066

RELEVANCE OF PRO CALCITONIN AS BIOMARKERS OF SEPSIS AFTER PEDIATRIC CARDIAC SURGERY AND TITRATING RESPONSE TO ANTIMICROBIAL THERAPY

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OBJECTIVES. To compare High sensitivity C-reactive protein (HSCRP) and serum procalcitonin (PCT) as biomarkers of sepsis in neonates and infants after pediatric cardiac surgery and response to antimicrobial therapy.

DESIGN. Prospective study, June 2010 to October 2010.

SETTING. Pediatric cardiac ICU Fortis Escorts Heart Institute New Delhi.

INCLUSION CRITERIA. (1) Age < 1 year, (2) Post operative pediatric cardiac surgery neonates and infants with clinical sepsis,based on the SIRS criteria.

EXCLUSION CRITERIA. (1) Preoperative clinical sepsis on antimicrobial therapy. (2) Age > 1 year.

Of the total 180 cases operated, 25 were evaluated for sepsis based on clinical symptoms. Serum PCT and HS CRP were evaluated on first and seventh postoperative day, with the onset of clinical sepsis. Paired blood cultures were drawn prior to initiation of empirical broad spectrum anti microbial therapy and on 7th day of antimicrobial therapy. In patients with clinical features suggestive of ventilator associated pneumonia, tracheal cultures were also evaluated. A positive blood culture was considered gold standard for confirming diagnosis of clinical sepsis.

RESULTS. At the onset of clinical sepsis, HSCRP was ranging between 0.28 and 24 mg/dL (mean 11 mg/dL) and PCT range was between 0.122 and 21.78 ng/ml (mean 5.04 ng/ml). Nine patients were blood culture positive, and in two cases the tracheal cultures were positive. Of the nine blood culture positive cases, three isolates were *Klebsiella pneumoniae*, five isolates *Acinetobacter baumannii* and one isolate was *Staphylococcus aureus*. Both the tracheal isolates were gram negative organisms. All the culture positive cases had high PCT and HSCRP. On the 7th day, after initiation of antimicrobial therapy, HSCRP ranged between 0.28 and 18.46 mg/l (mean 6.74 mg/l) and PCT range was between 0.120 ng/ml to 1.78 ng/ml (mean 0.4 ng/ml). After initiation of appropriate therapy HSCRP and PCT values gradually declined, with the PCT values revealing a consistent regression with the clinical improvement, but due to the limited sample size, it was statistically non significant. Thirteen cases had thrombocytopenia with onset of clinical sepsis, and in eleven cases it reverted back to normal. Two cases had leucopenia, of which one recovered. Two cases expired and both had culture positive gram negative sepsis.

CONCLUSIONS. In lieu of multiple confounding factors due to high incidence of peri operative infection, the titration of empirical antibiotic therapy for clinical sepsis and its duration is a perennial dilemma faced after pediatric cardiac surgery in our country. This study was designed as a means to identify a biomarker to assist decision making and based on the initial results we conclude that pro calcitonin, in comparison to other biomarkers, has higher specificity in assisting diagnosis and deciding duration of antimicrobial therapy leading to better outcome and cost parameters.

0067

PROCALCITONIN LEVEL ASSOCIATED WITH BACTERIEMIA ETIOLOGY IN SEVERE SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. The etiology of bacteremia determines the choice of adequate therapy for severe infections. The clinical manifestations of gram-negative and gram-positive bacterial infections are similar while biological markers may serve as a guide for the early diagnosis of the nature of a pathogen.

OBJECTIVES. The purpose of the study was to assess an association between the level of procalcitonin (PCT) and the etiology of bacteremia.

METHODS. We analyze clinical data, biomarkers and etiology of blood culture in 150 patients with severe sepsis or septic shock hospitalized in Intensive care Unit over a period of 2 years (2009–2011). The PCT was analyzed by immunoassay (Vidas, Brahms) and was measured in the first 24 h from the beginning severe sepsis or septic shock. The program used for the data processing and statistical analysis was SPSS.

RESULTS. Twenty-four patients (16%) were severe sepsis and 126 (84%) septic shock. The mean age was 59 ± 16 years, 60% were men, APACHE II was 25.48 ± 6.72 and SOFA 9.7 ± 3.19. The length of stay in ICU was 10 ± 5.7 days and 22% of mortality. Blood cultures were realized in 130 patients, 66 were negative (49 cases received antibiotics before the blood culture) and 3 cases the result were fungi. In the gram-negative bacteremia group, plasma PCT levels were statistically significantly higher than in the gram-positive bacteremia group: 62.3 ± 32, n = 35 versus 33.5 ± 24, n = 26, p = 0.000, f = 5.8. *Escherichia coli* had the highest value into the gram-negative group (n = 20, 78 ± 40) and *Streptococcus pneumoniae* in the gram-positive group (n = 14, 53 ± 39).

CONCLUSIONS. Patients with severe infections and plasma PCT levels, may be supposed the etiology before obtaining blood culture results. In abdominal or urinary sepsis *E. coli* and *S. pneumoniae* in the case of pneumonia could be the responsible microorganisms with high values PCT.

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Short & long term outcomes: 0068–0079

0068

PREDICTING LONG-TERM SURVIVAL AFTER CARDIAC SURGERY

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INTRODUCTION. We developed a Surgical Procedure Assessment (SPA) score to assist in triage of cardiac surgical cases to a very busy intensive care unit (ICU). The SPA score consists of an index of surgical complexity: (1) low, e.g., coronary artery bypass grafting (CABG) or single valve; (2) moderate, e.g., double valve, CABG-valve; (3) high, e.g., ventricular assist device (VAD), lung transplant.

SPA 1 and 2 are further modified by an index of co-morbidity: A—no substantial co-morbidity; B—substantial co-morbidity. We found that the SPA score is better able to predict ICU length of stay (LOS), hospital LOS, in-hospital mortality and hospital charges than other more complex scores [1]. We wished to evaluate the ability of the SPA score to predict long-term survival and determine other predictors of long term mortality.

OBJECTIVES. To evaluate the ability of the SPA score to predict long-term mortality after cardiac surgery.

METHODS. All adult cardiac surgical patients at Columbia University Medical Center in 2002 were prospectively assigned a SPA score and followed for 7 years. Predictors of 7-year mortality were evaluated and the ability of the SPA score to predict 7-year survival after surgery was evaluated using Kaplan–Meier curves.

RESULTS. Of a total of 1201 adult patients who underwent cardiac surgery we were able to obtain mortality data from 1183 (98.5%). Of this cohort, 62% were still alive after 7 years. Female sex, more advanced age, lower ejection fraction and a history of diabetes were associated with decreased 7-year survival. 128 patients were older than 80 years at the time of operation, of these 62 patients were still alive after 7 years (48.4%). Patients who were SPA 1B (low complexity surgery, substantial comorbidity) had similar survival to SPA 2A (moderate complexity, no substantial comorbidity). Patients who were SPA 2 B (moderate complexity, substantial comorbidity) had significantly greater survival than SPA three patients until 7 years, when the curves met.

DISCUSSION. Age, sex, diabetes and ejection fraction were predictors of long-term survival. Almost 50% of the octogenarians were still alive after 7 years. Patients with SPA 1A had the best survival whereas SPA score 1B and 2A had similar survival rates after 7 years. SPA 3 had a high early mortality but comparable survival after 7 years.

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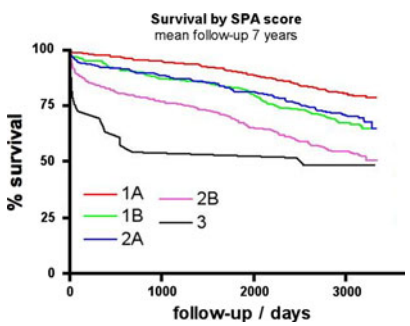

Survival by SPA score

0069

EFFECT OF ARDS ON QUALITY OF LIFE AFTER ICU ADMISSION

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OBJECTIVES. Measure the effect on quality of life, measured by the PAEEC index [1], after suffering an ARDS episode (defined by AEEC 1994), during an ICU admission.

METHODS. A retrospective case–control study. Collection of survey records of quality of life (PAEEC), applied to patients or their families who were admitted to the ICU from 1 January 2008 to 30 September 2010 and who survived an ARDS episode. Repetition of the survey via telephone to the surviving patients at least 6 months after the episode, in March 2011.

We Collected records of the quality of life survey conducted at admission on a control group of patients; and repeated the same questionnaire to this control group in March 2011. This control group of patients had been admitted to the ICU on the same period, had been under mechanical ventilation for whatever reason and had similar age, APACHE II score and a PAEEC index previous to the ICU admission; but had no episode of ARDS.

RESULTS. From 1 January 2008 to 30 September 2010; we admitted 85 patients in the ICU that at some point of their stay met the criteria for ARDS. ICU mortality was 49.4% and within 30 days after discharge from ICU 58.8%. Of the 35 survivors, 6 had been already dead at the moment of contact and we weren't able to locate another 6. Of the 23 patients that were contacted, 8 of them didn't have a quality of life evaluation index prior to the ICU admission. The mean number of organ failures was higher among patients who had ARDS [1.7 (0.8), $p = 0.006$] and the average time in days of stay in ICU [21 (12.6), $p = 0.04$]. At the time of the evaluation, the index of quality of life had deteriorated an average of 1.9 (4.6) points in the group of patients who had suffered ARDS.

To value whether the observed effect could be explained by having suffered ARDS, we compared the change between the two assessments of quality of life of patients with the control group. The mean difference was 1.9 (4.6) among cases and 3.3 (4.8) among controls. The differences between the two groups were not statistically significant (Mann–Whitney $p = 0.27$)

	Cases n = 15	Not located n = 14	Deceased n = 6	p	Control group n = 15	p*
Age	56.4 (15.7)	53.2 (15.3)	64 (7.5)	NS	59.3 (17.2)	NS
Male	13 (86.7%)	11 (79%)	5 (83%)	NS	10 (66.7%)	–
APACHE II at admission	16.1 (6.6)	17.4 (8.0)	16.0 (7.0)	NS	15.4 (5.1)	NS
Length of stay in ICU (days)	21 (12.6)	17.4 (15.1)	24 (21.2)	NS	18.1 (29.6)	0.040
Number of organ failure	1.7 (0.8)	1.9 (0.7)	1.8 (0.7)	NS	0.8 (0.8)	0.006
PAEEC difference	1.9 (4.6)	NA	NA	–	3.3 (4.8)	NS
Time of 2nd evaluation (months)	21.9 (10.6)	NA	NA	–	21.7 (7.7)	NS

CONCLUSIONS. In this small sample, the deterioration of quality of life index (PAEEC) that can be objectified after an episode of illness requiring mechanical ventilation and development of ARDS is not different from patients who have not.

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0070

THE IMPACT OF ALCOHOL ON CRITICAL CARE REFERRALS AND ADMISSIONS IN PORTSMOUTH, UK

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INTRODUCTION. Alcohol is becoming a major sociomedical problem in the UK. By 2015, it is estimated that the number of alcohol-related hospital admissions in the UK will increase to 1.5 million per annum, costing the NHS approximately £3.7 billion p.a, unless interventions are made to decrease alcohol consumption. Portsmouth Hospital has the highest number of alcohol related admissions to hospital in the South of England. Alcohol-related medical problems can affect almost every system and result in critical care admission [1].

OBJECTIVES. To determine the number of referrals and subsequent alcohol-related admissions to the Department of Critical Care at Queen Alexandra Hospital, Portsmouth.

METHODS. We conducted a 6 month prospective survey of all referrals to the Critical Care Unit. We recorded the age, sex, cause of admission and it's relation to alcohol consumption. For all patients we determined the amount of time staff spent off the unit assessing patients. For patients admitted to the unit, length of stay, level of care and outcome were determined.

RESULTS. 104 patients were included in the 6 month survey. 71 patients required admission to ICU, the remaining 34 were reviewed and management advice was given. Alcohol was directly implicated in 75% of patients. The mean age of patients reviewed was 49, with 69% of patients being male. Staff spent 286 h off the Critical Care Unit assessing these patients. The main indications for admission were attempted suicide, encephalopathy and gastrointestinal haemorrhage. Length of stay was prolonged, the mean length of stay in our cohort was 4.75 days (cf. 3.2 days overall unit LOS). Total bed days was 346, with 53% of these requiring Level 3 care. Most patients required one or two organ support during their admission. Ten of our patients (14.2%) died on the Critical Care Unit, all of whom were chronic alcoholics. The unit mortality was similar in those admitted with excessive alcohol consumption compared to the non-alcohol related admissions, however, hospital mortality for these patients was higher (24 vs. 17%).

CONCLUSIONS. Alcohol-related critical care referrals and admissions present huge resource burden to our Critical Care Unit. These patients require longer critical care admissions, with over half requiring neurological support. The perception that patients with alcoholic liver disease have an increased mortality critical care mortality was not seen in this survey [2]. Such findings should be confirmed in larger studies.

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0071

PATIENTS WITH HEMATOLOGICAL MALIGNANCIES ADMITTED TO THE INTENSIVE CARE UNIT

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INTRODUCTION. In patients with hematological malignancies admitted to the ICU the number of organs in failure, the need for mechanical ventilation and hematopoietic stem cell transplantation have been associated with a worse prognosis.

OBJECTIVES. The objectives of this study were to describe clinical features of haematology patients requiring ICU admissions and to analyze the outcome of this group of patients.

METHODS. Retrospective study in a 17 beds medical-surgical ICU of a community hospital. Patients with hematological malignancy admitted to ICU during a study period of 7 years (2003–2009) were registered. Planned postoperative ICU admissions were excluded. We analyzed the following variables: age, sex, APACHE II on admission, hematologic diagnosis, reason for admission to the ICU, length of stay in ICU, mechanical ventilation requirements, hemodynamic support with vasoactive medications and/or hemofiltration and ICU mortality and hidden mortality after ICU discharge.

RESULTS. 40 consecutive hematologic patients admitted in ICU during the study period were analyzed. Mean age was 49.5 ± 15.3 years, 60% were male and 40% women. With regard to hematological diagnosis, 50% were acute leukemia, 37,5% lymphoproliferative syndromes, 10% monoclonal gammopathies and 2.5% other diagnoses. 35% of episodes corresponded to patients with prior allogeneic hematopoietic progenitor cells transplant, and 15% with autologous transplant. The mean APACHE II on admission was 20 ± 4.9 and ICU length of stay 8.7 ± 8.5 days. The most common cause of admission was acute respiratory failure (65%), followed by septic shock (30%). Most frequent identified infectious focus was respiratory (52.5%). 25% of patients required renal replacement therapies. Vasoactive drugs requirements were 85%. Initially, noninvasive mechanical ventilation was indicated in 45%, finally 77.5% required orotraqueal intubation and mechanical ventilation. ICU mortality was 55, 71% in patients underwent mechanical ventilation. 18 patients, 45%, were discharged alive of ICU, an analysis of hidden mortality 1 year after ICU admission developed a mortality of 66.6%, most of them died in the first 3 months after ICU discharge.

CONCLUSIONS. Most hematological patients admitted to the ICU presented a high APACHE II at admission and mechanical ventilation and vasoactive medications requirements.

Hematological patients who required mechanical ventilation presented a high mortality. In our series, a high hidden mortality was observed in hematologic patients discharged from ICU to haematology ward.

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0072

CRITICAL CARE MANAGEMENT AND OUTCOMES OF OBSTETRICS PATIENTS IN INTENSIVE CARE UNIT

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INTRODUCTION. Assessment and management of critically ill pregnant patients are similar to those for nonpregnant patients, with some important differences. Admission of an obstetric patients to the ICU occurs in 2–4 per 1,000 delivery. Despite this low incidence, the maternal mortality is high, with the rate from 2 to 20%.

OBJECTIVES. The aim of this study was to evaluate the etiology, clinical characteristics, interventions and outcome of critically ill obstetric patients admitted to the general university intensive care unit.

METHODS. A retrospective consecutive series study was performed including all obstetric patients admitted to an 9-bed general intensive care unit at the tertiary university hospital during a five-year period. Patients were divided into two groups: group 1 (n = 11), those requiring surveillance and intensive monitoring and group 2 (n = 28), those requiring intensive care including mechanical ventilation, cardiovascular support, renal replacement therapy and medical/surgical interventions. Data collected included demographics, reason for admission, admission's diagnosis, APACHE II and SOFA score, intensive care unit course, types of interventions used and outcome. Date presented as mean ± SD or n (%).

RESULTS. During the study period 39 obstetric patients were admitted to the ICU, representing 2.6% (1,498) of all admissions and that were 0.66% (5,858) of all deliveries. 11 (28%) patients were admitted for surveillance and intensive monitoring after cesarean section and 28 (72%) patients were admitted for intensive care including mechanical ventilation (89%), cardiovascular support (39%), surgical interventions (25%), CRRT (14%), etptacog alfa (Novo-Seven) (11%), immunosuppressive therapy (7%), drotrecogin alfa (activated) (4%). The most common reason for admission was respiratory failure. The mean length of stay in group 1 was 3.4 (SD ± 1.58) days while 6.39 (SD ± 7.07) days in group 2, respectively ($p < 0.05$). Only one patients died in group 2 (mortality rate 2.6%).

CONCLUSIONS. Acute and long term obstetrics morbidities remain extremely high in critically ill obstetric patients. Low maternal mortality rate is attributed to advancement in intensive care medical intervention.

0073

A TROPONIN AND NT-PRO-BNP SCORE AS PREDICTOR OF 1-YEAR SURVIVAL AT THE INTENSIVE CARE UNIT

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INTRODUCTION. Biomarkers can predict mortality in critically ill patients [1, 2]. Combining them may improve their prognostic value.

OBJECTIVES. The aim of this study was to combine procalcitonin (PCT), CRP, troponin and NT-Pro-BNP in a model to predict 1-year-survival (Fig. 1).

METHODS. This prospective observational cohort study was conducted in a polyvalent intensive care unit. NT-Pro-BNP, troponin, PCT and CRP concentrations were measured at admission in 100 adult patients (Table 1).

Comparisons between survivors and nonsurvivors were determined by Mann–Whitney test. Receiver operating characteristic (ROC) curves were used, and the optimal cut-offs were calculated. A multivariate logistic regression model was constructed with 1-year-survival as dependent variables, and variables that were significant in the univariate as independent variables. After calculating the probability of death for each record, we have done respective grouping according the mortality from 0 to 100%.

RESULTS. Admitting diagnoses were related to medical (n = 118), surgical (n = 83), or multiple trauma (n = 32). The mortality rate was 59% at 1 year. Lower NT-Pro-BNP and Troponin were significantly associated with 1-year survival. (Fig. 1)

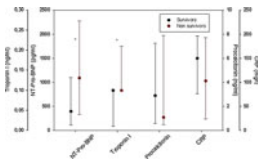

Fig. 1 Biomarkers in survivors vs. non survivors

The appropriate cutoff values for NT-Pro-BNP and troponin were, respectively, 300 pg/ml, Sensibility 80%, specificity 64% and 0.1 Se 80% Sp 64%, Odds Ratio were 2.8 and 3 for NT-Pro-BNP and troponin, respectively. Using logistic regression analysis, the association of NT-Pro-BNP and Troponin with 1-year-survival was determined (Table 1).

Biomarkers score

	Mortality probability (%)
NT-Pro-BNP <300 and troponin <0.10	26%
NT-Pro-BNP <300 and troponin ≥0.10	51%
NT-Pro-BNP ≥300 and troponin <0.10	53%
NT-Pro-BNP ≥300 and troponin ≥0.10	77%

CONCLUSIONS. Elevated NT-Pro-BNP and troponin concentrations at ICU admission are associated with a decreased 1-year-survival risk in critically ill patients. A Biomarker score is more useful in differentiating between survivors and non survivors at 1-year.

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0074

THE VERY ELDERLY PATIENT AND INTESIVE CARE UNIT: DOES IT WORTH?

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INTRODUCTION. The improvement of health care resulted in increased life expectancy, and thus an increase in admission of elderly patients in ICUs. The age is usually accepted as a negative prognostic factor (SAPS II, APACHE...). In this article we analyze various parameters aiming to compare the outcome of the very elderly versus elderly patients admitted to our ICU.

OBJECTIVES. To analyze the experience of our Intensive Care Unit (UCI) on patients aged over 65 years, by describing the mortality, analyzing the applicability of the prognostic scores in this age group, and quality indicators as translated by the difference between the crude mortality (UCI) and hospital mortality.

METHODS. Retrospective study comparing two groups of patients (group I - elderly -> 65 and < 80 years of age and Group II - very elderly - over 80 years) admitted to the UCI from January 1999 to December 31 of 2009.

We studied the epidemiological parameters, common scores of severity at 24 h of admission (APACHE II and SAPS II) and mortalities in both groups. Values were calculated for SMR (Standardized Mortality Ratio),by severity score. We used the usual statistical tools, assuming $p < 0.05$ as statistically significant.

RESULTS. During this period, 4228 patients were admitted to the UCI. Of these, a total of 1508 patients (34.1%) aged over 65 who were divided into two groups: group I (elderly) with 1,162 patients, and group II (very elderly) with 346 patients.

Between these two groups, the average delay (6.1 ± 8.3 vs. 4.9 ± 6.2 days) and the days of mechanical ventilation (4.7 ± 7.7 vs. 3.9 ± 5.7 days) were significantly lower in patients of group II. The latter group, however, showed higher levels of severity (SAPS II: 49.5 ± 18.9 vs. 46.2 ± 19.8, APACHE II: 23 ± 8.9 vs. 22.2 ± 9.8, $p < 0.05$) that were reflected as increased hospital mortality (36.0 vs. 29.9%). In Group II, APACHE II was more reliable in predicting hospital mortality than SAPS II (AII SMR: SMR 1.0 vs. IBS: 0.82). The study of SMR showed values below 1.0 in all groups except the surgical trauma and urgent for the group II. The gap between Hospital mortality and Unit mortality, was more pronounced in patients in group II (36 vs. 18.2%) compared with group I (29.9 vs. 18.7%). The analysis of patients by diagnostic categories, found similar results in four subgroups, although only statistically significant in the subgroup of medical patients regarding the Unit Delay, Hospital Delay, days of mechanical ventilation and SAPS II.

CONCLUSIONS. The very elderly patients admitted to the unit showed increased severity and mortality when compared to the elderly patients, this is particularly true for subgroups of trauma and surgical emergency. A more pronounced difference between the unit and hospital mortality was observed in the very elderly patient group. These results confirm the relevance of age as a negative prognostic factor, especially in urgent surgical and trauma patients.

0075

HEALTH RELATED QUALITY OF LIFE AFTER ICU CARE - MORTALITY IS THE ISSUE?

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INTRODUCTION. Health related quality of life has been an important outcome parameter after critical illness due to several reasons among which the decreasing ICU mortality rates has been a contributing factor. We have in a multicenter trial examined the HRQoL from different perspectives and found factors such as co-morbidity, and social factors as the most important. Interestingly, very little effect has been attributed to ICU related factors. In this data we have found that a minority of the patients has a decreased HRQoL compared with a general, sex, age and co-morbidity adjusted reference population. Our hypothesis for this investigation is that this group constitutes the ones, who face a significant mortality in the short term perspective post ICU.

METHODS. Prospective, multicenter study in three mixed ICU's in Sweden. Questionnaires, including HRQoL (SF-36), demographic data and previous illnesses, were sent out 12 months after discharge to all former adult ICU patients. The study patients that had a registered HRQoL less than the lower reference limit ^{x} in the six dimensions (bodily pain, general health, vitality, social function, role functional emotional, mental health) known not to improve further after 12 months post ICU were examined and characterized.

X (ref from a sex, age and co-morbidity adjusted control population).

RESULTS. A total of 739 patients were investigated. Of these 290 (39%) patients were found to have a value below less than the lower reference value in at least one of the six dimensions. Among them 48 patients died (50% of those dying) within the next coming 2 years.

CONCLUSIONS. HRQoL of former ICU patients is lower than a healthy control population. If the HRQoL among ICU patients are compared with a sex, age and co-morbidity adjusted cohort only a minority of the patients fall below the lower normal reference value. The overall majority of these patients will die in the next coming year or two. These findings further support the small effect of HRQoL on former ICU patients by the ICU care period itself.

0076

DECREASED HRQOL AFTER CRITICAL CARE IS ONLY SEEN FOR A MINORITY OF THE PATIENTS AND MAINLY IN THE PHYSICAL DIMENSIONS AFTER CAREFUL ADJUSTMENT FOR AGE SEX AND COMORBIDITY

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INTRODUCTION. Health related quality of life (HRQoL) is one of the most important outcome factors after critical illness. Several studies conclude that the ICU patients HRQoL are decreased compared with an age and sex adjusted general population.

We have in a longitudinal, multicenter, trial examined the HRQoL from different perspectives and found that the patients pre-existing, chronic diseases are the most important factor for HRQoL outcome, and very little effect has been attributed to ICU related factors.

Our hypothesis for this investigation is that the main registered decrease in HRQoL for former ICU patients is due to a small group of patients that either has a significant pre-existing chronic disease or has a large ICU acquired burden of illness as registered by an high short term post-ICU mortality.

METHODS. Prospective, multicenter study in three mixed ICU's in Sweden. Questionnaires, including HRQoL (SF-36), demographic data and previous illnesses, were sent out 6 months after discharge to all former adult ICU patients. The patients mortality where registered up to 3 years after discharge from the ICU. The lower level of the 95% CI in each SF-36 dimension for a reference group from the uptake area of the study population was used for comparison. In these analyses, after adjustment for age and sex, the groups were divided to those with pre-existing disease and those who were previously healthy.

RESULTS. A total of 980 patients were investigated. For patients with pre-existing disease (n = 700 (71%)) 77 patients (11%) were found to have a HRQoL value below that of a reference group with comorbidity. For the previously healthy patient group (n = 280 (29%)) 60 (21%) patients had the correspondingly lower level and the lower level was reached only in the physical dimensions. A seven fold increase ($p < 0.001$) in mortality were found in both groups with HRQoL values less than the lower reference group (46% died) compared with the patients with values in parity of the reference group (7% mortality).

CONCLUSIONS. If the HRQoL among ICU patients are compared with a sex, age and co-morbidity adjusted cohort only a minority (10–20%) of the patients fall below the lower normal reference value, and importantly this decrease is seen only in the physical dimensions. Nearly half of these patients will die in the next coming 3 years. These findings further underlines the importance of the effect of pre-existing disease for the short and long-time HRQoL after critical care.

0077

HEALTH-RELATED QUALITY OF LIFE OF LONG-TERM SURVIVORS OF INTENSIVE CARE—CHANGES AFTER INTENSIVE CARE TREATMENT

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INTRODUCTION. To determine whether health-related quality of life (QOL) of intensive care unit (ICU) survivors changes 24 months after intensive care treatment compared to QOL before admission.

METHODS. 132 intensive care unit (ICU) survivors were contacted by phone for QOL assessment on average 24 months after discharge. Fernandez questionnaire was used to measure changes in QOL. Preadmission QOL was assessed and postdischarge QOL during the same phone interview. In addition, age, sex, admission diagnosis, ICU length of stay, presence of organ failure and necessity of mechanical ventilation were assessed to examine the influence of these factors on QOL.

RESULTS. 101 ICU survivors responded to QOL questionnaire. In this population the total score of QOL did not change significantly over time (5.48 ± 5.3 before admission vs. 5.60 ± 5.8 at follow-up, $p = 0.922$). Similarly, the performance of normal daily activities did not alter (3.0 ± 3.5 vs. 3.39 ± 3.6, $p = 0.305$). In contrast, the ability to perform basic physiological activities worsened significantly (0.39 ± 0.76 vs. 0.76 ± 1.52, $p = 0.037$), whereas emotional state of the patients improved significantly after intensive care treatment (2.08 ± 1.78 vs. 1.46 ± 1.56, $p = 0.003$). In a stepwise multiple regression analysis the total score of QOL before admission was the only variable which influenced the QOL 2 years after ICU-stay.

CONCLUSIONS. In the interviewed population the total score of health-related QOL did not change after intensive care treatment. Surprisingly, emotional state improved significantly although physical performance decreased. The QOL after ICU discharge was predominantly influenced by preadmission QOL.

0078

QUALITY OF LIFE IN SURVIVORS OF SEVERE SEPSIS: A BRAZILIAN STUDY

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INTRODUCTION. Sepsis has acquired a great epidemiological importance due to its increased incidence up to 90%.

OBJECTIVE. The aim of this nested case–control study was to evaluate the quality of life in survivors from severe sepsis with EuroQol-5 Dimensions (EQ-5D) and "Visual Analogue Scale" (EQ-VAS).

METHODS. Data were retrieved from our local registry of patients with severe sepsis from May 2004 to December 2009. Patients were enrolled under the conditions of being 18 years of age or older, and having a clinical diagnosis of severe sepsis. Each patient with sepsis was considered as a case and the patient who was admitted immediately after was selected as a control as long as they did not have sepsis and survived ICU admission.

RESULTS. From the sepsis registry containing 349 patients, a total of 185 patients who survived and were discharged from the hospital were identified. In the control group, 164 patients were evaluated. Fifty patients from each group were eligible to take part in the study. Of the patients who survived to hospital admission, the patients in the sepsis group had higher mortality at 1 year (36.5%) compared to the control group (19.7%) [RR 1.85 (1.07–319; $p < 0.05$)]. The EQ-5D Index of the control group is 0.747 ± 0.327 and 0.678 ± 0.427 in the sepsis group, ($p = 0.66$). Older patients (>60 years old) in the sepsis group had a significantly higher prevalence of moderate to severe problems in all dimensions. There were no differences in EQ-VAS (72.7 ± 26.2, control group; 79.7 ± 21.1, sepsis group; $p = 0.19$). A median value of 60 was obtained for septic patients older than 60 years in comparison to 88 obtained for the patients in the control group.

CONCLUSION. Survivors of sepsis had a higher mortality rate than critically ill patients without sepsis after discharge from ICU. Older patients with sepsis had a higher prevalence of moderate and severe problems in all dimensions evaluated for QOL.

0079

QUALITY OF LIFE AND DEATH TO 1 YEAR OF ELDERLY PATIENTS WITH HEART ATTACK

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INTRODUCTION/OBJECTIVES. To analyze the survival and quality of life at 6 and 12 months after discharge of patients (p) > 75 years with myocardial infarction in 2009.

METHODOLOGY. All patients were referred for consultation at 6 and 12 months after hospital discharge.

RESULTS. The sample consisted of 94 p, 46 men. Average age 79.8a children (men) and 80.06 years (women). At 6 months they had re-entered 14 p, 8 coronary event, 2 for stroke, 1 for lower limb ischemia, 1 due to heart failure, 1 for bradyarrhythmia that required permanent pacemaker and 1 non-cardiac cause. In the first 6 months died 12 p, cardiogenic shock (6 p), multiorgan failure (2p), arrhythmia (2p), sepsis (1p) and cancer (1p). Half Karnofky Index: 87.2. Between 6 and 12 months were readmitted 8 p, 2 and 6 heart failure by coronary events. 10 patients died, 5 of cardiogenic shock, 2 for neoplasia, 1 stroke, 1 and 1 multiorgan failure due to arrhythmia. GEL Karnofky index average was 76.6. Found as predictors of mortality at 6 months, female gender ($p = 0.38$, OR 6.44 (1.11-37.42) and left ventricular dysfunction ($p = 0.039$, OR 6.45 (1.1–37.7) and 12 months: females with OR 3.67 (1.01-13.46, $p = 0.049$).

CONCLUSIONS. The survival of elderly patients with myocardial infarction in the short term is high, with an acceptable performance status and a light unit for the development of activities of daily living.

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Cardiac arrest: Therapeutic hypothermia: 0083–0093

0080

ASSESSING THE NEED FOR FMRI-BASED COMA OUTCOME SCORING: A RETROSPECTIVE SURVEY

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INTRODUCTION. Significant progress has been made in predicting the outcome of coma secondary to anoxic-ischaemic encephalopathy following cardiac arrest [1]. Predicting the outcome and functional recovery of comatose patients from traumatic brain injury, metabolic injury, encephalitides, or stroke has been improved by the use of evoked potentials and electroencephalogram, but remains challenging [2]. Functional MRI-based technology, and its increasing availability, provides innovative methods to predict outcome in this group of patients [3].

OBJECTIVES. The study's aim was to assess the scale of the prognostic challenge posed by comatose patients at Aberdeen Royal Infirmary, and to inform any future on-site fMRI prognostic studies and services. The two main objectives were firstly to estimate the number of comatose patients leaving the intensive care unit for step-down care; and secondly to assess the degree of functional impairment of survivors.

METHODS. A retrospective study identified the number of patients discharged from the intensive care unit (ICU) with a GCS score of 8 or less (January 2009–December 2010). Health records of identified patients were examined and Karnofsky scoring was determined.

RESULTS. Over 2 years, 46 comatose patients were stepped down from intensive care treatment. 30.4% were women ($n = 14$) and 69.6% were men ($n = 32$). The leading modes of injury were trauma ($n = 18$), intracranial haemorrhage ($n = 8$), and anoxic-ischaemic encephalopathy ($n = 7$). By March 2011 46% patients had died ($n = 21$). For non-survivors the mean survival time was 43 days (SD $\pm$ 66) following step-down from ICU. For survivors the performance status varied from mild memory impairment to vegetative states (Karnofsky scores from 30 to 90%). Regression analysis showed that GCS was not a predictor for any of the categories of injuries; age was a weak predictor of survival [odds ratio 1.05 (CI 1.003–1.1), $p = 0.37$].

CONCLUSIONS. The outcomes of our study are two-fold: (1) the number of patients in a coma secondary to brain injury is substantial (2) the outcome and the extent of recovery in these patients is very variable and not easily predictable with current methods. This study shows the need to supplement existing coma outcome predicting tools by evaluating novel methods such as fMRI-based scoring paradigms. One of the aims of the newly created Aberdeen Coma Science Group is to address this knowledge gap.

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0081

SEMI-AUTOMATIC DEFIBRILLATORS IN THE HOSPITAL. ARE WE DOING WELL?

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OBJECTIVES. Determining the use of manual defibrillators and semi-automatic external defibrillators (AEDs) installed in hospital wards in a University Hospital (not monitored areas).
METHODS. After implementation of a new plan to care hospital cardiopulmonary arrest (CPA) carried out a prospective study according to the Utstein style of the cardiorespiratory arrest occurred in the year after implantation. After the elaboration of a risk map, in order to improve hospital chain of survival, semiautomatic external defibrillators were placed in all the conventional areas of hospitalization and common services (area of radiology,...) where a lower incidence cardiac arrest was expected. In high risk areas already existing defibrillators were renewed. All cardiorespiratory arrest occurred in the hospital in unmonitored areas where they had placed new equipments were analysed, excluding those that occurred in the emergency unit (which has a distinct protocol to the rest of the hospital), the operating room and monitored areas (ICU, Hemodynamics, Arrhythmia Unit and postoperative recovery room). Special attention was paid to the use of semi-automatic external defibrillators by the wards staff before the arrival of the resuscitation team. A voluntary training program started too, beginning after the period under review.
RESULTS. In this first year after the start of the new hospital CPR plan 37 patients were treated in the described areas, predominantly male (22 patients) with an median of age of 74.5 years and a mean of 70.5 (±13.2). Regarding etiology, the most prevalent was respiratory (21 patients; 56.8%), followed by cardiac (4 patients; 24.3%), the rest were very fragmented multiple etiologies. In 46% of cases the cardiorespiratory arrest was attended by health personnel and in 13.5% the resuscitation team was present at the time of the cardiac arrest The most frequently detected rhythms were not defibrillable ones and only in three patients the rhythm was subsidiary of electrical treatment. Before the arrival of the resuscitation team advanced life support had started in only six patients and in two a manual defibrillation was made. Semi-automatic external defibrillators were used in three cases that needed no defibrillation. The average interval cardiac arrest-resuscitation team maneuvers start was less than 5 min (290 ± 226 s).
CONCLUSIONS. During the study semi-automatic external defibrillators placed in the hospital under the new CPR plan have proved inoperative due to its underutilization. Probably this is related to the lack of a comprehensive training plan addressed to the target community.

0082

IN-HOSPITAL CARDIAC ARREST. OUTCOME AND PROGNOSIS FACTORS. A SINGLE CENTER STUDY

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INTRODUCTION. In hospital cardiac arrest (IHCA) bear a poor prognosis [1] with only low improvement among recent years [2]. Although nationwide datas are available [3, 4] only systematic monitoring of IHCA allows knowledge of local incidence, outcome and risk factors as results may be widely different between institutions.
OBJECTIVES. To examine the incidence, prognosis factors and outcome of IHCA in our institution.
METHODS. We conducted a single medico-surgical center (236 adult-only beds) prospective observational study by recording dedicated IHCA follow-up forms from 01/01/09 to 31/03/2011. IHCA was defined as cardiopulmonary rescucitation (CPR) performed in patients receiving chest compression and/or defibrillation. Data recorded were: patient demographics, comorbidities, location of IHCA, initial cardiac rhythm, timing of rescucitation, type of treatment, immediate and secondary (30 days) outcome, type and duration of ICU care.
RESULTS. 130 patients (91 men, 39 women) were treated for IHCA. Mean age was 71 ± 13 (median 76).Overall incidence was: 0.24 case/bed/year or 4.9 case/1,000 stay. Comorbidities were: ischemic cardiomyopathy (77.6%), diabetes (30%), mechanical ventilation (24%). Hospital stay was related to coronary intervention (34%), surgical intervention (31%), medical condition (36%).Initial cardiac rhythm was asystole (ASYST) (45.5%), ventricular fibrillation (VF) (32.1%), ventricular tachycardia (VT) (9.9%) and Others (12.5%). Time to RCP was 1.4 ± 0.8 min, duration of RCP was 17 ± 14 min. In survivors, IGS score was 51 ± 14 and ICU stay was 6.5 ± 12 days. Immediate survival was 63.7%; 30 days survival was 38.1%. Immediate outcome was related to age (survivors, 69 ± 13; non survivors, 75 ± 13; $p < 0.01$), ischemic cardiopathy ($p < 0.05$), VF and VT as initial rhythm (immediate survival rate: AYST, 47%; FV, 75%; VT, 82%) ($p < 0.01$), chest compression ($p < 0,02$), IV epinephrine ($p < 0.001$) and tracheal intubation ($p < 0.001$).30 days outcome was related in addition to diabetes mellitus, chronic respiratory or renal disease ($p < 0.05$) and location of IHCA (survivors: CICU + coronarography room 49%, OR + RR 57%, emergency 38%; ICU 29%, general ward 20%; $p < 0.05$).Gender, neoplasic disease, nighttime occurrence and previous cardiac arrest were not related to outcome. Mortality increased with age (adjusted odd ratio 2.7 over 77 years and 3.5 over 82 years).
CONCLUSIONS. In our institution : IHCA definition is responsible for a higher incidence and a better outcome than previous studies. Immediate survival is related to initial cardiac rhythm and late survival is related to comorbidities. Age is clearly related to outcome while gender and nighttime occurence had no prognosis role. Perioperative IHCA share the same prognosis as cardiac emergency IHCA.
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0083

PRECISE AND EFFICIENT TEMPERATURE MANAGEMENT IN RESUSCITATED PATIENTS UNDERGOING MILD THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. Mild therapeutic hypothermia (MTH) is a worldwide-recommended treatment in patients with spontaneous circulation after cardiac arrest. Several studies have shown favorable effects of lowering body core temperature (T) on neurological outcome after cardiac arrest. MTH is relatively easy to perform and lacks severe side effects or complications associated with mortality. The process of cooling or warming a patient is often a critical factor in achieving positive outcomes.
OBJECTIVES. Investigate differences between Medi-Therm® hypothermia device (Gaymar®), using body wraps, and our conventional method using cooled flat blankets on different outcomes.
METHODS. According to Dutch legislation, no approval of the research ethics committee is required for protocolized (standard) treatment. Consecutive patients were included, treated with Medi-Therm® hypothermia device (GM), and compared to controls treated with cooled flat blankets (noGM). In the GM group, body wraps were placed around the patients body, while T of the water circulating through the body wraps was controlled via a patient/T feedback loop. Both groups were treated according to standard protocol with induction of MTH (32°C) maintained for 24 h. All patients were given cold fluid infusion i.v. during early induction of MTH. We recorded speed of obtaining target T, overshoot of MTH (defined as $T < 31.0$°C), T maintenance stability and overall survival.
RESULTS. MTH was induced in 60 GM and 99 noGM patients. There were no significant differences in age, BMI, overall survival and ICU hospitalization time between the different cooling methods. Significantly, fewer females compared to males were included, with no difference between GM and noGM groups. All patients reached core target T of 32.5°C within 214 ± 196 and 239 ± 153 min for noGM and GM groups, respectively. Mean rate of decrease in T during induction time was significantly slower in GM (0.56 ± 0.36°C/h) compared to noGM (0.75 ± 0.55°C/h) group ($P = 0.017$). This resulted in the lowest T of 31.6 ± 0.8 and 31.2 ± 0.8°C in GM and noGM groups, respectively ($P = 0.001$). During 24 h maintenance phase 10% of the patients in the GM versus 23% in the noGM group exhibited an overshoot of hypothermia ($P = 0.039$) and reached core T below 31°C. Furthermore, rewarming rates were significantly slower in GM (0.25 ± 0.10°C/h) compared to noGM (0.31 ± 0.31°C/h) group ($P = 0.039$), with no differences in total rewarming time and highest T during rewarming phase. Monitoring of blood pressure, heart rate and creatine, creatine kinase (MB), troponine T and glucose levels revealed no adverse effects in both groups.
CONCLUSION. Compared to control T management using flat blankets, use of body wraps (Gaymar®) to induce MTH in patients after successful resuscitation offers a more controlled and precise cooling in terms of less overshoot of low body T at the price of a slightly slower induction of MTH.

0084

THERAPEUTIC HYPOTHERMIA — THE FIVE-YEAR EXPERIENCE OF AN INTENSIVE CARE UNIT

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INTRODUCTION. Therapeutic hypothermia has shown to have a major impact on long-term neurologically intact survival and may prove to be one of the most important clinical advances in the science of cardiopulmonary resuscitation. In 2005 a standardized therapeutic hypothermia protocol was implemented in our intensive care unit.
OBJECTIVES. To evaluate our protocol outcomes in what concerns mortality, patient selection and complications
METHODS. Retrospective observational study of all the patients submitted to therapeutic hypothermia protocol since its implementation in 2005 until December 2009.
RESULTS. During this 5-year period, 62 patients started therapeutic hypothermia protocol. Nine patients were excluded from the study because of early death, hypothermia for acute stroke or insufficient data. We included 53 patients with a medium age of 64 (30–80) years old. Seventy-two percent of the deaths occurred in patients above 60 years old. Mortality was not significantly different between patients with in-hospital and out-of-hospital arrest. The time of return to spontaneous circulation and the time to beginning of cooling were also non-significantly different between the group of survivors and the group of patients who died. The main arrest rhythm was assystole (60.4%) followed by ventricular fibrillation (20.8%), with mortality rates of 50 and 63.6%, respectively. The time to target temperature was in average 496 min ranging from 45 to 1,560 min. These results are biased by a change in equipment in 2007, with a reduction in the time to target temperature of 516 min in 2006 and of 321 min in 2007. The Glasgow Coma Score (GCS) at 48 and 72 h was significantly different between the group of survivors and nonsurvivors—GCS 5.9 versus 4.2 at 48 h ($p = 0.02$) and GCS 7.8 versus 4.6 at 72 h ($p = 0.03$). The difference in GCS was not significantly different before 48 h. At 6 months nine patients were alive and eight were lost to follow-up. As complications, the more frequent were infections acquired in the first 5 days after hypothermia.
CONCLUSIONS. These results identified some flaws in our practice and resulted in a revision of the protocol to achieve the objectives accordingly to most recent evidence. The main objectives in the new protocol are to achieve goal temperature the quickest possible with aggressive interventions as curarization or extra-corporeal circulation and the use of controlled rewarming instead of passive rewarming. With the implementation of a follow-up out-patient consult it will be possible to access more accurately the functional outcome of our intervention.

0085

SURVIVAL EFFECT AFTER A THERAPEUTIC HYPOTHERMIA PROTOCOL IMPLEMENTATION

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OBJETIVE. To evaluate whether implementation of a therapeutic hypothermia (TH) protocol improved survival and neurologic outcomes in patients successfully resuscitated from cardiac arrest.

METHOD AND PATIENTS. A Retrospective Historic Cohort Study realized in a Cardiac Intensive Care Unit from January 2007 to December 2010.

An active cooling therapeutic hypothermia protocol, using a cooling surface method with hydrogel patches (Arctic Sun®) to achieve a temperature of 33°C for 24 h was initiated on July 2009 for unconscious patients resuscitated from cardiac arrest. The device is connected to a temperature control console, measuring core temperature with an urinary catheter.

In this study we compare patients who presented after implementation of a therapeutic hypothermia protocol with those who presented before the protocol was implemented.

Demographics and outcomes were obtained from an intensive care medical database.

RESULTS. A total of 81 consecutive adults, with nontraumatic cardiac arrest, admitted between January 2007 and December 2010 were included, 35 on TH group and 46 on control group.

Both groups were similar with no statistic differences on personal previous medical history characteristics or cardiopulmonary resuscitation time.

The only differences between groups was a greater number of patients with ventricular fibrillation (VF) as an initial rhythm and ECG changes in the TH group (72, 7%, $p = 0.059$), which results in a greater coronarography number (65.7%, $p < 0.001$).

Mortality at hospital discharge decreased in the therapeutic hypothermia group ($p = 0.005$, OR 0.154, 95% IC 0.043–0.546).

In adjusted analysis, VF as an initial rhythm ($p < 0.05$, OR 0.30, 95% confidence interval 0.096–0.96), short resuscitation time period ($p = 0.02$, OR 1.085, CI 1.013–1.162) and younger patients ($p = 0.018$, OR 1.055, CI 1.010–1.102) also result in a better survival.

CONCLUSIONS. The implementation of a therapeutic hypothermia (TH) protocol was associated with a significant improvement survival.

Early age, a short cardiopulmonary resuscitation time and VF as a first rhythm after cardiac arrest are also related to lower mortality.

0086

EVALUATION OF ABR, SSEP AND AEP P50 AS PREDICTORS OF NEUROLOGICAL OUTCOME IN RESUSCITATED PATIENTS

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INTRODUCTION. One of the predominant cause of hypoxic-ischemic encephalopathy is a cardiac arrest, a number of people who resuscitated from a cardiac arrest have residual neurological sequelae. Whilst the ABR (Auditory Brainstem Response) has been used to diagnose brain death, the SSEP (Somatosensory Evoked Potential) has been a tool to predict non-awakening from comatose state. However, none of methods have been established to access neurologically good outcome [1]. Since it has been known that hippocampal CA_3 pyramidal cells are easily injured in hypoxic-ischemic states [2] and also been considered the source of AEP (Auditory Evoked Potential) P50 components to be hippocampal CA_3 pyramidal cells [3], we assumed that evaluating the AEP P50 components might be useful for the prediction of neurological outcome in resuscitated patients.

OBJECTIVES. The purposes of the study are to confirm the stability of the ABR and SSEP to predict neurological outcome and examine the AEP P50 components to be a neurological predictor for resuscitated patients.

METHODS. The OHCA (Out-of-Hospital Cardiac Arrest) patients who were successfully resuscitated and then admitted to the ICU were examined by the ABR wave V and SSEP wave N20. The AEP P50 components were only accessed for the patients with positive ABR wave V and SSEP wave N20 by double stimulus paradigm. The ABR, SSEP and AEP were measured on around the 5th day from the admission.

RESULTS. From the results, as is already known, it was verified that the ABR and SSEP were to be the good predictors which correspond to neurologically poor outcome. In the study, 27 OHCA patients were examined for the ABR and SSEP. The negative predictive value of the ABR and SSEP were both 1.0, the accuracy of them were 70.4 and 77.8%, respectively. Also ten patients were evaluated regarding to the AEP P50, five patients with the presence of P50 components achieved good neurological recoveries, whilst the other five patients with the absence of P50 components were corresponded to the poor neurological outcome.

CONCLUSIONS. The P50 would have a possibility to be a predictor regarding to neurologically good outcome. The SSEP could be evaluated in order to exclude neurologically poor outcome before assessing the P50 to predict neurologically good outcome.

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0087

OUTCOMES OF OUT-OF-HOSPITAL CARDIAC ARREST SURVIVORS WITH OUR POST-ARREST HYPOTHERMIA PRACTICE

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INTRODUCTION. Recent RCT's have shown that mild hypothermia improves neurologic outcome in selected patients after cardiac arrest [1, 2]. Therapeutic hypothermia is now recommended by the ALS Task Force of the ILCOR and incorporated in the American and European resuscitation guidelines as part of post resuscitation care.

OBJECTIVES. Impact of post-arrest hypothermia on Glasgow Outcome Score (GOS) and survival of out of hospital cardiac arrest (OHCA) patients.

METHODS. An observational study was conducted for OHCA patients admitted alive at WMUH between April 2010 and October 2010. All patients received standard care including adequate sedation and mechanical ventilation. Mild hypothermia was initiated as soon as possible and maintained at 32–34°C for 24 h with a combination of cold saline, cooling blanket and ice packs. Patients were allowed to passively re-warm. Neurologic outcome of discharged survivors at 6 months was evaluated using the GOS [3].

RESULTS. All 25 patients admitted following OHCA fulfilled our cooling criteria. 3 patients had cooling initiated in A&E whereas 16 had cooling initiated in ICU and 6 were not cooled. Five patients were at target temperature on arrival to A&E. Of the 19 patients who had cooling initiated in hospital, target temperature was achieved in only 13 patients. In patients where cooling was initiated in A&E, the median time to reach target temperature from hospital admission was 4.25 h and when cooling was initiated in the ICU it was 6.25 h. A temperature above 37.5°C was noted in 12 (48%) patients during re-warming. A total of 9(36%) patients had a favorable outcome and were discharged with a GCS of 15 from the hospital and all had a GOS of 5 at 6 months. Seven out of nine survivors were cooled. The cause of death was hypoxic brain injury in 12 (48%) and cardiogenic shock in 3 (12%) patients. All deaths occurred in hospital following treatment limitation decisions at 41 (9.5–94) [median (range)] h.

CONCLUSIONS. Our mortality rate of 64% was higher than the HACA study [2] but slightly less than the ICNARC [4]. All survivors had a good neurological outcome. In patients where we achieved timely target temperature, outcome was favorable. Using this method of cooling we failed to achieve consistent hypothermia. Preventing rebound hyperthermia was difficult.

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GRANT ACKNOWLEDGMENT. WMUH

0088

COMMUNITY-BASED APPLICATION OF MILD THERAPEUTIC HYPOTHERMIA FOR SURVIVORS OF CARDIAC ARREST IN HOSPITAL MBOIMIRIMSAO PAULO-BRAZIL

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INTRODUCTION. Implementation of therapeutic hypothermia for survivors of cardiac arrest worldwide has been slow, at least partially because of the perception that this therapy is technically difficult, especially at the community level.

OBJECTIVES. Our objective was to demonstrate that the application of therapeutic hypothermia is technically feasible in a community-based setting in a developing country.

METHODS. Retrospective cohort study of patients treated with therapeutic hypothermia after cardiac arrest in a community hospital in São Paulo, Brazil. At a community hospital in São Paulo, Brazil after return of spontaneous circulation (ROSC), survivors of cardiac arrest were treated with therapeutic hypothermia using ice and cold saline infusions in order to cool patients to 32 to −34°C within 6 h of cardiac arrest to achieve goal temperature within 4 h of hypothermia initiation and to maintain goal temperature for 24 h.

RESULTS. From January 2009 to December 2010, 32 survivors of cardiac arrest, 21 males, 11 females, mean age 33 ± 25 years, were managed with therapeutic hypothermia. Initial rhythm was most commonly ventricular fibrillation (13 patients), followed by asystole (9 patients), ventricular tachycardia (6 patient) and pulseless electrical activity (4 patient). The mean time from ROSC to initiation of therapeutic hypothermia was 89 ± 50 min and the mean time from ROSC to goal temperature was 51 ± 32 min. Complications during treatment with hypothermia included: arrhythmias (16%), pneumonia (36%). and gastrointestinal bleeding (11%). Overall survival at hospital discharge with good neurologic outcome (Glasgow outcome scale 4–5) was seen in 56% of the patients. There were no major complications directly attributable to rewarming.

CONCLUSIONS. A simple protocol of mild therapeutic hypothermia using locally available resources is technically feasible and safe in a community-based setting in a developing country.

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0089

ANALYSIS OF OUTCOME IN PATIENTS WITH IN HOSPITAL CARDIAC ARREST (IHCA) AT WARD

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INTRODUCTION. Sudden cardiac arrest in hospital is an critical emergent problem and leads to severe neurologic impairment. Survival rate is very low and the major cause of death after IHCA is a result of neurological injury. Mild systemic hypothermia (34°C) improves neurologic recovery after out-of-hospital cardiac arrest (OHCA). IHCA differs from OHCA in terms of mechanisms and pathophysiology.

OBJECTIVES. A majority of studies focus mainly on incidence and outcome of OHCA, but there are few studies in IHCA. So we evaluated clinical characteristics by neurologic outcome of IHCA survivors.

METHODS. The study included all CPCR patients at ward. We prospectively analyzed the data on all CPCR events at ward between March, 2008 and February, 2010. Neurologic outcome was defined as a cerebral performance category (CPC). Survivors on 28 days were classified into five groups by CPC score and a favorable neurologic outcome was defined as a CPC score 1 or 2 and unfavorable neurologic outcome was defined as a CPC score 3, 4, 5.

RESULTS. In this study, 337 patients were enrolled. The mean ages of the patients were 61.4 ± 14.9 years, and 207 (61.4%) of 337 patients were male. Non-cardiac causes were 230 (68.2%) and cardiac cause were 107 (31.8%). Cardiac cause showed better outcome than non-cardiac cause. We observed 11% of ventricular tachycardia/ventricular fibrillation (VT/VF) and 42.7% of PEA as the first documented pulseless rhythm of IHCA. In survivors on 28 days, VT/VF was 15 patients and PEA was 25 patients(40.5 vs. 17.4%, $p = 0.017$). Return of spontaneous circulation more than 20 min (ROSC >20) was 214 (63.5%) patients. Survivors on 28 days were 75 (31.1%) patients. The patients with favorable neurologic outcome were 52 (69.3%) and the patients with unfavorable neurologic outcome were 23 (30.7%). The baseline characteristics were similar in both groups. A favorable neurologic outcome group showed higher hospital survival rate than unfavorable neurologic outcome group (88.5 vs. 47.8%, $p = 0.001$). Therapeutic hypothermia was carried out in 11 (5.14%) of 214 ROSC survivors and 6 (54.5%) of 11 patients survived on 28 days. Among 6 patients who applied therapeutic hypothermia, 2 (33.3%) patients showed favorable neurologic outcome.

CONCLUSIONS. Many of CPCR survivors on 28 days showed favorable neurologic outcome and favorable neurologic outcome group showed higher hospital survival rates than unfavorable neurologic outcome group. Therapeutic hypothermia was applied to small patients of in hospital cardiac arrest survivors.

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0090

THE VF/VT RATE ON THE INITIAL ECG OF ARRESTED PATIENTS AT THE SCENE DECREASES IN THE ELDERLY

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INTRODUCTION. Elderly CPA patients generally have a poor prognosis. Elderly patients showing VF/VT on the initial ECG, however, have a better chance of a good prognosis.

OBJECTIVES. This study retrospectively investigated whether the chance of VF/VT on the initial ECG in elderly patients is less than that in younger patients.

METHODS. This study evaluated CPA patients transported by paramedics between 2006 and 2008. CPAs due to external causes were excluded. The patients' age, cause of CPA (cardiac or not), the duration between the call and contact with the patients, initial ECG, presence of witness and performance of bystander CPR were investigated.

RESULTS. Three hundred and one cases were enrolled. The parameters were compared along with the ages of the subjects. Most of the patients were in their 80s (96). There were 224 cardiac cause cases, which ranged from 25% in patients in their teens to 72% in those over 80 years of age. The VF/VT on the initial ECG in cardiac cause cases was 40 (18%). The rate was the highest in the patients ranging from 30 to 39 years of age (50%) and decreased with age; 20% in patients 40 to 49 years of age, 38% in patients 50 to 59 years of age, 29% in patients 60 to 69 years of age, 22% in patients 70 to 79 years of age, 9% I patients 80 to 89 years of age, 6% in patients 90 to 99 years of age and 0% in those over 100 years of age. There were no differences in the duration between the call and contact with the patients, presence of witness and performance of bystander CPR associated with age.

CONCLUSIONS. The poor prognosis in elderly cardiac arrest patients may result from the lower rate of VF/VT on the initial ECG. The prognosis was not associated with any delay in CPR, but it may instead be due to the overall condition of the older heart.

VF/VT: ventricular fibrillation/ventricular tachycardia, ECG: electrocardiogram, CPA: cardiopulmonary arrest, CPR: cardiopulmonary resuscitation.

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0091

TARGET TEMPERATURE MANAGEMENT AFTER OUT-OF-HOSPITAL CARDIAC ARREST, AN INTERNATIONAL, MULTI-CENTRE, RANDOMISED, PARALLEL GROUPS, ASSESSOR BLINDED CLINICAL TRIAL-RATIONALE AND DESIGN OF THE TTM-TRIAL-NCT01020916

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INTRODUCTION. Previous studies may suggest an improvement in mortality and neurological function with induced hypothermia after out-of-hospital cardiac arrest (OHCA) but the overall evidence level is of a low quality and the optimal target temperature is not known [1−4].

OBJECTIVES. To evaluate differences in efficacy and safety with two strict sub-febrile target temperatures management for 24 h after OHCA of presumed cardiac cause.

METHODS. Intervention: Patients will be randomly allocated to 24 h of temperature control at 33 and 36°C. Temperature control will be delivered with temperature management equipment at the discretion of the trial sites.

DESIGN. 850 OHCA patients. Inclusion criteria: age ≥18 years, OHCA of presumed cardiac cause, sustained return of spontaneous circulation (ROSC), unconsciousness (Glasgow Coma Score <8) after sustained ROSC. Exclusion criteria: Pregnancy, bleeding diathesis, suspected or confirmed acute intracranial bleeding or stroke, unwitnessed asystole, temperature on admission <30°C, persistent cardiogenic shock, limitations in therapy, disease making 180 day survival unlikely, pre-arrest cerebral performance (CPC) category 3 or 4. Primary outcome: all-cause mortality at maximal follow-up (min 180 days). Secondary outcomes: Composite outcome of all-cause mortality and poor neurological function [Cerebral Performance Category (CPC) 3 and 4] at hospital discharge and at 180 days. Cognitive status at 180 days. Bleeding, pneumonia, sepsis, electrolyte and metabolic disorders, arrhythmia, renal replacement therapy will be recorded as potential adverse events. A biobank for biomarkers of brain damage will be created.

RESULTS. The trial is presently recruiting centres in Europe and has of April 2011 recruited 44 patients.

CONCLUSIONS. The TTM-trial will broaden the base for a well-founded judgement of the efficacy of temperature management after OHCA in a representative population reflecting current clinical practice and investigating sub-febrile temperatures.

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GRANT ACKNOWLEDGMENT. Heart and Lung, AFA-insurance, Gorthon, Krapperup, Karlsson and Segerfalk foundations, the National Health System and the regional county council of Skåne; all in Sweden.

0092

PCR LIKE MARKER OF NEUROLOGICAL OUTCOME AFTER RECOVERED CARDIAC ARREST

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OBJECTIVES. To evaluate the prognostic value of procalcitonin in patients who do not develop severe infection after cardiorespiratory arrest (PCR)

METHODS. Prospective study of patients admitted to the intensive care unit of Hospital Clinico San Carlos after cardiac arrest in the period 2007–2010. We excluded those who died within 24 h after admission. The levels were determined procalcitonin (PRC) and neuron-specific enolase (NSE) within 48 h of admission and bronchial cultures, urine and blood cultures, recording clinical signs of infection. Neurological outcome was assessed according to the Glasgow Outcome Scale at discharge from ICU and hospital, identified as good neurological outcome (Group A) at 4 and 5 sgrupo neurological pressure switch groups 1–2 (group B)

RESULTS. Of the 104 patients admitted for this reason, we excluded 26 per patient died and 44 early signs of infection. The study group (34 patients) had a mean age of 59.4 (8 women and 26 men). Differences were seen between groups A and B in lactate (L) on admission 6.45 versus 12.6 ($p = 0.01$) and 17.41 NSE versus 81.9 ($p = 0.007$). There were significant differences in age 67.6 versus 60.4 ($p = 0.20$), the PRC 3.4 versus 8.9 ($p = 0.24$). The area under the curve for the variables were $L = 0.808$, $NSE = 0.889$, $PRC = 0.586$.

CONCLUSIONS. In patients recovered after cardiac arrest with no signs of infection only lactate on admission and the maximum value of NSE showed good predictive capability of neurological outcome.

0093

HYPERGLYCEMICA IN EXPERIMENTAL CARDIAC ARREST

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INTRODUCTION. Hyperglycemia aggravates cerebral ischemia–reperfusion, possibly through increased oxidative stress. In cardiac arrest, hyperglycemia is associated with poor outcome. Various glycemic control regimens exist, but the impact of these on cerebral perfusion in cardiac arrest is unknown.
OBJECTIVES. To investigate the effects of cardiac arrest on cerebral perfusion at high and normal glycemic ranges
METHODS. Pigs were randomized to different glycemic levels of 8.5–10 mM (high) or 4–5.5 mM (normal) and subjected to cardiac arrest and resuscitation. Cerebral oxygenation and biomarkers of damage, oxidative stress and inflammation were measured during 180 min.
RESULTS. Increased cerebral oxygenation was seen in the higher glycemic range after 12 min of cardiac arrest and resuscitation. A tendency towards increased inflammatory response and increased protein S100 beta levels were also seen in the high range, but markers of oxidative stress were not significantly elevated.
CONCLUSIONS. The early response (hours) to cardiac arrest is largely similar between the high and normal glycemic ranges in this porcine model. The significance of increased oxygenation in the high range group needs further investigation.
GRANT ACKNOWLEDGMENT. Laerdal Foundation for Acute Medicine

Subarachnoid hemorrhage: 0094–0107

0094

MULTICENTER CONTROLLED TRIAL ABOUT THE REEXAMINATION OF TRIPLE H THERAPY AFTER SUBARACHNOID HEMORRHAGE

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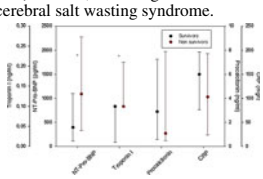
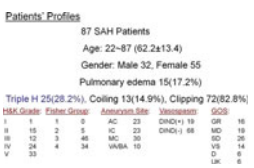
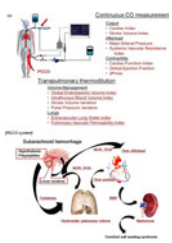
INTRODUCTION. Volume management is crucial in intensive care, however, in some patients it is very hard to achieve optimal water balance. Subarachnoid hemorrhage (SAH) patient is a representative example. Cardiopulmonary complications are common after SAH: neurogenic pulmonary edema, cardiac failure, and so on. Triple H therapy is a standard management after SAH, but it also has adverse effects; pulmonary edema, increased intracranial pressure, hyponatremia, sepsis and so on.
OBJECTIVES. We have started the multicenter controlled trial about cardiopulmonary function after SAH. We describe herein a trial of minimally invasive PiCCO Plus monitoring of cardiopulmonary function to reexamine the effect of triple H tharapy after SAH.
METHODS. This multicenter controlled trial analyzed the cardiopulmonary functions of 87 patients after SAH by PiCCO Plus monitoring over a period of 2 weeks.
RESULTS. Output, contractility and afterload were essentially normal after SAH. However, slightly elevated intrathoracic blood volume led to fluid redistribution that caused hydrostatic fluid retention in the lung tissues. Triple H therapy had no additional cardiopulmonary features except for the elevated plasma BNP levels. Persistent catecholamine release and altered sensitivity of blood vessels to catecholamines caused the blood volume redistribution and hydrostatic pulmonary edema. Cardiac preload due to catecholamine release led to brain natriuretic polypeptide (BNP) release, resulting in natriuresis. This appeared to be the underlying mechanism of cerebral salt wasting syndrome.



Patients' profile



PiCCO system



Hypothesis

CONCLUSIONS. We found that hydrostatic pulmonary fluid retention occurred after SAH. Triple H therapy gave no additional benefits on the systemic circulation after SAH.
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GRANT ACKNOWLEDGMENT. Scientific Grant of Health, Labour and Welfare Ministry in Japan (No. 20592117).

0095

ASSOCIATION BETWEEN AUTONOMIC NERVOUS ACTIVITY AND MYOCARDIAL INJURY IN PATIENTS WITH ANEURYSMAL SUBARACHNOID HEMORRHAGE

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INTRODUCTION. The pathophysiology of myocardial injury associated with aneurysmal subarachnoid hemorrhage (SAH) is unclear. Initial theories focused on sustained stimulation of cardiomyocytes at sympathetic nerve endings, but recent data suggest that dysfunction of the parasympathetic nervous system may contribute as well [1]. A study spectral analysis of heart rate variability (HRV) showed that parasympathetic nervous activity rather than sympathetic nervous activity was markedly accelerated during acute phase of SAH [2].
OBJECTIVES. This study was carried out to clarify whether the change of autonomic nervous system activity is associated with myocardial injury after SAH.
METHODS. After approval of Institutional Committee, informed consent was obtained from each patient or patient's relatives. We studied consecutive 72 patients undergoing surgical aneurysm clipping or endovascular surgery within 72 h after SAH between June 2006 and May 2008. General clinical data, Hunt and Hess grade were recorded on admission. Holter electrocardiography was performed on admission and on 7 postoperative day (7 POD) to determine spectral analysis of HRV for the entire 24 h. The low frequency (LF 0.031–0.141 Hz: unit ms^2) and high frequency (HF 0.141–0.391 Hz: unit ms^2) were calculated using software. The Glasgow Coma Scale (GCS) and SIRS score were recorded on admission, and 1 and 7 POD. Blood was sampled on admission, and 1, 3 and 7 POD for measurement of troponine T (TnT). Myocardial injury was defined as the peak TnT above 0.1 ng/mL. The values were expressed as median (interqurtile range). Intergroup comparisons were made by Mann–Whitney *U* test or Fisher's exact probability test. A p value of <0.05 was considered statistical significant.
RESULTS. Out of 72 patients, 7 had myocardial injury (group A), and 65 had no injury (group B). HF, a marker of parasympathetic nervous activity, was higher in group A [449.0 (339.9, 772.4) ms^2], compared with group B [232.1 (97.0, 406.6) ms^2] on admission. However, there was no significant difference in HF between two group A [58.2 (56.2, 144.3) ms^2] and group B [163.7 (67.7, 490.5) ms^2] on 7 POD. There were no significant differences in LF/HF ratio, a marker of sympathetic nervous activity, between two groups on admission [1.10 (0.60, 1.24) in group A vs. 1.06 (0.65, 1.44) in group B] or on 7 POD [1.51 (0.95, 2.93) in group A vs. 1.32 (0.77, 2.14) in group B].
CONCLUSIONS. HRV analysis showed that parasympathetic nervous activity was enhanced in the patient with myocardial injury after SAH on admission. The results suggest that parasympathetic nerve activation might play a role in myocardial injury during acute phase of SAH.
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GRANT ACKNOWLEDGMENT. This research was supported, in part, by research funds to promote functions of the Japan Labor Health and Welfare Organization.

0096

FUNCTIONAL OUTCOME AT 6 MONTHS FOLLOWING NEUROSURGICAL INTENSIVE CARE UNIT (NICU) ADMISSION FOLLOWING SPONTANEOUS SUBARACHNOID HAEMORRHAGE (SAH)

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INTRODUCTION. Spontaneous subarchnoid haemorrhage (SAH) is a neurosurgical emergency with an incidence estimated to be 9.1 per 100,000. Patients with SAH frequently require admission to neurosurgical intensive care units (NICU). However, there is a paucity of information regarding functional outcome following such admissions [1].
OBJECTIVES. To survey the functional outcome at 6 months in patients following NICU admission for spontaneous SAH.
METHODS. From January to December 2009 (inclusive) we collected information on all patients admitted to our NICU with SAH. Data collected included: best World Federation of Neurosurgeons score (WFNS) [2], time to diagnosis, time to intervention (either endovascular coiling or surgical clipping of aneurysm), complications and co-morbidities. At 6 months survivors were contacted initially by postal questionnaire (and then by telephone for non-responders) to establish their functional outcomes using two scoring systems (modified Rankin score {MRS} [3] and EQ-5D [4]).
RESULTS. Over the 1 year studied 106 patients were identified with only 2 lost to follow up. By the end of the follow up period, 30 (29%) had died. At entry, 75 (71%) were designated as having 'good grade SAH' (WFNS score 1–2) and 31 (29%) as 'poor grade SAH' (WFNS 3–5). 18/75 (24%) of patients with good grade SAH and 12/31 (39%) with poor grade SAH died. For the 104 patients with complete data, 41 (73%) of those with good grade SAH and 10/18 (56%) with poor grade SAH survived with a favourable outcome (MRS 0–2). This difference was statistically significant: Chi square, $p = 0.041$. Using the EQ-5D score in survivors, good grade SAH patients had a mean score of 7.57 and poor grade SAH scored 7.8. In patients that had a good outcome as assessed by both methods, the mean time to intervention was 3.72 days and this figure was 4.3 days in those patients with a poor outcome.
CONCLUSIONS. In our population, good grade SAH patients had better functional outcomes using both scoring systems. However, 56% of survivors of poor grade SAH also had a good outcome. Data suggests that delay to intervention may influence functional outcome but this requires further study.
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GRANT ACKNOWLEDGMENT. Self-funded.

0097

PERSISTENTLY ELEVATED MONOAMINES ARE ASSOCIATED WITH SEVERITY OF ANEURYSMAL SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Catecholamines are hypothesized to surge at the time of aneurysm rupture for patients experiencing aneurysmal subarachnoid hemorrhage (aSAH), but the relationship of catecholamines to aSAH severity or whether they persist beyond the rupture event is underexplored.

OBJECTIVES. Using a novel assay for monoamine metabolites in endogenous tryptophan and tyrosine pathways upstream from serotonin and epinephrine respectively, we aimed to determine temporal trajectory profiles of urine monoamines for aSAH patients, and their association with aSAH severity according to clinical symptoms [Hunt and Hess grade (H&H)].

METHODS. Prospective longitudinal study recruited 128 aSAH patients with Fisher $\geq$2 and/or H&H $\geq$3. High-pressure liquid tomography coupled with a colorimetric multi-electrode array system determined tryptophan and its metabolite 5-hydroxyindole-3-acetic acid (5-HIAA), and tyrosine and its metabolite homovanillic acid (HVA) levels in 24-h urine samples collected days 0–5 after aSAH. A group-based trajectory analysis was performed with the PROC TRAJ macro in SAS V9.2 to identify distinct monoamine subgroups with similarly behaving patterns. Associations between monoamine trajectory groups and demographics and the H&H grade assigned by attending neurosurgeon at admission were determined using cross tabulation tables, Fisher's exact-test, and Pearson Chi-square tests.

RESULTS. Models were selected based on clinical criteria and statistical judgment. Trajectory analysis identified two distinct groups (low and high, all $p < 0.001$) for each monoamine. The proportions of patients in low trajectory groups [tryptophan (55%), 5-HIAA (35%), tyrosine (62%), HVA (23%)], and high trajectory groups [tryptophan (45%), 5-HIAA (65%), tyrosine (38%), and HVA (77%)] were identified. Chi-square analyses to determine overall associations between high and low trajectory groups did not note differences on age or race for any monoamine, and only tyrosine was significant on gender (low group 17% vs. high group 44% male, $p < 0.001$). Higher H&H was significantly associated with high trajectory groups for tryptophan, 5-HIAA, and HVA (all $p < 0.05$) and trended towards significance for tyrosine ($p = 0.07$).

CONCLUSIONS. Monoamines remain persistently elevated over time after aSAH in patients with greater aSAH severity according to clinical symptoms. Thus, the exposure of patients with severe aSAH to elevated catecholamines is not limited to the time of aneurysm rupture alone but extends well into the course of care. How persistently elevated monoamines relate to aSAH complications and outcomes requires further study.

GRANT ACKNOWLEDGMENT. NHLBI R01HL074316.

0098

HEMODYNAMIC EFFECTS OF DIFFERENT VOLUME REPLACEMENT SOLUTIONS IN NON-TRAUMATIC SAH PATIENTS

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INTRODUCTION. Annual incidence of nontraumatic aneurysmal subarachnoid hemorrhage is 6–25 cases per 100,000. Advances in the management of subarachnoid hemorrhage have resulted in a relative reduction in mortality rate that exceeds 25–27%. However, more than one-third of survivors have major neurologic deficits.

OBJECTIVES. Intravenous administration of different colloids and cristalloids is widely used during intensive care of SAH. But there is no evidence of real effects and effectiveness of this volume replacement therapy. Aim of the study is to determine hemodinamic effects of different volume replacement solutions in SAH patients.

METHODS. After the resolution of local Ethical Committee in 2008–2010 years prospective, randomized, controlled study was provided in 20 SAH patients (H–H 2–3).

During first 48 h of intensive care we randomly administered for volume replacement different solutions: NaCl 0.9%, 6%HES 130/0.42, 10%HES 200/0.5, 4% modified fluid gelatin 4% (MFG). Monitoring of hemodynamic parameters was realized by thermodilution method (Swan-Ganz catheter insertion). Infusion rate was the same in all groups during first 48 h. Comparable analysis of nonparametric quantity characteristics was based on the Freidman criteria.

RESULTS. NaCl 0.9% did not change any hemodynamic parameter. HES (130 and 200) and MFG solutions significantly increased CO and PCWP.HES (130 and 200) and MFG solutions significantly increased CO and PCWP. Changes in PAP data were registered only during HES administration. CVP increased significantly in HES 200/0.5 10% and MFG 4% groups. We did not find significant changes in SVR and MAP in all groups. CO-cardiac output, SVR-systemic vascular resistance, MAP-mean arterial pressure, PAP-pulmonary arterial pressure, PCWP-pulmonary catheter wedge pressure, CVP-central venous pressure.

CONCLUSIONS. Administration of HES (200/0.5 and 130/0.42) solutions is more predictable and safe for hypovolemic SAH patient.

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0099

IMPACT OF VENTRICULAR WALL MOTION ABNORMALITIES ON SURVIVAL IN PATIENTS WITH ANEURYSMAL SUBARACHNOID HAEMORRHAGE

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INTRODUCTION. Wall motion abnormalities occur in approximately 25% of patients after aneurysmal subarachnoid haemorrhage (SAH); meta-analysis reported an association between wall motion abnormalities and mortality.

OBJECTIVES. We conducted a multicenter prospective observational cohort study to assess the association between ventricular wall motion abnormalities and death.

METHODS. 303 consecutive patients with aneurysmal SAH were included in our study between February 2005 and March 2008. The diagnosis of aneurysmal SAH was established by CT scan or by xanthochromia of the cerebrospinal fluid if the CT was non-diagnostic. All patients with aneurysmal subarachnoid haemorrhage who presented within 72 h of the onset of symptoms were eligible for inclusion. Aneurysms were confirmed by angiography. The exclusion criteria were failure to obtain informed consent, patients' or—in case of comatose state—relatives' inability to understand the issues of the study, or legal incapacity, failure to locate an aneurysm, or presentation >72 h after onset of symptoms. Echocardiography was performed on admission, at day 4, and 8 after the initial bleed. We calculated the impact of co-variates on mortality with the Cox proportional hazards model. Rebleeding and delayed cerebral ischemia were treated as time dependent co-variates and the following variables were treated as fixed variables: participating centre, gender, age over 50 years, history of myocardial infarction, history of hypertension, history of hypercholesterolemia, history of peripheral vascular diseases, history of ischemic stroke, history of haemorrhagic stroke, history of smoking, history of diabetes mellitus, WFNS score of 3 points or higher, Hijdra cisternal blood score of 20 points or higher, aneurysm in anterior circulation, heart rate, presence of ischemic ST changes, and presence of ventricular wall motion abnormalities.

RESULTS. Seventy per cent of these 303 patients were female. WMA were found in 81(26.7%) of the 303 patients. Death at 3 months after SAH was significantly associated with history of ischemic stroke (hazard ratio 3.23, 95% CI 1.45–7.22), WFNS score of 3 points or higher (hazard ratio 3.91, 95% CI 2.05–7.48), rebleeding (hazard ratio 19.26, 95% CI 6.14–60.36), and presence of mid ventricular wall motion abnormalities (hazard ratio 2.086, 95% CI 1.18–3.68).

CONCLUSIONS. Although stress induced cardiac dysfunction in causes other than SAH is often reported to have an excellent prognosis, in this study we found a significant hazard ratio for death and mid ventricular wall motion abnormalities.

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0100

USEFULNESS OF C-REACTIVE PROTEIN AS A PROGNOSTIC FACTOR FOR POOR OUTCOME AND VASOSPASM IN PATIENTS WITH ANEURYSMAL SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Systemic inflammatory response syndrome (SIRS) is common after SAH even in the absence of infection, and associated with worse outcome. C-reactive protein (CRP) has been investigated in patients with aneurysmal SAH because multiple inflammatory processes are directly involved in the development of secondary ischemia after aneurysmal SAH. There is a conflicting result about reliability of CRP as a predictor for poor outcome.

OBJECTIVES. In this study, we tested our hypothesis that CRP can be an important independent predictor for poor outcome and vasospasm in patients with aneurysmal SAH. We also determined other predictors for poor outcome or vasospasm associated with aneurysmal SAH. Finally, we studied the influence of the different time points of CRP measurement on the prediction of vasospasm and clinical outcome.

METHODS. Laboratory data such as C-reactive protein (CRP) level and white blood cell count, preoperative [demographic data, location and maximal diameter of aneurysm, Hunt-Hess Grade, Fisher Grade, Glasgow Coma Scale (GCS) at admission], intraoperative (surgical and anesthetic time, anesthetic and surgical techniques, intraoperative fluid balance, the lowest mean blood pressure during anesthesia), postoperative (APACHE 2 score) data, and complications [intracerebral hemorrhage (ICH), hydrocephalus, vasospasm, surgical decompression, cerebral infarction, tracheostomy] were collected and used as predictable factors for poor outcome (Modified Rankin Scale score 4–6) at hospital discharge or vasospasm by binary logistic regression with forward conditional method subsequent to independent *t* test and Chi-square test, as appropriate.

RESULTS. 37 and 35 patients showed poor outcome and vasospasm after SAH, respectively. Age (OR 1.090, 95% CI 1.013–1.173), GCS score at admission (OR 0.604, 95% CI 0.453–0.806), ICH (OR 0.047, 95% CI 0.004–0.508) and CRP level measured 1 or 2 days after surgery (CRP POD 1–2, OR 1.774, 95% CI 1.293–2.434) were significant independent factors in predicting for poor outcome ($P < 0.05$). Hunt and Hess grade 1–2 at admission (OR 0.332, 95% CI 0.121–0.916) and CRP POD 1–2 (OR 1.112, 95% CI 1.015–1.219) were independent factors in predicting for vasospasm ($P < 0.05$).

CONCLUSIONS. CRP POD 1–2 was a useful prognostic factor for poor outcome and vasospasm in patients with aneurismal SAH.

0101

MONITORING OF VOLUME STATUS IN THE ACUTE STAGE AFTER ANEURYSMAL SUBARACHNOID HAEMORRHAGE WITH TRANSPULMONARY THERMODILUTION

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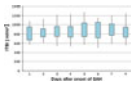
INTRODUCTION. There are reports of patients suffering from derangements of volume status and dysnatremia in the acute stage after aneurysmal subarachnoid haemorrhage (SAH) [1, 2]. Hypovolemia is associated with increased delayed cerebral ischemia [3] while hypervolemia is a risk factor for pulmonary edema and cardiac failure. Fluid management by clinical signs and standard monitoring is difficult [4].

OBJECTIVES. To investigate volume status of patients with SAH we used advanced monitoring of hemodynamic parameters by transpulmonary thermodilution via PICCO®-technique.

METHODS. Upon approval of the local ethics committee we carried out a prospective analysis of patients with diagnosed aneurysmal SAH admitted to the Operative ICU of the University Medical Centre Mannheim. Measurement of the intrathoracic blood volume index (ITBI) and the extravascular lung water index (ELWI) was performed twice daily at least till day 8 after the incident. Besides we recorded daily fluid balance and the most pathological serum sodium value. The treating physicians were blinded and aimed to maintain normovolemia by monitoring clinical signs. Exclusion criteria were: First measurement >48 h after the incident, pregnancy, age <18 years, moribund, clinical relevant heart insufficiency and no indication for CVC beside study.

RESULTS. We report on the first 27 patients found eligible admitted from 03/2010 till 03/2011. 22 (81%) were female, mean age was 53 years (SD ± 13). 16 (59%) had a good clinical grade (H&H I–III), 11 (41%) had a poor clinical grade (H&H IV–V) 20 (74%) patients had 1 or more days an ITBI <850 ml/m^2 (normal range 850–1,000 ml/m^2) regardless of clinical grade. In only ten patients we found a sodium value within the normal range (135–150 mmol/L) over all 8 days. In 9 patients at least 1 value of hyponatremia and in 7 at least 1 value of hypernatremia occurred.



Course of ITBI

CONCLUSIONS. A reduced ITBI <850 ml/m^2 and sodium dysbalances are common in the acute stage after aneurysmal subarachnoid haemorrhage. A correlation between ITBI <850 ml/m^2 and the incidence of vasospasm could not be shown yet. Prospective studies are planned to determine the influence of the therapy of an reduced ITBI <850 ml/m^2 on the incidence of vasospasm.

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0102

SUBARACHNOID HEMORRHAGE PATIENTS ADMITTED TO A THIRD-LEVEL HOSPITAL INTENSIVE CARE UNIT IN SPAIN DURING A 5 YEAR PERIOD (2005–2009). THERAPEUTIC APPROACH, INITIAL AND LONG-TERM OUTCOME

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INTRODUCTION. Subarachnoid hemorrhage (SAH) is a neurologic emergency. The mainstay of its management lays on surgical or neuroradiologic procedures and excellent management in the intensive care unit (ICU).

OBJECTIVE. To review the patients (pts) with SAH admitted to our ICU in a 5-year period (January 2005–December 2009), and to evaluate long-term clinical outcome.

METHODS. Medical files review. We collected demographic data, medical history, severity scores on admission (GCS, Hunt-Hess, Fisher and WFNS scales), location of the aneurism bearing artery, type of intervention and its delay, complications, situation on discharge from ICU, Glasgow Outcome Scale (GOS) at 6 months.

RESULTS. 139 pts were admitted, median age (±SD) was 57.70 (±13.86), 57 (41%) male. Most frequent risk factors: hypertension (45.32%); smoking (32.37%); hyperlipidemia (25.18%); none (12.95%).

Severity scores on admission

GCS	14–15: 87 (62.58%)	8–13: 20 (14.39%)	3–7: 32 (23.02%)		
HUNT-HESS	I: 35 (25.18%)	II: 50 (35.97%)	III: 17 (12.23%)	IV: 23(9.35%)	V: 24 (17.26%)
Fisher	I: 5 (3.59%)	II: 39 (28.05%)	III: 23 (16.55%)	IV: 72 (51.80%)	
WFNS	I: 63 (45.32%)	II: 19 (13.67%)	III: 5 (3.60%)	IV: 23 (16.55%)	V: 29 (20.86%)

Location of aneurisms: anterior communicating art: 29 (20.86%); posterior communicating art: 25 (17.98%); middle cerebral art: 22 (15.83%), internal carotid art: 10 (7.19%). Multiple aneurisms: 15 pts (10.79%). Endovascular coiling: 58 pts (41.72%). Most frequent complications: nosocomial infection 15 (25.86%); hydrocephalus (HDC) 12 (20.69%); infarction/delayed cerebral ischemia (DCI) 11 (18.96%); acute respiratory failure (ARF) 10 (17.24%); rebleeding 6 (10.35%); death 5 (8.62%); none: 18 (31.03%). On discharge, good clinical condition: 40 pts (68.96%). 27 pts (19.42%) underwent surgical clipping. Most frequent complications: cerebral edema/intracranial hypertension 8 (29.63%); HDC 7 (25.92%); infarction/DCI 7 (25.92%); ARF: 4 (14.81%); rebleeding 2 (7.41%); death 3 (11.11%); none 7 (25.92%). On discharge good neurological status: 14 pts (51.85%). *COILING PLUS CLIPPING:* 7 pts (5.04%). 4 of them good clinical status on discharge; one died. No aneurisms: 24 pts (17.27%); 17 of them had no complications; 3 had HDC. 18 were in good neurologic condition on discharge, 3 died. *NO TREATMENT:* 23 pts (16.55%). 16 died in the ICU (69.56%); only 2 were alive al 6 months.

Treatment delay

	Day 1–3	Day 4–14	Day >14
Coiling	37 (63.79%)	19 (32.76%)	2 (3.45%)
Clipping	12 (44.44%)	9 (33.33%)	6 (22.22%)
Coiling/clipping	6/2	0/2	1/3

GOS at 6 months

GOS	COILING (53 Pts)	CLIPPING (24 Pts)	COILING+CLIPPING (6 Pts)	NO TREATMENT (8 Pts)	NO ANEURISMS (21 PAT)
1	3 (5.17%)	1 (3.70%)	0	3 (13.04%)	2 (8.33%)
2	4 (6.90%)	0	0	0	0
3	3 (5.17%)	6 (22.22%)	2 (28.57%)	1 (4.34%)	0
4	8 (13.80%)	4 (25.93%)	0	0	0
5	32 (55.17%)	9 (33.33%)	4 (57.14%)	1 (4.34%)	15 (62.50%)
NO DATA	3 (5.17%)	1 (3.70%)	0	2 (8.68%)	4 (16.66%)

CONCLUSIONS. Though SAH may be a devastating condition, good outcomes on discharge from ICU and long-term are not exceptional. In our hospital coiling is used more often than clipping.

0103

EVALUATION OF THE REQUIREMENTS FOR CRITICAL CARE IN PATIENTS UNDERGOING EMERGENCY ENDOVASCULAR COILING OF INTRACEREBRAL ANEURYSMS

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INTRODUCTION. Systemic and cerebral complications are common following emergency endovascular coiling of intracerebral aneurysms, however, the requirement for post-coiling critical care admission in these patients has not been determined. Within our institution the majority of the patients are discharged to the neurosurgical ward.

OBJECTIVES. We proposed to determine the local rate of critical care admission along with the prevalence of postoperative complications and the rate of escalation from ward to critical care in this group of patients.

METHODS. Retrospective case note analysis of all patients undergoing emergency endovascular coiling of intracerebral aneurysms between January 1st and December 31st 2010 at Queen's Medical Centre, Nottingham, UK.

RESULTS. 111 cases were available for analysis. 32 patients were admitted directly to critical care postoperatively and 79 patients were admitted to the ward. Of those 68% suffered some form of complication and 16% required escalation of care. The prevalence of selected complications according to patient postoperative location is shown in Table 1. Of the nine ward based patients who subsequently required an EVD and returned to the ward, six then required escalation to HDU admission.

The prevalence of postoperative complications

Complication	Ward n = 79 (proportion)	Critical care n = 32 (proportion)	Overall n = 111 (proportion)
Vasospasm	24 (30)	14 (43)	38 (34)
Cerebral ischaemia	12 (15)	8 (25)	20 (18)
Infection, chest	11 (14)	20 (63)	31 (28)
Infection, other	12 (15)	4 (13)	16 (14)
Labile BP	13 (16)	8 (25)	21 (19)
Hydrocephalous	15 (19)	18 (56)	33 (30)
Cardiac	10 (13)	13 (48)	23 (21)
Electrolyte disturbance	12 (15)	6 (19)	18 (16)
Seizures	7 (9)	5 (16)	12 (11)

CONCLUSIONS. A significant number of patients required admission to critical care due to the development of postoperative complications. It is not known whether providing goal-directed care in HDU/ICU for a limited amount of time in the early postoperative period decreases the likelihood of later complications. We suggest all patients be admitted to HDU for 24–48 h postoperatively and any patient who subsequently requires an EVD for hydrocephalous should be discharged to critical care.

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0104

PROGNOSTIC FACTORS FOR THE DEVELOPMENT OF VENTRICULAR WALL MOTION ABNORMALITIES IN PATIENTS WITH ANEURYSMAL SUBARACHNOID HAEMORRHAGE

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INTRODUCTION. Wall motion abnormalities (WMA) occur in 25% of patients after subarachnoid haemorrhage (SAH). Studies showed that age, aneurysm position, high grade SAH predicted the occurrence of WMA. In these studies the amount of cisternal blood, an important indication for the severity of the initial bleed, was not included in the analysis.

OBJECTIVES. To assess the predictors for the occurrence of WMA after aneurysmal SAH.

METHODS. We conducted a prospective multicentre observational study of 303 consecutive patients with aneurysmal SAH between February 2005 and March 2008. The diagnosis of aneurysmal SAH was established by CT scan or by xanthochromia if the CT was non-diagnostic. All patients with aneurysmal subarachnoid haemorrhage who presented within 72 h of the onset of symptoms were eligible for inclusion. Aneurysms were confirmed by angiography. The exclusion criteria were failure to obtain informed consent, patients' or—in case of comatose state—relatives' inability to understand the issues of the study, or legal incapacity, failure to locate an aneurysm, or presentation >72 h after onset of symptoms. Echocardiography was performed on admission, at day 4, and 8 after the initial bleed. Predictors for WMA were determined by multivariate logistic regression. The following variables were entered as independent variables: participating centre, gender, age over 50 years, history of myocardial infarction, history of hypertension, history of hypercholesterolemia, history of peripheral vascular diseases, history of ischemic stroke, history of haemorrhagic stroke, history of smoking, history of diabetes mellitus, WFNS score of 3 points or higher, Hijdra cisternal blood score of 20 points or higher, aneurysm in anterior circulation, heart rate, presence of ischemic ST changes.

RESULTS. 70% of 303 patients were female. WMA were found in 81 (26.7%). Female gender (male vs. female OR 0.48. 95% CI 0.25–0.94), $p = .033$, history of myocardial infarction (OR 9.14, 95% CI 1.44–58.14, $p = 0.019$), WFNS grade >2 (OR 2.13, 95% CI 1.18–3.82, $p = 0.012$) predict the occurrence of WMA.

CONCLUSIONS. Female gender, history of myocardial infarction, and poor WFNS grade on admission are independent predictors for the occurrence of WMA after aneurysmal SAH.

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0105

THERAPEUTIC APPROACH TO ANEURISMAL SUBARACHNOID HAEMORRHAGE (ASH): EVOLUTION IN 10 YEARS

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INTRODUCTION. ISAT[1] study showed a mortality decrease in ASH patients treated with coil embolization. We studied two groups of patients in a 10 year period, to analyze the influence of aneurysm therapy on the outcome of ASH.

OBJECTIVES. To compare the therapeutic approach to ASH in 2009 and 1998–1999 and evaluate its impact on outcome at discharge and 6 month follow-up.

METHODS. Retrospective, observational cohort study.

Patients: adults admitted in a tertiary hospital Intensive Care Unit (ICU) with the diagnosis of ASH in Jan' 1998/Dec' 1999 [Historic Group (HG)] and Jan'/Dec' 2009 [Present Group (PG)]. Those with no demonstrable aneurysm were excluded from the study. Data collected: demographics (gender and age), risk factors for ASH, clinical status on admission, Fisher scale score and aneurysm characteristics. We studied the influence of therapeutic approach on mortality, and on neurological outcome on discharge [Glasgow Outcome Scale (GOS)] and in a 6 month follow-up period (Rankin modified scale). Statistical analysis: we used the SPSS 18.0 application. We used Student's *t* distribution for normally distributed numerical variables and for categorical data chi-squared test or Fisher's test when necessary.

RESULTS. We included 106 patients: 56 in HG and 50 in PG. There were no differences in demographics, risk factors, clinical status or Fisher scale score. Most aneurysms were located on anterior circulation. Therapy chosen was coiling in 69.6% in HG and 66% in PG. Percentage of success was higher in PG (84.8 vs. 76.9%), but with no statistical significance. There were no differences on therapy complications. Surgical clipping was carried out in 30% of patients, with better results in HG. There was a higher incidence of complications with clipping versus coiling in both groups. Two patients in HG, and three in PG, couldn't be treated. Six patients in HG and four in PG were coiled and clipped. Hospital mortality was 17% in both groups. There were no differences in ICU or hospital length of stay. There was a trend to better outcome at hospital discharge and on follow-up on PG, but with no statistical significance. PG clipped patients had worse neurological status on hospital discharge when compared with coiled patients ($p = 0.038$). Patients with no treated aneurysms had the worst evolution with higher mortality (50%, $p < 0.001$), and worse scores on GOS and modified Rankin scales.

CONCLUSIONS. Coiling is the preferred aneurysm therapy in our hospital. There is a trend to higher coiling success in PG, but no statistical differences in mortality and neurological outcome. Clipped patients in PG had more complications and worse neurological outcome, than coiled patients. Patients with no approachable aneurysms had the worst outcome.

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0106

REGISTER OF SEVERE SUBARACHNOID HEMORRHAGE IN ICU WITH A STANDARDIZED AND MULTIDISCIPLINARY MANAGEMENT

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INTRODUCTION. Severe aneurysm-related subarachnoid hemorrhage (SAH) is associated with a high mortality rate and frequent neurological sequelae. Prognosis largely lies on occurrence of complications, namely rebleeding, vasospasm and hydrocephalus. Detection and treatment of such complications are therefore central in the management of SSH. However, few data are available regarding management of most severe forms of SAH in ICU.

OBJECTIVES. To describe multidisciplinary management in a specialized ICU of patients with SSH including early control (within 24 h) of the aneurysm (coiling or clipping) together with in-ICU management and neurologic multimodal monitoring including sequential transcranial Doppler ultrasounds.

METHODS. Retrospective, observational, single center study including all patients with severe SAH (defined as grade WFNS ≥ 3 [1], and/or grade Fisher ≥ 3 [2]) admitted to ICU between 2006 and 2011. The following data were collected: demographic, management characteristics [treatment of the aneurysm, gate to arteriography time, external ventricular diversion (EVD), second line arteriography for vasospasm diagnosis and treatment] as well as major complications (rebleeding, vasospasm, ischemia) and mortality. Results are expressed in median (interquartile range), $p < 0.05$ considered significant.

RESULTS. 240 patients were included, age 52 (43–59) years, IGS2 36 (21–43). WFNS grade on admission: Grade3, 14/240(6%); Grade4, 74/240(31%); Grade5, 21/240(9%), CTscan Fisher grade: F3.37/240(15%); F4.194/240(81%); F5.6/240(3%).

Delay for arteriography time was 2 (0–7) h. 28 patients (12%) were operated because of coiling failure or hematoma evacuation, the aneurysm was not cured in 28 patients (12%) due to technical issue or brain death on admission.

Table

Major complications	
Rebleeding	16 (6.7%)
Vasospasm	70 (29%)
Recidive of vasospasm	One, 29 (12%), >1.4 (2%)
Cerebral ischemia	29 (12%)
Mortality/brain death at admission	49 (20%)/45 (19%)
Treatment	
Coiling/clipping/none	184 (76%)/28 (12%)/28 (12%)
Ventricular catheter placement	96 (40%)
Arteriography for vasospasm diagnosis	70 (29%)
Treatment of first vasospasm episode	Balloon 11 (16%)
	Chemical (calcic inhibitor or inhibitor of phosphodiesterase-3), 7 (1%)
	Balloon + chemical 20 (24%)
	None 12 (17%)

CONCLUSIONS. We observed a low mortality rate 49/280(20%) and few complications compared to previously published studies which included less severe forms of subarachnoid hemorrhage [3]. Our results strongly suggest that a multidisciplinary and proactive management including 1. early endovascular control of the aneurysm, 2. specialized ICU management allowing early and prompt treatment of major complications improves outcome of patients with severe SAH.

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0107

ANALGO-SEDATION (AS) VERSUS SEDO-ANALGESIA (SA) IN PATIENT WITH SUBARACHNOID HEMORRHAGE (SAH): A PROSPECTIVE AND RANDOMIZED STUDY

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INTRODUCTION. Mechanically ventilated patients in the Intensive Care Unit (ICU) normally need sedation and analgesia to maintain comfort, relieve anxiety, facilitate care, and adapt to ventilatory support [1]. Guidelines for the sustained use of sedatives and analgesics have been developed for patients in the general ICU [2], but little attention has been directed toward sedation of patients in the Neurointensive Care Unit (NICU) [3].

OBJECTIVES. To analyze the differences in terms of adequacy of analgo-sedation, awake time (AT) for Daily Sedation Interruption (DSI), weaning from mechanical ventilation and ICU Lenght of Stay (ICU-LOS) after the implementation of two different analgo-sedation protocols.

METHODS. Design: Analysis of a prospective and randomized collected database.

Setting: ICU in an University Hospital. Patients: A total of 48 patients aged 30–80 (19 M and 29 F) with a Fisher score II–III submitted to interventional neuro-radiology procedures from June 2010 to January 2011. Patients with procedure-related complications and/or an Admission SOFA score >8 were excluded.

Randomization: on ICU admission, the patients were randomly assigned to Group 1 (AS) (remifentanil 0.02–0.2 γ/kg/min $\pm$ propofol 0.5–2 mg/kg/h aimed at maintaining a RASS score between -3 and -2) or Group 2 (SA) (propofol 0.5–4 mg/kg/h $\pm$ remifentanil 0.02–0.1 γ/kg/min, aimed at maintaining a RASS score between -3 and -2). The first DSI was carried out after 24 h. The same weaning protocol was used for both groups.

Data collection: Preoperative and each hour (during the first 12 h in ICU) assessment of Bispectral Index (BIS); assessment of COMFORT scale and Pain Intensity (PI) Scale on ICU admission, after 12 h and once daily until ICU discharge; assessment of Glasgow Coma Score (GCS) once a day during DSI. AT for DSI (min) 24 h after admission and then once a day. ICU admission and each hour assessment of Mean Arterial Pressure (MAP, mmHg) and Heart Rate (HR, bpm). Weaning parameters were assessed 30 min after the start of weaning protocol. Moreover, data about Admission SOFA score, weaning duration and ICU-LOS were collected. Statistics: χ^2 test, Mann–Whitney test and unpaired *t* test were used when appropriate. A *p* value of <0.05 was considered statistically significant.

RESULTS. No differences in perioperative variables between the two groups (p = NS for all measurements). BIS values were lower in group 1 ($p = 0.001$); PI score was lower in group 1 ($p = 0.04$); GCS was higher in group 1 ($p = 0.04$). AT for DSI was lower in group 1($p = 0.01$). HR was lower in group 1 ($p = 0.02$) while MAP was lower in group 2 ($p = 0.03$). Weaning duration and ICU LOS were lower in group 1 ($p = 0.03$ and $p = 0.02$, respectively).

CONCLUSIONS. Our results shown a better management profile and pain control for patients in group 1.

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ICU organization, costs & resource allocation: 0108–0120

0108

SOCIAL DEPRIVATION DOES NOT PREDICT RESOURCE ALLOCATION IN CRITICAL ILLNESS

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INTRODUCTION. Social deprivation is associated with increased intensive care and hospital mortality [1]. Access to healthcare is a major public health issue in the UK, and those patients with high indices of deprivation have disproportionate difficulty in utilising healthcare. Healthcare professionals within the National Health Service are obliged to provide the best care possible, irrespective of geographical, political and social influences on healthcare provision. Limited data exists on the allocation of resources to said patients.

OBJECTIVES. We hypothesise that this increased mortality is not the result of decreased resource allocation within the critical care setting.

METHODS. Patients were recruited from a major metropolitan tertiary referral centre. Entry criteria were: Intubated on admission, likely to remain intubated for 48 h, likely to survive 7 days on intensive care. Indices of multiple deprivation (IMD) were calculated from residential postcodes, using the 2010 English Index of multiple deprivation. Cost of critical care was calculated from the 2010 Home Health Research Group (HHRG) tariffs. Costs were corrected for illness severity using admission APACHE II score, and correlations calculated using Spearmans rank coefficient.

RESULTS. 72 patients were recruited, of which 52 survived. The mean age was 51.7 (SD 18.7), and mean APACHE II score 24.3 (SD 6.8).No correlation was seen between IMD and cost of ITU stay ($r = 0.06$, $p = 0.65$). Among the sub domains of IMD, no correlation was seen with income deprivation ($r = -0.02$, $p = 0.86$), employment deprivation($r = 0.00$, $p = 1.0$), health deprivation and disability ($r = 0.08$, $p = 0.55$), education skills and training deprivation($r = -0.12$, $p = 0.40$, barriers to housing and services ($r = -0.60$, $p = 0.67$), crime ($r = 0.09$, $p = 0.53$) or living environment deprivation ($r = -0.09$, $p = 0.54$).

CONCLUSIONS. We found no evidence of social class bias in critical care resource allocation by clinicians in our cohort. The increased mortality seen in critically ill patients from areas of deprivation is likely to be the result of health determining factors prior to critical illness, or in factors post intensive care. This study warrants expansion to multiple centres in both affluent and deprived areas. Further research into resource allocation throughout the entire patient journey is needed to clarify contributing factors to the increased mortality.

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GRANT ACKNOWLEDGMENT. This report is independent research arising from a Doctoral Research Fellowship supported by the National Institute for Health Research.

0109

MOVING TO A NEW HOSPITAL: THE TRANSFER OF AN ENTIRE CRITICAL CARE UNIT TO A NEW INSTITUTION

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INTRODUCTION. Transfer of the critically ill patient is not without risk [1]. We describe moving an entire ICU and its patients to a new hospital.

OBJECTIVES. To present our experience.

METHODS. Data was taken from the minutes of meetings and event logbook.

RESULTS. Whiston hospital is a 750 bed facility with a 14 bedded critical care unit. Between 15th March and 27th April the entire hospital moved from the old facility to the new build. A temporary corridor linked the two hospitals. On the 24th March 2010 the critical care unit was moved. 12 critically ill patients were transferred between the hospital sites. Here we describe the preparation and planning. We arranged to staff two critical care units. All consultants cancelled their clinical commitments. There was a consultant for each site—a sending and a receiving consultant. A 3rd consultant took referrals. A further 2 consultants performed the transfer of patients. The number of nurses working was increased to 14 per site in ensuring a nurse patient ratio of 1:1. There were two designated transfer teams. Ventilated patients were ventilated with oxylog 3000 whilst their ICU ventilator was transferred with them. Prior to transfer both units were equipped with a resuscitation trolley/defibrillator, difficult airway trolley, haemodialysers and had provisions for line insertion. An ABG analyser was installed on both sites. In the lead up to transfer day a dummy run took place to map the route, identify places of safety to stabilise patients that deteriorated, to check that the bed could pass down the corridor and time the duration of transfer. It took 15 min to transfer each patient with a turnaround time of 30 min. A 10 p.m. ward round on the eve of the move identified those stable enough to be transferred. Any patients due for dialysis were dialysed prior to the move. Anyone on BIPAP/CPAP was considered for intubation. Contingency plans were in place for those unfit for transfer or dying. At 7 a.m. the ward round commenced and the first patient to be transferred left the unit. There was a designated lift, the route cleared and all patients assessed as to whether they could be pushed up a corridor with a 25° incline (if not they had to be transferred via an alternative route by ambulance). Consultants, matron and move co-ordinator communicated via mobile phone. Despite extensive planning we could not legislate for one patient having a cardiac arrest and 'blowing a pupil' and another requiring intubation for respiratory failure BEFORE the transfers began. Despite this all patients were safely transferred along with the whole ICU in under 5 h.

CONCLUSION. With careful planning and dedicated staff it is possible to transfer multiple numbers of critically ill patients without consequence. However, despite extensive planning one should always expect the unexpected.

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0110

SERUM CREATININE IN POSTOPERATIVE CARDIAC SURGERY PATIENTS AS A PREDICTOR TOOL OF LENGTH STAY IN INTENSIVE CARE UNIT

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INTRODUCTION. The ability to predict long length of stay (LOS) in Intensive Care Unit (ICU) patients is critical to its adequate management. In this context, finding low cost methods that can predict patients at risk of long LOS after undergoing cardiac surgery would be of great value.

OBJECTIVES. To evaluate serum creatinine as a prediction tool of long LOS probability in patients at cardiac surgery postoperative.

METHODS. Using December 2009 to March 2011 serum creatinine database, we conducted a retrospective study that included all patients undergoing valve replacement surgery and coronary artery bypass grafting surgery or both. Patients under 18 years old, those who died during hospitalization in ICU or were considered as emergency surgery and those who last more than 180 min after ICU arrival to collect blood for serum creatinine measurement were excluded from the analysis. The serum creatinine was measured using CREA Flex® reagent cartridge, Cat. No. DF33A. The serum creatinine was categorized as normal (<1.2 mg/dl) and abnormal (≥1.2 mg/dl). All analysis were performed using BioEstat *v.5* software. We considered ≥5 days as long ICU LOS (Table 1).

RESULTS. A total of 157 patients were enrolled; 49 were excluded according criteria described above. 117 patients were included in statistics analysis, 89 (76.0%) had normal serum creatinine value and 28 (23.9%) had abnormal values. The LOS range varies from 2 to 38 days. The median and mean values days were 4 and 5.2 in the normal serum creatinine group and 5 and 6.3 in the abnormal one, respectively. Baseline clinical features for both groups were similar, except for renal failure with renal replacement therapy (p 0.04) and chronic obstructive pulmonary disease (p 0.02) (Table 1). In the multivariable logistic regression model male sex ($p = 0.05$) and short mechanical ventilation time ($p < 0.0001$) seems to be statistically significant independent predictor factor of short ICU LOS. The rate of long ICU LOS was higher in patients with abnormal serum creatinine than in the normal group (OR 2.79, 95% IC 1.16–6.68, $p = 0.03$).

TABLE 1 BASELINE CLINICAL FEATURES

Variables	Creatinine			Variables	Creatinine		
	<1.2 mg/dl (n = 89)	≥1.2 mg/dl (n = 28)			<1.2 mg/dl (n = 89)	≥1.2 mg/dl (n = 28)	
Age (years)	59 ± 12	55 ± 14	p 0.16	Diabetes (%)	40.4%	35.7%	p 0.65
Male sex (%)	66.2%	78.5%	p 0.22	Smoker (%)	20.22%	25%	p 0.59
Mechanical ventilation (days)	1.1 ± 0.9	1.4 ± 1.2	p 0.27	Valve replacement (%)	34.8%	32,1%	p 0.79
Renal failure in renal replacement therapy (%)	0%	14.2%	p 0.04	Coronary artery bypass graft surgery (%)	58.4%	64.2%	p 0.58
Renal failure without renal replacement therapy (%)	1.12%	0%	p 0.32	Valve replacement + coronary artery bypass graft surgery (%)	6.7%	3.5%	p 0.48
Chronic obstructive pulmonary disease (%)	5.61%	0%	p 0.02	Outcome date			
Cancer (%)	1.12%	3.57%	p 0.51	Length of ICU stay (days)	5.2 ± 4.6	6.3 ± 6.4	
High blood pressure (%)	76.4%	85.7%	p 0.29	Long length of ICU stay (days)	29%	53%	p 0.0182

CONCLUSIONS. Serum creatinine measurement obtained in immediate cardiac surgery post operative period seems to be a good and low cost tool to predict higher-risk patients for long ICU LOS. However, one study with great number of patients is needed.

0111

EMERGENCY AND CRITICAL CARE SERVICES IN TANZANIA

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INTRODUCTION. Emergency and Critical Care (EaCC) can be defined as all care given in hospital to patients with sudden, serious reversible disease. The majority of the global burden of such disease is in low-income countries, and mortality rates are high. Basic EaCC can be cheap and is likely to be cost-effective, but not much is known about the current structure of EACC services in low-income countries.

OBJECTIVES. To describe the state of EACC in one low-income country, Tanzania, and to assess the quality of the services.

METHODS. Ten hospitals were assessed in four regions of Tanzania. Site visits utilized direct inspection and interviews with administrative and clinical staff using a specially designed data collection tool. EaCC was sub-divided into Triage, Emergency Care and Critical Care. Quality was assessed using key indicators drawn from the current literature.

RESULTS. Triage for adult patients was absent or informal at a majority of hospitals. Emergency care was similarly lacking in structure and facilities at most hospitals. Seven of the ten hospitals had no Intensive Care unit. District and Regional hospitals had on average 52 and 68% of the Key Indicators for adequate EaCC for adults and children, respectively. Hospitals had 92% of the Key Indicators for Basic Critical Care and 23% for Advanced Critical Care. The importance of EACC was well recognised and there was a clear desire to improve services.

CONCLUSIONS. The quality of care for critically ill patients in Tanzania is suboptimal. Hospitals are not well organised for the management of acutely ill and critically ill patients. The limiting factors for good, basic EaCC are human resources, training and hospital organisation, and not a lack of physical resources. Interventional studies are required to assess if specific improvements in EaCC can improve quality of care and lower mortality rates.

GRANT ACKNOWLEDGMENT. Laerdal Foundation; AAGBI; Karolinska Institutet Travel Fund

0112

COST EFFECTIVE BLOOD TRANSFUSION IN THE INTENSIVE CARE UNIT

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INTRODUCTION. Red blood cell (RBC) transfusion is common in critically ill patients and the most frequent indication for transfusion is critical care-associated anaemia [1].

There is little evidence to support the efficacy of RBC transfusion in haemodynamically stable critically ill patients with a low haemoglobin (Hb). Recently there has been growing recognition that transfusion-related complications, such as transfusion-related infections may be associated with worse clinical outcomes.

In 2009 a Clinical Practice Guideline regarding blood transfusion in critically ill patients was published in Critical Care Medicine [2] based upon the best available evidence. The Guideline recommends that in the absence of acute haemorrhage or acute coronary syndrome, RBC transfusion should only be considered if the Hb ≤7 g/dl.

OBJECTIVES. Our Critical Care Unit does not have a protocol trigger for the transfusion of RBCs and practice may vary between Consultants. We retrospectively reviewed our blood transfusion practice against the new Clinical Practice Guideline and performed a cost analysis.

METHODS.

SAMPLE POPULATION: All patients on the Critical Care Unit who had received RBC transfusions between 1st January–1st July 2010 were identified from our Clinical Information System (Metavision, iMDsoft, Tel Aviv).

Excluded: Those actively haemorrhaging

Of these patients, 37 were randomly selected for in-depth review.

Each episode of RBC transfusion was correlated with the laboratory-measured haemoglobin concentration immediately before transfusion. Each episode of blood transfusion was classed as 'appropriate' (Hb ≤7 g/dl) or 'inappropriate' (Hb >7 g/dl). The 'inappropriate' group was further sub-divided to include a 'borderline' group (Hb 7–8 g/dl). The costs of RBC transfusions were calculated using a cost per unit of £124.21 (price at the time of the study).

RESULTS. 139 patients received non-urgent blood transfusions, a total of 380 U.

The 37 patients selected for in-depth review accounted for 67 episodes, 141 units, at a cost of £17,513.61.

Of the 67 episodes, 21 (31%) were 'appropriate', 33 (49%) were 'borderline' and 13 (20%) were inappropriate, in accordance to the published Guidelines.

CONCLUSIONS. Assuming that the patients reviewed give an accurate reflection of our department's blood transfusion practice, if blood had been given when the haemoglobin was <8 g/dl the cost would have been £14,010.88. If as per published Guideline blood was given when the haemoglobin was ≤7 g/dl the cost would have been £5,429.22, a cost saving of 69%

If extrapolated to include all patients who received non-urgent blood transfusion in the 6 month period concerned, the cost saving would have been £32,567.

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0113

COST SAVINGS ACHIEVED BY THE INTRODUCTION OF CLINICAL AND NON-CLINICAL WASTE BINS IN A UNITED KINGDOM ICU

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INTRODUCTION. The National Health Service in the UK produces 250,000 tonnes of waste per annum, with a disposal cost of more than €45M [1]. In the UK, disposal of clinical waste costs €356 per tonne, whilst non-clinical waste disposal costs €91 per tonne. In 2009, Derriford Hospital ICU adopted a policy of having receptacles for clinical and non-clinical waste in each bed space with a view to reducing waste disposal costs. The cost for disposal of waste within Derriford Hospital Trust is currently more than €340,000 per annum.

OBJECTIVES. (1) To calculate the cost saving achieved by using clinical and non-clinical waste bins. (2) To scrutinise contents of clinical and non-clinical bins for cross-contamination.

METHODS. The waste produced from the bed spaces of all non-infective patients in the ICU was prospectively collected for one 12-h daytime nursing shift. The nursing staff in the bed spaces were aware of this process. The waste was weighed, and the contents of the non-clinical waste bins were sorted by hand to identify any cross contamination from the clinical waste stream. Bed occupancy data was used to extrapolate these data to give approximate annual costings.

RESULTS. Waste was collected from seven bed spaces (3 excluded due to infection risk). These consisted of four level three patients, two level two patients and one level one patient (a ratio similar seen on yearly trend data for this unit). A total of 25.2 kg of clinical waste was collected (median per bed space 3.8 kg, IQR 2.13–4.425 kg) and 4.69 kg of non-clinical waste (median per bed space 0.75 kg, IQR 0.53–0.835 kg).

Extrapolating these data to yearly bed occupancy, this 26 bedded ICU has saved €3,600 (12%) per annum by the addition of domestic waste bins to each bed space. In terms of cross contamination, one gauze swab with blood staining was found in the domestic waste stream. In terms of cross contamination, one gauze swab with blood staining was found in the domestic waste stream.

CONCLUSIONS. The use of domestic waste bins in ICU bed spaces reduces the cost of waste disposal. There was minimal cross contamination from the clinical waste stream.

0114

RELATIONSHIP BETWEEN DELAYED ADMISSION TO CRITICAL CARE, DELAYED TRANSFERS OF CARE AND WASTE OF CRITICAL CARE RESOURCES IN A 15 BEDDED DISTRICT GENERAL HOSPITAL CRITICAL CARE UNIT

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INTRODUCTION. Delayed transfers of care (DTOCs) are wasteful of critical care resources, potentially harmful to patients waiting to be discharged, and potentially harmful to patients with a delayed admission to critical care (DACC). Patients deserve care from appropriately trained staff in the correct environment in the correct timeframe. For the critically ill this means prompt admission to critical care, and for those recovering from critical illness prompt discharge for rehabilitation. DACC increases the risk of morbidity and mortality. DTOCs impact negatively on patient recovery by increasing the risk of infection, and reducing ability to provide appropriate facilities and rehabilitation.

OBJECTIVE. We aimed to identify the proportion of patients where appropriate care has been delayed either due to DACC or DTOC. The economic cost of this was calculated.

METHODS. Data was collected prospectively in October 2010 for all critical care referrals. A DACC was defined as a delay of more than 60 min from the point of acceptance and following completion of any intervention. DTOC was a delay of more than 4 h after a consultant decision that the patient was fit for ward discharge. The data was collated and submitted to the Critical Care Network for analysis.

RESULTS. 71/101 referrals were accepted for critical care admission. 31% were DACC. All DACC were directly related temporarily with at least one DTOC. 70% of DACC were also associated with time required to clean the bed space following DTOC discharge to allow a patients' admission, and 20% to nursing capacity due to care provided for DTOC and transfer to a ward bed. Over the study period critical care hours lost due to DTOCs was 1,352 h (56.3 days). This equates, (at a level 2 bed day cost of £900) to £50, 708 and £608,499.00/year (E 760624.00). DTOCs had a negative impact on rehabilitation of patients prior to critical care discharge affecting their sleep, and participation with physiotherapy.

Delayed transfers of care Oct 2010

Patients in	Week 1	Week 2	Week 3	Week 4	Week 5
DTOC >72 h	0	2	0	0	0
DTOC 25–72 h	4	6	5	1	2
DTOC 4–24 h	6	2	4	5	5
Total DTOC h	180.5	701.8	207.08	89.67	173.17

CONCLUSIONS. Despite attempts to reduce DTOC they clearly continue to present a considerable economic burden by the inefficient use of scarce critical care resources. This study also demonstrates DTOCs effects on the timely admission of the critically ill to critical care, where they should be cared for, and the negative effect on rehabilitation for patients awaiting discharge from critical care. DTOC need to be viewed as an inefficient use of resources and an adverse health event, rather than a necessary inconvenience of inadequate in-patient hospital beds.

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0115

APPROPRIATE BLOOD TRANSFUSION ON THE ICU: AUDIT OF CURRENT PRACTICE IN A DISTRICT GENERAL HOSPITAL

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INTRODUCTION. Liberal blood transfusion strategy has been attributed to worse outcome and increased cost on the intensive care unit. A UK National guideline advocates tolerating low haemoglobin (Hb) levels in ICU patients [1].

OBJECTIVES. To audit our current transfusion practice and identify barriers of best practice in a 10-bedded mixed medical-surgical critical care unit in a district general hospital.

METHODS. Retrospective analysis of all patient-level data stored between January and December 2010 in our clinical information system (CIS, Carevue, Philips) against the recently published AAGBI transfusion guidelines[1]. Blood transfusion was deemed appropriate if the following conditions met: recent or ongoing blood loss >1,500 mL and/or Hb <8.0 g/dL. Patients age, sex, APACHE II score, length of stay (LOS), surgical status, ICU and hospital outcome was recorded. Pre-transfusion Hb level, number of units of blood transfused was recorded for every transfusion episode. For statistical analysis Chi-square test and Mann–Whitney *U* test was used. Data is presented as median (interquartile range).

RESULTS. 101 patients were transfused in 199 transfusion episodes during the 12 months period. Main findings are presented in Table 1.

TABLE 1

	Transfusion episodes (n)	Pre-transfusion Hb (g/dL)	Units of blood (n)
Appropriate transfusion	130 (65%)	7.4 (7.0–7.8)	321
Inappropriate transfusion	69 (35%)	8.4 (8.1–8.7)*	127

$p < 0.05$. There was no significant difference between age, sex, APACHE II, LOS and outcome between the appropriate and inappropriate group. Significantly more surgical (46/112) than medical (23/87) patients were transfused inappropriately during the observed transfusion episodes ($p = 0.031$). Surgical patients had significantly lower APACHE II scores and significantly higher pre-transfusion Hb levels

When analyzed the single transfusion episodes (when blood transfusion was given only once during the ICU stay) we found that in 34 episodes using 59 units of blood the transfusion was inappropriate.

CONCLUSIONS. ~34% of blood transfusions were deemed inappropriate when compared to the AAGBI guidelines. Surgical patients seem to receive blood at significantly higher pre-transfusion Hb levels without any signs of bleeding. This highlights an educational and interface issue on our unit. Based on our results, even the most conservative estimate shows that 13% of the blood transfused on our unit is inappropriate and wastage of precious resources. Further education is warranted for the critical care and surgical residents about appropriate blood transfusion. Our plan is to introduce a decision support tool for transfusion using our electronic CIS to raise awareness and reduce inappropriate use of red blood cells.

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0116

BLOOD GLUCOSE CONTROL-ASSOCIATED COSTS INCREASE WITH THE IMPLEMENTATION OF INTENSIVE INSULIN THERAPY

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INTRODUCTION. Intensive insulin therapy (IIT) reduces morbidity and mortality of critically ill patients [1, 2]. A survey among intensive care unit (ICU)-managers and -nurse clinicians showed that <10% of participant's evaluated costs surrounding the implementation of IIT [3]. We evaluated the costs associated with blood glucose control before and after implementation of IIT. We hypothesized blood glucose control-associated costs to increase.

METHODS. Three ICUs developed and implemented an evidence-based guideline for IIT. For 1 year before and 1 year after it's implementation, all disposables and devices explicitly used for blood glucose control were identified in each center. Costs were calculated, based on costs for disposables and devices: "variable cost" included costs associated with disposables; "fixed cost" included costs for syringe pumps and point of care devices for blood glucose level (BGL) measurements. The costs were calculated on a per year, per bed, per patient and per admission day level.

RESULTS. In total 2,490 patients were admitted in 2 years; 1,321 before and 1,169 patients after implementation. Patient demographics were similar. Median BGL declined from 119 [99–150] to 105 [85–130] mg/dL ($P < 0.001$). The number of BGL measurements per patient per day doubled from 4 [3–7] to 9 [5–12] per day ($P < 0.001$). Yearly variable costs for the three ICUs increased from €58.574 to €118.624 ($P < 0.001$), yearly fixed costs increased from €679 to €12.445 ($P < 0.001$). Variable costs per bed increased from €1.404 [€1.348–€1.831] to €2.454 [€2.235–€4.239] ($P < 0.001$), fixed costs per bed increased from €24.62 [€12.31–€25.03] to €314.12 [€282.06–€354.78] ($P < 0.001$). Variable costs per patient increased from €17.16 [€6.45–€47.30] to €53.90 [€29.24–€115.24] ($P < 0.001$), fixed costs per patient increased from €0.55 [€0.28–€0.64] to €8.06 [€7.98–€11.14] ($P < 0.001$). Variable costs per admission day increased from €6.59 [€4.04–€9.65] to €20.83 [€14.09–€28.76] ($P < 0.001$), fixed costs per patient increased from €0.12 [€0.06–€0.13] to €1.61 [€1.33–€2.40] ($P < 0.001$).

DISCUSSION AND CONCLUSION. Blood glucose control-associated costs (both variable and fixed costs), expressed on a per year, per bed, per patient and per admission day level, rise considerable with implementation of IIT.

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0117

AUDIT OF COAGULATION TESTING RESULTS BEFORE AND AFTER THE INTRODUCTION OF A NEW TESTING PROTOCOL IN A GENERAL UK ICU

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INTRODUCTION. It is well recognised that patients in critical care undergo a large number of daily blood tests, some of which may not be necessary. Iatrogenic anaemia in ICU patients is a well established problem [1, 2]. Routine blood testing in our institution included daily coagulation tests in all patients, involving 3.5 mls of blood and a processing cost of £4.90/€5.56. An audit of routine coagulation studies demonstrated normal clotting in 72% of patients throughout their admission, with only 2 patients developing deranged clotting during admission. This facilitated a change in unit protocol from daily testing, to admission and then twice-weekly coagulation studies.

OBJECTIVES. To assess if there is a quality and cost benefit to patients in a general ICU from reducing the frequency of coagulation testing from daily to twice weekly. To ensure no adverse effects to patient care from this reduced frequency of testing.

METHODS. A new coagulation testing protocol was instigated on the 1st March 2011. Patients received a coagulation sample on admission and then twice weekly, unless clinically indicated. Coagulation results and frequency of testing were retrospectively audited in the month before and after the instigation of the new protocol.

RESULTS. Of the 67 admissions in February 2011, 10/67 (15%) had abnormal clotting on admission. 4/67 (6%) of patients with a normal admission coagulation developed abnormal clotting during their stay, 2 secondary to massive transfusion, 1 from severe sepsis and one patient started on a heparin infusion.

Of 58 admissions in March 2011, 17/58 (29%) patients had abnormal clotting on admission. 3/58 (5%) of patients with normal admission coagulation developed abnormal clotting results during their stay, 2 secondary to sepsis and 1 from massive transfusion. These patients had prompt recognition and treatment of their deranged clotting, despite the new reduced frequency of testing.

Results of frequency of coagulation studies in ICU

	February 2011	March 2011
Total patient admissions	67	58
Average length of stay (days)	3.9	3.5
Patient bed days	261.3	203
Total number of coagulation tests	289	160
Coagulation tests/patient bed days	1.1	0.8
Total amount of blood taken for coagulation studies (mls)	1,011.5	560
Average blood taken/patient (mls)	15.1	9.6
Total cost of coagulation studies £/€	1,416.10/1,607.27	784.00/889.84

CONCLUSIONS. The implementation of twice-weekly coagulation testing has reduced the number of coagulation tests on ICU. This may help minimise blood loss contributing to anaemia in long-term critical care patients. There was no evidence of a detrimental effect to patient care with reduced coagulation monitoring. The financial saving for March 2011 was £632.10/€717.43 highlighting a potential annual saving of £7,500/€8,500.

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0118

EFFICIENCY OF CT SCAN IN ICU PATIENTS

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INTRODUCTION. Computed Tomography scans (CT) give a lot of useful information about diagnosis and the process of the clinical picture in ICU patients.

OBJECTIVES. The aim of our study was to record the number of CT scan examinations done and to evaluate the efficiency of the incoming imagination data.

METHODS. During a five years period, from November 2005 to November 2010, 270 patients admitted to our adult both medical and surgical ICU and included retrospectively in our study. Mean age: 62.1 years, mean APACHE II score: 18.4, mean length of stay (LOS): 13.3 days. We recorded the total CT scans amount done after the admission in our ICU, as well as in proportion to the body region and we studied whether the CT scan data provided new diagnostic or therapeutic criteria or not.

RESULTS. ICU patients who had done CT scan examination: 64 (23.7%). Only head: 36 (56.25%), only abdomen: 7 (10.93%), only chest: 4 (6.25%), all regions: 10 (15.62%), chest and abdomen: 2 (3.12%), head and chest: 3 (4.68%), head and abdomen: 2 (3.12%). ICU patients who had done CT scan examination one time: 54 (84.37%), two times: 7 (10.93%), three times: 2 (3.12%), four times: 1 (1.56%). Total number of CT scan examinations: 101. Abdomen: 25 (24.75%), head: 54 (53.46%), chest: 22 (21.78%). Number of CT scan examinations with data provided new diagnostic or therapeutic criteria: 48 (47.52%). Abdomen: 9 (36%), head: 32 (59.25%), chest: 7 (31.81%).

CONCLUSIONS. According to our data, one over four patients had CT scan examination during ICU stay, more often head, while one over four examinations involved more than one body region, suggesting that there was high necessity for information. Nevertheless, CT scan provided new diagnostic or therapeutic criteria in less than half of the exams, suggesting that the efficiency recorded was moderate. In order to improve the efficiency and to reduce the number of CT scan examinations, we suggest seeking for other reliable imaging data first, like ECHO examination.

0119

VIRTUAL AUTOPSY: A NEW APPROACH FOR QUALITY CONTROL IN THE INTENSIVE CARE UNIT

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INTRODUCTION. Medical autopsy is an important tool for quality control in the intensive care unit (ICU). However the decreasing trend in the frequency of autopsies over the past years has become a serious issue. A recent addition to the autopsy workflow is the possibility of postmortem imaging using multidetector computed tomography (MDCT) and magnetic resonance imaging (MRI) also called virtual autopsy.

OBJECTIVES. In this study we assessed the value of postmortem MDCT as an alternative to medical autopsy in ICU patients.

METHODS. From January 1st to June 30th 2010 we evaluated the value of virtual autopsy in a single-center open, non-controlled, prospective cohort study. All ICU patients who died during the study period were eligible. Virtual autopsy consisted of MDCT of head, neck, chest and abdomen. Results were compared to medical autopsy and to the clinical diagnosis. MDCT-derived new diagnoses were classified as major or minor according to Goldman's criteria.

RESULTS. We screened 285 patients of whom 162 (98 men, 64 women; age range 29–97 years) underwent virtual autopsy and 47 underwent an additional medical autopsy. Twenty-one new major and 51 new minor diagnoses were detected by virtual autopsy. In six cases (4%) virtual autopsy was able to detect complications associated with invasive procedures. In the autopsied patients, all the major diagnoses ($n = 10$) and 87% ($n = 15$) of the minor diagnoses were confirmed by medical autopsy. The main major diagnoses indicated by virtual autopsy were intracranial findings such as stroke and intracerebral bleeding (10), abdominal bleeding (4), pulmonary disease (3) and pancreatitis (2).

CONCLUSIONS. In a population of ICU patients, virtual autopsy detected new diagnoses in up to 40%, underscoring the potential usefulness of this approach for quality control in intensive care medicine (ClinicalTrials. gov number, NCT01040520).

0120

COST-EFFECTIVENESS ANALYSIS OF IMMUNONUTRITION FOR GASTROINTESTINAL CANCER PATIENTS

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INTRODUCTION. In a recent meta-analysis**,** immunonutrition intervention has been demonstrated to be effective in decreasing post-surgical complications, infections and length of hospital stay for gastrointestinal cancer patients (Cerantola et al. 2011).

OBJECTIVES. To assess the economic impact of using immunonutrition to fight against infectious complications, controlling for the severity of the cases.

METHODS. Data on costs were derived from a Swiss university hospital cost-accounting system (2006–2009). Data on effectiveness of immunonutrition were derived from the cited meta-analysis. Using DRG data, cost-weights for patients with and without complications were computed to take into account the severity of the patients' profile, independently of their complication. Finally, taking into account the observed case severity and the relative risks for complications derived from meta-analysis, costs of hospital stay with and without immunonutrition were computed.

RESULTS. Observed data were based on 344 inliers patients, including 54 patients with complication. Controlling for the severity of the cases, use of immunonutrition was associated with hospital savings from CHF4,092 up to CHF6,517 per patient.

CONCLUSIONS. Despite high severity of surgical pathology, the use of immunonutrition in patients undergoing surgery for GI cancer is an efficient intervention for hospitals in order to decrease post-surgical complications and to control hospital costs.

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GRANT ACKNOWLEDGMENT. Cost study analysis funded by and realized in collaboration with Nestle HealthCare Nutrition.

Severity of illness & predictors of outcome: 0121–0133

0121

INFLUENCE OF MISSING PHYSIOLOGIC VARIABLES ON PERFORMANCE OF THE SAPS3 OUTCOME PREDICTION MODEL

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INTRODUCTION. The SAPS3 probability of death is calculated from scores that describe patient characteristics before admission (Box I), circumstances of admission (Box II) and presence and degree of physiologic derangement at ICU admission (Box III). Little is known about how missing data influence the performance of the model. Boxes I and II are usually complete while missing data in Box III are more common.

OBJECTIVES. To examine the influence of missing physiologic variables (Box III) on discrimination and overall accuracy.

METHODS. Admissions during 2009 and 2010 to 45 ICUs that submitted data to the Swedish Intensive Care Registry (SIR) were analyzed. Validated biochemistry and physiologic data variables were collected and the SAPS3 score was computed centrally by SIR. The general SAPS3 equation was used to calculate the probability of in-hospital death. Death within 30 days after admission to ICU was used for analysis of discrimination (c index) and overall accuracy (Brier's score).

RESULTS. The median (p25–p75) number of missing physiologic variables was 0 (0–2) in the complete cohort (n = 31 647). The c index and Brier's score for the entire cohort were 0.852 and 0.12, respectively. The influence of missing variables is shown in Table 1.

TABLE 1 INFLUENCE OF MISSING DATA

	N	c index Mean (95% CI)	Brier's score
No missing variable	16,919	0.834 (0.83–0.84)	0.14
1 missing variable	4,899	0.87 (0.85–0.88)	0.11
2 missing variables	3,784	0.89 (0.87–0.91)	0.07
3 missing variables	1,900	0.87 (0.85–0.90	0.08
Only bilirubin missing	1,962	0.86 (0.84–0.88)	0.13
Only oxygenation missing	1,443	0.89 (0.87–0.91)	0.07
Only temperature missing	521	0.86 (0.82–0.89)	0.13
Only pH missing	350	0.89 0.84–0.95)	0.08
Only platelets missing	139	0.83 (0.75–0.90)	0.15

CONCLUSIONS. The discrimination and overall accuracy of SAPS3 was good in this nationwide clinical registry and remained good with increasing amounts of missing data. Discrimination and accuracy improved, although marginally, with missing data. This may indicate a coupling between lack of physiologic information, certain types of admission and outcome.

REFERENCE. Moreno et al. Intensive Care Med. 2005;31:1345–55.

GRANT ACKNOWLEDGMENT. The Swedish Intensive Care Registry receives support from the Swedish County Council.

0122

SEVERITY SCORES FOR ACUTE PANCREATITES: A COMPARISON OF DISEASE SPECIFIC VS GENERAL SCORING SYSTEMS IN PREDICTING OUTCOMES

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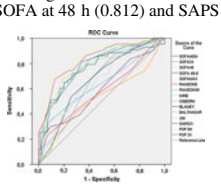
INTRODUCTION. The goal of a predicting scoring system (SS) to stratify patients according to their severity, is to improve assessment and management in a clinical standardized fashion. Severe acute pancreatitis (SAP) represents a small percentage of admissions in intensive care units (ICU). However, it usually evolves with multiorgan failure and serious local complications. Early prediction of severity has important implications for management and timely interventions. Several prognostic scoring systems are currently available, both general and disease specific, for assessing pancreatitis severity, but there is only scarce data comparing them.

OBJECTIVES. To compare disease specific and general SS systems in predicting outcomes in ICU patients with acute pancreatitis.

METHODS. The authors conducted a retrospective analysis of clinical data from all patients registered from July 1st of 1991 to 31st of January 2011 in the prospective database of our ICU of the H. de St. António dos Capuchos with the primary diagnosis of acute pancreatitis. Basic demographic and clinical data were recorded. Data was also collected in order to calculate different predictive scores at admission (Ranson, Prospective Outcome Prediction (POP) and SOFA score); at 24 h of admission (APACHE II, SAPS II, SOFA and POP score); at 48 h of admission (Ranson, Osborne, Blamey and Imrie and SOFA score); the SOFA max score and Balthasar (1st CT in ICU). The definition of severity was defined by the Atlanta criteria. Statistical analysis was carried out by means of PASW Statistics 18 for Windows. Descriptive statistics and comparison of hospital survivors were done as appropriated. Discriminative power of the different scoring systems was accessed by using the area under the ROC curve (aROC).

RESULTS. One hundred and thirteen patients fulfilled the inclusion criteria (57 male); the mean age was 58.77 years (±16 years of age). The median of the length of stay in the ICU was 12 days (5.0–28.5). The overall mortality in hospital was 38.05%. We found a statistical significant difference between age and Hospital outcome (p = 0.001). The most frequent aetiology of acute pancreatitis was lithiasic (45.1%) followed by unknown causes (29.2%), other defined causes (18.8%) and ethanolic (8.8%). The severity criteria which demonstrated higher discriminatory power according to aROC were SOFA max (0.897); POP at admission (0.892); POP at 24 h (0.887); SOFA at 48 h (0.812) and SAPS II (0.804).



ROC curve

CONCLUSIONS. Our review demonstrated the superiority of the POP scores at admission and at 24 h (aROC of 0.892 and 0.887, respectively) in accessing severity in patients with SAP when compared to other scores. However, the general scores also presented a reasonable discriminative power at 24 h (SAPS_II) and at 48 h (SOFA 48).

0123

LOGISTIC EUROSCORE AS PREDICTOR OF PROLONGED INTENSIVE CARE UNIT STAY AFTER CARDIAC SURGERY

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INTRODUCTION. Ageing population and an increase of high risk patients are nowadays well known factors; it is important to assess not only the perioperative mortality but also the recovery time in order to have a global vision of the entire process of the cardiac surgery.

OBJECTIVES. To determine whether the preoperative risk stratification model EuroSCORE predicts a long length of stay in the intensive care unit after cardiac surgery.

METHODS. Data for all patients undergoing heart surgery at the University Hospital of Salamanca, Spain, between 2008 and 2009 were retrospectively collected. EuroSCORE values of the patients were obtained; the outcome measure was the duration of ICU stay in days, defined as prolonged 4 or more than 4 days. The univariate association between preoperative factors included in EuroSCORE and prolonged length of stay was assessed with a χ^2 test for categorical binary data and a Student *t* test for continuous variables. All variables significant in the univariate analysis were used into a multivariable logistic model to confirm if they were independent predictors of prolonged length of stay. The discriminatory power of EuroSCORE was analyzed by a ROC curve; the best cutoff value was identified according to the Youden index (sensitivity + specificity − 1). The predictive accuracy for prolonged stay was assessed by the Hosmer–Lemeshow goodness-of-fit. Data was analyzed using SPSS 17.0.

RESULTS. We analyzed the records of 647 patients who underwent cardiac surgery, excluding 48 operative deaths; all types of major cardiac surgical interventions were included. The average age was 68.90 ± 10.48 years (range 20–87). The majority of patients were men (67.3%). Patients had a mean ICU stay of 4.14 ± 5.05 days. Mean logistic EuroSCORE was 7.58% (range 0.88–59.32%).

Five factors prove to be independent predictors of 4 or more than 4 days of stay in the ICU. Those were age, serum creatinine >2.27 mg/dl, critical preoperative state, left ventricular dysfunction and recent myocardial infarct. The area under the ROC curve for an ICU stay of 4 or more than 4 days was 0.72 (95% CI, 0.67–0.76). The best cutoff point was at a EuroSCORE of 6.24; the sensitivity and specificity were 65 and 70% respectively, with a good negative predictive value (81%). The result from logistic regression analysis is presented on Table 1

TABLE 1 LOGISTIC REGRESSION

	b	S.E.	*P*	O.R.	95% CI
Logistic EuroSCORE	0.12	0.01	<0.001	1.12	1.09–1.16
Constant	−1.70	0.15	<0.001		

Hosmer–Lemeshow test gave a *p* value of 0.17 for the EuroSCORE to predict a prolonged length of stay which indicates good accuracy.

CONCLUSIONS. The logistic EuroSCORE could be a useful tool to asses which patients need to stay more days at the ICU; this is essential in order to provide and efficient management of our limited number of beds.

REFERENCE. Messaoudi N et al. Is EuroSCORE useful in the prediction of extended intensive care unit stay after cardiac surgery?

0124

COMPARISON OF THE PERFORMANCE OF THE ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION 4 WITH THE ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION II AND SIMPLIFIED ACUTE PHYSIOLOGY SCORE 3 IN A SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. It has been 5 years since the introduction of the APACHE 4 model in 2006. The APACHE 4 model has been shown to have good discrimination and calibration in the general US ICU population. However, to our knowledge, there have been no external validations of APACHE 4 in a critical care population of Korea and no comparison of APACHE 2 and SAPS 3 in a surgical ICU of Korea.

OBJECTIVES. The aim of this study was to compare the performance of the Acute Physiology and Chronic Health Evaluation (APACHE) 4 to APACHE 2 and Simplified Acute Physiology Score (SAPS) 3 in a surgical intensive care unit (SICU) population.

METHODS. We conducted a retrospective study of a SICU between March 1st, 2008 and February 28st, 2011 in a university hospital. The probability of ICU mortality was calculated for SAPS 3, APACHE 2, SAPS customized for Australasia[C-SAPS3(Au)] using standard formula. Three models were analyzed using logistic regression. Calibration and discrimination were determined by the Hosmer–Lemeshow test and area under the receiver operating characteristic (aROC) curve from patients.

RESULTS. The study included 3,923 patients. ICU mortality was 2.7%. For SAPS3, C-SAPS(Au), APACHE 2 and APACHE 4, the area under the receiver operating characteristic (aROC) curves were 0.800, 0.797, 0.806 and 0.800, respectively. Hosmer and Lemeshow H statistics showed good calibration for all models (p > 0.05).

CONCLUSIONS. In this group of surgical ICU patients, the performance of APACHE 4 was similar to that of APACHE 2, SAPS 3 and C-SAPS3.

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0125

PRE-ADMISSION APACHE II SCORES COMPARED WITH STANDARD ICU APACHE II SCORES IN A DISTRICT GENERAL HOSPITAL MIXED MEDICAL/ SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. The APACHE II score collected in the 1st 24 h on the ICU underestimates patients' severity of illness and predicted mortality because patients often receive ICU management prior to admission thereby correcting many of their physiological and laboratory variables.

OBJECTIVES. Assess the effect of lead-time bias on the APACHE II probability of mortality algorithm.

METHODS. A prospective observational study of APACHE II pre-admission physiology data was collected on patients admitted to North Manchester General Hospital ICU to assess the effect of lead time-bias on the APACHE II probability of mortality algorithm. Pre-admission data collection starts 6 h before ICU management is started by anaesthetic or ICU staff and continues for 24 h. ICU data started from the time of ICU admission. 24-hour pre-admission physiology data compared to normal 24-h ICU data. Exclusions—transfers in, ICU admission time <8 h, elective admissions, readmissions

RESULTS. 57/75 patients eligible for study. Average APACHE II score using pre-admission data 18.58. Average APACHE II score using ICU admission data 13.37. Average predicted mortality and standardised mortality ratio (SMR) using pre-admission data was 0.298 and 2.47, respectively. Average predicted mortality and SMR using ICU admission data was 0.192 and 3.84, respectively.

CONCLUSIONS. Pre-admission APACHE II 38% higher than ICU admission APACHE II score. There was a 55.2% increase in average predicted mortality and 36% drop in SMR based on preadmission data. These findings support the hypothesis of lead-time bias and support the need to continue to collect pre-admission and standard ICU admission physiology data to assess its effect on the admission APACHE II probability of mortality algorithm.

0126

ACUTE PANCREATITIS IN INTENSIVE CARE UNIT: CHARACTERISTICS AND PROGNOSIS

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INTRODUCTION. Acute pancreatitis (AP) is a common disease that normally runs a benign course in the majority of patients. However, in up to 20% of individuals the disease is severe and may be associated with a mortality close to 20%. In the management of pancreatitis have evolved and these developments are having an impact in the treatment of patients, lowering the morbidity and mortality.

OBJECTIVES. Describe the characteristics and prognosis of patients admitted to the ICU with a diagnosis of acute pancreatitis (AP)

METHODS. Retrospective study. We analyzed patients admitted to a 36-bed ICU with the diagnosis of AP during 9 years: January 2000 to December 2009. We studied the epidemiological characteristics and comorbidities of patients admitted in ICU, the etiology, the reason for admission, the need for support and outcome (hospital length of stay and mortality).

RESULTS. 128 patients were admitted to our ICU with the diagnosis of AP during the study period. The mean age was 60 $\pm$ 14 years, and 68% of patients were male. Biliary etiology was the most frequent (48.4%), followed by alcohol (19.5%) and hypertriglyceridemia (4.7%). 53.1% patients were admitted to hemodynamic monitoring (without organ dysfunction at admission). The reason for admission in ICU was: hemodynamic instability in 25.8%, and respiratory failure in 13.3%. The mean APACHE II scale was 16.4 $\pm$ 7.5, mean Ramson scale was 4.5 $\pm$ 2, mean Imrie was 4.22 $\pm$ 1.7 and Japanese severity score (JSS) was 3.5 $\pm$ 3. 51.6% of the patients needed vasopressor support during his stay in ICU; 48.5% had respiratory failure and 45.3% renal failure. 28% of patients had an infectious complication (abdominal focus 52.7% of cases; the most common pathogen was *Pseudomonas aeruginosa*). 30.6% of patients underwent surgery. The mean stay in ICU was 16.5 $\pm$ 21.4 days and mortality in ICU was 28.1%. The mortality in patients with hemodynamic instability mortality reached 51.5% (66.7% in surgery group). The patients who had hemodynamic, respiratory and renal failure (34.3% of total), had mortality of 65.9% (hospital 72.7%)

CONCLUSIONS. In our hospital AP mainly affected 6th decade-males. Biliary etiology was the most frequent. Both hospital length of stay and mortality were very high. A third of patients had hemodynamic, respiratory and renal failure, with a mortality higher than 65%.

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0127

ACCURACY OF SAPS II SCORES ASSESSED BY SPECIALIZED CRITICAL CARE NURSES: A REAL LIFE SITUATION

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INTRODUCTION. Reliable overall severity scores have been achieved by various healthcare workers. However, these results all refer to well defined study settings with specifically trained observers.

OBJECTIVES. To measure the accuracy of the simplified acute physiology score II (SAPS II) in real life.

METHODS. In this retrospective multicentre audit (4 ICUs) three reviewers (2 intensivists, 1 ICU study nurse) independently reassessed a total of 120 SAPS II scores. Differences between the reviewers' judgments (mechanism of error making was recorded) were resolved by discussion and a gold standard was achieved. Correlation and agreement of the SAPS II sum scores and of the different variables among reviewers as well as between nurses and the gold standard were assessed (ICC, % agreement and kappa). Bland & Altman (gold standard—nurses) of sum scores were determined and regression of the difference calculated.

RESULTS. Correlation for sum-scores among reviewers was almost perfect (mean ICC = 0.985; significant correlation $p < .0001$; p for significant difference >.05). Errors in reviewers' assessment were essentially due to negligence (48% of cases) or to a problem related to the definition of the variables (22%). The mean ($\pm$SD) nurse registered SAPS II sum-score was 40.34 $\pm$ 20.19 points versus 44.17 $\pm$ 24.86 points of the gold standard ($p < 0.002$ for difference), with a lower ICC (0.81). The B&A was +3.83 $\pm$ 26.97, with a significant regression between the difference and the gold standard, indicating overall an overestimation of lower scores ($\leq$25 points) and underestimation of higher scores with significant differences between centres. About 90% of the SAPS II scores (112/120) were erroneous in at least one variable. There was excellent agreement in the variables sodium, temperature, age, chronic diseases, leucocytes, potassium and bilirubin (k = 0.83 − 0.97), the lowest agreement was found in heart rate and systolic pressure (k = 0.45 − 0.51). Reliability of scores or variables was not associated with nurses characteristics.

CONCLUSIONS. In real life, nurse registered SAPS II scores are generally quite accurate but less than described in study settings. Lower (<25 points) SAPS II sum-scores are overestimated, higher underestimated. Reliability is not influenced by different backgrounds, levels of training and gender of nurses.

0128

MELD SCORE AT ADMISSION MORE ACCURATELY PREDICTS MORTALITY AT ADMISSION TO CRITICAL CARE, WHEN COMPARED TO OTHER SCORING SYSTEMS IN PATIENTS WITH ALCOHOLIC LIVER DISEASE

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INTRODUCTION. A number of scoring systems have been used in chronic liver disease to predict mortality. Patients admitted to intensive care with alcoholic liver disease are known to have a high mortality, particularly if they require renal support; however, no scoring system has been used to assess mortality at admission to critical care.

OBJECTIVES. To identify the most accurate scoring system to predict mortality at admission to critical care in patients with alcoholic liver disease.

METHODS. A retrospective review of patients admitted to the intensive care unit of two hospitals over a period of 3 years was conducted (n = 50). Scores for MELD, ABIC, Glasgow Alcoholic Hepatitis Score (GAHS) at day 1, and Discriminant Function (DF) at admission were calculated.

RESULTS. There was no significant difference in the ages (50.8 and 50.3, p = 0.9) or sexes of those who survived and those who died during hospital stay. 74% of patients required advanced respiratory support, with no significant difference between those who died and those who survived (69 vs. 74%, p = 0.76). Area under curve for MELD, ABIC, GAHS and DF were 0.89, 0.85, 0.83 and 0.84, respectively. A MELD score of greater than 25 had 92% hospital mortality, which rose to 100% with a score greater than 30.

CONCLUSIONS. MELD score at admission to critical care accurately predicts hospital mortality. The futility of admission to critical care for patients with a MELD score greater than 25 should be considered, as they have 92% hospital mortality.

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0129

INFLUENCE OF GENDER ON SURVIVAL ON THE MEDICAL INTENSIVE CARE UNIT: A RETROSPECTIVE DATA ANALYSIS OF 3,272 PATIENTS

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OBJECTIVES. Gender related disparities are known in many areas of medicine. We analysed whether gender-related disparities influence survival in a medical ICU of a University hospital. We also investigated variation of gender-related disparities over time.

METHODS. This is a retrospective data analysis of 3,272 patients admitted to a medical ICU of the Medical University of Vienna, Department of Medicine III between January 1st, 1999 and March 17th, 2009. We investigated the effect of gender on ICU survival. Fisher's exact test was used to compare the proportion of ICU survivors in female and male patients. To assess potential confounding we tabulated candidate variables according to gender and according to ICU survival. For formal hypothesis testing we used the Fisher′s exact test, Chi square test or Mann–Whitney U test as appropriate. Variables being both associated with gender and ICU survival at a significance level of at least 10% were considered potential confounders. We used logistic regression models with ICU survival as outcome and gender as predictor allowing for potential confounders as covariates.

RESULTS. Of 3,272 patients included in the study, 60.0% were male and 40.0% were female. The ICU survival rate was not significantly different between women (79%) and men (76%) (OR 0.85; 95% CI 0.72–1.01; $p = 0.07$) although men had a higher number of organ failures at admission ($p = 0.01$). After adjusting the survival rate for potential confounders no gender-related disparities influencing mortality could be found. Furthermore gender had no effect on the severity of illness, measured by the Acute Physiology and Chronic Health Evaluation (APACHE) II ($p = 0.63$) and Simplified Acute Physiology Score (SAPS) II ($p = 0.31$). There was no obvious trend of the survival effect over time. We found no significant effect modification by socio economic status (health insurance status) ($p_{interaction} = 0.46$), by organ failure ($p_{interaction} = 0.69$), or by different disease groups ($p_{interaction} = 0.74$).

CONCLUSIONS. In a large cohort of critically ill patients admitted to a medical intensive care unit, our analysis could not reveal any gender-related differences influencing survival and did not show a specific trend over time.

0130

PREDICTING ICU MORTALITY USING SAPS 3: AN INDIAN ICU EXPERIENCE

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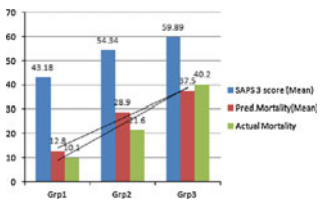
INTRODUCTION. SAPS 3 model for predicting mortality has been extensively studied in various parts of the world. Data from India is limited [1].

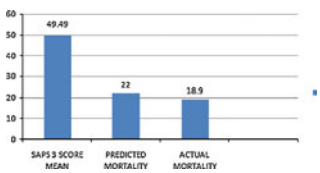
OBJECTIVES. Validate SAPS 3 scoring system for predicting mortality in a medical surgical ICU from India. Evaluate, if *s*.lactate helps to improve mortality prediction along with SAPS 3.

METHODS. It is a retrospective, observational cohort study done in a 16 bedded medical-surgical ICU of a tertiary level hospital, including all patients admitted between 1st January 2010 to 31st March 2011. Calculate SAPS 3 score for all patients. Compare predicted and actual mortality (all deaths within 30 days of ICU admission). Patients were further divided into three groups based on at admission s.lacate levels as follows:
group 1 (low lactate level) s.lactate <2.0 mmol/l,
group 2 (Moderate lactate level) s.lactate 2.1–3.9 mmol/l and
group 3 (high lactate level) s.lacate >4.0 mmol/l. Intergroup comparison would be drawn to see if any significant difference were seen in SAPS 3 scores, predicted and actual mortality.

RESULTS. There were a total of 1,177 patients included in the study. In group1, there were 616 (52.3%) patients, the age 45.2 ± 17.8 years (95% CI, 40.5–50), the s.lactate 0.868 ± 0.52 (95%CI, 0.73–1.01), the SAPS 3 score 43.18 ± 10.89 (95% CI, 40.26–46.10) and the predicted mortality 12.75 ± 9.82% (95% CI, 10.12–15.38) and actual mortality seen 62 (10.06%) deaths. In groups 2 there were 352 (29.9%) patients, age 49.22 ± 18.25 years (95% CI, 42.64–55.80), the s.lactate 2.68 ± 0.49(95% CI, 2.50–2.86), the SAPS 3 score 54.34 ±16.27(95% CI, 48.47–60.21) and the predicted mortality 28.88 ± 23.36 (95% CI, 20.46–37.30) and actual mortality seen within this group were 76 (21.59%) deaths. In groups 3 there were 209 (17.75%) patients, age 49.47 ± 14.45 years (95% CI, 42.51–56.43), the s.lactate 6.66 ± 3.73 (95% CI,4.86–8.46), the SAPS 3 score 59.89–15.29 (95% CI 52.52–67.26) and the predicted mortality 37.47 ± 27.63% (95% CI, 24.15–50.79) and actual mortality seen within this group was 84 (40.19%) deaths. Overall for the study, SAPS score 49.49 ± 15.039; predicted mortality 21.96 ± 21.015%. This closely followed actual mortality seen in the study 18.86% (222/1177). Inter groups comparisons revealed that there were statistically significant differences (p value <0.05) between group 1 and the other two groups when looking at the SAPS 3 score and predicted mortality. There were no statistically significant difference (p value >0.05) when comparing the same variable between group 2 and 3.



Intergroup comparison on SAPS 3 score, Pr



Overall comparison of saps 3 mean score, predicted

CONCLUSIONS. There is good correlation between predicted and actual mortality using SAPS 3 model. Abnormal lactate levels might further enhance the mortality predictability.

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0131

PREALBUMIN IS AN INDEPENDENT RISK FACTOR OF MORTALITY IN CARDIAC SURGERY

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INTRODUCTION. Hospitalized patients are more vulnerable to suffer malnutrition and this is associated with an increased postoperative complications.

OBJECTIVES. To describe the nutritional status and assess the effect on mortality of it.

METHODS. Prospective observational cohort study of 124 consecutive patients between November of 2007 and February of 2008 were eligible. Younger than 18, immunocompromised and emergency surgery patients were excluded for analysis. Relationships with mortality were evaluated for the following variables: age, gender, lifestyle risk factors and pre-existing comorbidities (cardiac heart failure, diabetes, dyslipidemia, hypertension, obesity (defined as CMI >30 kg/m^2), chronic kidney failure, NYHA classification), pharmacological treatments (betablockers, statins, digital, ACE, diuretics), Parsonnet score, type of surgery (valvular or coronary), time of ischemia, time of extracorporeal circulation. Nutritional status was defined in function of albumin, transferrin, lymphocytes, CMI and prealbumin levels. The time of monitoring was 90 days. Discrete variables were expressed as counts (%) and continuous variables as mean and standard deviation (SD). Cox proportional-hazards regression analysis was used to assed the impact of independent variables on mortality across the time. Variables significantly associated with mortality in the univariate analysis were entered in the model. In order to avoid sprurious associations, variables entered in the regression models were those with a relationship in univariate analysis ($p < 0.05$) or plausible relationship with the dependent variable. Data analysis was performed using SPPS for Window 15.0.0 (SPSS, Chicago, IL).

RESULTS. A total of 124 patients were included. The 48.4% were women, the mean age was 65 ± 11 years. The frequency of comorbidities and pharmacological treatments were: hypertension (61%), chronic kidney failure (8%), diabetes (25%), dislipidemia 40.5%, obesity 29%, betablockers 39.5%, statins 40.3%, ACE 46.8%, Parsonnet score 16.8 ± 9.7 points. The mean prealbumin was 20.5 ± 6.5 mg/dl. Cox regression analysis identified that prealbumin levels remained associated with mortality (HR 0.854, 95% CI 0.746–0,973, p 0.018).

CONCLUSIONS. The prealbumin is showed as a protective factor of mortality in a way that, equality in the rest of the factors, each increment of 1 mg/dl of prealbumin, decreases in risk of dying in the 90 postoperative days 1.17 times. It could be useful to assess a good nutritional status before surgery.

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0132

EVALUATION OF THE DIFFERENT SCORING SYSTEMS PREDICTIVE ABILITY IN RELATION TO OUTCOME IN ICUS

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BACKGROUND. Tools to measure quality are becoming widespread and focus either on the outcomes of care or the processes of care. Fore ICU′s, the main focus on research on outcome management has been on the development of mortality prediction models.

PURPOSE. To evaluate the performance of three general severity-of-illness scores, APACHE IV, SAPS II AND MPM II24 systems in critical care units of for hospitals in Egypt, i.e., multicenter study.

METHODS. A prospective observational cohort study was performed on 873 patients admitted to ICUs of Kasr El-aini, Nasser Institute, Almokattam and new Kasr Elaini teaching hospitals between 13 October 2009 and 13 January 2010. The following data were collected over the first 24 h of ICU stay: demographics, APACH IV, SAPS II scores, MPMII24 variables and ICU outcome. Predicted mortality was calculated using original regression formulas. SMR was calculated with 95% confidence intervals. Calibration was assessed by using the chi-squared value from the Hosmer–Lemeshow test. Discrimination was evaluated by calculating AU-ROC curve.

RESULTS. The observed ICU mortality was 24.17%. Predicted mortality by APACHE IV and SAPS II systems was different from actual mortality, whereas MPM II24 has the nearest prediction one (SMR for APACHE IV: 1.69, SAPS II: 1.47, MPM II24: 1.28). All the models showed reasonable discrimination using the AU-ROC curve (APACH IV: 0.833, SAPS II: 0.836, MPM II: 0.818) with the best for SAPS II. For same data sets, SAPS II demonstrated superior calibration to all the models (SAPS II: 11.557, $P = 0.172$, APACHE IV: 12.914, $P = 0.115$, and MPM 1124: 17.830, $P = 0.023$).

CONCLUSION. Overall mortality prediction was underestimated by APACHE II and SAPS II. MPM II was the nearest to predict outcome. Calibration of SAPS II was the best, making it the most appropriate model for comparisons of mortality rates in different ICUs.

0133

EVALUATION OF THE PERFORMANCE OF SAPS 3 AND MPM_0-III IN INTERMEDIATE CARE UNIT. CAN THEY PREDICT HOSPITAL MORTALITY AND READMISSION TO INTENSIVE CARE UNIT?

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INTRODUCTION. The performance of severity scores has been established in intensive care unit (ICU) patients, but not in the setting of intermediate care units, which can also provide adequate treatment and monitoring with a lower cost.

OBJECTIVES. To evaluate the performance of SAPS 3 and MPM_0-III as predictors of hospital mortality and re-admission to the ICU.

METHODS. Prospective analysis of data from 395 patients consecutively admitted to a 24 beds intermediate care unit from May to October 2010, in a private tertiary teaching hospital in the city of Sao Paulo—Brazil.

To assess performance of SAPS 3 and MPM_0-III, discrimination power was measured by the area under the ROC curve and calibration by the goodness-of-fit test.

RESULTS. 56% of patients were male. Mean age was 68.8±16.8 years. 81.5% of the admissions were due to medical reasons. 54% of the patients were admitted from the ICU, 22.6% from the emergency department, 16% from the wards and 7.4% from the operating room. Co morbidities were present in 44.1% of the patients. Length of stay prior to admission in the intermediate unit was 7.8 ± 16.9 days, length of intermediate unit stay was 6.1 ± 9.1 days and length of hospital stay was 21.3 ± 36 days. Incidence of readmission to ICU was 13%.

Intermediate unit and hospital mortality rate were 4.1 and 10.4%, respectively. Mean SAPS 3 was 48.9 ± 11.4 (range 26–87) and the predicted mortality was 16%. The expected mortality derived from MPM_0-III was 19.1%.

Discrimination of SAPS 3 was good for hospital and intermediate unit mortality with a ROC curve of 0.79 (0.7—0.89) $p < 0.0001$ and 0.79 (0.64–0.95) $p = 0.001$, respectively. MPM-III also showed a good discrimination to hospital mortality with a ROC curve of 0.74 (0.62–0.85) $p = 0.001$ and to re-admission to the ICU 0.70 (0.6–0.78) $p = 0.005$.

Calibration using Hosmer–Lemeshow statistics was accurate for SAPS 3 ($H = 4.640$ $p = 0.704$) and MPM_0-III ($H = 5.626$, $p = 0.689$).

CONCLUSIONS. SAPS 3 and MPM_0-III performed well in predicting hospital mortality in intermediate care unit. MPM_0-III also showed a good performance in the prediction of re-admission to ICU.

Future studies are needed to confirm our results in a larger and different patient sampling.

In addition, the role of these scoring systems in benchmarking, clinical decision support in admitting and transferring patients should be extensively studied in the setting of intermediate units.

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0135

SYNBIOTIC 2000FORTE® AFFECTS MORBIDITY IN CRITICALLY ILL TRAUMA PATIENTS

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INTRODUCTION. Recent evidence indicates that short-chain fatty acids [SCFAs], produced by anaerobic fermentation of dietary fibre by intestinal microbiota, exert broad anti-inflammatory activities due to many distinct mechanisms of action.

OBJECTIVES. The aim of this study was to assess SCFAs production in critically-ill mechanically ventilated, multi-trauma patients receiving a synbiotic formula versus placebo and to correlate the findings with clinical outcome.

METHODS. Sixty-five critically ill, mechanically ventilated, multi-trauma patients were randomized to—once daily for 15 days—Synbiotic 2000Forte [IONIOS Pharma, Greece] or maltodextrin [placebo]. The synbiotic formula consisted of a combination of 10^{11} CFU of each of four probiotics; *Pediococcus pentoseceus* 5–33:3, *Leuconostoc mesenteroides* 32–77:1, *L. paracasei* ssp 19, and *L. plantarum* 2,362, as well as 2.5 g each of inulin, oat bran, pectin, and resistant starch. Fecal samples were collected on days 0, 4, 7, and 15, and assessed by capillary gas chromatography for total SCFAs production. Infections, septic complications, days under ventilatory support, and days of stay in ICU were recorded. Comparisons between groups at different time intervals were performed by ANOVA test and qualitative data by the two-tailed chi-square test, using SPSS.

RESULTS. The two groups did not differ with respect to age, gender, underlying disease comorbidities, severity of trauma on ICU admission, Acute Physiology and Chronic Health Evaluation II [APACHE II] score, Glasgow Coma Scale, and route of nutrition. Synbiotic-treated group exhibited a significant increase [$p = 0.001$] of total SCFAs from day-4 and thereafter [302 ± 28.62 mmol/gr] in relation to placebo-treated [169 ± 31.15 mmol/gr]. At clinical level, Synbiotic-treated patients exhibited a significantly reduced rate of infections [63 vs. 90%, p = 0.01], ventilatory-associated pneumonia [54 vs. 80%, $p = 0.03$], SIRS and severe sepsis [$p = 0.02$], days of ICU stay [27.7 ± 15.2 vs. 41.3 ± 20.5, $p = 0.01$], and days under mechanical ventilation [16.7 ± 9.5 vs. 29.7 ± 16.5, $p = 0.001$] versus controls.

CONCLUSIONS. This specific synbiotic formula administered in ICU multi-trauma patients upon admission seems to be associated with measurable clinical benefits attributed to its direct immunomodulatory actions, one of which being operated through excess SCFA production.

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Clinical trials for the treatment of sepsis: 0134–0147

0134

HYDROCORTISONE AFFECTS MITOCHONDRIAL RESPIRATION IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. The literature over the effects of corticosteroids on the mitochondrial function is controversial and include effects such as increased uncoupled and state 3 respiration rates, as well as impairment of mitochondrial ATP production by inhibiting electron transport chain at complex I. Regarding other drugs that would potentially affect mitochondrial function, steroids can compromise bioenergetics in septic patients, and this can explain part of the failure of this treatment for septic shock, as seen in the CORTICUS study. Our main goal was to characterize the effects of hydrocortisone (HC) administration on mitochondrial respiration of peripheral blood mononuclear cell (PBMC).

METHODS. 20 patients were included in the first 24 h after diagnosis of septic shock (SS). We followed the SSC guidelines (2004–2008), and SS patients received at least one dose of HC in the first 48 h after the diagnosis. In order to better understand the effects of HC in vivo, we compared mitochondrial respiration from PBMC of SS patients using or not hydrocortisone. The cellular respiration was analyzed by high-resolution oxygraph in permeabilazed cells. We have also conducted experiments with PBMC from healthy volunteers in order to understand the direct effect of HC on cellular respiration. In this setting cells were pre-incubated with 50 μ/dL HC for 15 min and succinate-induced respiration was assessed. Additionally, nitric oxide, mitochondrial superoxide production, as well as mitochondrial membrane potential were measured by flow cytometry.

RESULTS. We observed that state 3 respiratory rates of patients under HC treatment were significantly lower compared to patients not using HC (2.96 [1.78–6.67] vs. 7.91 [4.57–9.42] nmols O_2/min/10 7 cells, $p = 0.02$). State 4 was similar in both groups (0.96 [0.40–3.59] vs. 1.74 [1.22–2.95] nmols O_2/min/10 7 cells, $p = 0.75$). There were no significant differences between both groups regarding the doses of norepinephrine, serum lactate levels, SAPS II or SOFA scores. Incubation with HC affected state 3 respiration and increased nitric oxide production of PBMC in vitro.

CONCLUSION. This preliminary result suggests that HC administration affects mitochondrial respiration of PBMC from healthy volunteers and septic patients.

GRANT. FAPERJ/CNPq

0136

EFFECT OF SELECTIVE DIGESTIVE DECONTAMINATION (SDD) ON RESPIRATORY FAILURE IN PATIENTS WITH SEVERE BURNS

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INTRODUCTION. The Sequential Organ Failure Assessment (SOFA) score is useful to assess organ dysfunction in burn patients. Burn-induced organ dysfunction is associated with mortality. Selective digestive decontamination (SDD) reduces mortality but there are not studies about the effect of SDD on organ dysfunction in patients with severe burns. So then, SDD might be a preventive strategy of organ dysfunction in these patients.

OBJECTIVE. Demonstrate that the administration of SDD decreases respiratory dysfunction in patients with severe burns.

METHODS. Patients with burns ≥20% of total body surface and/or suspected inhalation injury were enrolled and assigned to receive SDD or placebo during burn intensive care unit (ICU) admission.

Assessment SOFA score was measured on admission and subsequent days.

This study was conducted in a 6-bed burn ICU of a tertiary hospital. The annual admission rate was 80 burn patients.

Inclusion criteria: age ≥14 years old, burns ≥20% of total body surface area and/or suspected inhalation injury that required mechanical ventilation, interval between injury and burn ICU admission ≤3 days.

Exclusion criteria: stay in the burn ICU <3 days, withdrawal of treatment within 3 days, immunosuppression, pregnancy, and inhalation injury not requiring mechanical ventilation within the first 3 days.

Variable of study: age, body surface burn area (%), full thickness burn area (%), predicted ICU mortality, sex (male), mechanical ventilation, inhalation injury.

SOFA score was calculated (admission, 1st–4th days, 7th day, 14th day). Area under curve (AUC) of SOFA and components. Analysis of data: SPSS 11.5. Univariate and multivariate logistic regression analyses were performed.

RESULTS. Patients 107: Placebo 54 patients. SDD 53 patients. The two groups were similar with respect to sex, age, total burn area, full-thickness burn area, and inhalation injury. There was no difference in patients requiring ventilation and number of ventilator days required.

Dependent variable: AUC of respiratory SOFA

Independent variable	Coefficient beta	Standard error	p
Administration of SDD	−1.782	0.663	0.008
Sex	1.652	0.805	0.043
Inhalation	1.929	0.722	0.009
Age	1.269	0.435	0.004
SOFA 24 h of admission	0.905	0.138	0.000

CONCLUSIONS. Treatment with selective digestive decontamination reduces respiratory failure in patients with severe burns.

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0137

"SIMBIOTIC DRINK©" IN MULTI-ORGAN FAILURE: REDUCTION IN LATE INFLAMMATORY RESPONSE

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OBJECTIVE. To assess whether the administration of the symbiotic preparation "Simbiotic Drink©" in patients with multi-organ failure diminishes the severity of the failure and the inflammatory response generated.

MATERIALS AND METHODS. Randomised, double-blind, controlled trial in which a symbiotic (Simbiotic Drink©), administered via enteral feeding during the first 12 h of admission to ICU, is assessed. All patients with failure of at least two organs according to SOFA (Sepsis-related Organ Failure Assessment) criteria were included. Underage, pregnant women, and acute pancreatitis patients were excluded. The symbiotic was administered in the first 12 h on diagnosis of multi-organ failure.

RESULTS. 92 patients included; 48 in the symbiotic group and 44 in the control group. There were no significant differences in the patients fundamental characteristics (medical history, age, reason for admission, severity scores), nor in length of ICU stay or in mortality. Comparing the symbiotic group with the control group, on the first day there were significant differences in fibrinogen levels (580 ± 297 vs. 470 ± 213) and albumin levels (2.4 ± 0.8 vs. 2.8 ± 0.7); on the second day there were differences in leukocyte levels (17,180 ± 9154 vs. 12,949 ± 6,061); on the third day, in fibrinogen levels (680 ± 193 vs. 579 ± 190); on the fifth day in fibrinogen levels (729 ± 223 vs. 579 ± 197) and protein C (214 ± 133 vs. 84 ± 86); on day 7, in levels of fibrinogen (715 ± 224 vs. 579 ± 236) and D-dimer (1506 ± 632 vs. 2693 ± 538). There are no significant differences in the SOFA II in the second week ($P = 0.05$), but the data stand out: 4.3 ± 2.8 versus 6.6 ± 3.9.

CONCLUSIONS. In patients with multi-organ failure, the early administering of Simbiotic Drink© results in scant differences, which are not early, and which are primarily related with inflammatory response. The overall SOFA in the second week tends to be better, however, does not reach statistical significance.

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GRANT ACKNOWLEDGMENT. This study has been possible thanks to a FISCAM (Fundación para la Investigación Sanitaria en Castilla La mancha) grant (PI-2007/13) of the Regional Health Service of Castilla La Mancha (Spain).

0138

MACROLIDE THERAPY IS ASSOCIATED WITH LOWER 30- AND 90-DAY MORTALITY IN MECHANICALLY VENTILATED PATIENTS WITH SEVERE SEPSIS

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INTRODUCTION. Recent studies suggest that macrolides may have beneficial effects for patients at risk for pneumonia. However, the evidence is limited regarding patients that require mechanical ventilation with severe sepsis.

OBJECTIVES. We examined the effect of macrolide therapy on 30- and 90-day mortality for patients with severe sepsis that required mechanical ventilation.

METHODS. A retrospective analyses of Department of Veterans Affairs administrative data of hospitalized patients aged ≥65 years with a discharge diagnosis of sepsis (by ICD-9 codes 0.38 and 0.20) in fiscal years 2002–2007, with at least one organ failure, required admission to the ICU, received at least 1 dose of antibiotics within 48 h of admission, and had at least 1 year of outpatient care before the index admission were included. Primary outcomes were 30- and 90-day mortality.

RESULTS. Severe sepsis was present in 6,595 subjects admitted to the ICU, 3,787 (57.4%) of which required mechanical ventilation. Macrolides were administered to 610 (16.5%). A multivariable regression analysis showed that the macrolide therapy was associated with decreased 30-day (31 vs. 53%, odds ratio [OR] 0.49, 95% Confidence Interval [CI] 0.41–0.60) and 90-day mortality (54% vs. 71%, OR 0.59, 95% CI 0.49–0.71) when compared to non-macrolide therapy after adjusting for potential confounders.

CONCLUSIONS. Macrolide use was associated with decreased 30- and 90-day mortality in mechanically ventilated patients with severe sepsis. Confirmatory randomized control trials are needed to determine whether macrolide therapy may be protective for septic patients requiring mechanical ventilation.

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GRANT ACKNOWLEDGMENT. Dr. Restrepo's time is partially protected by Award Number K23HL096054 from the National Heart, Lung, And Blood Institute. The content is solely the responsibility of the author and does not necessarily represent the official views of the National Heart, Lung, And Blood Institute or the National Institutes of Health. The project described was supported by Grant Number R01NR010828 from the National Institute of Nursing Research.

0139

EMPIRIC ANTIBIOTIC TREATMENT FOR SEVERE SEPSIS INTERNATIONALLY: DETERMINANTS OF ANTIBIOTIC SELECTION AND IMPACT OF TIME TO TREATMENT ON OUTCOME

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INTRODUCTION. Early appropriate antibiotic treatment is the cornerstone in sepsis treatment.

OBJECTIVES. The objective of the study is to analyze the empiric antibiotic treatment administered in different regions of the world and the relationship between time to broad spectrum antibiotics and mortality.

METHODS. We included all adult patients with severe sepsis or septic shock from all the participating units in the international Surviving Sepsis Campaign that received antibiotics (17,042 out 28,150). Clinical and demographic characteristics, time of presentation with severe sepsis criteria and data about treatment administered were collected. We evaluated differences in empirical antibiotic treatment according the geographic region (Europe, North America and South America), source of infection, community or nosocomial infection and patient severity. We assessed hospital mortality odds ratio for continuous time to broad spectrum antibiotic by a GEE population-averaged model. Finally we adjusted the model for severity, source of infection, and geographic region.

RESULTS. Using random-effects negative binomial regression North America administers 80% (IRR = 1.80, 95% CI: 1.65–1.98, $p < 0.001$) more antibiotics than Europe and South America administers 17% (IRR = 0.83, 95% CI: 0.72–0.95, $p = 0.005$) less ABX than Europe during the first 6 h of suspected sepsis infection. Globally, beta-lactam/beta-lactamase inhibitors, anti-Gram +, and fluoroquinolones were the most common antibiotics administered for empiric treatment of severe sepsis, with significant differences according to geographic region. The empiric antibiotic treatment in nosocomial infections includes significantly more use of carbapenems (20.4% vs. 6.8; $p < 0.001$), aminoglycosides (9.9% vs. 5.6; $p < 0.001$) and antifungi (4.4% vs. 0.8; $p < 0.001$). Most of the patients received combination therapy as empiric treatment, and where administered antibiotics changed according the source of infection and severity of patients. There was significantly higher use of carbapenems (15.9% vs. 7.6; $p < 0.001$), aminoglycosides (9.0% vs. 5.5; $p < 0.001$), and antifungi (3.7% vs. 1.0; $p < 0.001$) in the most severe patients. Adjusted probability of hospital mortality increased steadily according time-to-antibiotic administration: hour 1 29.9% ($p = 0.52$), hour 2 30.1% ($p = 0.81$), hour 3 30.9% ($p = 0.66$), hour 4 32.5% ($p = 0.10$), hour 5 34.8% ($p = 0.001$) and hour 6 37.9% ($p < 0.001$). The same results were found for severe sepsis and septic shock patients, community or nosocomial infections, different severity and different source of infection.

CONCLUSIONS. Severe sepsis is time dependent and early antibiotic treatment (first 4 h) has an impact on mortality. Physicians treat severe sepsis with different empiric antibiotics according geographic region, nosocomial or community infections, severity and source of infection.

0140

THE ROLE OF NOVEL RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN FOR SEPSIS AND DISSEMINATED INTRAVASCULAR COAGULATION PATIENTS

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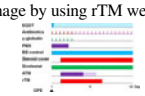
INTRODUCTION. It is expected that recombinant human soluble thrombomodulin (rTM) not only reverses hyper-coagulative status through activating protein C but also prevents multiple organ failure. rTM may improve both physiological scores and the amount of mediators, and reduces the mortality of sepsis and DIC patients in 28 days.

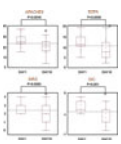
OBJECTIVES. We started a new protocol by adding rTM for sepsis and disseminated intravascular coagulation patients. We introduce the preliminary report in this paper.

METHODS. We enrolled and analyzed 21 patients who were treated for DIC accompanied by sepsis from May to October 2008. Our primary endpoint was mortality in 28 days. As composite outcomes, we followed Acute Physiology and Chronic Health Evaluation (APATCHE II) score, Sequential Organ Failure Assessment (SOFA) score, acute phase DIC score, and serum soluble thrombomodulin, TNF-α, IL-1β, IL-6, HMGB-1, protein C, protein S levels during 10 days. Statistical analysis was performed by Wilcoxon rank-sum test. $P < 0.05$ was regarded as statistically significant.

RESULTS. We found that all scores and mediators improved after administration of rTM in Day 10, but there was no significant improvement in at 28 days. Median of each score or mortality was as follows; APATCH II score: 32 at Day 1 to 26 at Day 10 ($p = 0.0048$), SOFA score: 12 to 8 ($p = 0.0096$), acute phase DIC score: 5 to 3 ($p < 0.001$), SIRS score: 3 to 2 ($p = 0.0095$), mortality in 28 days: 46.9%. Significant adverse effects such as gastrointestinal bleeding, cerebral hemorrhage, and bronchial hemorrhage by using rTM were not observed in this trial.



Protocol



Physiological scores

CONCLUSIONS. Further investigation will be needed to ascertain whether rTM is effective for DIC accompanied by sepsis.

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GRANT ACKNOWLEDGMENT. Health, Labour and Welfare Ministry in Japan (No. 22390337)

0141

OXYGEN TISSUE SATURATION IS IMPROVED BY ISOPRENALINE IN SEPTIC SHOCK PATIENTS

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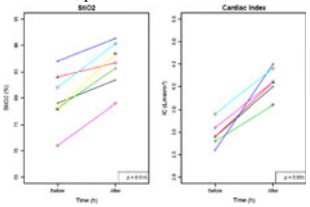
INTRODUCTION. Shock is characterized by either an inadequacy between tissue needs in oxygen and oxygen delivery or the inadequate utilization of oxygen. The hemodynamic management of patients in shock aims at improving tissue oxygenation. International guidelines suggest the need to optimize $ScvO_2$ in the early phase management of patients with severe sepsis and septic shock. We had shown previously that oxygen tissue saturation ($StiO_2$) is lower in nonsurvivors than in survivors after early resuscitation of septic shock [1].

OBJECTIVES. This study evaluates isoprenalin induced modification on oxygen tissue saturation.

METHODS. This retrospective, monocentric study reviewed medical charts from 45 patients admitted for septic shock (09/2009 to 03/2011) who received isoprenaline. In seven patients, an $StiO_2$ and a cardiac index value were available during the 24 first hours following the introduction of isoprenaline. $StiO_2$ was obtained with an InSpectra monitor (Hutchinson). Demographic, clinical and biological characteristics were collected. Hemodynamic and $StiO_2$ variables were compared before, and after the introduction of isoprenaline (between 1 and 12 h). Quantitative variables are presented by median (min–max). The statistical significance of observed differences were assessed with a bilateral Wicoxon test. A p value cutoff of 0.05 was chosen to consider a difference as significant.

RESULTS. Seven patients were admitted in intensive care unit for septic shock and had a median SAPS II of 51 at the admission. Patients had a median SOFA score of 9 the day isoprenaline was introduced. Isoprenaline perfusion (0.2 mg/h [0.08–0.3]) was associated with a statistically significant increase of cardiac index (2.9 [2.6–3.4] vs. 4.1 L/min/m^2 [3.6–4.5]; $p = 0.04$), heart rate (89 [50 126] vs.105/min [62–134]; p=0.02) and StiO2 (79 [71–87] vs. 87% [79–91]; $p = 0.02$). The other variables were not modified after the initiation of isoprenaline (mean arterial pressure (MAP), arterial oxygen saturation (SaO_2), venous oxygen saturation ($ScvO_2$), plasma hemoglobin levels, plasma lactate levels, amounts of norepinephrine).



StiO2 and CI increase after isoprenaline perfusion

CONCLUSIONS. In our septic shock patients, isoprenaline perfusion increase $StiO_2$ and cardiac index. The steady state level of MAP, SaO_2 and $ScvO_2$ suggest that these modifications may involved the capillary recruitment effect of isoprenaline. However, due to the small number of subjects included in this study, these results need to be confirmed.

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0142

PHARMACOKINETICS AND PHARMACODYNAMICS OF RECOMBINANT HUMAN SOLUBLE THROMBOMODULIN, THROMBOMODULIN-α, IN DISSEMINATED INTRAVASCULAR COAGULATION PATIENTS WITH SEVERE RENAL IMPAIRMENT

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INTRODUCTION. Thrombomodulin (TM) is a thrombin receptor on the endothelial cell surface that plays an important role in the regulation of the coagulation system {ID1046}. Recently, recombinant human soluble TM (TM-α) was developed as an anticoagulant for patients with disseminated intravascular coagulation (DIC). TM-α represent a new class of anticoagulants, and is composed of the active, extra-cellular domain of TM.

OBJECTIVES. To investigate the pharmacokinetics and pharmacodynamics of TM-α in disseminated intravascular coagulation (DIC) patients with severe renal impairment.

METHODS. Eleven DIC patients with the severe renal impairment (creatinine clearance (CL_{cr}) <30 ml/min) and 10 DIC patients without severe renal impairment ($CL_{cr} \geq 30$ ml/min) were included in this study. Intervention: In all patients, a dose of 380 U/kg of TM-α was administered during a 30 min infusion. Blood samples were taken before the start of the first TM-α administration, and at 0.5, 2, 4, 8, and 24 h after the start of administration.

RESULTS. In the patients with severe renal impairment, the elimination half life of TM-α was prolonged to about 1.2 times that in the patients without severe renal impairment. In contrast, the maximum concentration of TM-α in the patients with renal impairment was decreased compared with that in the patients without severe renal impairment, because the volume of distribution in the steady-state was increased in the patients with severe renal impairment. The clearance of TM-α in the patients with renal impairment was similar to that in the patients without severe renal impairment. The trough levels of TM-α were elevated in the pharmacokinetic simulation in the DIC patients with severe renal impairment (Figure). After the TM-α administration, the prothrombinase activities in DIC patients both with and without severe renal impairment were sufficiently inhibited during the observation period. No bleeding-related or other adverse events were observed.

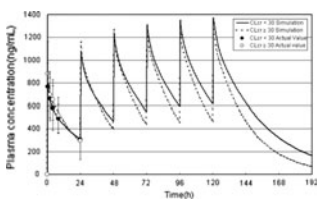

Fig.

CONCLUSIONS. Renal dysfunction dose not significantly affect the TM-α clearance in patients with DIC. However, there is a probability for higher trough levels of TM-α during repeated administration in patients with severe renal impairment.

0143

STUDY OF THE ROLE OF POLYMYXIN B DIRECT HEMOPERFUSION AS AN ADJUVANT THERAPY IN SEVERE SEPSIS OF VARIED ETIOLOGY

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INTRODUCTION. Sepsis and septic shock represent most dramatic complication of severe infection and are associated with high morbidity and mortality. Endotoxins play an important role in septic process. PMX-DHP is a promising option for endotoxin removal and thus for treatment of sepsis. Response to sepsis and to modalities to treat it also show variations in genomic groups. There has not been any study from India on the response to PMX-DHP in severe sepsis.

OBJECTIVES. Assess the impact on outcome of PMX-DHP in patients with severe sepsis. Primary end point: ICU and 28 day mortality Secondary end points: length of stay-ICU and hospital, hemodynamics optimisation and shock reversal, acute kidney injury, P/F ratio and endotoxin level (few patients)
To evaluate which patients, on the basis of the etiology and disease stage could benefit the most from the therapy.

METHODS. Design and setting: Retrospective case controlled study in a 28 bedded Critical Care Department of a teaching multispeciality hospital.

Participants: 24 patients with severe sepsis of varied etiology from abdominal, thoracic and urinary infections.
Group 1: PMX-B DHP + conventional medical therapy; n = 24
Group 2: Conventional medical therapy only; n = 48
1 patient therapy was used twice
Endotoxin activity assay used for collaborative evidence in 7 patients

Intervention: PMX-B DHP 2 h session either with CRRT or hemodialysis machine. 24 patients received therapy since 2007 in addition to conventional therapy. The decision as to whether or not use PMX-B DHP was based on severity score, hemodynamic status, futility of care and in few cases endotoxin activity assay. Decision was consensus between critical care team and treating physician.

RESULTS. Mean age was 28–72 years in the study group. ICU mortality was 25% in patients treated with PMX-DHP compared to 33.3% in control group which did not receive any adjuvant therapy. 1 patient therapy was used twice. EAA used for collaborative evidence in 7 patients. We had 16 survivors out of 24 therapy sessions. Sustained hemodynamic improvement was seen in 20 patients. Improved P/F ratio was seen in 16 patients. Only complication seen was cartridge block in three patients.

Subsets

Subset	n = patients	Mortality (%)
Abdominal sepsis	13	38.46
Pulmonary source	6	25
Urosepsis	2	0
Coexistent malignancy	3	33

CONCLUSIONS. PMX-DHP reduced mortality and is promising adjuvant in treatment of severe sepsis and septic shock.

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0144

ADERNOCORTICAL INSUFFICIENCY IN PATIENTS WITH SEPTIC SHOCK, INCIDENCE AND EFFECT OF STEROID THERAPY

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INTRODUCTION. Absolute or relative adrenocortical insufficiency (AI) is relatively common in septic shock patients. In some cases, septic shock refractory to IV fluids and vasopressors may show hemodynamic improvement after steroid therapy.

OBJECTIVES. To determine the incidence of AI in patients with septic shock, to clarify whether glucocorticoid supplementation is beneficial in patients with septic shock and its effect on mortality.

METHODS. An observational prospective study was performed at Critical Care Department, Cairo University on 50 patients with septic shock who required vasopressor therapy after adequate fluid resuscitation without previous steroid intake. After measurement of baseline total cortisol, the patients were subjected to ACTH stimulation test (250 μg). Post-stimuli cortisol levels were drawn 60 min after. Adrenal dysfunction (AD) was defined as serum cortisol <20 μg/dl with Δ cortisol (60 min post ACTH minus baseline) of ≤9 μg/dl. Functional hypoadrenalism (FH) was defined as serum cortisol <30 μg/dl or Δ cortisol ≤9 μg/dl. AI was defined as the presence of either AD or FH [1]. Patients with AI and patients who did not show any hemodynamic improvement after adequate fluid resuscitation and vasopressors therapy were given steroids. The steroid used was hydrocortisone 100 mg/8 h till clinical improvement.

RESULTS. 50 pts; 27 males and 23 females with mean age 58.6 ± 15.5 and mean APACHE II score 28.0 ± 9.0. The commonest source of infection was multiple sources (32%) followed by abdominal infection (26%), infected wounds (24.0%), chest infection (16%) then urinary tract infection (2%). 48% (24 patients) had negative culture and 52% (26 patients) had positive culture results. 40.0% (20 patients) with Gram +ve bacteria and 12.0% (6 patients) with Gram −ve bacteria. Hyperkalemia on admission was significantly higher in patients with AI (P = 0.016). Statistically significant higher incidence of AI in pts with pre-existing liver disease (P = 0.026). Steroids were given to 70% (35 patients) as follow: 38% (19 patients) with adrenal dysfunction, 24% (12 patients) with functional hypoadrenalism and 8% (4 patients) were given steroid empirically according to the guidelines of surviving Sepsis Campaign. Fifteen patients (43%) had initial hemodynamic improvement with no significant effect on mortality whether 10 days or overall mortality. Increased mortality in patients with AI (74.3%) versus those with no AI (53.6%), however, it did not reach a statistically significant value, P = 0.074. Overall mortality was 80% in all pts.

CONCLUSIONS. High incidence of AI in patients with septic shock. Initial hemodynamic improvement with steroid therapy. No effect of steroid therapy on mortality reduction.

REFERENCE. Rivers EP, Gaspari M, Saad GA, Mlynarek M, Fath J, Horst HM, Wortsman J. Adrenal insufficiency in high-risk surgical ICU patients. Chest. 2001;119(3):889–96.

0145

EFFECTIVENESS OF CONTINUOUS VENOVENOUS HEMODIAFILTRATION USING A POLYMETHYLMETHACRYLATE MEMBRANE HEMOFIFILTER JUDGING FROM MULTIPLEX SUSPENSION ARRAY SYSTEM ON SEPTIC SHOCK CASES

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INTRODUCTION. Septic shock is a condition associated with diffuse coagulopathy and multiple organ failure, and frequently ends in death. The effectiveness of continuous veno-venous hemodiafiltration using a polymethylmethacrylate membrane hemofilter (CVVHDF using PMMA) for critically ill patients has also been reported. This treatment was showed as cytokine adsorption therapy, but there are not so many report in the world.

OBJECTIVES. We treated 16 septic shock patients by CVVHDF using PMMA.

METHODS. The patients were checked seventeen kinds of cytokines using multiplex suspension array system.

RESULTS. The average Acute Physiology and Chronic Health Evaluation (APACHE) II score and the average sepsis-related organ failure assessment (SOFA) score were 25.8 ± 12.5 and 10.1 ± 3.3 (Bio-Plex^{TM}). Survival rate was 83.3%. One day after treated by CVVHDF using PMMA, IL-1β ($p = 0.0473$), IL-4 ($p = 0.0206$), IL-5 ($p = 0.0436$), IL-7 ($p = 0.0061$), IL-12 ($p = 0.0049$), IL-13 ($p = 0.0150$), IL-17 ($p = 0.0036$), IFNγ ($p = 0.0308$) and TNF ($p = 0.0208$) were significantly decreased. And 3 days after this treatment, IL-6 ($p = 0.0498$), GC-SF ($p = 0.0144$) and MCP ($p = 0.0134$) were significantly decreased.

CONCLUSIONS. Therapies aimed at blood purification, such as CVVHDF, continuous hemofiltration (CVVHF) and plasma exchange (PE) have been reported to be effective for the removal of inflammatory cytokines and various mediators. Few reports have shown the influence of the column used for CVVHDF on the removal efficiency of the above-mentioned factors, although several columns have been used in CVVHDF. CVVHDF using PMMA has been reported to be effective for cytokine removal.

Our findings suggest that many cytokines were decreased after CVVHDF using PMMA treatment. On the other hands, we checked that adsorption of many sepsis related factors on PMMA column.

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0146

DOES THE CONTINUOUS REGIONAL ARTERIAL INFUSION THERAPY SAVE PATIENTS WITH SEVERE ACUTE PANCREATITIS?

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INTRODUCTION. In Japan the mortality of acute pancreatitis is overall 2.9, and 8.9% in severe cases according to the report in 2003. In necrotizing pancreatitis, the mortality is 15–20% in total. According to an investigation in 1999 by the Ministry of Health and Welfare, 42% of patients with severe acute pancreatitis have necrosis of pancreas, and their mortality was 23%. The mechanism of pancreatic necrosis is concerned in ischemia of pancreas, impairment of microcirculation, formation of micro-thrombus with hyper-coagulable state.

In necrotizing pancreatitis, regional arterial infusion therapy, protease inhibitor and antibiotic (Nafamostat mesilate and Imipenem), reduce significantly the mortality and infected complications.

OBJECTIVES. We positively adopt the regional arterial infusion therapy for severe acute pancreatitis. A new criterion of deciding the severity of acute pancreatitis was introduced by the Ministry of Health and Welfare in October 2008 (Table 1), it is different from that was revised in 1998. The difference changed the adaptation of the arterial infusion therapy for severe acute pancreatitis. We investigated the influence on the introductory rate, the factors rerated to outcome.

METHODS. We divided the patients with acute pancreatitis admitted in our hospital from 2006 to 2010 into two groups before and after the revision of Japanese acute pancreatitis guideline, and compared the mortality, severity, introductory rate of arterial infusion therapy, rate of developing infectious complication, and the duration of ICU stay, hospital stay.

RESULTS. 53 patients diagnosed as acute pancreatitis were admitted in our hospital from 2006 to 2010, 30 patients were judged severe type among them. The mortality rate was overall 9.4%, and was 16% in severe type.

The introductory rate of regional arterial infusion therapy was 76% of the patients judged with the old criterion, and 46% with the new one.

The mortality rate among each group was showed in Table 2.

CONCLUSIONS. It seems the mortality rate depressed since the new criterion was introduced. It is reported in 2010 that continuous regional arterial infusion of protease inhibitor and antibiotic is effective in preventing complications and in reducing mortality rate in severe acute pancreatitis. But in our hospital, the mortality rate was higher in patients received regional arterial infusion therapy according to the new criterion. In our study, the mortality rate reduced after introducing the new criterion. But the number of patients was small, so more clinical studies are required.

REFERENCE. Pancreas. 2010;39(6):863–7.

0147

EFFECTS OF EARLY TIME TREATMENT OF DIC WITH ACCIDENTAL HYPOTHERMIA

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INTRODUCTION. Death from exposure and accidental hypothermia occurs throughout the world and can present significant management problems. Even with modern supportive care, the in-hospital mortality of patients with moderate or severe accidental hypothermia approaches 40%.

Although many guidelines are published about supportive care for accidental hypothermia, most of them don't refer to disseminated intravascular coagulation (DIC) which many patients highly develop. Acute period DIC score stated by Japanese Association for Acute Medicine is shown in Table 1.

OBJECTIVES. We positively treat patients with accidental hypothermia before complicating DIC in our hospital, and we retrospectively investigated whether the treatment of DIC with accidental hypothermia is effective.

METHODS. We extracted the patients with accidental hypothermia admitted in our hospital from January in 2009 to March in 2011, those who have clear outcome, temperature, platelet, and FDP on admission. We elucidated the concernment between temperature and platelet, FDP.

We also investigated the mortality rate of patients with accidental hypothermia complicating DIC according to the moment of diagnosis, and the presence or absence of treatment.

RESULTS. 36 patients with accidental hypothermia were extracted in this study. 23 patients (64%) developed DIC in the course of admission, 14(60%) of them developed DIC on admission time.

Figure 1 shows the concernment between temperature and platelet, FDP. Mortality rate is shown in Table 2. Only 1 patient were treated as DIC despite without DIC on admission, and he developed DIC at a later date.

CONCLUSIONS. Patients with hypothermia go into impaired blood clotting because of lowered activities of enzymes which usually behave well at 37°C. So we cannot recognize the patients' coagulopathy in the early period.

Patients with accidental hypothermia highly tend to develop DIC on admission or after admission. But it doesn't seem that temperature and platelet, FDP on admission are concerned each other.

The mortality of those with DIC is higher than without DIC. The mortality of accidental hypothermia complicating DIC is high, so we have to recognize that and start treating DIC as soon as possible. But further clinical study is needed.

REFERENCE. Crit Care Med. 1992;20(10):1402–5.

Lab diagnostics in sepsis & organ failure: 0148–0160

0148

PROCALCITONIN IN PATIENTS WITH A COMMUNITY ACQUIRED SEPSIS: ANALYSIS OF PATIENTS WITH HIGH CONCENTRATIONS OF PROCALCITONIN

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INTRODUCTION. Published studies about procalcitonin are mostly about the lowest concentration to diagnose sepsis. We decided to analyse the patient population on the other side—patients with high procalcitonin (PCT) with a cutoff value over 20 μg/l. Studies show, that patients with gram negative sepsis have a higher PCT than patients with gram positive sepsis, also patients with a community acquired sepsis have a higher concentrations than patients with nosocomial sepsis.

OBJECTIVES. To analyse patients with values of PCT over 20 μg/l according to source of infection and bacterial agents and to compare mortality and need for organ support and intensive care according to procalcitonin value

METHODS. A retrospective analysis of patients with a concentration of procalcitonin higher than 20 μg/l in the first 24-h after admission to our hospital for community acquired sepsis. Excluded were patients with limitations of care.

RESULTS. 109 patients admitted to our hospital with a community acquired sepsis had a concentration of procalcitonin over 20 μg/l within 24-h after admission between 1/1/2009 and 31/12/2010. Majority of patients had a Gram negative sepsis, with a prevalence of *Escherichia coli*. Other common pathogens of community acquired sepsis both Gram negative and Gram positive were also represented. Majority of patients had a urinary infection as a source of sepsis, all other types of community acquired infections were also represented.

CONCLUSIONS. Although more patients with Gram negative sepsis had PCT over 20 μg/l and patients with Gram negative sepsis had a higher average concentration of PCT, patients with Gram positive sepsis were still quite commonly represented in our sample of patients. The most frequent pathogen was *Escherichia coli* and the most frequent type of infection was a urinary infection. A high concentration of procalcitonin cannot exclude a Gram positive community acquired sepsis. There was a positive trend for the increase of mortality, need for organ support and admission to intensive care according to the concentration of procalcitonin, but even in the group of patients with PCT over 200 μg/l were patients with a not very severe course of sepsis and without organ failure.

High procalcitonin value on its own does not predict either the source of infection or the bacterial agents, it can be taken as a warning sign for a close follow up of a patient.

REFERENCE. Karlsson et al. Predictive value of procalcitonin decrease in patients with severe sepsis: a prospective observational study. Critical care 2010.

0149

INVESTIGATION OF TEMPERATURE VARIABILITY USING WAVELETS ANALYSIS IN CRITICALLY ILL PATIENTS DURING SIRS SEPSIS AND SEPTIC SHOCK

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INTRODUCTION. Even though temperature is a continuous quantitative variable, its measurement has been considered as a snapshot of a process, indicating if a patient is febrile or afebrile. Recently, other diagnostic techniques have been proposed for the association between temperature curve's complexity with severity of illness in the Intensive Care Unit (ICU).

OBJECTIVES. To investigate the longitudinal changes of temperature variability using wavelets transformation of the continuously monitored temperature signal, in a mixed population of critically ill patients, during the course of a suspected ICU acquired infection.

METHODS. Continuous temperature recordings were performed in 18 patients with ventilator-associated pneumonia, 10 with blood-stream infections and 7 with systemic inflammatory response syndrome (SIRS). Temperature monitoring was performed with a thermistor sensor (Datalogger Spectrum 1000, Veriteq Instruments, Richmond, BC, Canada), with a sampling frequency of 1 sample per 10 s. Continuous wavelet transformation (CWT) was applied to the temperature signal, aiming at decomposing it to different frequency components (0.008–0.02 and 0.02–0.05 Hz, indicating metabolic and neurogenic inputs upon local temperature control, respectively) during different time scales, using software available from Matlab. Different features indicating variability of the signal, such as wavelet coefficients and entropy measures per frequency band, were computed and correlated with daily measured specific organ failure assessment score (SOFA) of severity of illness. Multiple analysis of variance evaluated differences between groups of patients (SIRS, sepsis and septic shock) and multiple regression analysis assessed whether different features from CWT were independent predictors of SOFA score and development of septic shock. Test were performed with SPSS version 13.

RESULTS. Average entropy of the whole signal was significantly increased in patients with SIRS vs sepsis and septic shock (3.7 ± 0.2 vs. 2.8 ± 0.12 vs. 2.2 ± 0.18, $p < 0.001$, respectively, for all comparisons). Entropy/metabolic band was significantly increased in the SIRS group (0.07 ± 0.002) related to septic shock group (0.02 ± 0.0016, $p < 0.001$). The percentage of cross-correlation >0.95 between 30 s distant timeslots was 0.85 versus 0.05 in patients with septic shock versus SIRS ($p < 0.001$), indicating more steady and periodic behaviour of temperature during severe infection. Entropy/metabolic band and cross-correlation between adjacent timeslots proved to be independent predictors of severity of illness (β slope -1.087, $p = 0.022$ and 0.88, $p = 0.013$, respectively).

CONCLUSIONS. Reduced variability and more steady behaviour of temperature fluctuations seems to correlate with severity of illness, reflecting different thermoregulatory mechanisms and can be of prognostic value in patients with systemic inflammation.

0150

DETERMINING FACTORS IN THE ONSET OF SEVERE THROMBOCYTOPENIA ON ADMISSION IN CRITICAL PATIENTS WITH MULTI-ORGAN FAILURE

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OBJECTIVES. To evaluate the determining factors in the onset of severe thrombocytopenia (platelet count ≤50.000/µl) presenting in the first 24 h of admission to Intensive Care Unit (ICU) in patients with multi-organ failure.

METHODS. Retrospective, observational study, over 2 years, of all patients admitted to a multi-purpose ICU with diagnosis of multi-organ dysfunction (failure of at least 2 organs, according to SOFA—Sepsis-related Organ Failure Assessment—criteria) during the first 24 h of admission; With the exclusion of neurocritical and politrauma patients. Variables were collected including personal medical history, regular medication, baseline, demographic data, ICU severity scores, multiple organ dysfunction data, hospital data before ICU admission and ICU data from the first 24 h of admission (vasoactive drugs, mechanical ventilation, hemofiltration, etc.).

RESULTS. 587 patients included; 6.3% developed severe thrombocytopenia on the first day of admission. Related variables (presence or absence of severe thrombocytopenia) are: history of hypercholesterolemia (8.1 vs. 26.5%), on antiarrhythmic medication (0 vs. 9.6%), chemotherapy/radiotherapy in the past 6 months (13.5 vs. 3.1%) and hospitalization in the past year (56.8 vs. 34%); variables in the first 24 h of ICU admission were: principal type of deterioration, principal pathology of deterioration, presence of sepsis (62.2 vs. 40%), APACHE IV (84.6 ± 29.5 vs. 59.6 ± 22.6), SOFA (11.9 ± 4.1 vs. 7.7 ± 3.2), norepinephrine dose (0.7 ± 0.8 vs. 3 ± 0.5 mcg/kg/min), oligoanuria, acidosis, coagulopathy, and levels of leukocytes ($10.094 \pm 7{,}770$ vs. $15{,}161 \pm 8{,}872$/µl), hemoglobin (8.8 ± 2.8 vs. 11.5 ± 3.1 g/dL), prothrombin activity (54.5 ± 24.4 vs. 70.1 ± 19.8%), lactate (52.4 ± 48.1 vs. 26 ± 25.5 mg/dL), bilirubin (2.7 ± 3.1 vs. 1.4 ± 2.2 mg/dL), protein (4.3 ± 1.2 vs. 5.1 ± 1.2 g/dL) and albumin (2.1 ± 0.7 vs. 2.6 ± 0.8 g/dL). In logistic regression analysis, the variables that remain in the equation are (OR 95%) hospital admissions last year (3.5, 1.3–9.6), SOFA on the first day (1.5, 1.3–1.7) and albumin levels on the first day (0.3, 0.14–0.6).

CONCLUSIONS. The main determining factors in the early onset of thrombocytopenia in the first 24 h of multi-organ failure are a drop in albumin levels and a high SOFA score, along with a history of hospital admission in the previous year.

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0151

SEVERE THROMBOCYTOPENIA IN MULTI-ORGAN FAILURE: PROGNOSTIC IMPLICATION OR MORBIDITY MARKER

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INTRODUCTION. OBJECTIVES. To assess the relationship between severe thrombocytopenia (platelet count ≤50,000/) in patients with multiple organ dysfunction and mortality in ICU, and evaluate its role as a severity factor.

METHODS. A retrospective, observational study, over 2 years, of all patients admitted to a multi-purpose ICU with a diagnosis of multiple organ dysfunction (failure of at least 2 organs according to SOFA—Sepsis-related Organ Failure Assessment criteria) during the first 24 h of admission; with the exclusion of neurocritical and politrauma patients. Variables were collected, including personal history, regular medication, baseline, demographic data, ICU severity scores, multi-organ dysfunction data and main hospital and ICU data.

RESULTS. 587 patients included; 6.3% presented with severe thrombocytopenia. Patients presenting with severe thrombocytopenia have a mortality rate of 51.4% compared with 27.7% in those not presenting. In logistic regression analysis, with exitus in ICU as the dependent variable, severe thrombocytopenia does not remain in the model. The presence of thrombocytopenia is related to APACHE -Acute Physiology and Chronic Health Evaluation-IV (84.6 ± 29.5 vs. 59.6 ± 22.6), SOFA (11.9 ± 4.1 vs. 7.7 ± 3.2), length of hospitalization (18.9 ± 25.1 vs. 28.5 ± 28.9 days), norepinephrine dose day 1 (0.7 ± 0.8 vs. 3 ± 0.5 mcg/kg/min), and levels of leukocytes ($10{,}094 \pm 7{,}770$ vs. $15{,}161 \pm 8{,}872$/µL), haemoglobin (8.8 ± 2.8 vs. 11.5 ± 3.1 g/dL), prothrombin activity (54.5 ± 24.4 vs. 70.1 ± 19.8%), pH (7.27 ± 0.2 vs. 7.33 ± 0.12), bicarbonate (18.1 ± 5.8 vs. 22 ± 6.9 mmol/L), lactate (52.4 ± 48.1 vs. 26 ± 25.5 mg/dL), bilirubin (2.7 ± 3.1 vs. 1.4 ± 2.2 mg/dL), protein (4.3 ± 1.2 vs. 5.1 ± 1.2 g/dL) and albumin (2.1 ± 0.7 vs. 2.6 ± 0.8 g/dL). During its progression, severe thrombocytopenia relates to the highest value of: leukocytes ($12{,}922 \pm 8{,}666$ vs. $19{,}221 \pm 10{,}963$/µL), bilirubin (3.6 ± 2.3 vs. 1.6 ± 2.3 mg/dL) and lactate (64.1 ± 57.6 vs. 31.5 ± 29.1 mg/dL).

CONCLUSIONS. Early onset severe thrombocytopenia in patients with multiple organ dysfunction is not a factor in mortality, but is, however, a factor in severity in association with other factors which define the condition.

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0152

HYPOURICEMIA DUE TO HIGH URATE RENAL EXCRETION IN SEPTIC SYSTEMIC INFLAMMATORY RESPONSE SYNDROME

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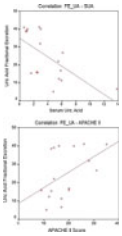
INTRODUCTION. Uric Acid (UA) is filtered at the glomeruli and absorbed at the tubule, so only 7–12% of the filtered UA is finally excreted. It has been shown that serum uric acid (SUA) can lower during an acute gout flare. These changes in SUA result from an increase in renal fractional excretion of UA (FE_UA) and correlate to the intensity of inflammation. SUA also drops during other acute inflammatory events such as surgical critically ill patients, though pathogenesis remains here unclear.

OBJECTIVE. Our aim is to determine whether during overwhelming systemic inflammatory response syndrome (SIRS) due to severe sepsis or septic shock changes in SUA related to alterations in UA renal handling do occur and to gauge its possible significance.

METHODS. We prospectively recruited patients meeting established criteria for severe sepsis or septic shock who were admitted in our Intensive Care Unit since May 2010. APACHE II score was used to evaluate clinical severity during the first 24 h following ICU admission and SUA and FE_UA were measured in each patient. None of them was on UA-lowering medication. The study is ongoing.

RESULTS. 17 consecutive patients (9 men:8 women) with diagnosis of severe sepsis ($n = 11$) and septic shock ($n = 6$) of different origins were included. Age 73 years (IQR 54–78). Median APACHE II: 17 (IQR 13–24). FE_UA was above 12% in 15 patients (82%). FE_UA median was 22% (IQR 14–40) normal 7–12%. SUA median was 2.9 mg/dl (IQR 1.3–5.7). Seven patients (41.2%) had hypouricemia (SUA <2.5 mg/dl). There was an inverse correlation between SUA and FE_UA ($p = -0.569$ [$p < 0.05$]). Presence of shock associated with lower SUA and higher FE_UA (SUA $p = -0.503$ [$p < 0.05$], FE_UA $p = 0.779$ [$p < 0.01$]). Noteworthy, FE_UA exhibited a significant positive correlation with APACHE II score ($p = 0.539$ [$p < 0.05$]).



Results

CONCLUSIONS. A raised excretion of UA (measured as FE_UA) resulting in low SUA levels was noted in patients with septic SIRS; higher increases in FE_UA correlated with higher APACHE II scores. This strongly suggests that the drop of SUA might be a usual consequence related to acute inflammation that appears largely explained by a higher renal clearance of urate. The underlying urate renal handling mechanisms still need clarification. Whether the relation found with APACHE II may have clinical or prognostic implications requires further studies.

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0153

D-DIMER AS A SIGNIFICANT PROGNOSTIC FACTOR IN PATIENTS WITH SEPSIS IN A COLOMBIAN POPULATION

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INTRODUCTION. C-reactive protein (CRP), Procalcitonin (PCT) and D-dimer (DD) have been associated with the differential diagnosis of infectious versus noninfectious systemic inflammatory response. However, their true clinical value as mortality markers in patients with sepsis remains to be determined.

OBJECTIVES. We aimed to determine the usefulness of CRP, PCT and DD as potential markers of 28-days mortality of any cause in sepsis patients admitted to the Emergency Department (ED).

METHODS. Prospective cohort study in consecutive patients admitted to the ED of the Hospital Universitario San Vicente de Paúl (Medellín, Colombia) with a diagnosis of infection and/or sepsis, according to a consensus of experts, from August 1, 2007 to January 30, 2009. Clinical and demographic data, APACHE II and SOFA scores were collected, as well as blood samples, within the first 24 h of admission. Patient vital status was determined to establish its association with levels of biomarkers, using logistic regression analysis and receiver operating characteristic (ROC) curves.

RESULTS. A total of 653 patients were analyzed. Mean age was 51.2 ± 20 years, 328 (50.2%) were men and 246 (37.6%) presented with no comorbidities. Median APACHE II, SOFA, CRP, PCT and DD were 10 (interquartile range, IQR = 6–15), 2 (IQR = 1–4), 12.2 mg/dl (IQR = 4.9–22.3), 0.59 ng/ml (IQR = 0.13–5.7) and 1,642 ng/ml (IQR = 988–2,997), respectively. Median DD in survivors was 1,546 mg/dl (IQR = 958–2,882) versus 2,719 mg/dl (IQR = 1,698–4,633) in non-survivors ($p = 0.0001$). The discriminatory ability with respect to overall mortality showed AUC-ROC values for DD = 0.68, PCR = 0.55, PCT = 0.58, SOFA = 0.77 and for APACHE II = 0.73. After multivariate analysis, the only biomarker with a linear relation with respect to overall mortality was DD, with an OR of 2.43 (95% CI 1.06–5.58) for values >1,184 and <2,464 ng/ml, and an OR of 3.91 (95% CI 1.73–8.83) for values >2,464 ng/ml.

CONCLUSIONS. Our results suggest that high levels of DD alone could be a useful tool for predicting a fatal outcome in patients with sepsis.

GRANT ACKNOWLEDGMENT. Instituto Colombiano para el Desarrollo de la Ciencia y la Tecnología (COLCIENCIAS), Grant 1115-3431-9153, RC 352-2006 and Universidad de Antioquia.

0154

EXPRESSION OF THE RECEPTOR FOR ADVANCED GLYCATION END PRODUCTS (RAGE) ON MONOCYTES DURING SEVERE SEPSIS AND SEPTIC SHOCK: A PILOT STUDY

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INTRODUCTION. RAGE is a pattern recognition receptor that binds multiple ligands. It is expressed on the surface of leukocytes and endothelial cells in response to inflammatory stimuli. The ligand-RAGE axis is emerging as a central mechanism linked to the initiation, amplification and perpetuation of the inflammatory response. RAGE inhibition increases survival in experimental models of abdominal sepsis and pneumonia. The soluble isoform of the full-length receptor RAGE (sRAGE) is elevated in septic patients and associated with their clinical outcome. To our knowledge, this is the first study that evaluates the expression of RAGE on the surface of monocytes from patients with severe sepsis and septic shock.

OBJECTIVES. To evaluate the expression of the RAGE on monocytes during severe sepsis and septic shock.

METHODS. Patients from the ICU of the Virgen de las Nieves University Hospital were enrolled in the study within the first 24 h after the onset of severe sepsis or septic shock (according to the SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference on 2001). Exclusion criteria were nosocomial sepsis, immunosuppression, chronic renal failure or diabetes. Blood samples were taken at admission, at 48 h and a week after and were processed immediately. Peripheral blood mononuclear cells were isolated by Ficoll-Paque density gradient centrifugation. Incubation with mouse anti-human RAGE mab (Abcam, Cambridge, UK) was carried out for 1 h, followed by a second incubation with a goat anti-mouse IgG-PE antibody. Cells were fixed with 2% paraformaldehyde and analysed by flow cytometry (Becton–Dickinson FACS). Clinical data, source of sepsis, APACHE II score, daily SOFA score were simultaneously recorded. A 28 day follow-up was performed to distinguish between survivors and non survivors.

RESULTS. Seven patients (3 with severe sepsis and 4 with septic shock) were enrolled in the study. Five patients were men. The sources were pneumonia (4 patients) and peritonitis (3 patients). The median APACHE II score and SOFA score at admission were 24 and 12, respectively. The mortality at 28 days was 57.1%. We detected in cases of sepsis an expression of RAGE that was highly variable among patients and over time, whereas the expression of RAGE remained undetectable on monocytes from normal individuals. There was not correlation between the expression of RAGE and the APACHE II score at admission or the SOFA score at each point. We found a trend towards a higher RAGE expression at admission among patients with septic shock [media 3.92 ± 4.23 vs. 0.20 ± 0.14% (p 0.17)] and among non-survivors [media 4.86 ± 4.65 vs. 0.5 ± 0.43% (p 0.18)] but they did not reach statistical significance. There was no correlation between RAGE expression and source of infection.

CONCLUSIONS. RAGE is expressed on monocytes during severe sepsis and septic shock. This expression is highly variable among patients and over time.

GRANT ACKNOWLEDGMENT. Granada University

0155

CIRCULATORY CYTOKINES AS PROGNOSTIC MARKERS OF MORTALITY IN SEVERE SEPSIS

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INTRODUCTION. In patients with severe sepsis, previous work has suggested that individual circulatory cytokines may be valuable prognostic markers. Since cytokines operate within complex networks, their predictive value may be improved by the simultaneous measurement of multiple cytokines. This could allow early, aggressive management in patients predicted to fare badly.

OBJECTIVES. This study examined established and novel prognostic cytokines in patients with severe sepsis.

METHODS. Between January and December 2008, patients admitted to ICU within 24 h of the onset of severe sepsis were recruited and 28-day mortality rate was recorded. Exclusion criteria included patients on immunosuppressants or chemotherapy and those with a moribund status. Ethical approval (REC W06/Q1107/42) was obtained. Whole blood (1 ml) was taken, centrifuged and resultant plasma stored until analysis for 18 separate cytokines by multiplex immunoassay. This included the novel cytokines Interleukin IL-13, IL-15 and IL-17. Data were expressed as pg/ml and analysed by Mann–Whitney *U* tests.

RESULTS. Sixty patients were included, of whom 27 (45%) died. Levels of all 18 cytokines were higher in non-survivors compared with survivors. Concentrations were significantly higher for IL-1beta, IL-2, Tumour necrosis factor-alpha, IL-10, IL-12(p70), IL-13, IL-15, IL-17, Interferon-gamma and Monocyte Chemoattractant Protein-1 ($p < 0.05$).

CONCLUSIONS. These results confirm the value of cytokines as potential prognostic markers of 28-day mortality in severe sepsis. They also highlight a novel prognostic role for cytokines IL-13, IL-15 and IL-17. The multiplex immunoassay allows the simultaneous analysis of multiple cytokines in one plasma sample. This may allow greater accuracy in the prediction of mortality in patients with severe sepsis.

0156

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN LUNG DISORDERS AND VARIOUS INFLAMMATORY MARKERS (CRP, PROCALCITONIN, ENDOTOXIN ACTIVITY ASSAY) SEEN FROM PULSE CONTOUR CARDIAC OUTPUT (PICCO)

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INTRODUCTION. Since the pathology of pulmonary edema can be understood by means of PVPI (Pulmonary Vascular Permeability Index) and EVLW (Extra Vascular Lung Water), its utility in the intensive care field is mainly what has been reported, with respect to Pulse Contour Cardiac Output (PiCCO). Furthermore, in order to understand the pathological conditions in cases that require management in an intensive care unit, with a focus on septicemia, the usefulness of various markers are herein reported.

OBJECTIVES AND METHODS. In an intensive care unit, the relationship of cardiorespiratory circulation, according to a PiCCO monitor, and CRP, procalcitonin, endotoxin activity assay, which are inflammatory markers, was compared and investigated in 11 severe cases which required management using an artificial respirator.

RESULTS. The mean age of the subjects was 62.6 ± 19.1 years, with eight men and two women, and the underlying conditions were: six cases of external lesions, two cases of post-resuscitation encephalopathy, one case of peritonitis, one case of retroperitoneal abscess, and one case of a ruptured abdominal aortic aneurysm. In a comparison of the group with high values for EVLW and the group with normal values, the EAA value showed a tendency to be higher in the high values group, at 0.46 ± 0.20, compared to the normal group, at 0.21 ± 0.19 ($p = 0.0664$). In a comparison of the group with high values for PVPI and the group with normal values, the procalcitonin value showed a tendency to be higher in the high values group, at 18.9 ± 21.8, compared to the normal group, at 2.4 ± 2.2 ($p = 0.0676$). Furthermore, conversely, in a comparison of the group with high values for EAA and the group with normal values, the PVPI value was significantly poor in the high values group, at 3.55 ± 0.48, and in the normal group, at 1.99 ± 0.68 ($p = 0.0029$). In a comparison of the group with high values for procalcitonin and the group with normal values, the cardiac index value was at a significantly low rate in the high values group, at 3.40 ± 1.05, and in the normal group, at 4.80 ± 0.39 ($p = 0.0325$).

CONCLUSIONS. EAA, which has been reported to be useful for obtaining an understanding of the septic pathology, etc., in recent years, is a measurement method designed to show the activity of endotoxins within the whole blood. However, it is a measurement method in which the influence of neutrophil activation can also be presumed. From the results, the possibility was suggested that the EAA value, which showed the greatest correlation with lung disorders by PiCCO monitoring, reflects inflammatory reactions in the lungs.

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0157

TRENDS OF C-REACTIVE PROTEIN (CRP) AND PROCALCITONIN (PCT) IN LIVE DONOR LIVER TRANSPLANTATION (LDLT) RECIPIENTS

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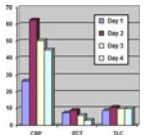
INTRODUCTION. Sepsis is the most feared complication after liver transplantation. Acute phase reactants like C-reactive protein (CRP) and procalcitonin (PCT) have been shown to be reliable markers for bacterial sepsis [1]. Since major surgery like liver transplant are known to increase the baseline levels of CRP and PCT, their role as early marker for sepsis in LDLT recipient is not yet clear.

OBJECTIVES. We evaluated the trends of CRP and PCT in early post operative phase in LDLT recipients.

METHODS. Serum CRP and PCT samples for first four postoperative days [2] were sent for all LDLT recipients. Clinically significant infections (CSI) were defined as pulmonary, bloodstream, urinary or abdominal infections. Any change in antibiotics was noted and their effect on values of CRP, PCT and total leukocyte counts (TLC) was noted.

RESULTS. 122 liver transplant recipients (26 female and 96 male) were studied. CRP and PCT values peaked on second postoperative day in all patients and then rapidly decreased but did not reach baseline during the study period. Mean CRP value was 45.09 mg/L (minimum 5.0 mg/L; maximum 185.6 mg/L) and mean PCT value was 6.78 ng/mL (minimum 0.12 ng/mL maximum 48.49 ng/mL). Trend in TLC values were independent of trend of CRP and PCT. 32 patients had CSI and their CRP (54.67 vs. 40.72 mg/L), PCT (9.04 vs. 4.09 ng/ml) and TLC values were higher as compared to non CSI patients but still followed the same trend.



CRP, PCT and TLC trends

CONCLUSIONS. CRP and PCT values are uniformly increased in postoperative LDLT recipients. They peak on second postoperative day and then start decreasing. Patients with CSI have higher values as compared to non-CSI patients and hence a higher cut off may be warranted to support their role as an early marker of sepsis.

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0158

UNCORRECTED METABOLIC ACIDOSIS AS MORTALITY PREDICTOR IN SEPTIC PATIENTS

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INTRODUCTION. Patients with sepsis require early antibiotics and goal directed fluid reanimation in order to diminish mortality. Early goal directed therapy does not consider acid–base status as prognostic factor.

OBJECTIVES. To determine whether acid–base status should be considered in early reanimation guidelines in septic patients.

METHODS. Retrospective, observational study of septic patients admitted to the ICU from January to December 2010. Demographics were obtained as well as fluid balance, gasometric and hemodynamic values at admittance, 24, 48 and 72 h later. Mortality on day 28 was determined.

RESULTS. 98 patients were included; mean age: 68 ± 16 (20–98 years), APACHE II score: 17±11 (0–94) and SOFA 9 ± 8 (1–86); 50 female (51%). At admittance, they were reanimated according to Rivers goals, improving mean arterial pressure from 74 ± 17 to 81 ± 12 $p = 0.01$; central venous pressure (CVP) and pulse variability pressure improved without statistical significance. Pulmonary wedge pressure (PCWP) goal was also achieved from 24.5 ± 8 to 19.3 ± 5 $p = 0.05$. Norepinephrine and vasopressin requirements, diminished after fluid reanimation from 15.4 ± 24 to 6.5 ± 10, $p = 0.01$ and from 0.05 ± 0.01 UI to 0.03 ± 0.01, $p = 0.0001$, respectively. Acid–base status improved in all patients: pH 7.32 ± 0.1 to 7.40 ± 0.09, $p = 0.0001$, HCO_3 22.5 ± 6 to 25.7 ± 5.2, $p = 0.0001$ and base deficit −2.59 ± 6.5 to 2.08 ± 5.6, $p = 0.0001$; lactate levels improved too, from 3.1 ± 4 to 1.6 ± 1.1, $p = 0.001$. When divided according to survival rate: 39 died (39.7%). Patients that survived were younger and had lower APACHE and SOFA scores. Fluids requirements were achieved in both groups (Rivers goals) but acid–base status had statistically differences. HCO_3 at admittance was similar in survivors (23 ± 5) and non-survivors (22 ± 7). Fluids were given in large amounts in both groups, but in non-survivors, acid–base status was never completely corrected. Rivers goals do not consider acid–base status as target for fluids.

	Alive	Death	*p*
Age	65 ± 17 (20–98)	75 ± 13 (42–96)	0.019
Apache II score	15 ± 7 (3.36)	29 ± 14 (7–94)	0.001
SOFA score	7 ± 3 (1–14)	11 ± 13 (4–16)	0.02
pH (admittance)	7.34 ± 0.11 (6.8–7.5)	7.3 ± 0.08 (7–7.5)	0.05
pH 24 h.	7.37 ± 0.08 (7.1–7.5)	7.32 ± 0.09 (7.1–7.5)	0.005
pH 48 h.	7.41 ± 0.06 (7.2–7.5)	7.33 ± 0.13 (6.9–7.4)	0.0001
pH 72 h.	7.42 ± 0.06 (7.2–7.5)	7.37 ± 0.12 (6.9–7.5)	0.01
Base deficit (BD) admittance	−1.8 ± 6.8 (−22 to 20)	−3.7 ± 6 (−15 to 8)	NS
BD 24 h.	−0.4 ± 6.3 (−12 to 18)	−2.8 ± 6 (−20 to 7)	0.06
BD 48 h.	2.1 ± 5.4 (−10 to 22)	−1.2 ± 7 (−14 to 29)	0.01
BD 72 h.	2.9 ± 5.3 (−11 to 16)	0.4 ± 6 (−12 to 15)	0.05
Lactate (atmittance)	2.7 ± 3.8 (0.5–25)	3.8 ± 4.3 (0.5–25)	NS
Lactate 24 h.	2 ± 2.2 (0.4–15)	3.9 ± 4.2 (0.4–25)	0.05
Lactate 48 h	1.6 ± 1.4 (0.5–10)	3.4 ± 2.9 (0.5–14)	0.0001
Lactate 72 h	13 ± 0.8 (0.5–4.8)	2.1 ± 1.3 (0.5–6)	0.001

CONCLUSIONS. In our septic patients, correcting acid–base status had more weight in survival rate at 28 days than hemodynamic parameters already corrected according to Rivers protocols. Bicarbonate as exogenous coadjuvant in achieving acid–base equilibrium must be studied in further protocols.

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0159

EOSINOPHILIA AS A MARKER OF ADRENOCORTICAL INSUFFICIENCY IN SEPTIC PATIENTS

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INTRODUCTION. Acute adrenal insufficiency is a common but often unrecognized dilemma in critically ill patients. Eosinophilia is assumed to be a marker of adrenocortical insufficiency (AI) in patients with sepsis and septic shock.

OBJECTIVES. To clarify whether eosinophilia may be used as a marker of AI & to determine the incidence of AI in patients with sepsis and septic shock and to detect the effect of steroid therapy.

METHODS. Sixty three patients were included in the study, 13 with sepsis and 50 with septic shock with no history of previous steroid intake. Each patient had complete blood count on admission and after 7 days to detect eosinophilic count. Eosinophilia was defined as eosinophilic count ≥3%. The patients were subjected to ACTH stimulation test (250 μg) after measurement of baseline total cortisol. Post-stimuli cortisol levels were drawn 60 min after. AI was defined as serum cortisol <20 μg/dl or Δ cortisol (60 min post ACTH minus baseline) of ≤9 μg/dl. Patients with AI as well as patients who did not show hemodynamic improvement after optimum fluid resuscitation and vasopressor therapy were given hydrocortisone 100 mg/8 h. A positive hemodynamic response was defined as vasopressor dose reduction while maintaining MAP >65–70 mmHg within 24 h of the first hydrocortisone dose or within 24 h of the ACTH stimulation test in patients not treated with hydrocortisone.

RESULTS. 63 patients; 38 males and 25 females with mean age 56.73 ± 17.39 and APACHE II score 25.78 ± 9.79. 47.6% had negative culture results versus 52.4% with positive culture. The most common organisms were: *Staphylococcus aureus* and MRSA in 22.2%, *Klebsiella* in 15.8%, *Acinetobacter* in 12.6%, *E. Coli* in 7.9%, *Pseudomonas* in 6.34% and *Candida albicans* in 6.34%. Eosinophilia was present in 15.8% of patients on admission and in 6.34% at day 7. AI was diagnosed in 55.6% (62% with septic shock and 30.8% with sepsis). In septic shock patients with AI, 25.8% had eosinophilia at day 1. None of the patients without AI had eosinophilia, specificity 100%.

Increased mortality among patients with AI versus those with no AI; (74.3 vs. 53.6%); however, it did not reach a statistically significant value, ($P = 0.07$). Of all the 42 patients treated with steroids (83.3% diagnosed with AI and 16.7% given steroid according to the guidelines of Surviving Sepsis Campaign), 48.5% had hemodynamic improvement after therapy.

No statistically significant difference regarding 10 day mortality between patients received steroids (40.5%) and those who did not (42.9%), $P = 0.85$. Higher overall mortality in patients treated with steroids (73.8%) versus those who did not (47.6%), $P = 0.05$.

CONCLUSIONS. Higher incidence of AI in patients with septic shock than those with sepsis Eosinophilia is a highly specific marker for AI Initial hemodynamic improvement with steroid therapy with no effect on 10-day mortality Higher overall mortality in patients treated with steroids.

0160

ELECTROLYTE DERANGEMENT IN CRITICAL ILLNESS: THE RELATIONSHIP BETWEEN POTASSIUM, MAGNESIUM, CALCIUM AND PHOSPHATE

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INTRODUCTION. Increasing evidence links electrolyte disorders in critically ill patients with greater morbidity and mortality (1). There are few guidelines on the treatment of electrolyte disorders in the critically ill (2) and most focus on individual electrolytes without taking the interrelationship between specific deficits into account. The purpose of this investigation was to determine the prevalence of hypocalcaemia, hypomagnesaemia, hypophosphatemia, and hypokalaemia on admission to critical care with the aim of identifying specific relationships between electrolyte imbalances.

METHODS. Data were collected retrospectively from 59 patients admitted to a 13-bed intensive care unit (ICU) of a tertiary referral centre. Serum calcium, potassium, magnesium and phosphate levels were determined for the first 3 days. APACHE II scores were calculated. Serum electrolyte levels were compared using the Wilcoxon test and their correlation was assessed with the Spearman and Pearson correlation coefficients. Electrolytes were replaced as part of standard treatment when serum: potassium levels were <3.5 mmol/l, inorganic phosphate levels <0.7 mmol/l, magnesium levels <0.75 mmol/l, or calcium levels <2.2 mmol/l.

RESULTS. 66% of patients were male and hospital survival was 59%. On admission over half the patients were hypocalcaemic and many were hypomagnesaemic at 53 and 47%, respectively. Admission phosphate and potassium levels showed 16% of patients to be hypophosphataemic and 7% to be hypokalaemic. Potassium and phosphate levels showed a positive correlation on admission. A significant positive correlation on admission was also found for phosphate and magnesium as well as magnesium and potassium. Median ionized and serum calcium levels increased significantly from days 1 to 3 and in patients surviving to discharge. Median magnesium and potassium levels demonstrated a significant increase from day 1 to 2 but then plateaued with no significant changes. Phosphate levels decreased from admission to day 3. However, median phosphate levels did show a slight significant increase on discharge compared to day 3.

CONCLUSIONS. Hypocalcaemia in particular showed sustained significant improvement over the course of 3 days and on discharge, while magnesium and potassium levels improved initially and then plateaued. In contrast phosphate levels dropped over the first 3 days and displayed only minimal improvement on discharge. This indicates that supplementation of phosphate might not be as efficient as replacement of potassium, magnesium and calcium. Hypomagnesaemia and hypokalaemia on admission correlated significantly with phosphate levels. The clinical significance, in particular the long-term consequences of electrolyte derangement in critical illness need to be elucidated further in larger studies.

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Brain injury: 0161–0174

0161

EARLY HYPERGLYCEMIA REFLECTS BLOOD GLUCOSE VARIABILITY, ICU-MORTALITY AND LONG-TERM NEUROLOGIC DISABILITY IN SEVERE BRAIN INJURED PATIENTS

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INTRODUCTION. It has already confirmed that hyperglycemia (HG) may worsen CNS injury and neurological outcome in traumatic brain injury (TBI). It is still unclear whether admission HG, an isolated HG event, persistent HG or blood glucose variability (GV) is predictive of poor outcome. Recently GV has been suggested as a major predictor of outcome than average glucose itself because rapid swings in blood glucose can induce cellular damage and wide osmolality changes with organ dysfunction. Furthermore these swings may hide the occurrence of occult hypoglycemia that could affect neurologic recovery.

OBJECTIVES. The aim of this study is to investigate if there is any correlation between early HG, GV and outcome.

METHODS. We have retrospectively stratified 194 TBI patients admitted to our intensive care unit (ICU) using admission blood glucose (ABG) as grouping variable. Patients with history of diabetes were excluded from the analysis. An insulin infusion protocol based on blood glucose values was used for all patients considering 140 mg/dl as therapeutic target. Stepwise multiple regression analysis (SMRA) was utilized to evaluate the best predictor of outcome among physiological status on admission, head injury severity and early factors responsible of secondary injury (body temperature, hypoxia, hypo and hypercapnia, hyperglycemia, hypotension and anemia). As index of early GV we have calculated the first 2 days maximum blood glucose excursion (Delta Blood Glucose, Max BG–Min BG). The same variables were recorded the first 2 days of ICU stay to detect early organ dysfunction responsible of secondary brain injury. The 3 groups were analyzed using one-way ANOVA and relative frequencies with Chi-square test. Outcome measures considered are 30-days mortality, GOS on ICU discharge and 6-months GOS.

RESULTS. No differences were found among groups in demographical data, admission status, brain damage severity, neurosurgery and 6-months GOS. As expected the HG group (ABG >180 mg/dl) had lower ICU-GOS ($p < 0.001$), higher mortality rate ($p < 0.01$) and increased 24 and 48 h DBG ($p < 0.01$). There were no differences between group A and B. SMRA demonstrated ABG as the best early predictor of ICU-GOS (step 1: $p < 0.01$, R^2 43) followed by hypoxia (step 2: $p < 0.05$, R^2 62) and hypotension (step 3: $p < 0.05$, R^2 76). Moreover, highest ABG values had a strong correlation with higher 24 and 48 h DBG ($p < 0.0001$) and higher risk of death (OR 4.49, 95% CI 1.7–11.9).

CONCLUSIONS. Our results demonstrate a strong relationship between admission HG with the development of brain secondary damage and poor outcome. Moreover, patients with ABG <140 mg/dl did not show different outcome compared to patients who had a permissive hyperglycemia on admission probably because they both demonstrated the same GV and because they developed in the following days a moderate hyperglycemia too becoming the 2 groups overlapped.

0162

COMPARISON OF THE OUTCOMES IN TWO SIMILAR GROUPS OF TBI PATIENTS TREATED ON THE BASE ICP/CPP PROTOCOL VERSUS PATIENTS TREATED ON THE BASE OF AUTOREGULATION PROTOCOL WITH THE SUPPORT OF EVALUATION OF VASCULAR AUTOREGULATION USING PRX INDEX

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OBJECTIVES. Evaluate usefulness of Prx index monitoring.

METHODS. In this study included 40 patients with TBI admitted from 2001 till 2002 treated by the ICP/CPP protocol (group 1) and 40 patients with TBI admitted from 2007 till 2009 treated on the base of Autoregulation protocol with the support of evaluation of vascular autoregulation using Prx index (group 2). Both groups GCS 4–8 at admission Target values in the 1 group were ICP <20, CPP >70 mmHg, in the 2 group ICP <20, CPP 50–70 mmHg, and CPP >70 if autoregulation was preserved. If Prx >0.2 target CPP was 50–60 mmHg. If Prx <0.2 target CPP was >70 mmHg. If Prx from 0 to 0.2 we tried to optimize CPP in the safe interval (ICP <20 mmHg)
In case of autoregulation failure and increase intracranial hypertension we performed decompressive craniectomy. Outcome evaluated after 12 months (Tables 1, 2).

TABLE 1 CHARACTERISTICS OF THE GROUPS

Patients	Group 1 (ICP/CPP-protocol) N = 40	Group 2 (autoregulation protocol) N = 40
Age	27 ± 11	31 ± 11
Female/male	10:40	9:40
GCS	5.6 ± 1.3	5.7 ± 1.4
Marshall I	3	5
Marshall II	16	16
Marshall III	15	15
Marshall IV	6	4
Removed hematomas (epi-subdural, intracerebral)	15 (38%)	11 (28%)
Decompression	3 (7.5%)	14 (35%)

RESULTS.

TABLE 2 RESULTS AND OUTCOMES IN GROUPS

Patients	ICP/CPP protocol N = 40	Autoregulation protocol N = 40
ICP (mmHg)	15.2 ± 5.5	14.8 ± 6.8
Patients with ICP >30 (mmHg)	16 (40%)	10 (25%)
Patients with second tier therapy	13 (33%)	7 (18%)
GOS 1 (death)	3	2
GOS 2 (vegitative)	8	4
GOS 3 (severe disability)	10	9
GOS 4 (moderate disability)	11	12
GOS 5 (good recovery)	8	13

In the 2 group we got more favorable outcomes (62%) that in 1 group (47%) and less vegetative status 4 (10%) versus 8 (20%).

CONCLUSIONS. Less unfavorable results in autoregulation-protocol group. Trend is positive but statistically non significant. Further investigations are needed.

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0163

INCIDENCE, SEVERITY AND TIME COURSE OF EARLY HAEMOSTATIC DEFECTS IN CRITICALLY ILL PATIENTS WITH TRAUMATIC BRAIN INJURY

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INTRODUCTION. Early coagulopathy and thrombocytopenia have been related to worse outcome in patients with traumatic brain injury (TBI) [1], but their reported incidence and severity vary considerably [2].

OBJECTIVES. This retrospective study aims to describe the incidence, severity, and time course of early coagulation disorders and thrombocytopenia in patients with TBI admitted in a Neurocritical Care Unit.

METHODS. We studied n = 97 patients admitted with TBI in a calendar year (2010). Exclusion criteria were age <17, previous use of anticoagulants, known liver failure, active malignancy under treatment, known haematological disease affecting coagulation or platelet number or function. Coagulopathy was defined as an activated partial thromboplastin time (aPTT) >33.8 s, or prothrombin time (PT) >12.6 s, or platelet count $<150 \times 10^9$/L. We further characterised coagulopathy as severe if aPTT >50 s, or PT >16 s, or platelet count $<100 \times 10^9$/L, and as mild otherwise.

RESULTS. The mean age of this population was 46.9 years (range 17–90 years), 68% of the patients were male. The median Glasgow Coma Score was 8 (range 3–15). The average length of stay in the unit was 11.2 days (range 1–45 days). Sixty percent of the patients had severe TBI (GCS pre-intubation ≤8), and 53.6% had injury confined to the head. The incidence of coagulopathy was 46.3% on admission to the Unit, and 83.5% of patients went on to develop coagulopathy within 72 h. The incidence of severe coagulopathy was 8.2 and 32% at these time points, respectively. In 97.9% of the patients their worst coagulation status during the first 3 days post admission had been recorded by day 2.

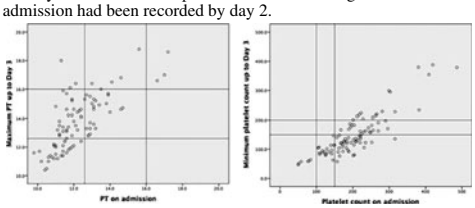

Fig. 1

CONCLUSIONS. Early and delayed coagulopathy are very common in TBI, and mandate the requirement for close monitoring of haemostatic status. The majority of patients develops and maintains a mild coagulopathy, but a significant percentage progress to develop severe derangements of clotting times and/or platelet count. The risks and benefits of earlier correction of haemostatic abnormalities in this patient group needs to be investigated.

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0164

CEREBRAL BLOOD FLOW BY THERMAL DIFFUSION IN SEVERE TRAUMATIC BRAIN INJURY. CORRELATION WITH NEUROMONITORING AND PROGNOSTIC IMPLICATIONS

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INTRODUCTION. Loss of cerebral autoregulation often occurs after severe traumatic brain injury (TBI). The ability to assess cerebral autoregulation in patients with severe TBI at bedside by means of a simple clinical test is an important goal that could potentially influence clinical care [1]. The Hemedex cerebral perfusion monitor uses the termal difusión technique to measure local cerebral blood flow (CBF) [2, 3].

OBJECTIVES. Determine the correlation between continuous monitoring CBF by thermal diffusion and multimodal neuromonitoring as well as a prognostic factor.

METHODS. Prospective study, no randomized, observational in a surgical intensive care unit in a main university hospital. After the study was approved by the Ethics Committee of our hospital and written informed consent was obtained from the patients, five patients were included. All patients were diagnosed with severe TBI receiving advanced neuromonitoring:

- Intracranial pressure (ICP)
- Brain tissue oxygen (PtiO2)
- Bispectral index (BIS)
- Mean arterial pressure (MAP)
- Central temperature (central T^a)
- Cerebral perfusion pressure (CPP)

The values obtained were collected for statistical graphing and then were correlated with their neurological status. The statistical analysis used for the study was Pearson correlation coefficient, p bilateral, for bivariate correlation.

RESULTS. According to the CBF results showed statistically significant correlation with ICP ($r = 0.370$, $p < 0.01$) and the central T^a ($r = 0.346$, $p < 0.01$). We have observed a poor statistical correlation of CBF with PtiO2 ($r = -0.87$, $p > 0.05$), BIS ($r = 0.127$, $p > 0.05$), MAP ($r = 0.215$, $p > 0.05$), CPP ($r = 0.048$, $p > 0.05$).
Regarding the prognostic factor exists a striking relationship between baseline CBF in the first 4 h with the Glasgow Outcome Score (GOS) at 3 months after TBI. In three of the patients in our study, CBF was> 20 mL/100 g/min (considered normal) and was associated with a GOS of 4–5, that means, good–excellent functional status. In the other 2 patients the CBF was <20 mL/100 g/min, lower limit of normal, and was associated with GOS 3, that means, moderate impairment of functional status. The last patient was associated with GOS 1, diagnosed with brain death at 36 h after admission, showed values of CBF <5 mL/100 g/min from the start. The mortality of five patients was 20%.

CONCLUSIONS. In our observational study of non-intervention with a very small sample size, we observed a good correlation between CBF and ICP (Gold standard) as well as the central temperature. On the other hand, presents an excellent prognostic value in patients with severe TBI. As a newly added device in neurocritical care unit further studies are needed to establish the role of CBF measurement by thermodilution in multimodal neuromonitoring.

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0165

ACUTE CARE FACTORS, INJURY CHARACTERISTICS AND OUTCOMES OF ELDERLY ADULTS FOLLOWING HEAD INJURY

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INTRODUCTION. As the population ages, the elderly will constitute a prominent proportion of trauma patients. The elderly suffer more severe consequences from traumatic brain injuries (TBI) compared to the young individuals, which presumably results in increased healthcare resource use.

OBJECTIVES. Aim of the study was to identify the differences in acute care factors, injury characteristics and outcomes in TBI patients, on the basis of age.

METHODS. A prospective study enrolling 276 consecutive patients (236 males/40 females) with TBI (associated or not with multiple trauma), admitted in our ICU. Acute care factors such as preadmission clinical data (hypoxia, hypotension, GCS, pupils size and reactivity), acute physiological disturbance (APACHE II-24h, SOFA), duration of mechanical ventilation and ICU stay and severity of injury (RTS, ISS and CT scan grade) were analyzed for two age groups (<65 and ≥65 years). Outcomes included functional outcome (GOS) and mortality upon ICU discharge. Data were analyzed by independent *T* test, Mann–Whitney test, logistic regression and χ^2 analysis.

RESULTS. Acute care factors and injury characteristics are presented in Table.

TABLE

Variable	Group < 65 years (n 233)	Group ≥65 years (n 43)	p value
Hypotension	27.2%	18.3%	0.233
Hypoxia	29.1%	25%	0.442
Pupils on site (abnormal)	24.7%	20.8%	0.889
GCS on site	9.7 ± 4.2	9.4 ± 3.8	0.638
APACHE II	14.3 ± 6.7	20.7 ± 5.6	0.000
SOFA	3.9 ± 2.7	5.2 ± 3.1	0.080
RTS	4.4 ± 2.7	3.9 ± 2.9	0.480
ISS	27.8 ± 12	28.5 ± 9.3	0.638
CT scan grade >3	65.2%	83.3%	0.058

Length of mechanical ventilation and ICU stay was significantly prolonged in the group of elderly patients (<65 years: 8.4 ± 9.1 vs. ≥65 years: 16.4 ± 15.5 days, $p < 0.004$ and <65 years: 11.4 ± 12.7 vs. ≥65 years: 20.3 ± 18.8 days, $p < 0.007$, respectively). A worse functional outcome (OR 4.49, CI 2.28–8.84, $p < 0.001$) and a twofold increased mortality risk (OR 2.19, CI 1.07–4.51, $p < 0.028$) was confirmed for elderly TBI patients than the younger ones.

CONCLUSIONS. Elderly patients sustaining TBI are at an increased risk of adverse functional outcome and mortality relative to their younger counterparts and tend to die later following their ICU admission. This could be attributed mainly to diminished physiological reserve, which weakens the ability of elderly individuals to respond to a traumatic insult, while injury characteristics are alike among the age based groups. These findings suggest opportunities for improving geriatric trauma care that could lead to better outcomes.

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0166

NEUROLOGIC PROGNOSIS IN COMATOSE TRAUMATIC BRAIN INJURY PATIENTS—A MULTIDISCIPLINARY SURVEY: THE NEUROIMAGING TO PREDICT COMA EMERGENCE AND RECOVERY (NICER) STUDY

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INTRODUCTION. Outcome prediction is acknowledged as a major challenge in the care of patients with severe traumatic brain injury (TBI), yet the views and practices of medical professionals in regards to TBI prognosis are not well understood.

OBJECTIVES. This survey was undertaken to assess these views, specifically in reference to comatose TBI patients.

METHODS. We conducted a cross-sectional survey using a multiple-choice Web-based instrument that was distributed to the members of the Neurocritical Care Society and to 253 neurosurgeons at academic medical centers who care for TBI patients.

RESULTS. There were 333 respondents; of whom 90% were physicians. Neurology was the most common primary specialty (41%), followed by neurosurgery (29%), anesthesiology (13%) internal medicine (9%) and surgery (2%). Neurocritical care was the most common subspecialty (50%) and respondents had a wide range of clinical experience. When asked which was the best method to quantify injury severity, a majority of respondents cited the clinical neurologic exam (72%), followed by brain MRI (18%), and EEG (5%). In response to the question of when is the earliest time at which long-term outcome prediction could be made, 73% responded within the first 4 weeks after injury. Twenty-three percent of respondents felt post-TBI outcomes can be deemed permanent no earlier than 6 months after injury, while 41% believed this to be the case only at 12 months. When asked to identify the most important milestones for functional recovery, 53% of respondents chose the ability to follow commands, while 19% chose the recovery of reliable communication. A false negative rate of ≤1% was the highest acceptable for a test to predict good outcome for 40% of respondents, while 43% cited a false positive rate of ≤1% as the highest acceptable for a test to predict poor outcome. More than half of respondents (55%) reported obtaining a brain MRI acutely in half or fewer of their severe TBI patients. MRIs are obtained to detect lesions not identified by other means (50%), to help predict prognosis (26%) and to better characterize known injuries (23%). Trainees were more likely to order MRIs for severe TBI than respondents with greater experience.

CONCLUSIONS. In this sample of medical professionals with experience in neurocritical care, the clinical neurologic exam is considered the best indicator of TBI severity, while only a minority believed that brain MRI fulfilled this role. MRI is used by most respondents in a minority of TBI patients and is favored more by physicians in training. Given the rich possibilities of MRI in identifying and characterizing anatomical and functional changes in the brain, these results indicate that brain MRI may be an underutilized resource in TBI management.

0167

ROTATION THROMBOELASTOMETRY (ROTEM®) PARAMETERS EVOLUTION PATTERN IN SEVERE TRAUMATIC BRAIN INJURY (TBI)

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INTRODUCTION. 30–40% of severe TBI have an acute coagulopathy playing a major role on hemorrhage progression and mortality [1]. There is also a high risk of thromboembolic events [2] due to the obvious prohibition to preventive anticoagulation in acute TBI. Pathophysiology and kinetics of this acute coagulopathy are complex and unrecognized, partly because of usual hemostasis assays limits. An overall coagulation status may be given by ROTEM® in addition to routine coagulation parameters.

OBJECTIVES. Our primary end-point was to characterize the evolution of usual assays and ROTEM parameters after a severe TBI, more particularly time course of occurrence of an hypercoagulable state, defined as Maximal Clot Firmness (MCF EXTEM) >73 mm or fibrinogen level >5 g/l [3].

METHODS. This is a prospective, observational study, approved by the institutional review board. Inclusion criteria were recent (<8 h) isolated (non-head AIS <3) TBI with Glasgow score at admission (GCS) <9 or brain CT scan TCDB score 2–6 and pathological transcranial doppler (diastolic velocity <20 cm/s, pulsatility index >1.25). Exclusion criteria were previous coagulopathy, hemorragic shock or devastating neurologic injury. ROTEM measurements (Clot Formation Time CFT, Clot Firmness at 10 min A10, and 15 min A15 and Maximal MCF) and standard biological analysis (PT, aPPT, fibrinogen and platelet level) were performed at H0, H12, H24, D7 and D14. Statistical analysis (median 25–75 percentiles) were performed with Cuzik test.

RESULTS. 27 patients (24 M and 3 F) were included (age = 35 ± 13 years, GCSi = 8 ± 3, ISS = 19 ± 10, SAPS2 = 40 ± 11). We noticed diminution of clot formation time, and increase of clot firmness from admission to D14 ($p < 0,001$). Biological parameters showed an increase of platelet count and fibrinogen level ($p < 0.001$) (Table 1). Hypercoagulable state was found on 1/27 patients at H0 versus 13/18 at D7, and 14/16 at D14. No significant association was observed with thromboembolic events occurence, neither with anticoagulant treatment.

TABLE 1

	H0 (n=27)	D7 (n=18)	D14 (n=16)	p-value
Platelets (G/l)	201 [162; 250]	272 [186; 323]	499 [323; 676]	≤0.001
Fibrinogen (g/l)	2 [1.7; 2.5]	7.4[6.5; 9.5]	6.8 [5; 8.9]	≤0.001
A15 EXTEM	50 [46; 54]	71 [68; 75]	78 [72; 80]	≤0.001
MCF EXTEM	56 [52; 60]	74 [71; 77]	79 [76; 81]	≤0.001
A15 INTEM	57 [53; 60]	73 [71; 77]	78 [66.5; 82]	≤0.001
CFT INTEM	90 [79; 120]	56 [42; 72]	45 [34; 53]	≤0.001
A10 FIBTEM	7 [5.5; 9]	29.5 [22; 31]	24.5 [19; 36]	≤0.001

CONCLUSIONS. Our study showed that ROTEM appears as a valuable complement of hemostasis standard analysis in TBI. It showed significant changes in coagulation pattern over time, and a trend to pro-coagulable status during the first 2 weeks. Yet relationship with significant occurrence of thromboembolic events remains unclear.

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GRANT ACKNOWLEDGMENT. TEM international, LFB.

0168

ANALYSIS OF CARDIOPULMONARY FUNCTION AFTER SEVERE HEAD INJURY

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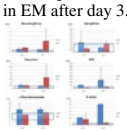
INTRODUCTION. Volume management is crucial in intensive care, however, in some patients it is very hard to achieve optimal water balance. Severe head injury (SHI, GCS ≤8) patient is a representative example. Cardiopulmonary complications are common after SHI: neurogenic pulmonary edema, cardiac failure, and so on. We have started the controlled trial about cardiopulmonary function after SHI.

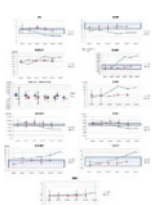
OBJECTIVES. We describe herein a trial of minimally invasive PiCCO Plus monitoring of cardiopulmonary function after SHI.

METHODS. We have analyzed the cardiopulmonary functions of 12 patients after SHI by PiCCO Plus monitoring over a period of a weeks

RESULTS. CT scan on arrival revealed diffuse injury (DI) in five patients and evacuated mass lesion (EM) in seven patients. Endogenous catecholamines were elevated in DI at day 7. BNP was higher in EM than in DI during the entire study period. D-dimer was elevated in EM at day 7. EM showed low cardiac index and global ejection fraction and high mean arterial pressure and systemic vessel resistance index after day 3. CVP was high but global endodiastolic index was low in EM after day 3. Extravascular lung water index was high accompanied with high pulmonary vessel permeability index in EM after day 3.



Endogenous vasoactive substances



PiCCO measurements

CONCLUSIONS. EM showed afterload mismatch like circulatory characteristics after day 3. This circulatory feature brought about cardiogenic and inflammatory pulmonary edema. Therapeutic strategy of pulmonary edema after EM should not reduce the blood volume but lower the blood pressure with cardiac support.

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GRANT ACKNOWLEDGMENT. The General Insurance Association of Japan

0169

LUNG PROTECTIVE VENTILATION IS ROUTINELY FEASIBLE IN TRAUMATIC BRAIN INJURY (TBI) PATIENTS

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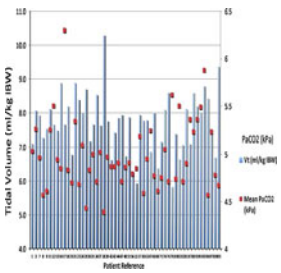
INTRODUCTION. Recently it has been suggested that ventilating patients who are brain stem dead post TBI at tidal volumes (Vt) of 6–8 ml/kg rather than 10–12 ml/kg is associated with less lung injury and potentially improves the lung donor pool [1]. As we do not know at presentation which TBI patients may become BSD it could be argued that all TBI patients should be ventilated at 6–8 ml/kg as a standard of care.

OBJECTIVES. To assess what proportion of ventilated TBI patients in our NICU were ventilated at Vt of 6–8 ml/kg ideal body weigh (IBW).

METHODS. 100 consecutive TBI patients' prospectively collected electronic records were retrospectively reviewed from our clinical information system. For those receiving SIMV for >24 h their IBW was calculated using the ARDSNet formula [2] and their average daily Vt in ml/kg IBW, $PaCO_2$, ICP and lowest PaO_2/FiO_2 ratio were calculated.

RESULTS. 54 patients were ventilated for >24 h. 1 patient did not have their height measured therefore data is presented on 53 TBI patients who were ventilated for >24 h and IBW could be calculated. They were ventilated for a mean of 4.6 days, 50/53 had ICP monitoring, their median pre-sedation GCS was 7 (IQR 5–10) and 9/53 died on ICU (17%). 64.2% were ventilated with Vt <8 ml/kg IBW and only two patients were ventilated with Vt >9 ml/kg IBW. 32 patients developed arterial blood gases (ABG) consistent with ALI and 17 of these were consistent with ARDS.

Vt <8 ml/kg IBW n (%)	Vt 8–9 ml/kg IBW n (%)	Vt >9 ml/kg IBW n (%)	Pre sedation GCS Median (IQR)	ICP (mmHg) Median (IQR)	$EtCO_2$ (kPa) Median (IQR)	PaO_2/FiO_2 <39.9 kPa n (%)	PaO2/FiO2 <26.6 kPa n (%)
34 (64.2%)	17 (32%)	2 (3.8%)	7 (5–10)	13 (8–15)	4.9 (4.7–5.2)	32 (60.3%)	17 (37.1%)



Vt IBW

CONCLUSIONS. Our NICU is able to ventilate 95% of its TBI patients at tidal volumes <9 ml/kg ideal body weight with the majority of patients at <8 ml/kg. A significant number of TBI patients develop ABG suggestive of acute lung injury where using larger Vt may be injurious. We have shown it is possible to routinely ventilate TBI patients at lower than 'traditional' tidal volumes without significant ICP management problems and encourage others to consider adopting this approach.

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0170

IMPACT OF NON-NEUROLOGICAL COMPLICATIONS ON MORTALITY IN SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTION. Severe Traumatic Brain Injury (TBI) mortality and morbidity is frequently caused by the neurological consequences of the brain injury. Nevertheless, non-neurological complications are also frequent. A better knowledge of the incidence, causes and consequences of non-neurological complications in patients with severe TBI would help in their prevention and treatment.

OBJECTIVES. A better knowledge of the incidence, causes and consequences of non-neurological complications in patients with severe TBI would help in their prevention and treatment.

METHODS. Cohort study, in one multidisciplinary intensive care unit of a university hospital (35 beds). 224 consecutive adult patients with severe TBI (initial Glasgow Coma Scale (GCS) <9) admitted to the ICU were included. Neurological and non-neurological variables were recorded.

RESULTS. Sepsis occurred in 75% of patients, respiratory infections in 68%, hypotension in 44%, severe respiratory failure (PaO_2/FiO_2 <200) in 41% and acute kidney injury (AKI) in 8%. The multivariate analysis showed that GOS at 1 year was independently associated with age, initial GCS 3–5, worst TCDB first CT scan and presence of intracranial hypertension, not AKI; and, ICU mortality was independently associated with initial GSC 3–5, worst Traumatic Coma Data Bank (TCDB) first Computed Tomography (CT) scan, presence of intracranial hypertension and AKI. Presence of AKI regardless of GCS multiplied risk of death 6.17 times ($p < 0.02$), whilst ICU hypotension increased the risk of death in patients with initial scores of 3–5 on the GCS 4.28 times ($p < 0.05$).

CONCLUSIONS. Low initial GCS, worst first CT scan, intracranial hypertension and acute kidney injury determined mortality in severe TBI patients. Besides the direct effect of low GCS on mortality, this neurological condition also is associated with ICU hypotension which increases mortality among patients with severe TBI.

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0171

EVALUATION OF FIBRINOGENIC FUNCTION IN ACUTE TRAUMATIC BRAIN INJURY (TBI)

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INTRODUCTION. Hemostatic disorders are frequent during the acute stage of TBI and linked to poor neurological prognosis [1, 2].

OBJECTIVES. Fibrinogenic function (evaluated with fibrinogen plasmatic level and quality of clot firmness in thromboelastometry) has not been studied in this settings [3].

METHODS. The study was approved by institutional review board. Twenty patients with TBI without severe extra neurological lesions were included (19M/1F, age 31 ± 9, GCS 8 ± 3, ISS 20 ± 11, SAPS2 37 ± 12). None of those patients had hemostatic disease nor treatment before. Fibrinogenic function was assessed with fibrinogen concentration (Clauss method) and with thromboelastometry (ROTEM® TEM international, maximal clot firmness MCF FIBTEM and clot firmness at 10 min A10 FIBTEM) during the first 24 h after admission (H0, H12, H24). All patients had brain CT scan on admission. Neither fibrinogen, platelet concentrates nor FFP were given during this period. Two groups of patients were identified: one with severe brain injuries defined as intracranial hypertension (ICP >20 mmHg) and/or severe lesions on CT scan (TCDB III–VI), and one less severely injured (TCDB I–II, without intracranial hypertension). Statistical analysis (median 25–75 percentiles) were performed with Spearman coefficient, Mann–Whitney test and ANOVA.

RESULTS. 9 patients admitted for TBI with severe radiological lesions were compared with 11 patients less severely injured. The two groups were similar (age, GCS at admission, ISS and SAPS2). A significant difference was observed in A10 FIBTEM and MCF FIBTEM at H12 (Table 1). Fibrinogen plasma level and FIBTEM parameters increased during the first 24 h. There was a good correlation between fibrinogen concentration and thromboelastometric values ($r = 0.84$; $p < 0.01$).

TABLE 1

	TCDB I–II (n = 9)	TCDB III–VI/ICHT (n = 11)	p
Age (years)	30 [27; 33]	27 [26; 31]	0.25
GCS at admission	7 [7; 8]	8 [6; 11]	0.42
ISS	9 [9; 27]	25 [18; 32]	0.19
SAPS 2	32 [29; 44]	41 [26; 45]	0.76
FIBTEM A10 H12 (mm)	11 [10; 13]	7 [5; 10]	0.04
FIBTEM MCF H12 (mm)	11 [10; 14]	8 [5; 10]	0.04
Fibrinogen H12 (g/L)	2.7 [2.5; 3.1]	2.5 [2.4; 2.9]	0.36

CONCLUSIONS. Thromboelastometry, as a point-of-care device, allows early evaluation of fibrinogenic function in TBI. ROTEM parameters are linked with TBI severity, attesting massive discharge of tissular factor and consumption coagulopathy. Fibrinogen's role in hemostatic disorders treatment has to be defined.

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GRANT ACKNOWLEDGEMENT: LFB, TEM international.

0172

INFLUENCE OF COAGULOPATHY IN MORTALITY OF PATIENTS WITH ISOLATED TRAUMATIC BRAIN INJURY (TBI)

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INTRODUCTION. Several studies have shown the relevance of post-traumatic coagulopathy as a prognostic factor in patients with isolated TBI. Coagulopathy may contribute to clinical worsening by promoting secondary injury.

OBJECTIVES. To access the effect of coagulopathy in the mortality of patients with isolated TBI admitted in an intensive care unit (ICU).

METHODS. Observational study in patients admitted with isolated TBI between January 2009 and February 2011. Post-traumatic coagulopathy was defined as: aPTT >40 s, INR >1.2 or platelet count <120,000/dL. Patients with previous known coagulopathy and on coumarin use were excluded. Parameters analyzed were: age, sex, Glasgow coma score (GCS), APACHEII, SAPSII, aPTT, INR, platelet count, hemoglobin, hematocrit, glucose, pH, ionized calcium and lactate levels at admission and after 48 h. Mortality, in the ICU and at 28th day, was assessed. Data was analyzed using SPSS 16.0.

RESULTS. 48 patients were included, 77.1% were male, the average age was 45.9 ± 16.2 years. Initial GCS was 7 ± 4, APACHEII and SAPSII were 26 ± 12 and 48 ± 15, respectively. Coagulopathy was verified in 43.8% of patients at admission (defined by INR elevation in 39.6%, aPTT increase in 4.2%, and decrease in platelet count in 22.9%) and 61.7% at 48 h (INR elevation in 37.5%, aPTT increase in 16.7%, and decrease in platelet count in 41.7%). Mortality rate in the ICU was 45.8% and at 28th day was 47.9%. Mortality was significantly higher in patients with lower GCS ($p = 0.004$), higher APACHEII ($p = 0.026$) and coagulopathy at 48 h ($p = 0.007$).

CONCLUSIONS. As in previous studies, a worse outcome was observed in patients who developed coagulopathy at 48 h. Mortality was not correlated to coagulopathy on admission. These data reinforce the need to access and correct coagulopathy promptly in patients with isolated TBI.

0173

HYPERTONIC SALINE AND HEAD INJURY: TRENDS OF USE IN ADULT INTENSIVE CARE UNITS IN THE UNITED KINGDOM

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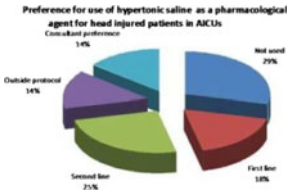
INTRODUCTION. The recent advance of hypertonic saline for raised intracranial pressure has provided an alternative to the long-used drug mannitol. Hypertonic saline's role has yet to be fully established [1, 2].

OBJECTIVE. A survey was conducted to establish the pattern of current practice within the UK.

METHODS. Neurosurgical units were identified from an association website [3] and contacted by telephone and asked to complete a short standardised questionnaire about their local practice with hypertonic saline.



Preference for use of hypertonic saline

RESULTS. Of the 28 units for which data were obtained, 19 used a standardised protocol for managing head-injured patients. 71% of units used hypertonic saline in head injured patients; however, its role varied from first-line pharmacological intervention to use only for otherwise intractable cases. 15% of units used it only in the first 48 h, whilst the majority used it beyond this time-frame. 50% of units that used hypertonic saline mandatorily used intracranial pressure monitoring whilst administering the drug; practice was variable at the remaining centres. Few units appeared to have set numerical values for use or discontinuation, with the impression given that on most units relying on global assessment of the patient's clinical, physiological and biochemical parameters to guide ongoing treatment.

DISCUSSION. We conclude that there is very variable practice in the use of hypertonic saline between and sometimes within neurosurgical centres, and speculate this derives from the current paucity of large-scale trials, in comparison to mannitol, and its use in longer term (over 48 h) [1, 2, 4]. We would support calls for better trial evidence to clarify the role of hypertonic saline in head injured patients.

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0174

CORRELATION BETWEEN SYSTEMIC HEMODYNAMICS AND CEREBRAL OXYGENATION AND METABOLISM IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

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INTRODUCTIONS. Cerebral perfusion pressure (CPP) and cardiac index (CI) determine cerebral blood flow in patients (pts) with intracranial hemorrhage. To maintain target values of CPP is one of the main goals of intensive care in pts with severe traumatic brain injury (TBI). But correlation between systemic hemodynamic parameters and cerebral oxygenation and metabolism is still unclear.

OBJECTIVES. To determine correlation between systemic hemodynamic parameters and cerebral oxygenation and metabolism in patients with severe TBI.

METHODS. Five male pts with severe TBI were enrolled in the study (age, 39.6 ± 14.7; Glasgow Coma Scale, 4–8). Cerebral microdialysis, monitoring of systemic hemodynamics (PiCCO) and intracranial pressure (ICP) were used in all pts. Brain oxygen tension ($PbrO_2$) (Licox) was estimated in 3 pts. Microdialysis catheters and $PbrO_2$ probes were placed into "lesioned" (penumbra zone) and "intact" brain tissue. We determined correlation between systemic hemodynamic parameters (CI, oxygen delivery index (DO_2I), CPP, systemic vascular resistance index (SVRI)) and cerebral oxygenation and metabolism ($PbrO_2$, glucose levels and lactate/pyruvate (L/P) ratio in brain interstitial fluid).

RESULTS. We did not find any significant correlation between CI, DO_2I and cerebral oxygenation and metabolism. We found out moderate inverse correlation between CPP and glucose levels in "intact" brain tissue ($n = 59$; $r = -0.3$; $p = 0.02$), between CPP and L/P ratio in "intact" brain tissue ($n = 49$; $r = -0.36$; $p = 0.01$) and between CPP and L/P ratio in "lesioned" brain tissue ($n = 49$; $r = -0.31$; $p = 0.03$). The lowest L/P ratio values in "intact" and "lesioned" brain tissue were registered at CPP >80 mmHg. We found out moderate correlation between SVRI and $PbrO_2$ in "lesioned" brain tissue ($n = 46$; $r = 0.3$; $p = 0.045$). The lowest L/P ratio values in "intact" and "lesioned" brain tissue were measured at SVRI 1,200–2,000 dynes × s × sm^{-5}/m^2.

CONCLUSIONS. The main systemic hemodynamic parameters which determine cerebral oxygenation and metabolism in patients with severe TBI are CPP and SVRI. It is necessary to maintain target values of CPP >80 mmHg and SVRI 1,200–2,000 dynes × s × sm^{-5}/m^2.

Emergency medicine: 0175–0183

0175

ANALYSIS OF RECOMBINANT ACTIVATED FACTOR VII USAGE FOR BLEEDING CONTROL IN CASES OF HEMORRHAGIC SHOCK

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INTRODUCTION. Recombinant activated factor VII (rFVIIa, Novoseven®) is approved for the treatment of bleeding episodes in patients with congenital hemophilia and inhibitors of factor VIII or IX, and Glanzmann thrombasthenia. However, in the absence of efficacy and safety data from randomized trials, the usage of rFVII for unlabeled purpose is limited. There were a few case reports for bleeding control in patients with hemorrhagic shock.

OBJECTIVES. We retrospectively reviewed patients with hemorrhagic shock who received rFVIIa to evaluate the efficacy and safety.

METHODS. We reviewed a total of 28 cases in which rFVIIa was used in 2010, in Seoul Asan Medical Center in Korea. Demographics, laboratory data, amount of transfusion were reviewed. The primary end point for bleeding control was units of RBC transfused within 24 h of the first dose.

RESULTS. Among a total of 36 cases from medical and surgical ICU, 28 cases were included for analysis. The mean age of the patients was 56 years (range 34–85 years) and 16 cases were male and the other 12 cases were female. rFVIIa was applied for postoperative bleeding in 15 cases, disseminated intravascular coagulopathy associated with sepsis in 9 cases, and gastrointestinal bleeding in 4 cases. The mean APACHE II score was 25.5. 19 cases (67.9%) received single dose (mean = 60.6 μg/kg), 6 cases received 2 doses, and the remaining 3 cases received more than 3 doses. After administration of rFVIIa, hematologic profile was improved and the need for transfusion was reduced compared with the 24 h prior to rFVIIa administration: the mean number of units of packed red blood cells required decreased from 10.46 U (range 0–35) to 7.95 U (range 0–22) ($p = 0.166$) and the mean number of units of fresh frozen plasma required decreased from 9.37 U (range 0–34) to 8.16 U (range 0–30) ($p = 0.542$). The mean hemoglobin was increased to 10.4 from 9.4 g/dL ($p = 0.045$). The mean platelet count was also increased to 80.8×10^3 from $73.68 \times 10^3/mm^3$ ($P = 0.325$). Prothrombin time was improved from 1.80 (INR) to 1.47 ($p = 0.032$). After administration of rFVIIa, brain infarction was found in four cases (14.3%). Three of the cases were associated with cardiovascular surgery, and one was associated with postpartum bleeding.

CONCLUSIONS. Recombinant activated factor VII for bleeding control in patients with hemorrhagic shock showed improvement of hemoglobin level and prothrombin time. Thromboembolic events were observed occasionally.

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0176

PREVENTION OF CONTRAST INDUCED NEPHROPATHY (CIN) BY N-ACETYLCYSTEIN (NAC) : DIFFERENT DEFINITIONS, DIFFERENT RESULTS

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INTRODUCTION. The use of NAC for the prevention of CIN is still debated; no data is available for ICU patients. The effectiveness of NAC could depend on the marker used to define CIN. The aim of our cohort study was to evaluate the incidence of CIN with or without the use of NAC using different definitions and markers of renal function.

METHODS. In a first period we prospectively enrolled patients receiving iodine contrast for examination in two ICUs, in one oral NAC was always used while it was never used in the other; saline hydration and low osmolality contrast media were always used in both ICUs. CIN was defined as either an increase in creatinine (creat) ≥0.3 or ≥0.5 mg/l (classical definition) or >25% with or without the association of the urinary output criteria (UO <0.5 ml/kg/h >6h). In a second period, we compared the evolution of Creat and Cystatine C (Cys C) concentration before and 48–72 h after 40 additional examinations with NAC.

RESULTS. Seventy exams with iodine contrast were included in each ICU. Patients were similar in the two ICUs at admission and at contrast injection for risk factors of CIN and severity. Hydration and volume of contrast were similar. Using classical definition, the global incidence of CIN was 11%. This incidence depended on the definition used (figure). Adding the UO criteria significantly increased the incidence of CIN in the NAC group. NAC was associated with a reduction of CIN only when using an increase in creat ≥0.3 mg/L without UO criteria (9 vs. 21%, $p = 0.03$). In the second period the creat significantly decreased from 1.15 (0.87–1.42) to 0.97 (0.75–1.20) mg/l, $p = 0.03$ after contrast with NAC while Cys C remained stable: 1.34 (1.05–1.94) versus 1.23 (0.94–1.77) mg/l, $p = 0.46$.

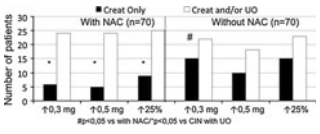

Fig. 1

DISCUSSION. Effectiveness of NAC to prevent CIN in ICU patients depends on the definition used. Adding the UO criteria increased the incidence of CIN using NAC. The discordant evolution between Cys C and creat suggests that creat alone is a poor marker of renal function in presence of NAC.

0177

CAN DAILY FOUR SCORE ASSESSED AT DAY 3 REPLACE DETAILED NEUROLOGICAL ASSESSMENT TO PREDICT OUT-OF-HOSPITAL CARDIAC ARREST OUTCOME?

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INTRODUCTION. Out-of-hospital cardiac arrest (OHCA) is an important cause of mortality. Furthermore, more than 50% of survivors will have long-term neurological impairment. The neurological examination remains the basis of the outcome assessment. According to most studies, the main predictors of poor outcome are motor response no better than extension, absent pupillary or corneal reflexes at day 3 and presence of myoclonus status epilepticus. Recently, a new coma scale, The Full Outline of Unresponsiveness (FOUR) score has been proposed. Here, we study the prognostic value of the FOUR score in OHCA.

OBJECTIVES. To determine the prognostic value of the FOUR score in OHCA.

METHODS. All the patients admitted for OHCA from January 2009 to May 2011, excluding those with history of previous neurological disease or do-not-resuscitate order, were included. Daily determination of motor response, pupillary and corneal reflexes, GCS and FOUR score were performed from day 1 to day 7. The Glasgow-Pittsburgh Cerebral Performance Categories scale (GP-CPC) at ICU discharge was used to assess neurological outcome. We compared patients with good neurological outcome (GP-CPC 1 and 2) to patients with poor outcome (GP-CPC from 3 to 5). Univariate comparisons were performed. A multivariate logistic regression was used to determine factors implicated in the prognosis of OHCA. The ROC curves were used to compare the prediction value for poor outcome of FOUR score at day 3, of GCS at day 3, of absent pupillary or corneal reflexes, or absent or extensor motor responses at day 3, and of absent pupillary or corneal reflexes, or absent or extensor motor responses at day 3 or myoclonus status epilepticus within the first day.

RESULTS. 72 patients were included. They were 60 ± 2 year-old. 22% had finally a good neurological outcome and 78% had a poor neurological outcome. In univariate analysis, poor neurological outcome was associated to higher age, to higher cumulative dose of epinephrine, to higher low-flow, to lower mean daily GCS and mean daily FOUR scores from day 1 to 7, to absence of motor response better than extension, papillary and corneal reflexes from day 1 to 7. In multivariate analysis, higher age (OR = 0.3/year increase), FOUR score at day 3 (OR = 8e+9 per point increase), absence of motor response better than extension at day 3 and myoclonus status epilepticus were associated to poor neurological outcome. Area under the ROC curve for predicting poor outcome of FOUR score at day 3, GCS at day 3, absent pupillary or corneal reflexes, absent or extensor motor responses at day 3 or myoclonus status epilepticus at day 1 are, respectively, 0.82; 0.74; 0.8; 0.85; 0.79 and 0.58.

CONCLUSIONS. FOUR score at day 3 is able to predict poor neurological outcome in OHCA. Further investigations are needed to include cerebral imaging, biochemical markers and neurophysiological testing.

0178

ROLE OF HYPERBARIC OXYGEN THERAPY IN CRITICALLY ILL PATIENTS: OUR EXPERIENCE IN A UNIVERSITY GENERAL HOSPITAL

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INTRODUCTION. Hyperbaric oxygen (HBO) therapy has been traditionally used as a routine adjuvant tool for the treatment of a broad spectrum of pathologies, some of them affecting critically ill patients. Our hospital performs this activity since 1993 and it is a referral center in northern Spain for this issue. A critical care physician is in charge of the procedure and there is always a nurse inside the chamber performing the vital support and monitoring.

OBJECTIVES. To review the applications and benefits that HBO therapy has achieved in critically ill patients in our intensive care unit (ICU).

METHODS. ICU patients which received HBO as part of their treatment were reviewed. The period study was 2005–2011. The following parameters were analyzed: age, sex, previous diabetic or vascular diseases, indication for HBO, number and mean time of sessions received, pressures reached (in ATA units), patient's tolerance, level of consciousness, clinical and analytical data of infection and need for ulterior surgery. The results are presented as absolute value (percentage) or mean and standard deviation (SD).

RESULTS. 30 patients were included in the study, 18 were unstable requiring inotropic support. 83.3% were males and the mean age was 53 y/o (SD 18.9). Indications of HBO were: CO intoxication (2 cases, 6.7%), gangrenous myonecrosis (15 cases, 50%), non-clostridium tissue infections (6 cases, 20%), traumatic causes (such as compartmental syndrome) (6 cases, 20%). Each patient received 5.2 sessions on average (SD 2.8) and mean duration was 65.8 min (SD 4.9). The mean maximum pressure was 2.3 ATA (SD 0.04). In the CO intoxication cases, the mean carboxyhemoglobin previous to HBO therapy, was 29.5 (SD 28) and after this treatment was 19.4 (SD 14.3). Complete neurological recovery was evident in one of the CO intoxication cases (initial Glasgow Coma Scale (GCS) 3 and final GCS 15). In the group of patients which received HBO due to infectious causes, the mean blood lactate level was 20.4 (SD 7.6) before the HBO sessions and It decreased to 11.7 (SD 2.6) after this therapy. Infectious disease control was favorable in all cases. 27 patients of the series (90%) had good tolerance to HBO. Two unstable patients suffered cardiac arrest during the OHB session with fatal outcome, despite CPR maneuvers. These were the main adverse events related with the HBO therapy in this series.

CONCLUSIONS. HBO can be used safely in the intensive care context. Critically ill patients with certain diseases can benefit from HBO therapy as an adjuvant tool. Previous careful selection for each HBO indication is mandatory in order to avoid fatal events.

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0179

CLINICAL CHARACTERISTICS AND THERAPEUTIC MANAGEMENT OF ACUTE PULMONARY THROMBOEMBOLISM IN THE INTENSIVE CARE UNIT

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INTRODUCTION. Pulmonary embolism (PE) is a serious illness and sometimes difficult clinical diagnosis because it can take many forms.

OBJECTIVES. We want to define the clinical characteristics of patients with pulmonary embolism who require admission to intensive care unit (ICU).

METHODS. We made a retrospective study of patients with PE admitted to ICU or developed PE in ICU. Period of study: January 2005–September 2010. We analyzed demographic variables (age, sex, history, type of admission), diagnosis (clinical, radiology, echocardiography, laboratory), evolution and mortality. We calculated probability scores (Geneva simplified; Wells) and risk scale (PESI) in all patients.

RESULTS. We found 64 patients. The mean age was 64 years (SD 16.2). 51.6% were women. 18.8% had a history of neoplasia in the last 10 years. Only one patient had a previous TEP. 65.5% were admitted for PE from the emergency room. The rest were previously admitted for medical (18.8%), surgical (7.8%) or traumatic (6.3%). 79.7% of patients with dyspnea, chest pain 34.4 and 14.1% had presented cardiorespiratory arrest. Most of the patients had Geneva and Wells intermediate probability (82.5 and 65.1%, respectively) and showed high probability 7.9 and 23.8%, respectively. Most of the patients had high risk PESI scale: 82.5% (14.3% class IV, 54.0% class V). The diagnosis was mainly by CT (71.4%), followed by echocardiography (15.9%) and clinical (12.7%). 92.1% had higher D-dimer but only 33.3% had elevated troponin I. We performed echocardiography in 73.8% of the patients, we found right ventricular dysfunction in 66.7% and pulmonary arterial hypertension in 86.1%. 12.8% of our patients had visible thrombus. 57.8% showed metabolic acidosis and 42.2% hemodynamic instability. 30% of them developed respiratory distress. In 44.4% of the patients needed catecholamines and 50% fluid. We used systemic thrombolysis in 31.3% of our patients. 3.1% underwent endovascular treatment. Only in 4.7% was placed vena cava filter. 9.4% had bleeding complications. The median stay in ICU was 4 days. ICU mortality was 14.1% (male 12.9%, women 15.2%).

CONCLUSIONS. The diagnosis of PE was essentially radiological. Most of our patients had high risk PESI scale, although pretest probability scales (Geneva and Wells) were intermediate. The majority of patients requiring ICU admission had echocardiographic data of right ventricular dysfunction, although less frequent elevation of markers of myocardial damage.

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0180

RESPIRATORY DEPRESSION IN RELATION TO BUPRENORPHINE AND DIAZEPAM COMBINATION IN RATS: STUDY OF THE PHARMACODYNAMIC MECHANISM OF INTERACTION

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INTRODUCTION. Buprenorphine (BUP) is responsible for ceiling respiratory effects; however, deaths due to asphyxia were attributed to BUP/benzodiazepine (BZD) co-ingestion. When experimentally administered alone, both drugs did not induce deleterious respiratory effects.

OBJECTIVES. To study the pharmacodynamic interaction between BUP and diazepam (DZP) on rat ventilation.

METHODS. In Sprague–Dawley rats, we studied the respiratory effects (using plethysmography and arterial gases) of DZP (20 mg/kg SC)/BUP (30 mg/kg IP) association [4 groups: solvent (SVT)/SVT, DZP/SVT, SVT/BUP, DZP/BUP; n = 8/group]. Reversion of DZP/BUP effects was analyzed following the pre-administration of specific opioid-receptor (naloxonazine (NLZ) [mu-antagonist]; naltrindole [delta-antagonist]; nor-binaltorphimine [kappa-antagonist]) and GABA antagonists (flumazenil (FLZ) [GABA-A-antagonist]; saclofene [GABA-B-antagonist]) [2 groups for each antagonist: SVT/DZP/BUP and antagonist/DZP/BUP; n = 6/group] at doses, time, and route of administration allowing complete receptor blockage. Comparisons were performed using ANOVA for repeated measurements followed by Bonferroni post-tests.

RESULTS. DZP/BUP combination resulted in a significant, rapid-onset, and short-duration respiratory depression: PaCO2 increase ($p < 0.01$) and minute volume decrease (VE, $p < 0.001$). The effect was additive regarding $PaCO_2$ ($p = 0.05$) and synergic regarding VE ($p < 0.001$). Like DZP/SVT group ($p < 0.05$), DZP/BUP group ($p < 0.001$) resulted in a significant tidal volume (VT) decrease in comparison to the SVT/SVT and SVT/BUP groups ($p < 0.001$). VT decrease was compensated in the DZP/SVT group by an increase in the respiratory frequency (f), in comparison to the SVT/SVT group ($p < 0.05$), corresponding to a decreased expiratory time (TE) ($p < 0.01$), which was not observed in the DZP/BUP group. Like BUP alone, DZP/BUP combination resulted in a significant increase of the inspiratory time (TI, $p < 0.001$), compensated by a significant decrease in TE ($p < 0.05$); f was significantly decreased in the DZP/BUP group when compared to the DZP/SVT ($p < 0.001$) and SVT/BUP groups ($p < 0.05$). However, although not significant, TE decrease was less marked with the association. Only NLZ and FLZ significantly reversed $PaCO_2$ ($p < 0.05$) and VE ($p < 0.01$), while FLZ significantly increased f ($p < 0.05$) and NLZ increased VT ($p < 0.05$).

CONCLUSIONS. DZP/BUP combination is responsible of an early-onset and short-duration respiratory depression, related to the combination of a significant VT decrease, a significant TI, and a mild TE increase

0181

BUPRENORPHINE AND NORBUPRENORPHINE-RELATED RESPIRATORY EFFECTS IN MICE: ROLE OF P-GLYCOPROTEIN TRANSPORTER

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INTRODUCTION. Several cases of death by asphyxia were attributed to buprenorphine (BUP). Norbuprenorphine (N-BUP), the active BUP metabolite was shown to be a major respiratory depressant in rats, while BUP was responsible for ceiling respiratory effects. Recently in vitro studies suggested that N-BUP, in contrast to BUP, is a good substrate of P-glycoprotein (P-gp), a major transporter of the blood–brain-barrier

OBJECTIVES. To study P-gp role in the modulation of BUP and N-BUP respiratory effects in mice.

METHODS. Using plethysmography, we studied BUP (10 mg/kg, IP) and N-BUP (1 mg/kg, IP) respiratory effects in wild-type and P-gp knock-out (KO) female FVB mice. Pre-administration effects of a powerful inhibitor of P-gp and P450 cytochromes (PSC833, 20 mg/kg SC) were studied. Comparisons were performed using ANOVA for repeated measurements followed by Bonferroni post-tests.

RESULTS. BUP was responsible of a dose-dependent respiratory depression, with a significant reduction in the minute volume (VE, $p < 0.0001$) and respiratory frequency (f, $p < 0.001$), without any alteration of the tidal volume (VT). A significant increase in the inspiratory time (TI) was observed with all doses >10 mg/kg, while a significant increase in the expiratory time (TE) appeared only at 30 mg/kg. N-BUP was responsible for a significant dose-dependent respiratory depression; however, a significant TE increase was observed with lower doses >1 mg/kg ($p < 0.01$). Pretreatment with PSC833 significantly enhanced BUP- as well as N-BUP-related respiratory depression in comparison to controls, with mainly a significant increase of BUP-related effects on TI ($p < 0.001$) and N-BUP-related effects on TI and TE ($p < 0.0001$). In P-gp KO mice, we observed a significant enhancement of the respiratory depression induced by both molecules, with increased BUP-related effects on TE ($p < 0.0001$) and increased N-BUP-related effects on TI ($p < 0.0001$).

CONCLUSIONS. In contrast to rats, both BUP and N-BUP are responsible of significant respiratory depression in mice. TE increase following the administration of low N-BUP doses assesses a more important N-BUP respiratory toxicity in comparison to BUP. Our study suggests a key-role for P-gp in the occurrence of BUP and N-BUP-mediated respiratory effects; however, additional studies are required to identify the exact mechanism of interaction with P-gp.

0182

PULMONARY EMBOLISM IN ICU. HOW CAN WE PREDICT MORTALITY?

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INTRODUCTION. The mortality of pulmonary embolism (PE) remains high. Prognostic stratification to identify high risk patients needing more aggressive treatment and monitoring is important.

OBJECTIVES. We want to determine the usefulness of clinical and predictive models of risk stratification in patients with PE requiring ICU admission.

METHODS. Retrospective study of patients admitted to our ICU for 5 years (January 2005–September 2010). We analyzed demographic variables at admission, severity scores (SAPS II), parameters of evolution and therapeutic management (troponin elevation, presence of right heart dysfunction, respiratory distress, need for catecholamines and volume, use of fibrinolysis), prognostic stratification scales (PESI, Wells, Geneva simplified). We made univariate analysis using *T* student and chi-square (Variables were significant if $p < 0.05$). We made multivariate logistic regression analysis and ROC curves for predicting mortality.

RESULTS. We collected 64 patients. The mean age was 64 years (SD 16.2). 51.6% were women. Most patients showed metabolic acidosis (57.8%), and 42.2% had hemodynamic instability. We performed echocardiography in 73.8%: right heart dysfunction was observed in 66.7% and pulmonary hypertension (PH) in 86.1%. Global mortality was 14.1%. The median hospital stay was 4 days. We performed univariate analysis with regard to mortality: we find significant presence of ARDS ($p < 0.00$), catecholamines ($p = 0.006$), acidosis ($p = 0.01$) and hemodynamic instability ($p = 0.023$). In multivariate analysis we found that SAPS II scale was an independent predictor of mortality ($p = 0.047$, OR 0.057 (CI 0.99–1.12)). We performed ROC curves of the prognostic stratification scales: Geneva, Wells, PESI, and we found an area under the curve: 0.55, 0.65 and 0.47, respectively. We performed a univariate analysis including patients with poor PES grades we found significant this variables: SAPS II ($p = 0.014$), age ($p = 0.005$), previous PE ($p = 0.03$), PH ($p = 0.03$), fluids ($p = 0.008$), catecholamines ($p = 0.002$), hemodynamic instability ($p = 0.003$). In the multivariate analysis we only found significant SAPSII ($p = 0.046$), (OR −0.071, CI 0.86–0.99).

CONCLUSIONS. The increase of troponin I has low sensitivity for the diagnosis of PE. Prognostic stratification scales do not seem to be reliable predictors of mortality. Hemodynamic instability, metabolic acidosis and ARDS were independent predictors of mortality.

0183

THE ACENOCOUMAROL OVERDOSE IS INR INDEPENDENT AND ILLNESS SEVERITY DEPENDENT: THE CHOICE OF THERAPY

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OBJECTIVE. To evaluate the profile of patients attending an emergency department Intoxication oral anticoagulants (warfarin) and to therapeutic measures.

METHODS. We collected all poisoning by warfarin (Sintrom®) registered in the database of the Unit of Clinical Toxicology (UTC) of the Hospital Universitario La Paz, during December 2010 and January 2011. The UTC has a record of epidemiological control where they are including all the poison coming to our hospital. Demographic data, drug or substance that causes intoxication at the time of clinical care and management in the emergency treatment of poisoning.

RESULTS. In the period under review there have been 20 warfarin poisoning from a total of 63 records (31.7%), being the second leading cause of poisoning behind drugs of abuse (cocaine and benzodiazepines). 50% were male and mean age of patients was 79.7 ± 7.9 years. The indication for anticoagulation was 80% for atrial fibrillation, 15% for thromboembolic disease and 5% for stroke. The mean INR on arrival to the emergency room was 5.8 (range 3–11.1). 15% had neurological symptoms on arrival (2° to cerebral hemorrhage), 35% bruising and soft skin, epistaxis 15 and 45% did not show any symptoms. 25% required only supportive treatment and discontinuation of the drug, and the rest (75%) administration of vitamin K (30%), prothrombin complex concentrate (PCC) (Octaplex®) by 30% and fresh frozen plasma (5%). A 5% (1 case) were given vitamin K and plasma, and another case Octaplex® and vitamin K concomitantly. The INR of patients who were administered Octaplex® was 3.5, which were given vitamin K 6.3, which received fresh frozen plasma 9.55 and who received only supportive treatment 4. Statistically significant differences between the INR in patients receiving fresh frozen plasma and other patients. No statistically significant differences between the other groups. 100% of cerebral hemorrhages were Octaplex®.

CONCLUSIONS. 1. oral anticoagulant poisoning is one of the most important causes of drug intoxication. 2. More often asymptomatic the patient arrives at the ER, although a significant proportion of severe disease. 3. The therapeutic management is independent of the INR of arrival at the emergency department (excluding patients receiving fresh frozen plasma). 4. The most severe (cerebral hemorrhage) often receive PCCs (Octaplex®).

Acute coronary syndrome: 0184–0197

0184

ACTIVE FIXATION ELECTRODES FOR PERMANENT ENDOCARDIAL PACING: THRESHOLD AND IMPEDANCE EVOLUTION IN THE FIRST 6 MONTHS

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INTRODUCTION. Given the generalisation of the usage of active fixation in the past years, we want to confirm the clinical suspicion of the improvement of thresholds and impedance after implantation. This way we can ease our daily practice in pacemaker implants being more permissive during the initial search for optimal parameters.

OBJECTIVES. Threshold and impedance evolution valuation of active fixation leads after pacemaker implantation.

METHODS. Patients with active fixation electrode inserted were included. Threshold and impedance were valued at the following moments: before active fixation (0), immediately after the active fixation (post), at patient discharge (D), 1 month after discharge (1 m) and 6 months after discharge (6 m). Comparisons were done using paired data; significative if $p < 0.05$.

RESULTS. 40 patients included. Average age 80.2 ± 9.3; 63.3% were men. 36.7% were DDD and 63.3 VVI. Impedance values on atrial electrode were: O 1,189 ± 397, post 627 ± 271, D 477 ± 119, 1 m 513 ± 84 and 6 m 468 ± 94, with all comparisons being significative; threshold values: 0.1 ± 0.4, post 0.9 ± 0.4, D 0.5 ± 0.3, 1 m 0.5 ± 0.3 and 6 m 0.5 ± 0.4, being significative ($p < 0,01$) between 0 and post, and 0 and D. Impedance values on ventricular electrode were: 0.1513 ± 718, post 769 ± 225, D 617 ± 145, 1 m 563 ± 108 and 6 m 554 ± 124, with all comparisons being significative. Threshold values: 0.9 ± 0.4, post 0.9 ± 0.3, D 0.5 ± 0.2, 1 m 0.6 ± 0.3 and 6 m 0.7 ± 0.2, being significative ($p < 0.01$) between 0 and post, and ($p > 0.001$) between 0 and D.

CONCLUSIONS. Impedance diminishes significatively during the procedure and progressively in a lower proportion during the first 6 months. Thresholds improve significatively in the first 24 h after insertion. This is why we believe the optimal threshold for implantation could be wider.

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0185

PROGNOSIS AND QUALITY OF LIFE OF ELDERLY PATIENTS WITH HEART ATTACK

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INTRODUCTION. Acute coronary syndrome without ST-segment elevation (NSTE ACS) is one of the clinical entities that have suffered more variations in terms of pathophysiologic knowledge and therapeutic approach especially in cardiology in recent years.

OBJECTIVES. To analyze the survival and quality of life at 6 months after discharge of patients >75 years with the diagnosis of myocardial infarction.

METHODS. We studied 52 consecutive patients admitted with NSTE-ACS and Tn positive in 2005. We analyzed gender, TIMI score, origin, destination at discharge, survival after discharge and quality of life (Karnofsky scale telephone survey).

RESULTS. We analyzed 52 patients (p), including 29 men (55.8%). TIMI: in 40 p (76.9%) of 3–4 points and 12 p (23.1%) of 5–7. Killip clinical grade: 35 p (67.3%) in grade I, 8 p (15.4%) in grade II, 6 p (11.5%) in grade III and 3 (5.8%) in grade IV. Source: 38 p (73.1%) were admitted from the emergency room, 12 p (23.1%) from the ICU and 2 pts (3.8%) from another center. Coronary angiography was performed in 19 p (35.2%). In 5 p (9.3%) coronary angiography was performed within 48 h of admission. ICP was performed at 16 p (29.6%), all grade I–II Killip. The culprit vessel was the DA in 14 p (73.8%), the CD 4-p (21.1%) and the CX in 1 p (5.3%). There was no need rescue angioplasty. 9 p is used in thrombolysis (16.9%). None underwent coronary bypass surgery. The discharge destination was as follows: 44 p (84.6%) at home, 2 p (3.8%) were referred to another center and 4 (7.7%) died in Plant degree Killip III and IV, 2 with TIMI 3–4 and the other 2 with TIMI 5–7, coronary angiography is not carried out any of them. Survival: Of the 38 patients interviewed by telephone, 36 p (94.7%) survived at 3 months and 2 p die within the first 2 months. At 6 months, 35 survived (92.1%) of these 38 patients surveyed. All PCI patients surviving at 6 months follow up after discharge. Quality of life: 18 (50%) with >70 points, 10 p (27.7%) with 60 points, 7 patients (19.4%) with 50 points and 1 patient (2.9%) with 40 points.

CONCLUSIONS.1. Survival of elderly patients with myocardial infarction in the short term is high, particularly those undergoing PCI.2. The quality of life for most of these patients is good, incapable of normal activity, but may make an independent life.

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0186

EARLY HEART FAILURE IN NON-ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION (NSTEMI) AND ANTIPLATELET STRATEGY

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INTRODUCTION. Outcome of high risk NSTEMI and its relationship with different reperfusion strategies has been widely reported in medical literature. However, short-term complications of NSTEMI have been poorly studied. Cardiac failure, although uncommon in NSTEMI, could be modified by antiplatelet combinations administered before percutaneous coronary intervention (PCI) is performed.

OBJECTIVES. To report the rate of heart failure and cardiogenic shock in the early outcome of NSTEMI and to assess the relationship between different antiplatelet strategies and the occurrence of these complications before early PCI.

METHODS. A cohort retrospective observational study was performed with NSTEMI patients admitted to the Intensive Care and Coronary Unit (ICCU) from a spanish register. Heart failure was diagnosed following clinical parameters. Cardiogenic shock was defined as the need of vasoactive drugs to keep organs perfusion. Patients were treated before PCI with any of these combinations of antiplatelet drugs: aspirin plus clopidogrel (Group A), aspirine plus tirofiban (Group B) or aspirine plus clopidogrel plus tirofiban (Group C).

Statistical analysis: Quantitative variables were shown as percentage and mean ± standard deviation (SD). Chi square and Fisher exact test were employed to test qualitative variables. ANOVA test and Bonferroni "post hoc" test was used for quantitative variables. A p value <0.05 was considered statistically significant. We conducted an univariate logistic regression and a multivariate analysis to assess the effect of the non-homogeneous variables among treatment groups. Group C (triple antiplatelet) and TIMI low-risk were the reference for univariate and multivariate analysis.

RESULTS. One hundred and sixty-two patients were included in Group A, 139 in Group B and 301 in Group C. There were differences between groups for electrocardiogram (EKG) findings, and TIMI risk. Heart failure rates were as follows: Groups A 19.1%, Group B 6.5%, Group C 17.9% ($p = 0.003$). The rate of cardiogenic shock was not different for these groups (3.7, 3.6 and 1.7%, respectively, $p = 0.314$). Once multivariate analysis was performed, neither groups of antiplatelet combinations (Group A, OR 0.72, CI 95% 0.4–1.32, $p = 0.293$; Group B, OR 0.46, CI 95% 0.2–1.03, $p = 0.061$) nor other variables were found to be associated with heart failure.

CONCLUSIONS. Heart failure is common complicating the early course of NSTEMI. Triple antiplatelet strategy does not appear to be superior to dual antiplatelet selection for early occurrence of heart failure or cardiogenic shock. There is a trend of decreasing the rate of heart failure when a combination of aspirin plus tirofiban is employed.

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0187

EVALUATION OF APACHE II AND KILLIP SCALES IN PATIENTS WITH ACUTE ST-ELEVATION MIOCARDIAL INFARCTION CORONARY SYNDROME

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OBJECTIVE. To evaluate in ICU patients with acute ST elevation myocardial infarction (STEMI), the Killip class and APACHE II index.

MATERIALS AND METHODS. We studied patients with a diagnosis of STEMI admitted in Carlos Haya (Málaga) and Infanta Margarita (Cabra) hospitals, since 2008–2010.

We conducted a case–control study nested in a cohort. Patients who died during hospitalization were the cases and a random sample of non-deceased were controls.

We introduced clinical data, physiological variables routinely gathered and laboratory data.

We analyzed age, sex, Killip class on admission, TIMI, APACHE II and ICU and hospital mortality. We used the student test, X2 and logistic regression.

RESULTS. The cohort included 709 patients (524 from Málaga and 185 from Cabra).

42 patients (5.92%) died in the ICU and 51 (7.19%) during hospitalization. We selected at random on 124 controls from surviving patients (1 of 6 from Málaga and 1 of 4 from Cabra). The age between the cases was 76.67 ± 8.1 ($p < 0.001$), in controls 65.02 ± 13.77. 39.2% were women between the cases opposite 24.4% in controls ($p < 0.05$). The APACHE II was 18.56 ± 8.06 from the cases and 9.61 ± 4.03 in controls. The Killip values with a $p < 0.01$ were: 29.4% Killip I, 23.5% Killip II, 9.8% Killip III and 37.3% Killip IV in cases. The controls Killip values were: 75.8% from Killip I, 15.3% Killip II, 4.8% Killip III and 4% Killip IV.

For the calculation of the values of total sample we weighted according to sampling fraction, APACHE II was 10.42 ± 4.85. Killip class I were 72.4%, with a mortality of 2.9%, 15.5% were Killip II (10.9% mortality), 5.8% Killip III (12.2% mortality) and 6.3% were Killip IV (42.2% mortality).

Killip scale showed complementarity with the APACHE II evaluated with logistic regression. Thus, the Odds ratio for Killip I was 1, for Killip II was 2.34 (0.98–5.54) for Killip III 1.94 (0.55–6.73) and for Killip IV, 5.09 (1.97–13.18) and APACHE II 1.26 (1.17–1.35). Discrimination (ROC area) for this model was 0.89 and for the APACHE II only was 0.848 and for the Killip scale only 0.764.

CONCLUSIONS. Patients with a diagnosis of STEMI, the Killip scale discrimination is worse than the APACHE II one. There is a complementarity between both. In the future, the APACHE II can be complemented by the Killip classification in these patients.

0188

CLINICAL FACTORS ASSOCIATED WITH THE APPEARANCE OF ARRHYTHMIC STORM

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INTRODUCTION. Arrhythmic storm is one of the worst events in patients with an implantable cardioverter defibrillator (ICD).

OBJECTIVES. The aim of our study was to evaluate clinical factors that relate to the occurrence of arrhythmic storm and its long-term prognostic impact.

METHODS. We analyzed 361 consecutive patients with left ventricular systolic dysfunction of ischemic origin who were implanted an ICD. We compared the clinical characteristics, mortality rates, admission for heart failure and a combined target formed by the sum of the two, in those that had developed at least one arrhythmic storm episode (defined as the appearance of three or more electric shocks within 24 h, or four or more in 48 h). The median follow-up was 38.9 months, completed in 93.1% patients.

RESULTS. 29 patients developed arrhythmic storm (8.6%), there were no differences in baseline characteristics in both groups. Patients with arrhythmic storm had more atrial fibrillation (31 vs. 15.8%, $p = 0.04$), more use of oral anticoagulant therapy (47.6 vs. 27.8%, $p = 0.05$) and amiodarone (42.9 vs. 19.8%, $p = 0.02$) and lower beta-blocker therapy (61.9 vs. 82%, $p = 0.03$). Patients with arrhythmic storm showed a poorer prognosis with higher mortality rates (40 vs. 14.4%, $p = 0.03$), more frequency of admission for heart failure (28.6 vs. 14.2%, $p = 0.08$) and more frequency of the combined endpoint (57.1 vs. 22.3%, $p = 0.001$). After multivariate analysis, the development of arrhythmic storm was not an independent predictor of mortality ($p = 0.19$), or admission for heart failure ($p = 0.28$), although it was associated with an increased risk of death and heart failure (OR 3.20, IC 95% 1.03–9.94) in the long term.

CONCLUSIONS. Patients who develop arrhythmic storm have a higher prevalence of atrial fibrillation and less prescription of beta blockers. The occurrence of arrhythmic storm was associated with an increased risk of death and heart failure in long term.

0189

CLINICAL SIGNIFICANCE OF HYPERGLYCAEMIA IN ACUTE CORONARY SYNDROME PATIENTS

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INTRODUCTION. The clinical significance of moment measurements (admission and fasting glycaemia), persistent (hyperglycaemic index—HGI, time average glucose—TAG, mean glucose, maximum glucose) or chronic hyperglycaemia (HbA_{1c}, estimated average glucose—eAG) is still elusive in clinical practice.

OBJECTIVES. To identify the clinical significance of hyperglycaemia in ACS population as a surrogate marker for ventricular systolic dysfunction, enzymes for myocardial necrosis, impairment in glucose metabolism and a prognostic factor for 6-month and 1-year outcome.

METHODS. The study included 226 consecutive patients with ACS, admitted to the Clinic of Cardiology, University Hospital "Aleksandrovska", Sofia, between March 2009 and August 2010. Indicators for moment, persistent and chronic hyperglycaemia were defined, calculated and a correlation analysis with standard parameters—EF, maximum CPK, maximum CPK-MB and troponin was performed. Patients were followed up for 12 months.

RESULTS. Indicators for persistent and chronic hyperglycaemia correlated neither to ejection fraction, nor to the enzymes for myocardial necrosis ($p > 0.05$). In contrast, acute hyperglycaemia correlated negatively with ventricular systolic dysfunction ($p = 0.001/0.007$) and positively with maximum CPK, MB and troponin ($p = 0.0001/0.008$). TAG was an independent predictor for 6-month rehospitalization ($p = 0.027$) because of cardiac complications. No difference was found in indicators for hyperglycaemia between patients with STEMI/Unstable angina and newly diagnosed impaired glucose tolerance. There was statistical difference only in acute (fasting glycaemia, $p = 0.025$) and chronic hyperglycaemia (HBA1c; eAG = p 0.002) between patients with STEMI/Unstanble angina and newly diagnosed diabetes.

CONCLUSIONS. Glycaemia at admission and fasting glucose could be used as metabolic surrogate markers for ventricular systolic dysfunction. TAG could serve as an independent surrogate marker for 6-month rehospitalization. None of the indicators for hyperglycaemia could be used as independent prognostic factors for short- and long-term survival. Hyperglycaemia rather reflects an underlying impairment in glucose metabolism.

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GRANT ACKNOWLEDGMENT. Young Investigator NO 2-D/2010.

0190

IMPORTANCE IN THE LEARNING CURVE IN CORONARY ANGIOGRAPHY AND TRANSRADIAL CORONARY ANGIOPLASTY

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INTRODUCTION. The transradial approach is an attractive alternative to the femoral approach for coronary angiography and coronary interventions. By facilitating early ambulation is associated with fewer vascular complications and therefore associated with greater patient comfort, along with decreased hospital stay, making these techniques, in most cases, outpatient basis.

OBJECTIVES. We describe our experience and analyze the influence of the learning curve.

METHODS. Prospective observational study. We divided the study population into 2 subgroups: A (first 200 cases reported between January and March 2009) and B (200 cases reported between January and March 2010). When it was considered possible and appropriate, coronary intervention was performed in the same procedure.

RESULTS. We analyzed a total of 400 patients (p), no differences in baseline characteristics of p/coronary lesions: mean age 65 ± 10.8 versus 65.5 ± 10. 4 years, females 34.7 versus 37.8%, indications for coronary angiography: ACS 39 versus 42.1%, percentage of PCI 34.7 versus 32.6% and the percentage of success of the procedure (94.5 vs. 96%). In the first period, the percentage of crossover was 4.1 versus 2.6% in the second period ($p < 0.05$).The complication rate was 12.5% (25 patients) in the first period, all of which mild hematomas in the forearm, in the second period we find a complication rate of 7.5% (15 patients), 13 mild hematomas, 1 severe hematoma, 1 radial artery pseudoaneurysm. Procedure times [23 (16–29) versus 19 (15–24) min, $P < 0.001$] and fluoroscopy [6.4 (4.2–10) vs. 5.0 (3.0–7.7) min, $P < 0.001$] were lower in the second period.

CONCLUSIONS. The transradial approach is technically more complex due to the possibility of spasm, the more difficult to cannulate the artery, the anatomical variations of upper limb arteries and manipulation of catheters, however, is a safe and effective alternative to femoral. Therefore, we need a learning period for the to perform transradial procedures.

0191

MYOCARDIAL INFARCTION WITHOUT ST ELEVATION IN OCTOGENARIANS: PROGNOSIS AND QUALITY OF LIFE

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INTRODUCTION. To analyze the survival and quality of life at 6 months after discharge from the octogenarian patients with the diagnosis of myocardial infarction.

METHODS. We studied 27 patients admitted consecutively octogenarians in the cardiology, myocardial infarction, in 2005. We analyzed gender, TIMI score, origin, destination at discharge, survival after discharge and quality of life (Karnofsky scale).

RESULTS. We analyzed 27 patients (p), 15 patients were men (55.6%). TIMI: in 20 p (74%) of 3–4 points and 17 p (26%) of 5–7. Killip clinical grade: 15 p (55.6%) in grade I, 6 p (22.2%) in grade II, 4 p (14.8%) in grade III and 2p (7.4%) in grade IV. Source: 23 p (85.2%) were admitted from the emergency room, 3 p (11.1%) from the ICU and 1 p (3.7%) came from another Center. Coronary angiography was performed in 3 pts (11.1%). In 1 p (3.7%) coronary angiography was performed within 48 h of admission. ICP was performed at 3 p (11.1%), all grade I-II Killip. The culprit vessel was the DA in 2 p (66.6%), and the CX in 1 p (3.7%). There was no need rescue angioplasty in any patient. None underwent coronary bypass surgery. The discharge destination was as follows: 24 p (88.9%) at home, 3 p (11.1%) died on the ground in grade III and IV Killip, 2 with TIMI 4–5, no coronary angiography to any of them. Survival: Of the 24 patients interviewed by telephone, 18 p (75%) survived at 3 months and 6 p (25%) die within the first 2 months. At 6 months, surviving 9 p (50%). All PCI patients surviving at 6 months follow up after discharge. Quality of life at 6 months, 3 p (16.6%) with >70 points, 2 p (11.1%) with 60 points, 3 patients (16.6%) with 50 points and 1 patient (5.5%) with 40 points.

CONCLUSIONS.1. Myocardial infarction in octogenarian patients is a major cause of loss of quantity and quality of life. 2. Most of these patients are discharged to their own homes, albeit with a high degree of dependency for the development of activities of daily living.

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0192

ACUTE CORONARY SYNDROME WITH ST ELEVATION: COMPARING RANDOMIZED CONTROLLED TRIAL AND A 10 YEARS REGISTRY. HOW CLOSE ARE THOSE TO EVERYDAY PRACTICE?

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INTRODUCTION. Randomized controlled trials (RCT) are the best experimental designs to test whether an intervention is efficacious, but quite often they lack generalizibility. Representative registries are good complements, as better reflect everyday practice. Acute coronary syndrome with persistent ST segment elevation (STE-ACS) is an important health problem where both approaches must be taken into account.

OBJECTIVES. To compare important epidemiological and management characteristics of patients with STE-ACS in main reperfusion randomized controlled trials and our everyday practice.

METHODS. We analyse our hospital STE-ACS data from 5th January 2001–30th September 2010 using ARIAM registry (prospective, Análisis del Retraso en el Infarto Agudo de Miocardio). Patients included were eligible for both reperfusion strategies: fibrinolysis (FIB) or primary percutaneous coronary intervention (PPCI) and received it in less than 12 h from symptom onset. They are compared with data extracted from ad hoc meta-analysis on this topic: [1, 2].

RESULTS.

Patients characteristics 1

	FIB ARIAM-HUVV1,129 patients (72.8%)	PPCI ARIAM-HUVV 422 patients (27.2%)	Statistical significance FIB vs. PPCI	Total ARIAM-HUVV 1,551 patients	Totalmeta-analysis
Age [years, mean (SD)]	62.1 (12.2)	61.2 (12.6)	ns	61.9 (12.3)	62.5
Gender (% men)	77.9	82.9	ns	79.2	73.9
Weight (kg)	77.7	85.1	ns	79.1 (16.9)	79
Diabetes (%)	25.2	29.4	ns	26.3	12.9
Previous STE-ACS (%)	10.3	15.4	$p = 0.008$	11.7	13.5
Previous PPCI (%)	6	11.6	$p < 0.001$	7.6	3.8
Systolic arterial pressure [mmHg mean (SD)]	115.2 (25.1)	126 (30.1)	$p < 0.001$	118.1 (26.9)	133
Heart rate [bpm mean (SD)]	84 (14.9)	81.2 (18.1)	$p = 0.004$	83.3 (15.9)	76
ACS location (% anterior/LBB)	39.1	47.2	$p = 0.007$	41.3	46.1

Patients characteristics 2

	FIB ARIAM-HUVV 1,129 (72.8%)	PPCI ARIAM-HUVV 422 (27.2%)	Statistical significance FIB vs. PPCI	Total ARIAM-HUVV 1,551 patients	Total meta-analysis
Synt-FMC [min, median (IQR)]	60 (30–115)	65 (30–180)	ns	60 (30–120)	142, 140
FMC-needle [min, median (IQR)]	75 (52–102)[b]	–	–	–	19, 47[a]
FMC-PPCI [min, median (IQR)]	–	160 (120–240)	–	–	76, 94[a]
Mortality at hospital discharge (%)	8.9	6.6	ns		8.2

FMC first medical contact, *HTA* arterial hypertension. [a]First figure derived from (1) (symptom to randomization and randomization to treatment), second from (2) (symptom to door, door to treatment). ** phase. Notice the temporal frame shift from door-needle (that doesn't take into account the prehospital phase where our median is 23 min), to FCM-needle that includes prehospital. PPCIRD: PPCI related delay (calculated as median FMC-Baloon minus FMC-Needle) is 70 min in our serie, 57 and 46 in meta-analysis

CONCLUSIONS. Our everyday STE-ACS patients differ from those included in RCT in several important variables: they have a rate of diabetes twice that in RCT, time to FCM is shorter and PPCIRD longer. Nevertheless, RCT and our practice are reperfusing relatively late (considering [3]). In general, our trend seems to be moving toward FIB before hospital and PPCI if arrives hospital without having received FIB.

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0193

PROGNOSTIC REPERCUSSION OF EARLY INTERVENTIONAL STRATEGY IN PATIENTS ADMITTED FOR ST-ELEVATION MYOCARDIAL INFARCTION

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INTRODUCTION. Early coronary reperfusion is the main objective in the treatment of ST-elevation myocardial infarction (STEMI).

OBJECTIVES. Our aim was to analyze the prognostic repercussion of early interventional strategy (EIS), defined as coronary angiography within 72 h of acute coronary event.

METHODS. Retrospective analysis of 240 consecutive patients admitted for STEMI from January 2008 to January 2010. Prognostic variables were studied, and an adjusted analysis made of the repercussions of EIS on the variables.

RESULTS. 166 (69%) of patients (p.) received an EIS, and they were younger compared to the p. that received an ischemia-guided strategy (57.3 $\pm$ 10.5 vs. 65.9 $\pm$ 10.6 years, $p = 0.0001$) and they presented lower comorbidity (Comorbidity Charlson Index 1 $\pm$ 0.9 vs. 1.5 $\pm$ 1.3, $p = 0.004$). There were no differences regarding the use of thrombolytic or left ventricle systolic dysfunction (LVSD) ($p > 0.2$) in both groups, development of acute heart failure (13.3 vs. 9.5%, $p = 0.3$), serious arrhythmic events (23 vs. 13.5%, $p = 0.06$) or cardiovascular mortality (2.4 vs. 1%, $p = 0.5$). Patients who received an EIS showed higher percentage of major adverse cardiovascular events (32.1 vs. 20.3%, $p = 0.04$). After adjustment, the type of therapeutic strategy did not influence the development of complicated forms of STEMI ($p = 0.3$). It were found as independent predictors of poor prognosis the presence of LVSD (mOR 2.5, CI 95%, 1.1–5.8) and higher TIMI Risk score (OR 7.1, CI 95%, 3.2–9.6).

CONCLUSIONS. In our series, the EIS was not associated with risk of developing major adverse cardiovascular events in patients admitted for STEMI. The presence of LVSD and a higher TIMI Risk score predicted a poor prognosis in-hospital phase.

0194

INFARCTION-RELATED CORONARY ARTERY INTERVENTION STRATEGY COMPARED TO COMPLETED ANATOMICAL CORONARY INTERVENTIONAL STRATEGY IN PATIENTS ADMITTED FOR ST-ELEVATION MYOCARDIAL INFARTION AND MULTIVESSEL CORONARY DISEASE

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INTRODUCTION. Interventional strategy in patients with ST-elevation myocardial infarction (STEMI) and multivessel coronary disease (presence of significant coronary lesions in two or more vessels) is a debated issue.

OBJECTIVES. The aim of our study was to determine the prognostic influence of infarction-related coronary artery intervention strategy (IRCAIS) compared to completed anatomical coronary artery interventional strategy (CACAIS) in patients admitted for ST-elevation myocardial infartion and multivessel coronary disease.

METHODS. Retrospective analysis of patients admitted with STEMI and multivessel coronary disease from January 2008 and December 2009. Specific prognostic variables were studied, establishing an adjusted analysis made of the repercussions of these strategies on the variables.

RESULTS. We included 118 patients (p.), of whom 100 p. (84.7%) received IRCAIS. There were no significant differences in baseline characteristics between both groups ($p > 0.05$), nor prognostic differences during in-hospital phase; development of acute heart failure (18% in IRCAIS group vs. 22.2% in CACAIS group, $p = 0.4$), severe arrhythmic events (20 vs. 16.7%, $p = 0.5$), death (3 vs. 0%, $p = 0.6$) and major adverse cardiovascular events (33 vs. 33.3%, $p = 0.6$). After adjustment, the modality of intervention strategy was not associated with in-hospital prognosis ($p = 0.9$). The presence of left ventricle systolic dysfunction and a higher TIMI Risk score predicted a worse prognosis (mOR 3, CI 95%, 1.01–9.2 and mOR 8.7, CI 95%, 2.9–15.9, respectively).

CONCLUSIONS. In our series, the type of coronary intervention strategy chosen in patients with STEMI and multivessel coronary disease was not associated with in-hospital prognosis.

0195

IMPACT OF GENDER ON THE PROGNOSIS OF PATIENTS CARRIERS OF A DEFIBRILLATOR FOR ISCHEMIC VENTRICULAR DYSFUNCTION

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INTRODUCTION. Post-infarction patients with severe left ventricular dysfunction are at high risk of sudden cardiac death. Antiarrhytmic therapy does not improve survival, so implantable cardioverter defibrillators (ICDs) emerged as treatment of choice for both primary and secondary prevention of mortality after myocardial infarction. There are few data in the literature about the occurrence of arrhythmic events in patients carriers of ICD and the possible influence of gender on their development. Our goal was to analyze the impact of patient sex on the occurrence of arrhythmic events and long-term prognosis.

METHODS. We analyzed 361 consecutive patients with ischemic left ventricular dysfunction who were implanted an ICD. We compared by gender the frequency of sustained arrhythmic events and the type of therapy administered. We studied the percentage of deaths and admissions for heart failure, and a combined endpoint formed by the sum of those two, with a mean follow up of 38.9 months.

RESULTS. Only 30 patients (8.3%) were women. We found no gender differences in baseline characteristics. The male sex was associated with higher incidence of arrhythmic events during follow-up (40.6 vs. 24.1%, $p = 0.06$). We observed no sex differences in the percentage of appropriate therapy administered (76.9 vs. 85.7%, $p = 0.50$), cardiac arrhythmic storm (6.9% in women vs. 8.8% $p = 0.5$) or the percentage of deaths (21.4 vs. 16.2%, $p = 0.3$). The admission because of heart failure was more frequent in women (33.3 vs. 13.7%, $p = 0.02$) and the combined endpoint death-heart failure (42.9 vs. 23.6%, $p = 0.05$). After adjustment, the sex is not an independent predictor of the occurrence of sustained arrhythmic events ($p = 0.3$). Female sex predicted greater risk of long-term mortality [OR 2.6 (95% CI 1.1–6.1), admission for heart failure (OR 4.4, 95% CI 1.8–10.5) and increased risk of the combined endpoint death-heart failure (OR 3.2, 95% CI 1.5–6.8).

CONCLUSIONS. The incidence of arrhythmic events in patients carriers of ICDs because of ischemic ventricular dysfunction is more common in men, despite which, women have a worse prognosis in the long-term monitoring.

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0196

EFFECT OF INVASIVE TREATMENT ON PROGNOSIS IN NON-ST-SEGMENT ELEVATION ACUTE CORONARY SYNDROME

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INTRODUCTION. The therapeutic approach of non-ST segment elevation acute coronary syndrome (NSTEACS) is a controversial issue today. Randomized studies conducted during the last decade have shown divergent results. The aim of this study was to determine the effect of an invasive treatment on the prognosis of patients with NSTEACS.

METHODS. The study included 440 consecutive patients admitted for NSTEACS between January 2006 and December 2008, and in whose the cardiac catheterization documented the existence of significant coronary artery stenosis of at least one vessel. We analyzed in-hospital and during follow up death rates, and also the risk of readmission for acute coronary syndrome (ACS), heart failure, new coronary revascularization, severe arrhythmia and a combined endpoint consisting of the sum of the above during follow up. The mean follow up was 24 months. We compared two groups of patients: group 1, those patients who received a revascularization strategy during hospitalization, versus those managed with a conservative strategy (group 2).

RESULTS. Overall, 320 patients (72.7%) got a revascularization strategy during hospitalization; the most frequent revascularization modality used was percutaneous transluminal coronary angioplasty in 95.6%, and in 4.4% coronary artery bypass surgery. There were no differences in the baseline characteristics between both groups; in the group 1 we found more patients with multivessel coronary disease (64.7 vs. 74.2%, $p = 0.03$). We did not find differences between the two groups in the in-hospital death rates (6.7 vs. 3.1%, $p = 0.08$). During follow up, group 1 patients showed lower rates of total and cardiovascular mortality (7.5 vs. 17.1%, $p = 0.004$ y 6.5 vs. 14.5%, $p = 0.009$, respectively), lower rates of readmission for ACS (18.5 vs 27.5%, $p = 0.03$), smaller percentage of new coronary revascularization (12.8 vs. 25.7%, $p = 0.002$), less frequency of heart failure (6.4 vs. 11.9%, $p = 0.05$) and combined endpoint (24.8 vs 47.7%, $p = 0.0001$). After multivariate analysis, coronary revascularization during admission did not influence in-hospital mortality ($p = 0.9$), but predicted lower risk of total mortality and cardiovascular long-term (OR 0.58, 95%, 0.26–1.30 and OR 0.37, 95% CI 0.13–1.04, respectively), hospitalization for ACS (OR 0.58, 95% CI 0.33–1.00), new coronary revascularization (OR 0.45, 95% CI 0.26–0.79) and major cardiovascular events (OR 0.38, 95% CI 0.23–0.62).

CONCLUSIONS. Coronary revascularization procedure in patients admitted with NSTE-ACS and coronary heart disease predicted lower risk of major cardiovascular events, less percentage of new acute coronary syndrome or coronary revascularization in a long-term follow up. It was also a protective factor for long-term mortality, without reaching statistical significance.

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0197

ARRHYTHMIC STORM IN PATIENTS WITH IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS BECAUSE OF ISCHEMIC VENTRICULAR DYSFUNCTION

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INTRODUCTION. Arrhythmic storm is one of the worst adverse events in patients with implantable cardioverter defibrillator. It is defined as the appearance of three or more electric shocks within 24 h, or four or more in 48 h.

OBJECTIVES. Our objective was to analyze the development of arrhythmic storm in patients with implantable cardioverter defibrillators based on the indication for it.

METHODS. We analyzed 361 patients consecutively with ischemic systolic left ventricular dysfunction who were implanted a subcutaneous defibrillator. Patients were classified in three groups depending on the indication for the defibrillator: secondary prophylaxis, primary prophylaxis criteria as MADIT-1 and primary prophylaxis criteria as MADIT-2. We studied the type of device, and compared the rates of occurrence of arrhythmic storm in each group, with a median follow up of 38.9 months in 93.1 of patients.

RESULTS. 53.6% of implants were indicated for secondary prevention, 16.9% met criteria for MADIT-1 and 29.4% for MADIT-2. MADIT patients were younger (62.2 ± 11.7 vs. 66.9 ± 7.4 years, $p = 0.0001$) and had worse left ventricle ejection fraction (26.2 ± 6.7 vs. 28.8 ± 7.5%, $p = 0.0001$). MADIT-2 patients received more beta-blocker therapy (87.6 vs. 86.7% of MADIT-1 and 72.6% in secondary prophylaxis, $p = 0.01$) and higher percentage of cardiac resynchronized (24.5 vs. 6.6 and 5.2%, respectively, $p = 0.0001$). The occurrence of arrhythmic storm was more frequent in patients with secondary prophylaxis, followed by MADIT-1 and MADIT-2 patients (72.4 vs. 20.7 and 6.9%, respectively, $p = 0.01$). After the multivariate analysis, the implantable cardioverter defibrillator indication by MADIT-1 criteria predicted greater risk of occurrence of arrhythmic storm, followed by the secondary prophylaxis indication [odds ratio 9.4 (1.4–62.2) and odds ratio 7.6 (1.5–38.1), $p < 0.02$], compared with the MADIT-2 display.

CONCLUSIONS. The type of indication for implantable cardioverter defibrillator is the main risk factor associated with the development of arrhythmic storm in long-term. The highest risk groups were those which met MADIT-1 criteria and secondary prevention.

0199

REDUCED RATE OF FORCE DEVELOPMENT AND MAXIMAL VOLUNTARY TORQUE IN ICU SURVIVORS 12-MONTH AFTER DISCHARGE

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INTRODUCTION. Intensive care unit (ICU) admission is associated with decreased physical function for years after discharge. Knowledge of the underlying contractile properties responsible for this muscle function impairment may help target therapies to improve long-term physical outcome.

OBJECTIVES. To measure characteristics describing isometric contractile properties of the quadriceps muscle in ICU survivors 12 months after ICU discharge.

METHODS. We examined 16 ICU survivors (SAPS II 43 ± 12, mean ± SD) and 15 age and gender matched controls (64 ± 6 vs. 65 ± 6 years, $p = 0.67$). An extensive battery of biomechanical tests, including maximal torque, absolute rate of force development (RFD, defined as Δtorque/Δtime), relative RFD (%MVC/Δtime) and electromechanical delay (EMD), was administered during isometric knee extensions while simultaneously recording surface EMG (quadriceps, hamstrings).

RESULTS. Maximal torque during knee extension was reduced by 22% in ICU survivors compared to controls (179 ± 64 vs. 230 ± 57 Nm, $p = 0.03$). Furthermore, ICU survivors exhibited reductions both in absolute (868 ± 372 vs. 1,739 ± 470 Nm/s, $p < 0.001$) and relative RFD (512 ± 260 vs. 754 ± 189%MVC/s, $p < 0.01$) compared to controls. A trend toward increased electromechanical delay (EMD) was observed in ICU survivors compared to controls ($p = 0.06$). However, no change in reaction time from trigger to first EMG signal ($p = 0.78$) or in activation of antagonist muscles was found between patients and controls ($p = 0.83$). EMG data did not indicate impairment of motor strategy.

DISCUSSION. Twelve months after discharge, ICU survivors suffered from reduction in maximum torque and, in particular, in absolute and relative RFD (up to 50%). The decrease in absolute RFD may partially be explained by the coincided decline in maximum torque, however, the torque normalised relative RFD was also significantly reduced. A decrease in RFD seems to be associated with a lower neuromuscular response capacity, hampering adequate adaptive postural counter movements during time-restricted movements such as fall prevention. Therefore, the limiting factor in relation to many daily activities may in part be attributed to reduced RFD. RFD has shown responsiveness to combined power/strength training in healthy, elderly subjects. Thus, restoring the physical integrity of ICU survivors may benefit from dynamic power demanding exercises. This practice contrasts most current rehabilitation protocols. Appropriate consideration of individual contraindications (e.g. abdominal surgical wounds, aneurisms, etc.) is, however, warranted before patients can enter this regime.

CONCLUSION. In ICU survivors, RFD was reduced 50% 12 months after discharge. Thus, RFD may be a target for rehabilitation of ICU patients.

GRANTS: Supported by The Foundation of Jacob Ehrenreich and wife Grete Ehrenreich and The A.P. Møller Foundation for the Advancement of Medical Science.

Update on NIC: 0198–0211

0198

COMBINATION OF SEVOFLURANE POSTCONDITIONING AND ALBUMIN PROVIDES NEUROPROTECTION AFTER TRANSIENT GLOBAL CEREBRAL ISCHEMIA IN RAT BUT DOES NOT CONFER ADDITIONAL BENEFIT

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INTRODUCTION. High-dose human albumin confers marked neurobehavioral and histological neuroprotection in rat models of focal and global cerebral ischemia as well as traumatic brain injury. Volatile anesthetics, such as sevoflurane and isoflurane, have been shown to mimic potent protective mechanisms and exert direct neuroprotective effect in vitro and in vivo.

OBJECTIVES. The aim of this study was to determine whether combination of sevoflurane postconditioning and albumin offered additional neuroprotective effects after transient global cerebral ischemia in rats.

METHODS. 40 rats were randomly assigned to 4 groups: Control group (Group C, $n = 10$) received no treatment. Albumin group (Group A, $n = 10$) received albumin of 2 g/kg for 5 min after ischemia. Sevoflurane postconditioning group (Group P, $n = 10$) underwent two sevoflurane inhalations after ischemia. Each inhalation consists of 5 min of 2.5 vol% sevoflurane inhalation followed by washout period of 5 min. Sevoflurane postconditioning plus albumin group (Group PA, $n = 10$) received additional albumin during sevoflurane inhalation after ischemia. In all groups, ischemia was induced by bilateral common carotid artery occlusion plus hemorrhagic hypotension and was maintained for 10 min. Histologic outcomes were measured at 7 days after ischemia in CA1 pyramidal cells of the rat hippocampus.

RESULTS. The mean percentage of viable cells in hippocampal CA1 area was significantly higher in Group A and P compared with Group C (55 and 50 vs. 26%, $p < 0.05$). The mean percentage of viable cells in Group PA was not statistically different with that in Group A and P, but was significantly higher compared with group C (62 vs. 26%, $p < 0.01$). The percentage of apoptotic cells were was significantly lower in only Group PA than Group C (49 vs. 25%, $p < 0.01$).

CONCLUSIONS. Combination of sevoflurane postconditioning and albumin offered neuroprotective effect after transient global ischemia in rats, but did not confer additional benefit.

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0200

NA+/HCO^{3-} COTRANSPORTER IMMUNOREACTIVITY CHANGES IN NEURONS AND EXPRESSES IN ASTROCYTES IN THE GERBIL HIPPOCAMPAL CA1 REGION AFTER ISCHEMIA/REPERFUSION

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INTRODUCTION. The maintenance of intracellular pH is important in neuronal function. Na^+/HCO_3^- cotransporter (NBC), a bicarbonate-dependent acid–base transport protein, may contribute to cellular acid–base homeostasis in numerous physiological and pathological processes.

OBJECTIVES. In the present study, we examined alterations of NBC immunoreactivity, its protein and mRNA levels in the hippocampal CA1 region after 5 min of transient forebrain ischemia using gerbils.

METHODS. In the sham-operated animals, very weak NBC immunoreactivity was detected in CA1 pyramidal neurons, and the immunoreactivity in the pyramidal cells was significantly increased at 12 h after ischemia/reperfusion. Three days after ischemia, the immunoreactivity disappeared in the pyramidal neurons; however, the immunoreactivity began to be expressed in astrocytes, not in microglia, in the ischemic CA1 region at 3 days after ischemia/reperfusion judging from double immunofluorescence study with glial markers.

RESULTS. NBC immunoreactivity in astrocytes was strong 4 days after ischemia/reperfusion. In Western blot study, NBC protein level in the CA1 region was significantly increased at 12 h after ischemia/reperfusion and significantly decreased 2 days after ischemia/reperfusion. Thereafter, NBC protein level was again increased and returned to the level of the sham-operated group 4 days after ischemia/reperfusion. In RT-PCR analysis, change in NBC mRNA level in the ischemic CA1 region was similar to that in the NBC protein level after ischemia/reperfusion.

CONCLUSIONS. These results suggest that changes in NBC expressions may play an important role in the neuronal damage with astrocytosis induced by transient forebrain ischemia.

0201

EARLY DETECTION, OUTCOME AND TRIGGERING PRESSURE IN THE CRITICAL ILLNESS MYOPATHY (CIM)

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INTRODUCTION. Critical illness myopathy (CIM) is a common finding in severely ill patients, and it is known that it affects the process of weaning the patient from the respirator.
OBJECTIVES. To detect the presence of CIM in severe critically ill patients in early stages following the outcome and to compare the triggering negative pressure between patients with and without critical illness myopathy, diagnosed both clinically, by electromyography (EMG) and muscular biopsy.
METHODS. A prospective study performed among 69 critical patients admitted to ICU. Several items were recorded, including septic shock, length of stay (LOS), ventilation time, triggering force and eventual outcome. Each patient underwent a weekly electromyography (EMG) and Maximal negative triggering pressure (MNTP) measurement. When EMG alterations were detected (mainly the presence of fibrillation) a muscle biopsy was performed for electronic microscopy. For statistical analysis, we used the Student *T* test for independent groups considering significant a p-value <0.05.
RESULTS. Mean age of the whole group was 61 years. In all patients with EMG signs of fibrillation a muscle biopsy was performed, confirming by electronic microscopy the diagnosis of myopathy. The first detectable sign of CIM was fibrillation and was present in 68%, being in 30% detected in the first week and 70% during the second week. Patients with CIM had typical pathologic changes of CIM. The use of aminoglycosides and muscular relaxants was significantly higher among patients with CIM. There were no significant differences between patients with and without myopathy regarding age, body mass index, use of corticotherapy, SOFA and APACHEII scores or mortality scores and mortality. Nevertheless, LOS and mechanical ventilation were longer among patients with myopathy.
Mean MNTP was 21 ± 11 mmHg (with CIM $= 19 \pm 10$, without CIM $= 25 \pm 11$; $p =$ NS). Mechanical ventilation average time in the CIM group was 30 days, in contrast to 15 days among the non CIM group. At ICU discharge all patients with myopathy still had muscle weakness. The average time to reach full muscle strength was 21 days and it was independent from the MNTP. Six patients with myopathy who also developed polyneuropathy (identified by loss of all sensory potentials) eventually died.
CONCLUSIONS. The differences observed between patients with and without regarding the MNTP were not statistically different. MNTP does not correlate to the time of mechanical ventilation. Fibrillation in the EMG is the best method for early and easy detection of CIM. This is directly related to typical pathological changes of CIM.
GRANT ACKNOWLEDGMENT. This work is been partially supported by the grant "La Marato de TV3".

0202

EXPERIENCES WITH INTRAVENOUS THROMBOLYSIS IN ACUTE STROKE PATIENTS ADMITTED TO LOW VOLUME DISTRICT HOSPITAL

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INTRODUCTION. Due to short therapeutic window thrombolysis in acute ischemic stroke (AIS) should also be considered in small district hospitals. Lack of expertise with CT interpretation, inexperience in thrombolytic treatment and excessive fear of haemorrhagic complications may discourage this idea.
OBJECTIVES. To assess the feasibility, safety and outcome of thrombolysis in AIS in a low volume hospital.
METHODS. Retrospective observational study was performed in hospital with 325 beds, treating 140,000 habitants (1,950 km^2 gravitation area). The maximal time arrival at hospital and the transfer time to reference centre is 50 min each. Between September 2004 and December 2010 in ICU 54 AIS patients (pts) were treated with thrombolysis (rtPA iv, 0.9 mg/kg, 10% as bolus, rest over 1 h infusion) according to the international guidelines and inclusion criteria. Outcome NIHSS in survived pts, share of pts showing improvement (>1 NIHSS point), symptomatic haemorrhagic transformation (HT; CT finding and worsening by >1 NIHSS points), and in-hospital mortality were compared between three periods:1. Introduction of treatment between years 2004–2008.2. Year 2009,3. Year 2010.
RESULTS. The overall improvement was found in 69% of all 54 pts, mortality rate was 18% and HT was found in 7 pts. Only 4 pts (7% of all) had symptomatic HT. There were no significant differences between the three periods in the sex, average age of patients (64 ± 15, 63 ± 14 and 69 ± 8, respectively) and admission NIHSS score (see Table 1). Outcome NIHSS scores were statistically significantly improved in all periods ($p < 0.001$; *t* test), however, there was no significant difference between the periods in this respect (1W ANOVA). The comparisons of total treatment time and the treatment delay (time from diagnosis to treatment) showed a trend toward better management of pts in last years. Notably, the diagnostic delay was not shortened. In addition, proportions of improved pts and mortality also indicates better treatment outcome in 2010. However, the differences between the periods were not statistically significant (Table 1).

TABLE 1

Years/number of pts	2004–2008/n = 19	2009/n = 17	2010/n = 18
Admission NIHSS	14 ± 7	11 ± 5	11 ± 5
Outcome NIHSS	5 ± 4	3 ± 4	2 ± 2
Admission delay (min)	97 ± 44	84 ± 48	96 ± 37
Diagnostic delay (min)	37 ± 21	49 ± 21	35 ± 17
Treatment delay (min)	20 ± 18	18 ± 12	15 ± 14
Total time to treatment (min)	154 ± 45	150 ± 49	145 ± 40
Improvement (n, %)	11 (58%)	11 (65%)	16 (89%)
Symptomatic HT (n, %)	2 (11%)	1 (6%)	1 (6%)
Mortality (n, %)	5 (26%)	3 (18%)	2 (11%)

CONCLUSIONS. The treatment outcome and safety after thrombolysis in AIS in low volume district hospital are comparable with other larger studies.
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0203

OCULAR SONOGRAPHY TO ASSESS THE EFFICACY OF OSMOTHERAPY IN PATIENTS WITH RAISED INTRACRANIAL PRESSURE

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INTRODUCTION. The ONSD measurement with ocular ultrasound-scan is a recent non-invasive tool for the high intracranial pressure assessment in acute brain injured patients [1, 2]. Few clinical studies have assessed the fiability of ONSD variations during osmotherapy with mannitol for the treatment of raised ICP episodes.
OBJECTIVES. The aim of our study was to determine the rate of ONSD variation after mannitol administration for high ICP detected with an invasive intracranial pressure monitoring.
METHODS. We included, in a prospective observational study, 10 patients with acute brain injury (traumatic brain injury or subarachnoid hemorrhage) with parenchymateous ICP monitoring. The ONSD was measured on the right and left eye (3 mm behind the retina with a 7.5 MHz echography probe). Simultaneously, we measured ICP, $PaCO_2$, body core temperature, before and 20 min after mannitol 20% infusion for a raised ICP episode (ICP > 25 mmHg more than 15 min) not controlled by sedation and analgesia increase. Patients treated with pentothal or ocular trauma or ocular surgery history were excluded. The statistical analysis was realized with a non-parametric test (Wilcoxon test).
RESULTS. 26 ONSD measures were obtained. The mean value of mannitol dose was 0.7 g/kg (range from 0.2–0.8). In all cases of high ICP episodes, the ONSD was superior to 5.9 mm (mean = 6.4 mm). The ONSD variation was significantly different before and after mannitol infusion (mean values 6.4–5.8 mm, $p = 0.0037$) (Fig. 1). All patients had a significant decrease of ONSD after mannitol, associated to a significant reduction of intracranial pressure (38.4–23.5 mmHg, $p = 0.0038$) and to an increase of cerebral perfusion pressure (50.7–60.3 mmHg, $p = 0.0038$).

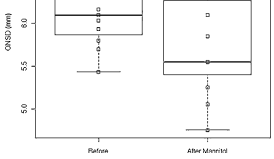

Fig.

CONCLUSIONS. The variation of ONSD seems to be a user-friendly parameter to check the efficacy of mannitol osmotherapy infused for raised ICP episode in patients with acute brain injury.
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0204

CORRELATION BETWEEN INTRACRANIAL PRESSURE AND ARTERIAL BLOOD PRESSURE DURING HYPERBARIC OXYGENATION IN MECHANICALLY VENTILATED PATIENTS WITH INTRACRANIAL HEMORRHAGES

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INTRODUCTION. Intracranial hypertension is one of the main factor of secondary ischemic injury in patients with intracranial hemorrhages (ICH). Therefore, intracranial pressure (ICP) measurement must be a routine procedure in critically ill neurosurgical patients. However, it is impossible to measure ICP during hyperbaric oxygenation (HBO) due to commercial devices are not available for such purposes. Control of arterial blood pressure (ABP) dynamics is one of the possible methods of ICP trend evaluation inside HBO chamber.
OBJECTIVES. To determine the correlation between ICP and ABP dynamics during HBO in mechanically ventilated patients with ICH.
METHODS. Twenty-one mechanically ventilated patients with ICH (severe traumatic brain injury—9, subarachnoid hemorrhage—12) and Glasgo Coma Scale 9 or less were enrolled in the study. HBO was performed by ≪Sechrist≫ HBO chamber equipped with ventilator ≪Sechrist-500≫. Patients received 49 HBO sessions (1.2–1.6 absolute atmospheres for 40–50 min) in first postoperative week. Heart rate (HR) and mean ABP were recorded during each session. Arterial oxygen tension (PaO_2), arterial carbon dioxide tension ($PaCO_2$) and ICP before and after HBO were analyzed.
RESULTS. 15 HBO sessions (31.3%) were accompanied by ICP increase from 15.3 ± 4 to 23 ± 5.7 mmHg ($p < 0.05$) [44 (36, 65.5)%]. Mean ABP also increased from 107 ± 16 mmHg to 121.5 ± 24 (11(−1.5, 26.7)%) ($p < 0.05$). HR increased from 97 ± 14.5 to 108 ± 15/min ($p < 0.05$). We found moderate correlation between ICP and mean ABP dynamics ($n = 30$, $r = 0.65$, $p = 0.6$).
ICP decreased during seven sessions of HBO (14.5%) from 18.9 ± 2.5 to 14.4 ± 3.3 mmHg (26 ± 12%) ($p < 0,05$). Mean ABP did not change (before HBO- 98,5±11,3 mm Hg, after-99,9 ±14 mm Hg). HR decreased from 88,7±11,4 per min to 83,4 ±11,7 per min. We didn't find any correlation between ICP and mean ABP dynamics (n=14; r=0,02; p=0,9).
ICP was unchanged during 26 HBO sessions (54,2%). ICP before HBO—15.3 ± 4.6 mmHg, after—15.5 ± 4.9 mmHg. Mean ABP also did not change: 107.3 ± 13.6 mmHg before HBO, 106.9 ± 13.4 mmHg after. HR was stable: 84.4 ± 15.6/min before HBO and 86.5 ± 15.6/min after HBO. Moderate correlation was determined between ICP and mean ABP dynamics ($n = 52$, r=0.42, $p = 0.002$).
CONCLUSIONS. ICP increase during HBO in mechanically ventilated patients with ICH is correlated with mean ABP dynamics and could be used for intracranial hypertension prediction. Mean ABP elevation during HBO more than 11% reflects ICP rising.

0205

IMPLANTATION OF A PLATFORM MEETING BASED ON TELEMEDICINE FOR THE TREATMENT OF PATIENTS WITH ACUTE STROKE (TELE-STROKE) IN THE INTENSIVE CARE UNIT OF A RURAL HOSPITAL (PIONEERING EXPERIENCE IN ANDALUSIA, SPAIN)

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INTRODUCTION. Acute ischemic stroke is a pathology whit high incidence, rate of mortality and morbidity, whit great disability. Requires early evaluation and treatment where systemic thrombolysis has proven to be effective. Geographical dispersion of the population in the area of influence of a rural hospital cannot assure the accessibility of the patients to acute stroke centers. Looking for new strategies, Telemedicine for stroke (TELE-STROKE), allows a neurologist instant interconsultation at the reference center using interactive software and audio–video link 24 h/7 days. We can to transfer written information, analytics and cranial CT in real time, which is shared between both professionals, and performs a neurological exploration by videoconference, facilitating joint decision-making

OBJECTIVES. To present the initial experience with patients with acute stroke who receive thrombolysis whit rt-PA with the support of Tele-Stroke platform in the Intensive Care Unit of a rural hospital, and evaluate the impact on health outcomes after its implementation

METHODS. Retrospective, descriptive study to evaluate characteristics, clinical evolution, complications and outcomes of the first 11 patients whit ischemic stroke who receive fibrinolysis in the ICU of Riotinto Hospital between January 2009 and March 2011, using the Tele-Stroke platform to establish a interconsultation whit the Department of Neurology at the Vírgen del Rocío Hospital

RESULTS. Mean age (±SD) of the patients receiving rt-PA was 68 ± 6.64 years (range 55–77), whit 27% women. Median NIHSS score on ICU admission was 11.45 ± 5.71 (4–23) and 6 ± 5.55 (0–18) at hospital discharge (excluding exitus), with 5.45 points of average improvement. Median APACHE II was 11.36 ± 5.5 (6–23). Time from symptoms onset to the arrival at Hospital was 71 ± 45.1 min (24–180), and the door to needle time was 92 ± 24.6 min (65–128). Time from symptoms onset to fibrinolysis was 163 ± 40.6 min (100–245). There were two minor hemorrhagic transformation that did not induce increase in neurological deterioration. Two patients (18%) died during hospitalization, due both to the large size of the cerebral infarct with mass effect. In the review 3 months after hospital discharge, Rankin score was ≤2 in 36% of patients. One patient with a history of a previous stroke and disabilities was discharged with bad vital prognosis and died due to broncoaspiration.

CONCLUSIONS. The implantation of a protocol for fibrinolysis in patients with acute stroke using a Telemedicine platform, makes it possible to have a neurological "on-line" appraisal in first-level hospitals and perform a proper treatment, that is effective and has few complications, improving the quality of care provided to patients. This results show that both mortality and disability decrease. The patients come with much delay from symptoms onset, the reason the series should be so short. A goal to achieve is to reduce in-hospital time for realization of diagnostic, and telematic contact.

0206

VENTILOMETRY TEST BY DIRECT AND INDIRECT METHODS IN NEUROCRITICALS ILLS: INITIALS RESULTS

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INTRODUCTION. Mechanical Ventilators in real time monitoring the respiratory rate (RR) and expired tidal volume (tV) and others parameters. The acquisition of the value of volume minute (minV) there is the equation: tV x RR and to obtain the rapid shallow breathing index (RSBI) is used RR/tV. There is the question in what method is benefic.

OBJECTIVES. Comparison of the two methods of ventilometry (direct and indirect method) in neurocriticals ills and the index of success.

METHODS. An interventional and prospective study in neurocriticals ills submitted in pressure support ventilation (PSV) modality. In pre-extubation phase: patients were evaluated, arterial blood gases, Glasgow coma score(GCS) >8 points and after all, the randomization were done and chosen one of the two methods: Direct: conventional ventilometry; indirect: parameters of the mechanical ventilation; evaluating the weaning scores (minV, tV, RR, RSBI and maximal inspiratory pressure-maxIP). Post-extubation phase: during 24 and 48 h analysing the success of weaning and after 48 h without intercurrences, were considered success of study. The test *t* Student were used to calculate the dates considering $p < 0.05$ significant statistically.

RESULTS. One hundred and thirteen patients randomized in two groups: G1: direct ventilometry; and G2: indirect ventilometry. G1: 60 patients male (56.5%) and female (43.3%). The average age were 48.3 ± 17.9 age, APACHE II of 17.7 ± 6.9 points, Risk of death with 21.2 ± 19.6% and GCS average in 8.45 ± 2.5 points. In G2: with 53 patients with 69.8% gender male and 30.1% female. The average age were 46.6 ± 18 age, APACHE II 17.64 ± 6.69 points; risk of death with 30.38 ± 18.21% and GCS average in 8.9 ± 2.8 points. During the comparative analysis between G1 × G2, of the ventilometry on pre-weaning tV and RR was significant ($p = 0.002$ and $p = 0.004$); in 24 h post-extubation, minV, tV and maxIP showed statistic significance ($p = 0.007$, $p = 0.004$ and $p = 0.049$); and finally in 48 h post-weaning only minV showed significance between the groups($p = 0.045$). In relation to average in time of permanence in PSV modality were 5.2 ± 4 days (G1) and 6.6 ± 2.7 days (G2). The percentage of success between G1 and G2 were hight (96.6 and 96.2%); the average of in success was lower with 3.3% (G1) and 3.7% (G2) were lower.

CONCLUSIONS. Despite of low index of in success, this technic showed efficacy, suggesting the indirect method may be used too.

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0207

WHICH PREDICTABLE VARIABLES IDENTIFY PATIENTS AT RISK OF POSTOPERATIVE TRANSIENT NEUROLOGIC DETERIORATION DUE TO CEREBRAL HYPERPERFUSION AFTER SUPERFICIAL TEMPORAL ARTERY-MIDDLE CEREBRAL ARTERY ANASTOMOSIS IN ADULT PATIENTS WITH MOYAMOYA DISEASE?

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INTRODUCTION. With regard to the treatment of adult-onset moyamoya disease, direct revascularization surgery such as superficial temporal artery-middle cerebral artery (STA-MCA) anastomosis has become one of standard therapeutic options. However, the incidence of postoperative transient neurologic deterioration due to cerebral hyperperfusion syndrome was reported with range of 27–38% in patients with adult-onset moyamoya disease after the procedure.

OBJECTIVES. The aim of this study was to determine whether which variable can predict the identification of patients at risk of postoperative cerebral hyperperfusion syndrome after STA-MCA anastomosis in adult patients with moyamoya disease.

METHODS. Laboratory data such as hemoglobin and white blood cell (WBC) count, preoperative (demographic data, initial clinical manifestation, mean value of systolic blood pressure on general ward, the angiographic staging), intraoperative (surgical time, the operative side, anaesthetic technique, fluid balance, mean systolic blood pressure, $PaCO_2$, the lowest hematocrit and intraoperative transfusion), postoperative (systolic blood pressure, APACHE II score) data were collected and used as predictable factors for postoperative cerebral hyperperfusion by binary logistic regression with forward conditional method subsequent to independent *t* test and Chi-square test, as appropriate.

RESULTS. Among 82 consecutive patients with 99 surgeries, 39 patients (47 sides, 47%) had transient neurologic deterioration due to cerebral hyperperfusion from 1 to 9 days postoperatively (median 2 days), which was sustained for 1–14 days (median 7 days). On binary logistic regression, surgical time (OR 1.01, 95% CI 1.00–1.02), operation on dominant hemisphere (OR 5.95, 95% CI 2.31–15.30), immediate postoperative WBC count (OR 1.17, 95% CI 1.01–1.35) were significant independent factors in predicting for cerebral hyperperfusion ($p < 0.05$).

CONCLUSIONS. Caution to the increased risk of cerebral hyperperfusion after STA-MCA anastomosis is needed in adult-onset moyamoya patients that have aforementioned factors.

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0208

SURVIVAL AND LONG-TERM OUTCOME OF ELDERLY COMATOSE PATIENTS IN MEDICAL ICU

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INTRODUCTION. The management of the elderly patients in intensive care unit (ICU) is an arising problem given the aging population. The age remains a limiting factor for ICU admission in several conditions. The comatose state is associated to a high mortality and invasive management in elderly comatose patients could be considered as futile. To our knowledge, they are no available data on survival and long-term outcome of elderly comatose patients in ICU.

OBJECTIVES. To determine survival and long-term outcome of elderly comatose patients

METHODS. We identified between January 2001 and December 2008, all the patients older than 75 years that had neurological impairment in the 24 first hours of ICU admission according to the ODIN score. Retrospectively collected medical records of each patient were reviewed in order to confirm inclusion criteria: comatose state defined as a Glasgow coma scale below 8 without sedative drugs. For statistical purpose, we compute three age groups: 75–80 years-old, 80–90 years-old and 90 or more years-old patients. Kaplan–Meier and log-rank test methods were used to estimate and compare survival curves. Cox proportional hazards model was used to determine the predictors of survival to hospital discharge and to adjust for potential confounding factors.

RESULTS. We identified 630 patients. They were 82 ± 5 years-old and the male to female ratio was 0.99. The mean mechanical ventilation duration was 7 ± 1 days. Sixty-two patients (10%) developed a ventilated-associated-pneumonia (VAP). Three-hundred-ninety-six patients died during their ICU stay (63%). Among the 234 survivors to hospital discharge, 73 returned home (37%). The mean survival after ICU discharge was 59 ± 20 days. No difference was found between the three studied age groups. Cox proportional hazards analysis determined that survival was associated to sex, the mean mechanical ventilation duration and the presence of VAP. Neither previous health status nor etiology of coma was link to survival in our population.

CONCLUSIONS. Our study on survival and long-term outcome of elderly comatose patients in medical ICU showed that the mean survival is not significantly different between the different age groups. Furthermore, one-third of survivors went back home. Thus, age cannot be used alone as a limiting factor for ICU admission in elderly comatose patients. A more comprehensive analysis of the survivor's quality of life seems mandatory to reinforce this conclusion.

0209

GOAL-DIRECTED INFUSION THERAPY IN PATIENTS WITH INTRACRANIAL HEMORRHAGE

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INTRODUCTION. Infusion therapy (IT) based on systemic hemodynamics monitoring (SHM) (goal-directed infusion therapy) in patients (pts) with intracranial hemorrhage (ICH) is a new direction of intensive care in neurosurgical ICU.

OBJECTIVES. To determine the role of SHM in IT volume and structure determination in pts with ICH.

METHODS. We observed 48 pts with ICH and GCS 4–8 (age 42.6 ± 13.5, male/female—28/20). Monitoring of systemic hemodynamics (PiCCO) was performed in all pts and started in the 1st, 2nd or 3rd day after depression of consciousness level (DCL) up to 4–8 Glasgow Coma Scale (GCS). Infusion therapy was based on SHM in 23 pts during 1–5 after DCL up to 4–8 GCS (goal-directed IT, group 1) and calculated without SHM parameters estimation in 25 pts (non-goal-directed IT, group 2). SHM parameters, water balance, IT volume and structure in 1–5 days after DCL up to 4–8 GCS in groups 1 (Gr1) and 2 (Gr2) were analyzed.

RESULTS. Cardiac function index was in normal ranges in all pts. Cardiac preload was higher in Gr1 during 1–5 days of observation. Global end-diastolic volume index (GEDVI) reached normal values at the 3rd day and remained normal at 3–5 days in Gr1: 1 day—618 ± 127 ml/m^2, 2 day—654 ± 111 ml/m^2, 3 day—701 ± 106 ml/m^2 ($p < 0.05$), 4 day—722 ± 104 ml/m^2 ($p < 0,05$), 5 day—740 ± 124 ml/m^2 ($p < 0,05$). Cardiac index (CI) was in normal ranges during 1–5 days of observation. Systemic vascular resistance index (SVRI) was 2,136 ± 768 dynes × s × sm^{-5}/m^2 at 1st day, and normalized at 2–5 days in Gr1. In comparison with Gr1 cardiac preload in Gr2 reached normal values only at 4th day after DCL. GEDVI was 633 ± 163 ml/m^2 at 1st day, 647 ± 155 ml/m^2 at 2nd day, 679 ± 212 ml/m^2 at 3rd day, 691 ± 165 ml/m^2 at 4th day, 728 ± 165 ml/m^2 at 5th day. CI decrease to 3.5 ± 1.2 l/min/m^2 at 1st day and to 3.8 ± 0.8 l/min/m^2 at 2nd day was accompanied by SVRI increase up to 2,451 ± 782 dynes × s × sm^{-5}/m^2 at 1st day and 2,264 ± 653 dynes × s × sm^{-5}/m^2 at 2nd day.

Less IT volume to maintain normal volemic status was used in Gr1. Average IT volume was 3,715 ± 294 ml/day (46 ml/kg/day) in Gr1 and 4,504 ± 387 ml/day (56 ml/kg/day) ($p < 0.05$) in Gr2. Average total fluid volume (enteral and parenteral) was 4,691 ± 144 ml/day (59 ml/kg/day) in Gr1 and 5,593 ± 192 ml/day (70 ml/kg/day) ($p < 0.05$) in Gr2. Average water balance was 170 (50; 430) ml/day in Gr1 and (500 (470; 1,000) ml/day ($p < 0.05$) in Gr2. Colloids prevailed in IT structure in Gr1 and cristalloids—in Gr2. Colloids volume was 1,000 (600; 1,250) ml/day in Gr1 and 600 (325; 1,000) ml/day in Gr2. Cristalloids volume was 400 (400; 750) ml/day in Gr1 and 1,600 (1,400; 2,700) ml/day ($p < 0,05$) in Gr2. EVLWI during 1–5 days of observation was higher in Gr2 and reached 8.9 ± 4.5 ml/kg at 5th day in comparison with 7.2 ± 3 ml/kg in Gr1.

CONCLUSIONS. Systemic hemodynamics monitoring should be used for IT volume and structure determination in pts with ICH.

0210

RELEVANCE OF BRAIN MRI, CT AND EEG IN DIAGNOSIS OF VIRAL ENCEPHALITIS IN PATIENTS WITH NORMAL CSF EXAMINATION

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INTRODUCTION. Clinical picture of viral encephalitis consists of a fever, headache accompanied by mental disorders and neurological symptoms of focal and/or diffused brain damage. Diagnosis is confirmed by CSF (cerebrospinal fluid) examination, neuroimaging, EEG (electroencephalography), and specific antibodies or virus nucleic acid detection in CSF. Diagnosis of viral encephalitis in patients with normal CSF examination may be difficult or delayed especially in the early stage of the disease.

METHODS. The study was carried in the group of 229 patients with clinical picture of viral encephalitis. The frequency of abnormalities in CT (computed tomography) and/or MRI (magneting resonance imaging) and pathologic EEG pattern in the patients with normal CSF were evaluated.

RESULTS. Normal CSF examination was found in 60 (26.2%) of 229 patients with viral encephalitis. In the other 169 patients CSF revealed inflammatory abnormalities. CT or MRI abnormalities were found in 20 (44.4%) of 45 performed neuroimaging examinations. In 30 patients in whom CT was performed, pathology was found in 8 (26.6%). MRI was done in 15 patients, in this group pathologic result was obtained in 12 (80%). Moreover, MRI abnormalities were found in two patients with previous normal CT. Pathologic EEG pattern was found in 54 (90%) patients with normal CSF examination. In 25 patients both CSF examination and neuroimaging were normal. In this specific group EEG was found pathologic in 22 (88%) patients.

CONCLUSIONS. 1. MRI was more sensitive than CT in diagnosis of viral encephalitis in patients with normal CSF examinations. 2. EEG was pathologic in the vast majority of patients with viral encephalitis and normal CSF examination. 3. EEG revealed pathologic pattern also in the majority of patients with normal both CF examination and neuroimaging.

0211

YEAR REVIEW OF ELECTRO-MYOGRAPHY (EMG) FINDINGS IN AN ADULT DISTRICT GENERAL HOSPITAL INTENSIVE CARE UNIT

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INTRODUCTION. Critical illness polyneuropathy (CIP) and myopathy (CIM) may affect 30–50% of patients with critical illness [1]. Neuromuscular weakness in the intensive care unit (ICU) may be due to underlying pathology pre-existing at admission, it may be secondary to drugs used in the management of critical illness, or it may be subsequent to the critical illness itself. Profound weakness has implications for weaning and rehabilitation. Establishing a diagnosis may allow treatment to be targeted.

OBJECTIVES. To perform a descriptive study looking at the use of electromyography (EMG) testing in one general ICU in order to establish the frequency of testing, types of patients tested, and how far test results correspond with clinical impression.

METHODS. The study was set in one district general hospital mixed medical and surgical ICU/HDU (high dependency unit) with approximately 650 admissions per year. All EMGs performed on any patient in critical care through the period from February 2005 to October 2010 were reviewed retrospectively. Note was made of the indication for, and the result of, the investigation. The ICNARC (Intensive Care National Audit and Research Centre) database was consulted to establish length of stay in ICU, APACHE II score, and outcome (survival to discharge or death).

RESULTS. 25 EMGs were performed during the period studied. Mean APACHE score in these patients was 19.44 (unit average score 19). 18 tests (72%) were abnormal. In 5 out of the 25 examinations, the report stated that testing was limited due to extensive oedema or poor patient cooperation. The average length of ICU stay for patients undergoing EMG was 35.33 days (range 10.9–62.6 days) (average length of stay for all patients: 7 days in ICU, 2 days in HDU). Six patients were readmitted to ICU during the relevant hospital admission. 20 patients (80%) survived to discharge from hospital. All five of the patients who died did so while still in ICU. CIP/CIM accounted for 10 of the 19 abnormal EMG results. The remaining abnormal cases were due to demyelinating neuropathy, acute axonal neuropathy, compressive or inflammatory neuropathy, or generalised myopathy. Of the 25 cases reviewed, EMG supported the clinical diagnosis in 10 cases.

CONCLUSIONS. The comparatively long duration of stay in critical care and high readmission rate among patients undergoing EMG suggests that this group of patients may suffer greater physical, and possibly psychological, challenges on discharge. Where ICU patients suffer profound weakness of any cause we need to offer structured rehabilitation and support on discharge in accordance with NICE guidance [2].

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0212

TIME FROM REPORTED ANAEMIA TO BLOOD TRANSFUSION—A QUALITY INDICATOR?

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OBJECTIVES. Assessment of the time taken from a documented low haemoglobin to clinical intervention.

INTRODUCTION. In healthy patients haemoglobins of less than 8 g/dl or less than 9 g/dl in patients with underlying co-morbidities are associated with increased morbidity and mortality [1]. National transfusion guidelines regulate all aspects regarding transfusion practice, however, it does not address time between the different steps leading up to the time of blood transfusion [2]. This study examines the time lags from blood sample processing to the time of transfusion.

METHODS. A retrospective study reviewing forty emergency surgical patients who received blood transfusion(s) using the hospital blood transfusion data base and the patient's clinical notes. Pre-and post transfusion values, time needed for laboratory processing and reporting until the start of transfusion were collected. In addition possible adverse events related to anaemia e.g. hypotension, breathlessness, tachycardia were recorded and if patients were grouped and saved or cross matched.

RESULTS. Forty patients were admitted acutely to a surgical specialty and required subsequent blood transfusion(s). 19 were female and 21 male with a mean age of 68.7 years. Mean hospital stay was 12 days. Median pre-transfusion haemoglobin was 7.4 g/dl with a range of 3.4–7.9 g/dl. 68% of patients had group and retain samples taken prior to the documented low haemoglobin. 22% of these patients had been previously cross-matched for blood. The median processing time of the blood sample in the laboratory until available for medical staff was 60 min with a range of 10–200 min. The median time between the publishing of a low haemoglobin until the start of a blood transfusion was 4.7 h with a range of 18 min to 44 h. Out of the 40 patients, 24 had documentation of an adverse event. The mortality rate in this group of patients was 23% compared to the mortality of 6% in the symptom free group ($n = 16$).

CONCLUSIONS. In the literatures symptomatic anaemia was shown to increase morbidity especially in patients with co-morbidities. This audit has identified significant delays between reporting and the start of blood transfusion. This time should be included as a quality indicator for blood transfusion services.

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0213

ANALYSIS OF RISK FACTORS OF MORTALITY FOR ONCOLOGIC SURGICAL PATIENTS

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INTRODUCTION. Surgical treatments for oncologic diseases are frequently indicated, even for palliative care, although operative mortality could be high. In order to improve outcome in oncologic surgery, it is important to determine those factors related to operative mortality.

OBJECTIVES. Our objective was to determine those factors related to mortality for oncologic surgical patients.

METHODS. We included all oncologic patients operated over a period of one an half years. The only exclusion criteria were those oncologic procedures that have an expected mortality lower than 1%. We performed a cross-sectional study; a database was created including pre, intra and postoperative variables. We have compared survivors and death patients using Chi square, and *t* Student when indicated. Those significant modifiable variables have been included in a multivariate analysis as well as surgical and comorbidity risk scores.

RESULTS. We include in the analysis 1,408 patients (148 emergency and 1,269 elective procedures). Anatomical distribution of surgery were: Thorax 14%, Abdominal 65%, Cerebral 7.5% and Head and Neck 13.5%. One-hundred nineteen patients (8.5%) died during operative period. There were differences in the type and timing of surgery; non-survivors had less invasive surgery and more emergency cases. Most patients (65%) were managed in the surgical ICU without differences between survivors and nonsurvivors, although non survivors stay was significantly longer (4.3 ± 6.5 vs. 1.6 ± 3 days). The following factors resulted significantly different for non survivors: COPD (31 vs. 16%), Preoperative renal failure (9 vs. 5%), preoperative hepatic disease (23 vs. 11%), metastasis (37 vs. 20%); preoperative admission days (5 ± 9 vs. 2 ± 6 days), Emergency surgery (39 vs. 8%); re-operation (21 vs. 6%), postoperative transfusion required (6 vs. 3%), Pulmonary complications (63 vs. 5%), Cardiac and hemodynamic complications (47 vs. 4%), Acute renal failure (19 vs. 1%), Postoperative sepsis (25 vs. 1%), Neurological complications (19 vs. 1%). Higher risk of mortality is done in those patients with a ASA score of 3–4, SRS score >9 and when a palliative procedure is planned.

CONCLUSIONS. Preoperative treatment of risk factors should reduce rates of morbidity and mortality, mainly in those patients operated for elective oncologic surgery. Palliative surgery has even more risk of mortality as major oncologic surgery.

0214

ADVERSE CARDIAC EVENTS DURING CATECHOLAMINE VASOPRESSOR THERAPY: A PROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION. Cardiovascular failure is a leading cause of death in surgical intensive care units (SICU). Aside from fluids, the majority of pharmacological agents used to treat cardiovascular failure are catecholamine derivatives with a high potential to induce adverse cardiac events (ACE).

OBJECTIVES. To determine whether postoperative patients with cardiovascular failure receiving catecholamine therapy (CT) experience a higher incidence of ACE with a higher load of catecholamines and whether independent risk factors for the occurrence of these ACE exist.

METHODS. From January 1 until December 31, 2009, a total of 112 postoperative patients with cardiovascular failure admitted to a 12-bed SICU located in a tertiary university teaching hospital were systematically screened for the occurrence of the following ACE during CT: prolonged elevated heart rate, new-onset tachyarrhythmias, myocardial cell damage, acute cardiac arrest, acute cardiac death, acute right-heart dysfunction, and reduction of systemic blood flow. We recorded hemodynamic data at study inclusion and when ACE occurred. Furthermore, the types and doses of catecholamines were recorded, and relations to hemodynamics were analyzed.

RESULTS. Fifty-four (48.2%) of the 112 included patients developed a total of 114 ACE during CT, yielding an incidence of 48.2% (95% CI, 38.8–57.6%). Chronic liver disease [n = 9 (16.7%) vs. n = 1 (1.7%), $p = 0.007$], need for renal replacement therapy [n = 8 (14.8%) vs. n = 1 (1.7%), $p = 0.01$], the SAPS II [median (IQR) 49 (37–55) vs. 38 (32–47) points, p=0.002] and the number of catecholamines infused at study enrolment [median (IQR) n = 2 (1–3) vs. n = 1 (1–2), $p = 0.02$], as well as the duration of CT [median (IQR) 186 (84–312) vs. 57 (39–111) h, $p < 0.001$] were independently associated with the occurrence of ACE (Figure). Patients experiencing ACE required longer CT and mechanical ventilation, stayed in the SICU longer, and had greater mortality than those without ACE. When the multivariate model included binary use and the dose of single vasopressors at study enrolment, use of epinephrine (OR 3.35, CI 95% 1.27–8.87, $p = 0.02$) and the dose of phenylephrine (OR 2.1, CI 95% 1.04–4.26, $p = 0.04$) were independently associated with the occurrence of ACE. Patients developing ACE had greater morbidity [SOFA-score at discharge (median (IQR) 11 (9–13) vs. 10 (8–12) points, $p = 0.04$] and mortality [n = 14 (25.9%) vs. n = 1 (1.7%), $p < 0.001$] than patients who did not.

CONCLUSIONS. ACE occurred with an incidence of 48.2% (95% CI, 38.8–57.6%) in SICU patients during CT and were related to increased morbidity and mortality. Although a causative relationship cannot be proved, the extent and duration of CT may play a contributory role in the pathogenesis of ACE in SICU patients with cardiovascular failure. Clinicians need to be aware of this high incidence of ACE when starting patients on catecholamines. Future research is required to identify alternative drugs to treat cardiovascular failure.

0215

POSTOPERATIVE CARDIAC SURGERY. GENDER DIFFERENCES

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OBJECTIVE. The aim of this study was to analyze the gender differences in hospital outcome in postoperative cardiac surgery patients.

MATERIALS AND METHODS. A retrospective longitudinal descriptive study of 362 patients admitted after cardiac surgery to the intensive care unit of a third level hospital, from March 2009 to March 2011, included in the Spanish registration ARIAM (Analysis of Delay in Acute Myocardial Infarction). There were 208 men and 154 women and we analyzed in both genders: the baseline clinical-demographic characteristics, cardiovascular risk factors, comorbidities, type of surgery, treatment, cardiac surgery complications, and in-hospital mortality.

RESULTS. Women were older (66.17 ± 11.03 vs. 63.73 ± 11.02, $p = 0.038$) and had more prevalence of obesity (39.60 vs. 27.90%, $p = 0.019$) and hypertension (70.10 vs. 61.50%, $p = 0.090$) than men, while men had greater frequency of smoking (25.00 vs. 5.20%, $p < 0.001$) and chronic lung disease (10.20 vs. 3.30%, $p = 0.012$). Men had more history of previous ischemic heart disease (both AMI and angina) and women more history of heart failure, atrial fibrillation and pulmonary hypertension. There were no differences in the presence of hyperlipidemia, diabetes and chronic renal failure. The Euroscore (European System for Cardiac Operative Risk Evaluation) medium were 6.47 ± 2.52 in women y 5.13 ± 3.17 in men ($p < 0.001$). Women have a different pattern of access to cardiac surgery: they were more likely to receive a valvular surgery (77.30 vs. 50.50%, $p < 0.001$) while men had greater frequency of coronary revascularization surgery (43.30 vs. 16.9%, $p < 0.001$). The aortic surgery was similar in both sexes. There were no significant differences in cardiopulmonary bypass time (113.56 ± 44.44 in men and 109.69 ± 47.47 in women) and aortic cross-clamp time (77.61 ± 35.30 in men and 75.98 ± 32.99 in women). The amount of inotropic/vasoactive drugs administered and the use of intra-aortic balloon pump were similar in both sexes. Complications of cardiac surgery (cardiogenic shock, cardiac arrest, perioperative myocardial infarction, major bleeding and renal failure) were similar for women and men. There was a non statistically significative trend to higher in-hospital mortality in women (11.00 vs. 5.80%, $p = 0.068$).

CONCLUSIONS. Women had a worst cardiovascular profile and non statistically significative trend to higher in-hospital mortality. This difference probably is not attributable to gender, but the type of surgery, because women were more likely to receive a valve surgery, that has a higher mortality. There are no studies specifically designed to investigate possible gender differences in cardiac surgery.

0216

THENAR OXYGEN SATURATION IN ICU CAN PREDICT POST OPERATIVE SIRS AFTER CARDIAC SURGERY

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INTRODUCTION. Studies have explored the ability of steady state StO_2 in predicting SvO_2 and outcome in septic shock. Furthermore, the inclusion of a dynamic test consisting in a transient ischemic challenge (the so-called vascular occlusion test) has improved this predictive value. After cardiac surgery, lot of patients are subjected to post operative SIRS.

OBJECTIVES. This prospective study was aimed to test the hypothesis that tissue hemoglobin oxygen saturation (StO_2) measured noninvasively using near-infrared spectroscopy is a reliable indicator of SIRS after cardiac surgery.

METHODS. The study was approved by the ethical research committee of the hospital. We enrolled prospectively 45 patients for a cardiac surgery with cardiopulmonary bypass. Measurements were done just after ICU admission. Steady state level of Thenar oxygen saturation (StO_2) and occlusion test were recorded noninvasively using the InSpectra Tissue Spectrometer Model 650 (Hutchinson Technology, Hutchinson, Minnesota). Results were expressed as mean ± SD and number (percentage). Absolute StO_2 and VOT-derived variables were obtained using the InSpectra Research Software v4.01 (Hutchinson Technology). The predictive value of StO_2 and StO_2 reoxygenation slope (ReOx) for detecting the SIRS was calculated using receiver operating characteristic (ROC) curves, and the area under the curve (AUC) was computed. Statistical significance was defined as $P < 0.05$ (two-tailed test).

RESULTS.

ICU admission parameters

Admission parameters	SIRS (n = 24)	No SIRS (n = 21)	p
Norepinephrine (H0)	13 (54%)	0 (0%)	<0.0001
Temperature (H6)	37.3 ± 0.8°C	36.6 ± 0.8°C	<0.005
$ScVO_2$ (H0)	66 ± 10%	67 ± 11%	NS
StO_2 (H0)	76 ± 8%	81 ± 6%	0.04
StO_2 reoxygenation slope (H0)	1.71 ± 0.8	2.43 ± 1.4	0.06

At the admission, a StO_2 cut off value of 80% can predict post operative SIRS after cardiac surgery (specificity = 57%, sensibility = 80%, PPV = 0.61, NPV = 0.76, LR+ = 1.83 et LR− = 0.35). For StO2 reoxygenation slope, a cut off value of 2.84 can also predict post operative SIRS after cardiac surgery (specificity = 50%, sensibility = 95%, PPV = 0.95, NPV = 0.5, LR+ = 1.9 et LR− = 0.1).

CONCLUSIONS. Patients who were subject to post operative SIRS after cardiac surgery have a lower basal level and reoxygenation slope at the ICU admission than the others. Despite a good sensitivity, StO_2 has low specificity.

0217

A RETROSPECTIVE AUDIT OF MORBIDITY AND MORTALITY OF PATIENTS WITH RENAL TRANSPLANT WHO WERE ADMITTED TO ITU WITHIN 1 YEAR OF TRANSPLANT SURGERY

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INTRODUCTION. Renal transplant is a common operation which restores renal function and improves the quality of life in those patients who have end stage renal failure. The surgical complications have been described in a large study and critical care management has been promoted elsewhere but not examined. The current quoted 1 year mortality is 7% for deceased heart beating donor.

OBJECTIVES. The purpose of our study was to describe all patients admitted to Intensive care within 1 year of renal transplant.

METHODS. We performed a retrospective audit of all patients who were admitted to the intensive care unit within 1 year of a renal transplant. We documented demographics, cause of admission, length of stay and mortality. We also documented the need for renal replacement therapy and all significant microbiology.

RESULTS. 1,405 renal transplants were performed over a 10 year period between 2000 and 2010. Sixty-four patients were admitted to Intensive care. Some were admitted more than once and in total there were 79 admission episodes. Over the period of study 18 patients died within 1 year in other hospitals. The average age of the patients was 49 years old. The 3 month mortality of these patients was 28% and the mean APACHE 2 score was 19.7. The overall mortality during the 10 year period was 2.85%. The mean length of stay on intensive care was 7.9 days. The commonest cause of early admission (before 4 months) was surgical haemorrhage, graft failure and then chest infection. The commonest cause of late admission (between 4 months and 1 year) was chest infection and sepsis. We demonstrated that 50% of patients needed some form of renal replacement therapy following admission and 11% needed ongoing renal replacement therapy after 1 year. The patients most in need of renal replacement therapy were those admitted with surgical haemorrhage or graft failure. The significant microbiology we described was atypical with a large number of viral infections (22%), gram negative infections (16%) then fungal infections (12%). This was consistent with immunosuppression and also prolonged hospitalisation.

CONCLUSIONS. We describe a population of patients admitted to intensive care following renal transplant and demonstrate a 2.85% 1 year mortality. Overall our outcome figures compare favourably with the national average. It may be that prompt critical care support could be considered as a useful intervention in all patients to supply initial surgical attention, ongoing renal support and expertise in the management of sepsis. The authors understand that the trial design was a retrospective audit rather than an interventional study and that the complexity of these patients may make prospective design impossible.

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0218

VARIABLES PREDICTIVE OF POSTOPERATIVE COMPLICATIONS AND PROLONGED INTENSIVE CARE UNIT STAY FOLLOWING OESOPHAGOGASTRECTOMY

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INTRODUCTION. The Incidence of oesophageal cancer is rising in northern Europe [1]. Surgery with curative intent, with or without neoadjuvant therapy, is a common therapeutic approach. Early postoperative complications are frequent and are independently associated with poor oncological outcome [2].

OBJECTIVES. A retrospective study to identify variables predictive of postoperative complications and prolonged intensive care unit (ICU) stay post-oesophagogastrectomy in a tertiary cancer hospital.

METHODS. Approval was granted to undertake this project. Data on patient variables including age, sex, body mass index (BMI), co-morbidity, smoking, pre-operative chemotherapy, ASA grade, APACHE II score, laboratory data, fluid balance, morbidity and mortality were collected over 3 years (January 2008–2011). Pearson's χ^2 and Mann–Whitney U tests used in analysis as appropriate. $p < 0.05$ was considered statistically significant.

RESULTS. Ninety-five patients were included in the study (4.2% of all ICU admissions during the study period). Patient demographics: 77 male, 18 female, median age 64 years (IQR 57–72), median BMI 26.7 (IQR 23.9–30.1), smoking history 72.6%, cardiac disease 21.1%, respiratory disease 15.8%, pre-operative chemotherapy 73.7%, weight loss >10% in 3 months 20.0%, ASA 2 61.1%, ASA 3 38.9% and median APACHE II 14 (IQR 12–17).

Postoperative ICU complication rate was 62.1%, ICU mortality 2.1% and 6-month mortality 4.2%. Common complications were respiratory (49.2%), surgical (23.7%) and cardiac (16.9%). Thirty-two percent of patients developed atrial fibrillation and 36.8% ECG changes. Sixty percent were mechanically ventilated for >24 h. Median length of ICU stay was 8 days (IQR 6–15).

Factors associated with increased ICU complications were: • Preoperative Haemoglobin, $p = 0.013$
• ASA 3, $p = 0.029$
• Respiratory disease, $p = 0.033$
• Smoking, $p = 0.049$

Age, BMI, histological diagnosis, weight loss >10 kg in 3 months, preoperative chemotherapy, cardiac disease, duration of surgery, APACHE II score and higher post-operative fluid balance were not statistically associated with increased risk of ICU complications.

Factors associated with ICU length of stay >7 days were:
• ASA 3, $p = 0.002$
• Preoperative haemoglobin, $p = 0.004$
• Cardiac disease, $p = 0.024$
• Preoperative chemotherapy, $p = 0.042$
• Duration of surgery, $p = 0.042$
• Higher fluid balance postoperative days 1–5, $p = 0.008$, 0.033, 0.046, 0.018, 0.009, respectively

CONCLUSIONS. Despite a high postoperative complication rate compared to other published studies [3], overall ICU mortality was low in this study. Respiratory complications were common. Smoking and respiratory disease predicted postoperative complications. Fluid balance in the first 5 postoperative days did not predict complications but was associated with prolonged ICU stay.

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0219

TRANSESOPHAGEAL ECHOCARDIOGRAPHY CAN DETECT SPACE OCCUPYING LESIONS OF CARDIAC TAMPONADE MORE IN DETAIL FOLLOWING CARDIOVASCULAR SURGERY

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INTRODUCTION. Cardiac tamponade following cardiovascular surgery is a life-threatening complication and varies in patterns due to surgical procedures. Transesophageal echocardiography (TEE) is considered more advantageous than transthoracic echocardiography to diagnose it.

OBJECTIVE. The aim of this study is to analyze the patterns of cardiac tamponade following cardiovascular surgery using TEE.

METHODS. We have retrospectively investigated postoperative cardiac tamponades in the ICU of Hirosaki University Hospital between Jan. 2006 and Oct. 2010. We reviewed type of surgery, changes in systemic BP (sBP), CVP and cardiac output (CO) before and after the diagnosis, speed of postoperative bloody drainage (ml/h) and duration between admission to the ICU and re-thoracotomy if performed. We also classified patterns of cardiac tamponade based on TEE findings and other visual examinations like CT scan. Data are expressed as mean ± SD or Median (Min. Max.). Paired t test was used for the comparison and $P < 0.05$ was considered as significant.

RESULTS. There were 22 cardiac tamponade cases during the investigated period. The types of surgery were 7 surgeries related to mitral valve, 7 coronary artery bypass graftings, 4 aortic valve replacements, 3 graft replacements of aortic arch and 1 repair of cardiac rupture. Before and after the tamponade diagnosis, CVP and CO significantly changed from 8.2 ± 2.6 to 14.0 ± 3.7 mmHg and from 3.6 ± 1.0 to 2.7 ± 0.9 l/min, respectively. The speed of postoperative bloody drainage was 139 ± 85 ml/h. Re-thoracotomy was performed for 18 cases and the median duration between admission to the ICU and re-thoracotomy was 14.5 (4, 168) h. There were 5 circumcardiac tamponades with unclotted blood and 17 cardiac tamponades with localized hematoma compressing one or more cardiac chambers. Those hematomas were located in the extra-pericardial space and intra-pericardial space. Extra-pericardial hematomas were formed in anterior mediastinal cavity compressing right ventricle in 5 cases and intra-pericardial hematomas were found in 14 cases. Intra-pericardial hematomas were formed with compression to RA in 11 cases, RV in 5 cases, LA in 4 cases and LV in 3 cases and around the proximal aorta in 3 cases. More than one hematoma was detected in 14 cases.

CONCLUSIONS. There were 7 different patterns of cardiac tamponade in 22 cardiovascular cases and it sometimes happened simultaneously. As each space occupying lesion may affect hemodynamics, intensivists should be cautious not only for circumcardiac tamponade, but also for other localized hematomas with TEE.

0220

SHORT-TERM MORBIDITY OF CORONARY ARTERY BYPASS GRAFTING DUE TO ACUTE KIDNEY INJURY

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INTRODUCTION. Occurrence of acute kidney injury (AKI) in post-operative period after cardiac surgery is associated with a high risk of morbidity and mortality [1]. The AKIN-classification describes different severity levels of AKI. However, the AKIN do not take into account the influence of therapeutic interventions in the peri-operative setting.

OBJECTIVES. The aim of this single center, retrospective, observational study was to investigate the association of peri-operative characteristics and the incidence of AKI on the global physical functioning 8 weeks after cardiac surgery.

METHODS. During a period of 18 months all patients, who underwent a coronary artery bypass grafting (CABG) were included. In the peri-operative period, following parameters were examined: demographic characteristics, diabetes mellitus, history of congestive heart failure or pre-existing cardio-surgery, urgency of surgery, EuroSCORE, SRI-score, hematocrit, infusion of red blood cells, serum creatinine (at admission, every 24 h, minimum 48 h, during 7 days and after 8 weeks), infusion of furosemide, duration of cardiopulmonary bypass and cross-clamping, need of renal replacement therapy and the subjective evaluation of global physical function after 8 weeks by the surgeon.

RESULTS. 565 patients were included and 14.7% of the patients evolved to AKI in the post-operative period. AKI was associated with higher age (66.5 ± 9.4 vs. 69.6 ± 10.2 years, $p = 0.05$), pre-existing renal dysfunction (eGFR 87.9 ± 30.9 mL/min/1.73 m^2 vs. 74.8 ± 34 mL/min/1.73 m^2, $p < 0.01$), history of congestive heart failure (4.9 vs. 7.4%, $p = 0.03$), urgency of surgery (5.3 vs. 13.4%, $p = 0.03$), higher EuroSCORE (3.6 ± 2.6 vs. 5.2 ± 3.5, $p < 0.01$) higher SRI-score (0.5 ± 0.7 vs. 0.8 ± 1.0, $p < 0.01$) both per- and post-operative transfusion of red blood cells (9.9% per-operative transfusion vs. 25.3%, $p < 0.01$ and 16.3% post-operative transfusion vs. 42.2%, $p < 0.01$) and infusion of furosemide in the post-operative period (60.0 vs. 84.3%, $p < 0,01$). After 8 weeks, 483 (86.4%) patients consulted their surgeon. Six patients died (1.2%). There was a significant difference in good versus moderate global physical functioning between patients with or without AKI (χ^2, $p < 0.01$). Duration of AKI (1–2, 3–6, ≥7 days) compared with global physical functioning after 8 weeks was not significantly different. Two patients were dialyzed within 7 days after surgery and died. Four patients were temporarily dialyzed in the subsequent 7 weeks. One of them died.

CONCLUSIONS. Administration of red blood cells and/or furosemide as part of the cure after CABG, may imply an opportunity to cause co-morbidity in the post-operative period due to AKI, which compromises further process of care.

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0221

PREDICTIVE FACTORS OF ACUTE RENAL FAILURE (ARF) IN THE IMMEDIATE POSTOPERATIVE LIVER TRANSPLANT IN AN INTENSIVE CARE UNIT (ICU)

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INTRODUCTION. Acute renal failure is one of the most frequent complications in the immediate postoperative of patients undergoing orthotopic liver transplant (OLT), increasing morbidity and mortality.

OBJECTIVES. The aim of this study was to determine the factors associated to the development of acute renal failure (ARF) in the postoperative period in these patients.

METHODS. Retrospective observational study through review of medical records of 49 patients undergoing OLT admitted to the ICU from January 2009 to September 2010. Perioperative variables were collected. Numerical variables are presented as mean, mean differences, median and percentiles (25 and 75th) and categorical variables as absolute numbers and proportions. Chi-square test and Fisher's exact test were used to compare categorical data and Student's t test for independent data was used for numerical data. A multivariate analysis was used to identify independent risk factors associated with ARF. A logistic regression model was developed with predictive purposes, using Mallows' Cp criterion implemented by Hosmer–Lemeshow.

RESULTS. 74% were men and 26% were women. Age was 52.7 ± 8.8 years. The median ICU length of stay was 3.5 days (P25: 2 days, P75: 8.5 days). The average admission APACHE II score was 17.8 ± 6. The average preoperative creatinine level was 0.93 ± 0.56 mg/dL. The univariate analysis showed significant differences between patients non developing and developing ARF: APACHE II score (mean difference—4.20, CI 95% −7.4 to −0.98), preoperative creatinine level (mean difference −0.40, CI 95% −0.72 to −0.08), number of PRBCs (packed red blood cells) units transfused intraoperatively (mean difference −6.62, CI 95% −11.60 to −1.70), number of FFP (fresh frozen plasma) units transfused during surgery (mean difference −5.33, CI 95% −10.30 to −0.40), preoperative ascites (Fisher's Exact Test 0.02, $p = 0.014$), use of vasoactive drugs in surgery (χ^2 test 9.28, $p = 0.002$) and use of vasoactive drugs in the ICU during the first 24 h (χ^2 test 9.28, $p < 0.001$). Preoperative ascites and vasoactive drugs used during surgery were independent risk factors for ARF in the multivariate analysis [OR 4.3 (CI 95%: 1.13–16.78) and OR 8.86 (CI 95%: 1.57–49.87), respectively). P(ARF) = 1/1 + e− (−1.15 + 2.18 × vasoactive + 1.47 × ascites) was the best prediction equation. The area under the ROC curve was 0.79 (CI 95%: 0.66–0.92). Sensitivity is 84% and specificity is 63.7%.

CONCLUSIONS. Ascites and use of vasoactive drugs in surgery were the only independent risk factors for ARF in transplant patients in this study. The logistic regression model got a good sensitivity and moderate specificity. This model has a good discriminative power.

0222

INCIDENCE OF SURGICAL SITE INFECTION IN ELECTIVE COLORECTAL SURGERY AND THE RELATIONSHIP BETWEN THE INFECTION AND PERIOPERATIVE FACTORS

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INTRODUCTION. Surgical site infection is the third most common nosocomial infection, accounting for about 38% of nosocomial infections, in surgical patients. A high incidence occurs in colorectal surgery, where infection rates of up to 26% can be seen. Multiple factors are involved in their development: concurrent medical condition and surgery factors.

OBJECTIVES. Our objective was to assess the incidence of surgical site infection in patients undergoing elective colorectal surgery, and the relationship between the infection and perioperative factors and outcome.

METHODS. We conducted a prospective observational study of 100 consecutive patients undergoing elective colorectal surgery. For each patient included in the study, we collected demographic, intraoperative and postoperative data. Comorbidity diseases were defined by specific diagnosis test and need for treatment.

We defined the surgical site infection according to the criteria of Centers for Disease Control and Prevention (CDC) Hospital Infection.

Data was analyzed with the statistical program SPSS 18. We applied *t* student and Chi-square test.

RESULTS. Mean age was 67 ± 12.65% were men, 75% had malignant disease without metastasis and laparoscopic technique was used in 31%. The incidence of surgical site infection was 25%, transfusion requirements 35%, presence of ileus 26%, and anastomotic leakage 13%. When comparing the infected group of patients with the uninfected group, the infected group had a higher prevalence of diabetes (48 vs. 24%, $P < 0.05$). Also significant differences were found related to transfusion requirements (56 vs. 28%, $P < 0.05$), the presence of ileus (48 vs. 19%, $P < 0.05$) and anastomotic leakage (28 vs 8%, $P < 0.05$). There were no differences in mortality and reoperation but infected patients spent more days in the hospital (24 ± 12 vs 13 ± 9).

CONCLUSIONS. In our series of patients surgical site infection was associated with a higher prevalence of diabetes, a greater number of patient transfusions, presence of ileus and anastomotic leakage. This resulted in a significant increase in the hospital stay of these patients. Further work is necessary to propose new strategies to improve outcomes based on a better perioperative glucose control.

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0223

EFFECT OF DOPAMINE AND NOREPINEPHRINE ON HEMODYNAMICS AND OXYGEN METABOLISM OF TISSUE IN PATIENTS WITH SEPTIC SHOCK AFTER ABDOMINAL SURGERY

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INTRODUCTION. Dopamine and norepinephrine are widely used as first line agents to correct hypotension in patients with septic shock. Both drugs can increase blood pressure in shock states. There has been considerable debate in recent years as to whether one is better than the other on improving internal organ perfusion and tissue oxygenation.

OBJECTIVES. To evaluate the effects of dopamine (DA) and norepinephrine (NE) on hemodynamics and oxygen metabolism of tissue in patients with septic shock after abdominal surgery.

METHODS. Forty sixty patients with septic shock after abdominal surgery were assigned to the groups of DA and NE randomly. They were given DA or NE for 6 h. Heart rate (HR), mean artery pressure (MAP), cardiac index (CI), stroke volume index (SVI), systemic vascular resistance index (SVRI), mixed venous oxygen saturation (SvO_2), early lactate clearance, and urine volume (UV) were measured at the end of the 6 h after the treatment. Creatinine clearance rate (Ccr) was measured at the end of the 12th hour after treatment.

RESULTS. There were no differences in MAP, CI or SVI between the two groups, HR was higher while SVI was lower in DA group than that in NE group ($P < 0.05$). SvO_2 and early lactate clearance in the group of NE were significantly higher than those in the group of DA ($P < 0.05$). There was no significant difference in UV, Ccr and 28-day mortality between two groups.

CONCLUSIONS. NE has better effects than DA on improving internal organ perfusion and tissue oxygenation. NE may be a better choice for the patients with septic shock after abdominal surgery.

0224

PREDICTIVE VALUE OF P-POSSUM SCORING FOR IVOR-LEWIS OESOPHAGECTOMY

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INTRODUCTION. Ivor-Lewis oesophagectomy is a major surgical procedure that carries a significant risk of morbidity and mortality. A large number of variables will affect overall outcome and scoring systems have been developed to try and assess risk of morbidity and mortality for patients in surgery. The P-POSSUM score (1) is a summative score, comprising a physiological score and an operative severity score. These two scores are combined in the following formula: Ln R/1-R = −9.065 + (0.1692× physiological score) + (0.1550× operative severity score), where R = predicted risk of mortality. This adapted formula from the original POSSUM score (2) has been validated in general surgical patients, but data in this specific patient population is scarce.

OBJECTIVES. To establish whether the P-POSSUM score helps to predict mortality in this subgroup of surgical patients.

METHODS. Retrospective review of 53 cases in 2 surgical centres in South Yorkshire, U.K. over a 2 year period.

RESULTS. 53 cases were reviewed and their P-POSSUM score was calculated. The operative severity score was 17 in all patients. 16 patients had a physiological score of 12–14, 30 patients had a score of 15–20 and 6 patients had a score of 20–30. The predicted P-Possum mortality for the low score group (12–14) is 1%, for the intermediate group (15–20) 2–5% and for the high score group (20–30) it is 11–20%. In our patient cohort we would have expected 2 deaths. The observed 30 day peri-operative mortality included 3 patients (5.5%), however in-hospital mortality included 6 patients (11%) for the whole cohort.

CONCLUSIONS. The POSSUM score has been criticised for overpredicting mortality in low-risk surgical patients, leading to the development of P-POSSUM. In our cohort P-POSSUM underpredicts 30-day mortality somewhat, however in-hospital mortality is markedly elevated beyond the P-POSSUM prediction. While in our cohort there were obvious differences in the contributions to the overall mortality figures between the two units, P-POSSUM may not be useful as a general tool to predict the risk for overall mortality from Ivor-Lewis oesophagectomy, as late in-hospital mortality (>30 days) is a major contributor to the overall risk.

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GRANT ACKNOWLEDGMENT. No grants were involved in this review, no conflicts of interest declared.

0225

HIT IN CRITICAL CARE PATIENTS: DESCRIPTIVE STUDY, INCIDENCE, RISK FACTOR

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INTRODUCTION. Type II heparin-induced thrombocytopenia (HIT) is one of the most important adverse drug events encountered. It is a life-threatening immune-mediated, prothrombotic complication that occurs with unfractionated heparin (UFH) and to a lesser extent with low-molecular-weight heparin (LMWH). Its diagnosis is often based on clinical features when thombopenia and thrombosis occur during heparin treatment, consolidated by laboratory assays.

OBJECTIVES. Describe the HIT patients, and find risk factors of HIT.

METHODS. Retrospective monocenter study, realized over 4 years in surgical intensive care unit. Demographic and clinical data, outcome, platelet count, result of anti-PF4/heparin antibody assay were collected. A test of Mann and Whitney, a test of Pearson and a multivariate analysis were realized.

RESULTS. 47 patients presented a confirmed HIT, then they were matched with 47 patients control. Incidence 1.45%, mortality 40%, nadir of thrombocytopenia 53,000/mm^3. Patients with HIT had more severe disease at the admittance in the ICU (IGS II 47 $\pm$ 15 points vs 40 $\pm$ 15, $p = 0.034$), required more renal remplacement therapy (74,4% vs 17%, $p < 0.001$), had a longer cardio-pulmonary bypass than the control group (172 $\pm$ 73 min vs 129 $\pm$ 58 min, $p = 0.014$), were more often exposed to hypothermia (41.6% vs 17%, $p = 0.024$) and were more transfused with several unstable blood products (63.8% vs 40.4%, $p = 0.023$). Predictive factors of mortality in ICU are the arisen of HIT (Odd Ratio: 4,637), use of renal replacement therapy (Odd Ratio: 16,762), platelet transfusion (Odd Ratio: 3), and transfusion of more than one blood product (Odd Ratio: 3,152). In multivariate analysis, the predictive factor of arisen a HIT was the use of renal remplacement therapy (adjusted Odd Ratio 14,219 [5,208–38,816].

CONCLUSIONS. Heparin induced thrombocytopenia is burdened by an high morbi-mortality. In intensive care unit, the diagnosis is difficult to do in front of a decrease of platelet count. Prolonged exposition to heparin and renal remplacement therapy stay to be the one predictive factors of this pathology.

0227

PREVALENCE AND RISK FACTORS FOR POSTOPERATIVE DELIRIUM IN A CARDIAC SURGERY INTENSIVE CARE UNIT

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INTRODUCTION. Delirium after cardiac surgery is a common complication after cardiac surgery. The prevalence of delirium and its likely risk factors have not been extensively studied.

OBJECTIVES. Our goal is to compare a variety of characteristics in patients with and without delirium and to identify risk factors associated with delirium in patients hospitalized in an intensive care unit after cardiac surgery.

METHODS. Patients who were admitted to cardiac surgery intensive care unit for various cardiac diseases during a 3-month period were included into the study. A total of 318 patients with coronary artery disease and/or valvular heart failure, congestive heart failure, cardiomyopathy, peripheral vascular disease who had medical treatment with or without surgical intervention were included into the study. A researcher-designed checklist of 29 patient-related risk factors for delirium was used to collect data in the intensive care unit. All patients were assessed by intensive care unit specialists and delirium was diagnosed according to criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition. Data were analyzed via univariate analysis and multivariate logistic regression.

RESULTS. The prevalence of postoperative delirium was 9.4%. Patients with and without delirium differed significantly on 29 variables. Three preoperative risk factors including, age, body mass index, and blood urea nitrogen to creatinine ratio and four postoperative factors including; blood urea nitrogen to creatinine ratio, cardiogenic shock, hypoalbuminemia, and early postoperative stroke were found to be significant, independent predictors of postoperative delirium ($p < 0.05$).

CONCLUSIONS. The ability to prevent or detect delirium in a short time period and provide early treatment can be possible with determination of patient-related risk factors. Special attention should be paid to the preoperative and postoperative risk factors.

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0226

DELIRIUM AFTER CARDIAC SURGERY IN EARLY POSTOPERATIVE PERIOD: CLINICAL OUTCOME

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INTRODUCTION. Delirium after cardiac surgery is a common complication and associated with increased morbidity and mortality. However, the knowledge base regarding the issue of postoperative delirium is still limited [1].

OBJECTIVES. To access the clinical outcome and risk factors in patients after cardiac surgery.

METHODS. Data on 90 patients with postoperative delirium were analyzed retrospectively according the Intensive Care Delirium Screening Checklist (ICDSC), the Richmond Agitation-Sedation Scale (RASS) and The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) criteria. The patients were divided in two groups by evaluating the severity of the delirium: light and moderate delirium group ($n = 74$) and severe delirium group ($n = 16$). The data are presented as the mean and the standard deviation (M(SD). Statistical significance was accepted at a level of $P < 0.05$.

RESULTS. The rate of early post-cardiac surgery delirium was low (4.17%). We have determined that post-cardiac surgery delirium prolonged the length of stay in the ICU (8.4 (8.6)) and hospital stay (23.6 (13.0)) days. The patients had higher preoperative risk score, their age was 71.5 (8.9) years, the body mass index was 28.8 (4.4) (kg/min^2), the majority were male (72.2%), ejection fraction was 46.1(11.9)%. The statistical analysis by multivariable logistic regression has indicated that increasing the dose of fentanyl administered during surgery over 1.4 mg was also increasing the possibility of developing a severe delirium (OR = 9.9, CI 1.5–65.1) and longer aortic clamping time could be independently associated with severe postoperative delirium (OR = 1.02, CI 1.0–1.05).

CONCLUSIONS. Our data suggest that early post-cardiac surgery delirium couldn't be common complication, but it significantly prolonged the length in stay at the ICU and hospital stay. The delirium risk factors such as longer aortic clamping time and the dose of fentanyl could be modified and could rapidly indicate a postoperative delirium.

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0228

PRE-OPERATIVE OPTIMIZATION OF PATIENTS UNDERGOING AN OPEN ESOPHAGECTOMY: BENEFICIAL EFFECTS RELATED TO SCVO2-GUIDE PREOPERATIVE OPTIMIZATION

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INTRODUCTION. Esophagectomy for invasive esophageal cancer or high grade dysplasia is associated with substantial peri-operative morbidity and mortality. Preoperative neo-adjuvant chemo-radiotherapy may further increase the risk of this procedure.

OBJECTIVES. To examine the influence of ScVO2-guided preoperative optimization

METHODS. From 2008 until present 53 patients with esophageal cancer were pre-operatively optimized in our ICU. Central Venous catheter (subclavian vene) and arterial line were introduced in the patient and a ScVo2 >70% and Mean arterial pressure >65 mmHg were pursued. If ScVO2 was below 70% first 500 ml Voluven® was introduced. When after 1000 ml Voluven® ScVO2 was still below 70% Dobutamine or Milrinone was started to reach a ScVO2 above 70%. These optimized patients were compared with 39 patients operated for esophageal cancer without ScVO2-guided preoperative optimization (2006–2007)

RESULTS. No significant differences in baseline characteristics were found (Table 1).

Baseline characteristics

	Pre-ScVO2 measurement group	ScVO2 measurement group	p-value
N	39	53	
Male/female	29/10	47/6	
Age (years) median [IQR	61 [56–66]	63 [55–69]	
Neo adj Chemoradiation	23%	64%	
Re admission ICU	18%	11%	p = 0.38
LOS ICU median [IQR]	2 [0–3]	2 [2–3]	p = 0.47
LOS Hospital	15 [10–30]	10 [9–15	p < 0.01

The optimized patients received 1601 ml [1212–2095] of fluids and 11.5% received inotropics. Median ScVO2 increase was 5%. ICU length of stay (LOS) was not affected by ScVO2-guided optimization, but hospital LOS was significantly reduced ($P < 0.01$) and hospital mortality tended to be lower. Patients without pre-operative neo-adjuvant chemoradiation had a significantly reduced LOS ($P < 0.01$).Within the optimized group, the patients that reached their ScVO2-goal tended to suffer from less post-operative complications compared to the patients that did not (Table 2).

Optimization

	ScVO2 < 70%	ScVO2>70%	
n	9	39	
Pulmonary complications	78%	43.6%	p = 0.067
Hypoxaemia	55.6%	23.1%	p = 0.081
Stenosis anastomosis	55.6%	25.6%	p = 0.084
Cardial complications	44.4%	23.1%	p = 25

CONCLUSIONS. Pre-operative ScVO2-directed optimization of esophagectomy patients is feasible and associated with a beneficial course of their ICU and hospital stay.

0229

TROPONIN IN HIGH RISK SURGICAL PATIENTS ADMITTED TO ICU: A 3 YEARS EXPERIENCE

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INTRODUCTION. Severe cardiac dysfunction occurs in a significant proportion (30%) of patients admitted in intensive care unit (ICU) and is closely related to length of stay and mortality.

OBJECTIVES. The aim of this study was to assess the relationship between troponin blood levels (cTn) and clinical outcome in surgical patients admitted to ICU.

METHODS. This retrospective study included 972 surgical patients admitted to a 9 beds ICU of an University Hospital from 2006 to 2008 with at least 2 measurements of cTn after admission (mark of test: Access AccuTnI of BECKMAN COULTER—ref.A 78803). The ICU clinical protocol provides cTn measurement at admission and then after 12 h in patients with history of ischemic heart disease, with clinical signs of myocardial ischemia during surgery and/or ICU admission and undergoing major vascular surgery and/or emergency surgery.

RESULTS. In the 358 patients (37%) with cTn values above the cut-off value (>0.06 ng/ml), ICU and Hospital length of stay (5 $\pm$ 10 and 18 $\pm$ 19 days) and mortality (8.7% and 17.3%) were larger ($p < 0.05$) than in group of patients without cTn increasing (2 $\pm$ 3 and 15 $\pm$ 15 days; 0.7% and 4,1%). The same figure has been observed also in the subgroups of patients with elective and emergency surgery as well as in patients with early (at admission) and late (12–24 h after admission) cTn elevation. The Kaplan–Meier analysis indicated a marked difference in survival rate between patients with cTn values below and above the cut off value ($p < 0.001$).

CONCLUSION. In surgical patients admitted to ICU both after elective and emergency, cTn elevation in the perioperative period was closed related to an increase in ICU and in Hospital length of stay and mortality. Therefore, multiple cTn assessments are recommended in high risk patients after surgery.

0230

THE EFFECTS OF DOXAPRAM HYDROCHLORIDE ON RESPIRATORY DEPRESSION DUE TO SEVOFLURANE ANESTHESIA DURING SPONTANEOUS VENTILATION IN HUMANS

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AIMS. Inhalation anesthetics were known to depress ventilatory response to hypercapnea. Doxapram hydrochloride is an analeptic drug which acts as a respiratory stimulant via peripheral and central chemoreceptors. Infusion of doxapram hydrochloride postoperatively attenuates the impairment of respiratory function postoperatively. But, there were no reports about the respiratory effect of this drug during anesthesia. So, the aim of this study was to evaluate the effect of doxapram hydrochloride on respiratory function during anesthesia.

METHODS. Sixty adult patients undergoing operation under spontaneous ventilation via laryngeal mask airway (LMA) were enrolled and randomized to receive the infusion of doxapram hydrochloride (0, 0.5, 2 mg/kg/h) 15 min after the start of operation. Anesthesia was maintained with 1 MAC sevoflurane-4LN_2O-2LO_2 under spontaneous ventilation via LMA. Tidal volume (VT), respiratory rate (RR) and arterial carbon dioxide tension($PaCO_2$) were recorded just before and 15 min after induction of anesthesia, 15 min after the start of operation and 15, 30, 45, 60 min after the start of doxapram hydrochloride infusion.

RESULTS. RR and PaCO2 were significantly higher during anesthesia than the value of just before induction of anesthesia in all groups. VT were significantly lower during anesthesia than the value of just before induction of anesthesia in all groups. But, the percent change of VT, RR and PaCO2 were similar at all observed period after the start of doxapram hydrochloride infusion in all groups.

CONCLUSIONS. Doxapram hydrochloride did not attenuate the respiratory depression during 1 MAC sevoflurane anesthesia.

0231

UTILITY OF SCORES IN CARDIAC SURGERY TO SELECT BETTER CANDIDATES TO TRANSAORTIC VALVE IMPLANTATION (TAVI) THAN ISOLATED OPENED VALVE REPLACEMENT

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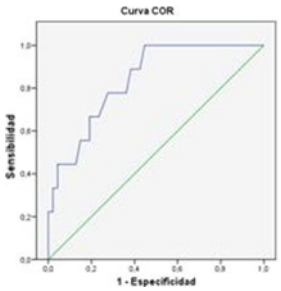
INTRODUCTION. We have analyzed hospital mortality of the patients who underwent aortic valve replacement and its relationship with our environment scores.

OBJECTIVES. Stablish an score and a cut point to select patients at high risk to transaortic valvular implantation in our centre.

METHODS. Prospective observational study with retrospective analysis of the patients who underwent aortic valve replacement in Carlos Haya Hospital from May 2009 to June 2010. Demographic variables were registered before surgical time and with our database scores (Parsonnet, Euroscore and SAPS 3). Student's t test has been used to compare averages with significance level of 0.05. We have represented the relationship between the three scores with the mortality in a ROC curve.

RESULTS. 256 patients who underwent cardiac surgery were registered, out of them, 56 were treated with isolated aortic replacement (21.8%). Average age was 62 $\pm$ 11 years and 85% had some cardiovascular risk factors. Hospital mortality was 16.1% and presented gravity scores: Euroscore 6 $\pm$ 2, Parsonnet 19 $\pm$ 11 and SAPS 3 41 $\pm$ 10. There were significant differences between three scores and mortality (0.017, 0.0001 and 0.009, respectively). Parsonnet presented a higher discrimination, with an AUC de 0.83 (IC95% 0.71–0.96). The cut point >16 points presented sensibility 89% and specificity 62.7%. Parsonnet COR C.



Parsonnet COR curve

CONCLUSIONS. In our centre, patients with Parsonnet score higher than 16 point, should be eligible for TAVI better than to conventional valvular replacement.

GRANT ACKNOWLEDGMENT. To ARIAM project secretary.

0232

BLOOD TRANSFUSION IN CRITICALLY ILL BURNS PATIENTS ATTENDING THEATRE: A PROSPECTIVE AUDIT

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INTRODUCTION. Burns patients are at high risk of requiring blood transfusion due to surgical excision, haemodilution, haemolysis and thrombosis. Palmieri et al[1], reported on 620 burns patients and demonstrated increased mortality in patients receiving blood transfusion outside the operating room and a 13% increased risk of infection with every unit of blood transfused. The transfusion threshold demonstrated by Palmieri et al. in their multi-centre study of burns patients was a Haemoglobin (Hb) of 9 g/dl.[2]

OBJECTIVES. We audited transfusion practices in a UK tertiary referral burns ICU, in patients attending burns theatre. Current practice is a target pre-operative Hb of 12 g/dL. We evaluate this practice, with regard to post-operative Hb levels and unnecessary transfusion.

METHODS. Data was collected for all burns patients attending theatre from the ICU over a 12-month period. Demographics, details of the burns and operation were noted. Data on the pre, intra and post-operative Hb levels along with all blood products transfused were assessed.

RESULTS. 35 patient episodes were obtained. Patients had a mean age of 48 years (22–64 years). Burn area varied from 3 to 80%. 20/35 had an inhalational injury. Mean pre-operative Hb was 12.1 g/dL (range 9.7–17.1 g/dL). 29/35 patients received blood pre-operatively, with a mean transfusion of 2.9 units of packed Red Blood Cells (RBCs). 23/35 patients received blood intra-operatively, mean transfusion of 2.8 units RBCs (range 0–12 units). Mean post-operative Hb level in those patients who received blood was 8.9 g/dL (range 6.3–11.6 g/dL). 9 patients transfused pre-operatively did not receive blood intra-operatively and 7 of these returned with a Hb of greater than 9.0 g/dL (range 9.1–10.9 g/dL). Overall 66% of patients had a post-operative Hb greater than 9.0 g/dL, with 33% having a Hb greater than 10.0 g/dL. Post-operative transfusion practices were inconsistent and appeared to vary between Intensivists.

CONCLUSIONS. This audit has demonstrated that a pre-operative target Hb of 12 g/dL is often in excess of that required and it is likely that many of these patients are over transfused. Our data suggested a trend between the size of the burn area grafted, and the number of packed RBC's required. We therefore conclude that when burns surgery is planned, pre-operative optimisation of the patient, including blood transfusion, should take into account the planned area of grafting. Where possible, blood transfusion should be undertaken intra-operatively and be guided by blood loss and Hb measurement. There should be clear triggers for transfusion post-operatively in the Intensive Care Unit.

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0233

UTILITY OF LEVOSIMENDAN IN LOW CARDIAC OUTPUT SYNDROME AFTER MITRAL VALVE SURGERY

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INTRODUCTION. The low cardiac output syndrome (LCOS) in postoperative mitral valve surgery is a complication that can reach a rate of up to 20% and is associated with increased morbidity and mortality, longer ICU stay and increased use of resources.
OBJECTIVES. We describe the demographic characteristics, therapeutic, complications, response to treatment and outcome of a series of 34 cases of postoperative LCOS in mitral valve surgery, treated with levosimendan.
METHODS. We conducted a prospective study analyzing the use of levosimendan in patients admitted to the cardiac surgery intensive care unit, after mitral valve surgery for a period of 27 months (Jan 2009–Mar 2011), which developed LCOS (Cardiac Index <2.2 l/min/m^2 and SvO_2 <65%) and do not respond to treatment with inotropic agents or depend on them. We collect demographic, hemodynamic and respiratory variables, therapeutic approach, complications and outcome. The results are expressed as mean and standard deviation, median or percentage.
RESULTS. There were 223 mitral valve surgeries. We selected 34 patients (15.3%) presented LCOS, without response to amines. 61.8% were women, the mean age 64.2 ± 10.4 years and EuroSCORE 7.5. The indication for surgery was rheumatic valve disease in 14 patients (41%) and degenerative in 10 (29%), mitral valve prolapse in 4 patients, annular dilatation in 3, 1 patient with ischemic mitral regurgitation and 2 valve for mitral prosthetic dysfunction. The hemodynamic management is done by the protocol of the unit for the LCOS. In the cases presented, levosimendan is administered for the lack of response to dobutamine or dependence on it. In only 2 patients we used a loading dose (6 μg/kg). Initial perfusion of 0.10 μg/kg/min was administered, reaching maximum dose of 0.20 μg/kg/min, in 12 h, in 70% of patients. Favorable clinical and hemodynamic response was achieved in 31 patients (91%), allowing a complete suspension of dobutamine in the first 24 h. The evolution of hemodynamic parameters was: basal MBP 81.2 ± 12.5 mmHg, MBP at 12 h 79.9 ± 10.3 mmHg, basal CI 2.7 ± 0.6 l/min/m^2, CI at 12 h 3.0 ± 0.7 l/min/m^2, and basal dose of dobutamine 6.1 ± 5.2 μg/kg/min and at 12 h 2.5 ± 3.5 μg/kg/min. There was only 1 patient who could not withdraw dobutamine in 24 h and 2 patients who required restarted it. Side effects attributable to levosimendan, were only 3 episodes of self-limited atrial fibrillation. The median length of stay in ICU was 5.5 days, with a median days of mechanical ventilation of 20 h. The postoperative mortality was 3% (1 patient).
CONCLUSIONS. In our series, patients with LCOS after mitral valve surgery, the infusion of levosimendan led to the removal of amines with good clinical tolerance and hemodynamic. It has also been shown to be a safe drug without severe side effects potentially attributable.
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0234

THE IMPACT OF PROPHYLACTIC POST-OPERATIVE CPAP IN ABDOMINAL AORTIC ANEURYSM PATIENTS IN A TERTIARY VASCULAR CENTRE

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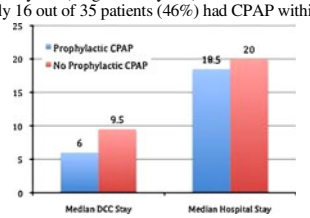
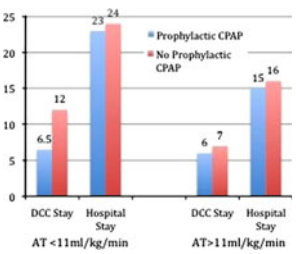
INTRODUCTION. Studies have shown improved post-operative outcome using prophylactic continuous positive airway pressure (CPAP) in general surgical patients [1] and after major vascular surgery [2,3]. This work highlights current critical care practise in abdominal aortic aneurysm (AAA) patients whose length of hospital stay exceeded the expected upper limit of 10 days.
OBJECTIVES. To determine prophylactic CPAP use and correlate this with length of stay.
METHODS. All patients undergoing AAA surgery in a 30-month period from 2008–2010 whose stay exceeded 10 days were retrospectively evaluated using critical care and hospital data capture systems. Data was collected on age, gender, cardio-pulmonary exercise testing (CPEX) result, CPAP use and timing, infection rate and critical care and hospital length of stay (LOS). CPAP was deemed to be prophylactic if used within 24 h of admission to critical care.
RESULTS. 35 patients were identified. None were excluded. Gender split was 29 males, 6 females. Median age was 75 years (range 61–84 years). Median CPEX anaerobic threshold (AT) was 10.5 ml/kg/min. Only 16 out of 35 patients (46%) had CPAP within 24 h of admission.



Median patient stay (Days) for post operative AAA



Median stay (Days) with regards to CPEX

3 patients died during that hospital admission, none of whom received prophylactic CPAP. Pulmonary infection rates were similar in both groups (4 patients vs 5 patients), however re-intubation was more common in those who did not receive prophylactic CPAP (4 vs 2 patients).
CONCLUSIONS. In this series, prophylactic CPAP shows a trend towards lower DCC and hospital lengths of stay, particularly in those at highest risk. Future work should focus on producing a standard of care incorporating the use of post-operative prophylactic CPAP in all eligible patients, with subsequent performance evaluation, in order to improve patient care.
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0235

CARDIAC-SPECIFIC BIOMARKERS AND LIFE THREATENING COMPLICATIONS OF OFF-PUMP VERSUS ON-PUMP CORONARY BYPASS SURGERY IN EGYPTIAN PATIENTS

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INTRODUCTION. Coronary artery bypass grafting (CABG) has traditionally been performed with the use of cardiopulmonary bypass (ONCAB). CABG without cardiopulmonary bypass (OPCAB) might reduce the number of complications.
OBJECTIVES. This study aims to compare between on- and off-pump surgery concerning postoperative morbidity and mortality, also to evaluate 6-months graft patency in Egyptian patients.
METHODS. This is a non-randomized single-centre control trial was prospectively conducted on 65 patients who were subjected to coronary artery bypass surgery followed by stay in the Open Heart Intensive Care Center of the Police Authority Hospital, in the period from July 2009 to January 2010. Patients were divided into two groups; group A: 25 patients underwent ONCAP and group B: 40 patients underwent OPCAB. All the demographic, operative and postoperative data were prospectively collected and analyzed statistically. Six months later, the patients underwent coronary angiography.
RESULTS. There was no significant difference between both groups intraoperatively concerning arrhythmias, blood transfusion, and hemodynamic support. Off-pump patients had a significantly higher mean number of constructed grafts than in the ONCAB group (mean, 3.30 ± 0.88 vs. 2.84 ± 0.80, P = 0.02). There were no significant differences between off- and on-pump regarding postoperative blood loss, blood transfusion, length of the ICU and the hospital stay, the ventilation time, the use of intra-aortic balloon pump, renal complications, respiratory complications, and reopening. However, graft occlusion, MI, raised cardiac enzymes, ventricular tachycardia, cardiogenic shock, and disturbed conscious level were significantly higher in the OPCAB group. Postoperative mortality rate was significantly higher in the OPCAB group than in the ONCAB group (15% vs. 0%, P = 0.046). Follow-up angiograms in 40 patients out of 65 (61.5%) who underwent 124 grafts revealed that no significant difference between off- and on-pump groups regarding overall rate of graft patency (83.5% vs. 84.4%, P = 0.84). No mortality was reported in both groups at 6-months follow-up.
CONCLUSIONS. There was a higher incidence in postoperative complications and mortality in off-pump procedure than the on-pump. At 6-months follow-up, no significant differences between both techniques were found in graft patency and mortality. Hence, longer-term mortality from randomized trials of off- versus on-pump CABG is needed.
REFERENCE. Shroyer AL, Grover FL, Hattler B, et al. On-pump versus off-pump coronary-artery bypass surgery. N Engl J Med, 2009; 361:1827–37.
GRANT ACKNOWLEDGMENT. We are thankful to all staff members of the Open Heart Intensive Care Center of the Police Authority Hospital, who made all the circumstances favorable to complete this work.

0236

LEVOSIMENDAN IN COMPLEX TREATING OF LOW CARDIAC OUTPUT SYNDROME IN NEONATES AFTER OPEN HEART SURGERY

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INTRODUCTION. Open heart surgery is associated with low cardiac output syndrome (LCOS) in 3–10%. Therefore, inotropic support is widely used prophylactically to prevent LCOS after open-heart surgery.
OBJECTIVES. The aim of our study was to evaluate the effectiveness of levosimendan in the complex intensive care for postoperative LCOS in neonates.
METHODS. We analyzed 170 neonates: with total anomalous pulmonary vein connection (TAPVC) undergoing total repair and patients with transposition of the great arteries with intact ventricular septum (TGA,IVS) undergoing arterial switch operation at our institution between January 2003 and March 2011. These patients was divided into two groups: the first group consisted of 143 patients with TGA, IVS (n = 77) and TAPVC (n = 66) received conventional inotropic support, and second group include 32 neonates with TGA (n = 24) and TAPVC (n = 8) received conventional inotropic support and levosimendan infusion postoperatively at 0.1 μg/kg/min. The groups were similar in diagnoses, birth weight, CPB protocol and surgical technique. These two groups were compared with respect to left ventricle ejection fraction (LVEF), duration of inotropic support, mechanical ventilation time, the length of stay in ICU and mortality.
RESULTS. We did not identify any significant differences in left ventricle ejection fraction (LVEF) in both groups postoperatively, but duration of inotropic support (161.6 ± 130.2 vs. 94.5 ± 47.1 h, $p < 0.05$), mechanical ventilation time (127.4±131.5 vs. 50 ± 32.6 h, $p < 0.0001$) and ICU stay (229.8 ± 213.8 h. 165.8 ± 96.1 h, p = 0.01) was significantly higher, in the first group when compared to the study group. Hospital mortality in the first group was 18 patients (13%), in the second group 0.
CONCLUSIONS. Levosimendan infusion in a cohort of neonates was beneficial on post-operative hemodynamic and improved postoperative outcomes.
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0237

THE PREDICTION OF SUCCESS OF BIPAP (BILEVEL POSITIVE AIRWAY PRESSURE) IN PATIENTS WITH OR WITHOUT CHRONIC OBSTRUCTIVE PULMONARY DISEASE AFTER CORONARY ARTERY BYPASS GRAFT SURGERY

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INTRODUCTION. Noninvasive mechanical ventilation (NIMV) treatment can be applied by the use of BIPAP (bilevel positive airway pressure) in patients with acute respiratory failure and the responses of patients to hypoxemia or hypercarbia is considered to be different.

OBJECTIVES. The prediction of success of BIPAP is evaluated by the comparison of the lung function tests and, arterial blood gas (ABG) values in patients with or without chronic obstructive pulmonary disease (COPD) after coronary artery bypass graft surgery (CABG).

METHODS. A prospective study was carried out in 60 patients that required NIMV and the patients were divided into group 1 (n = 30) with chronic obstructive pulmonary disease and group 2 (n = 30) with normal lung functions, postoperatively after coronary artery bypass graft surgery depending on the preoperative FEV 1% and arterial blood gases. The noninvasive pressure support ventilation was performed using BIPAP device. Standard medical treatment was continued in both groups. Extubation was performed within 12 h after surgery, no sedation was given. BIPAP was applied in spontaneous breathing at inspiratory positive airway pressure of 8–12 cmH_2O and expiratory positive airway pressure of 4–6 cmH_2O. Necessary adjustments were made according to $PaCO_2$ (partial arterial carbondioxide), arterial blood gas (pH, $PaCO_2$, PaO_2, SaO_2, HCO_3), tidal volume, and respiratory rate values as well as clinical evaluation. These parameters were evaluated at the first and fourth hour after application of BIPAP. Complications were recorded.

RESULTS. Between Group 1 and 2, preoperative arterial blood gas analysis showed significant difference in PaCO2 levels only ($p < 0.05$). Preoperative FEV1% was significantly lower in Group 2 ($p < 0.001$). The comparison of blood gas values before BIPAP, one and four hour after BIPAP showed that, patients in Group 1 and 2 improved their pH, PaCO2, PaO2, SaO2, HCO3, respiratory rate within one hour and continued this at the fourth hour (Table 1). If the BIPAP is unsuccessful at the first hour, in both group of patients, there were 3 (10%) patient in each group and success is more significant in patients with higher $PaCO_2$ after four hour of BIPAP ($p < 0.05$). No significant correlation was found between preoperative FEV1% and the success of NIMV.

CONCLUSIONS. The use of NIMV in addition to standard medical therapy can be recommended for both COPD patients and other patients with respiratory failure after coronary artery bypass surgeries in the intensive care unit. The careful evaluation of arterial blood gas results at the first and fourth hours aid in predicting the response to NIMV treatment. There was no significant correlation between preoperative % FEV1 and success of BIPAP after CABG operations.

Table 1 Serial clinical and arterial blood gas parameters during the ICU course of the two groups receiving BIPAP

	Group 1 (COPD* group)			Group 2(Non-COPD Group)		
	Before BIPAP	1 h after BIPAP	4 h After BIPAP	Before BIPAP	1 h after BIPAP	4 h After BIPAP
RR*	33.2 ± 4.6	27 ± 3.3	24.1 ± 2.4	31.9 ± 2.3	25.2 ± 3.8	22.8 ± 2.6
HR*	116.8 ± 14.6	108.3 ± 11.6a	102 ± 10.2b	114.4 ± 13.3	105.6 ± 10.6	102.1 ± 11.2
pH	7.23 ± 0.02a	7.31 ± 0.03a,c	7.35 ± 0.55b	7.35 ± 0.06	7.36 ± 0.05a	7.37 ± 0.04d
PaO_2	62.0 ± 3.7	85.7 ± 7.3a	89.6 ± 10.7	55.8 ± 6,9	76.9 ± 10.6a	89.6 ± 9.4b
$PaCO_2$	61.2 ± 2.7	54.3 ± 1.8a	48.6 ± 3.4b,d	34.3 ± 4.7	37.3 ± 5.2	37.7 ± 4.5

*COPD, chronic obstructive pulmonary disease; RR, respiratory rate (breaths/minute); HR, heart rate (beat/minute); ICU, intensive care unit; BIPAP, Bi-level positive airway pressure; a: value at 1 h significantly different from that at baseline within the groups; b, value at 4 h significantly different from that at 1 h within groups; c, value at 1 h significantly different from that at baseline between the groups; d, value at 4 h significantly different from that at 1 h between the two groups. A p value less than 0.05 was taken as significant

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0238

ONE YEAR RETROSPECTIVE REVIEW OF USE OF LEVOSIMENDAN IN A TERTIARY REFERRAL HEART AND LUNG CENTRE IN PATIENTS UNDERGOING MECHANICAL CIRCULATORY SUPPORT

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INTRODUCTION. Studies (1–3) have shown that the use of levosimendan in different clinical settings (acutely impaired left ventricular function secondary to ischaemia, decompensated heart failure and mechanical assist devices for post-cardiotomy heart failure) is associated with an improved 6 month survival. There is little data in patients undergoing LVAD insertion, ECMO and LVAD explantation.

OBJECTIVES. We wanted to assess our usage, indications and outcomes with the use of levosimendan in this diverse patient group.

METHODS. A retrospective analysis of our patients treated with levosimendan from 1st January 2010 to 31st December 2010. Data was extracted from an electronic patient data management system (IntelliVue Clinical Information Portfolio, ICIP, Philips Koninklijke, Netherlands). Data related to patient demographics, LV function, levosimendan dose, adverse events and outcome measures were collected. Outcome measures reported included change in inotropic/vasopressor support at a 24 h, time to wean from mechanical circulatory support and survival to discharge from intensive care.

RESULTS. Twelve patients who received levosimendan in the setting of cardiac surgery, ECMO, LVAD explantation and rescue therapy were identified. No significant adverse events were reported. F:M ratio: 2:10, mean age: 51.9 (range 37–74) years and LVEF: 27.2% (range 10–50). Mean dose of levosimendan used was 0.1075 mcg/kg/min (range 0.05–0.2), n = 12.

The change in inotropic and vasopressor support use 24 h immediately post levosimendan was: Norardrenaline +0.08 mcg/kg/min; Adrenaline +0.04 mcg/kg/min; Milrinone −0.02 mcg/kg/min; Vasopressin +0.1 u/kg/h.

The mean change in haemodynamic parameters 24 h immediately post levosimendan was: MBP, −4.7 mmHg; Lactate, +0.61 mmol/L.

CONCLUSIONS. The use of levosimendan in patients requiring LVAD support was associated with small changes in inotropic and vasopressor support at 24 h. Survival to ITU discharge was 5/12 (42%) of patients. This retrospective review indicates that the perioperative (if that is true) levosimendan can be used safely in patients with DCM (if that is the aetiology needing LVAD support. Further studies may be warranted in this clinical setting.

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0239

RISK MORTALITY FACTORS IN POST-OPERATIVE CARDIAC SURGERY OF PATIENTS WITH CIRRHOSIS IN ICU

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INTRODUCTION. Patients with liver cirrhosis are considered as high-risk population for cardiac surgery. Risk mortality factors for these patients are still under debate.

OBJECTIVES. The aim of this study was to evaluate which risk factors are associated with an increased mortality in these patients requiring cardiac surgery in a prospective observational study.

METHODS. Between January 2004 and February 2011, 58 patients with liver cirrhosis underwent cardiac surgery in our hospital. We registered medical past history, evaluation scores and immediate postoperative course data. Postoperative complications/mortality were analyzed in order to identify risk mortality factors. Continuous variables were compared using the student t-test and the χ^2 test was calculated to evaluate categorical prognostic factors. A multivariate analysis was done using logistic regression.

RESULTS. 69% (n = 40) of patients were male, mean age 64.92 ± 9.64 years, with a body mass index of 27.53 ± 4.57 kg/m^2. 70.7% (n = 41) were operated for valve replacement and 17.2% (n = 10) for CABG. 58.6% (n = 34) were classified as Child-Pugh class A, 36.2% (n = 21) as class B and 5.2% (n = 3) as class C. Global mortality was 12.1% (n = 7), 5 patients were Child class B and 2 class C. In Table 1 we show continuous variables associated with increased mortality. Presence of cardiac insufficiency (P = 0.015), atrial fibrillation (P = 0.047), renal failure (P = 0.032), the need for RRT (P < 0.0001), amiodarone (P = 0.005) during ICU admission and presence of cardiac blockade and need of pacemaker after surgery (P = 0.038), were statistically higher in patients who died.

Table 1 Continuous variables associated with increased mortality

	Alive	Exitus	P	P-Multivariate
MELD	15 ± 4.5	23.4 ± 5.4	0.005	NS
SOFA	6.59 ± 2.7	9.43 ± 1.8	0.005	NS
INR	1.5 ± 0.24	2.19 ± 0.11	0.0001	NS
Albumin (g/L)	27.68 ± 3.39	22.5 ± 3.87	0.006	NS
Pre-surgery Hb(g/dL)	11.8 ± 1.78	10.15 ± 1.44	0.021	NS
Total need for BP	2.9 ± 2.8	7.3 ± 3.6	0.02	NS
PaFiO2 (6 hs)	324 ± 92	251 ± 75	0.024	NS
CVP (mmHg)	11 ± 3	16 ± 4	0.0001	0.027
Art. Lactate (mmol/L)	2.45 ± 1.3	3.62 ± 1.5	0.0034	0.075

CONCLUSIONS. An elevated initial CVP predicts an increased mortality in post-operative cardiac surgery of patients with cirrhosis.

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Learning & teaching in the ICU: 0240–0253

0240

QUALITY OF REPORTING OF RANDOMIZED CONTROLLED TRIALS PUBLISHED IN INTENSIVE CARE MEDICINE FROM 2001 TO 2009. SYSTEMATIC REVIEW

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INTRODUCTION. Randomized controlled trials (RCTs) are the most rigorous and unbiased study design to demonstrate treatment efficacy, provided that high standards of transparent reporting are used.

OBJECTIVES. To assess the quality of reporting of RCTs published in *Intensive Care Medicine*.

METHODS. Two independent assessors identified all RCTs evaluating efficacy of treatments published in *Intensive Care Medicine* from January 2001 to December 2009. Quality of reporting was evaluated using the Jadad scale and individual key methodological components (randomization process, blinding, reporting of withdrawals and loss to follow-up). Spin, defined as use of specific reporting strategies to highlight that the experimental treatment is beneficial despite the evidence to the contrary, and treatment effect size or delta overestimation ('delta inflation') were also evaluated.

RESULTS. 207 RCTs were included for adequacy of reporting. Adequately reported RCTs according to a Jadad scale score of >2 were 60 (29%). When the quality was evaluated by individual methodological components, the percentage of adequate reporting was variable ranging from 29.5% for randomization, to 11.1% for blinding and to 56.04% for loss to follow-up. Compared to a previous analysis of RCTs published in *Intensive Care Medicine* over 26 years (1), there was only minimal improvement in quality of reporting. 216 RCTs were analyzed for spin and delta inflation. 106 RCTs (49.1%) reported statistically non-significant results for primary outcome. Spin was present in 67 (63.2%). The most used technique (43 trials) was the interpretation of statistically nonsignificant results as treatment equivalence. The predicted delta was declared in 61 RCTs (28.2%); in 5 the observed delta was not reported; in the remaining 56 RCTs (91.8%), a delta inflation (positive delta-gap) was observed in 33 articles (58.9%).

CONCLUSIONS. Quality of reporting of RCTs published in *Intensive Care Medicine* in most recent years did not show a significant improvement compared to previous analysis.

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0241

THE DEVELOPMENT OF AN IN-HOUSE THORACIC ULTRASOUND TEACHING PROGRAMME ON A UK INTENSIVE CARE UNIT

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INTRODUCTION. The National Patient Safety Association and British Thoracic Society[1] strongly advise for thoracic ultrasound use at the time of inserting intercostal chest drains (ICD's). This ensures correct placement and minimises risk of life threatening complication. In November 2010 we performed a telephone survey of 53 intensive care units (ICU's) across the UK. It revealed only 2 units (4%) were currently using thoracic ultrasound during ICD placement. Only 6 ICUs (11%) ran any form of ultrasound training. However, 48 respondents (91%) said they would consider incorporating a training program into their trainees' rotas if it proved practical and sustainable.

The Royal College of Radiology requirements to achieve Level 1 competency for thoracic ultrasound consist of 20 observed and 30 performed scans by the trainee. The trainee must also place 5 ICDs with ultrasound guidance.

OBJECTIVES. Our aim was to evaluate whether the development of an in-house teaching programme in line with Royal College requirements for thoracic ultrasound Level 1 competency, was a practical and sustainable solution for the low uptake of ultrasound use in ICD insertion amongst UK Intensive Care Medicine (ICM) trainees.

METHODS. Between October 2010 to January 2011 we piloted an ultrasound training program on the ICU at University College London Hospital for three ICM registrars. Pre-course material was disseminated to trainees followed by a program of three, 30 min sessions on the unit per week. Sessions were run by 1 of 4 radiology consultants. Each session was limited to 3–4 trainees, allowing every participant to observe and scan patients in each session. Trainees were encouraged to keep a logbook of scans. Once the required number of scans and ICD's were logged, the trainee sat a short written assessment and oral viva to gain Level 1 certification.

RESULTS. The time taken for a trainee to advance from little or no ultrasound experience to Level 1 competency was less than 4 months. All three ICM registrars successfully completed the course within this period. Since certification the three trainees have placed 14 ultrasound guided ICDs with no complications between January to April 2011.

CONCLUSIONS. Thoracic ultrasound is a desirable skill for any intensive care physician, but is under utilised by trainees. We have produced an effective and sustainable training program which allows trainees to become competent in basic thoracic ultrasound in under 4 months. We encourage other ICUs to adopt a similar teaching model, and anticipate that the time taken to train the ICM trainees will reduce the burden upon radiology departments, improve safety of ICD insertion, and increase compliance with recent guidelines.

REFERENCE. Ingrid Du Rand et al. BTS Pleural Disease Guideline 2010. *Thorax*. Volume 65 Suppl II. August 2010.

0242

THE LABMOBILE®: A MAJOR OPPORTUNITY TO SUPPORT REALISTIC INTERDISCIPLINARY SIMULATION TEAM TRAINING AND RESOLVE LATENT SYSTEM ERRORS AT THE POINT OF CARE

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INTRODUCTION. The concept of Labmobile®, a mobile simulation-based education unit (Full body patient simulator and mobile audio–video system) has been developed in France by the GIME. Our first pilot studies had shown that simulation training in situ was feasible.

OBJECTIVES. The first feedbacks were especially highlighted the critical system points to improve (call for help, knowledge of emergency equipment, and communication between the teams). Therefore, the aim of this work was to examine the effectiveness of realistic interdisciplinary team training implemented at the point of care

METHODS. During 3 years, 20 in situ simulation sessions were conducted in emergency services, ICU, delivery and operating rooms. Two scenarios involving a sudden adult cardiac arrest, with routine and uncommon procedures, were developed to mobilize maximum resources and multidisciplinary staff. We used digital video recordings for the debriefing and the participants were asked to complete an "anonymous one minute feeling paper".

RESULTS. 196 participants attended these sessions directly at their working site and with their usual equipment. 97% perceived the Labmobile® as very realistic and momentarily forgot about simulation and acted together as if the situation were real. 89% identified a gain in skills coordination and team communication. Several system issues were identified by the participants. In the uncommon procedures, 47% of participants were unaware of the location of resuscitation medications. Some latent system errors have been immediately resolved.

DISCUSSION/CONCLUSION. In routine procedures most of participants were able to practice and apply their (individual and team) knowledge and skills in resuscitation. But all participants were agreeing with the effectiveness of this type of team training, especially to resolve lake of interdisciplinary communication. In uncommon procedures, they identified a number of unanswered questions relating to work environment knowledge and team attitude, source of inter-professional conflicts and unsafely decisions for the patient. Involving the entire team with their true-to-life equipment in behavioral skills is essential for achieving highly reliable team functioning in actual practice. Training in real world environments promotes incorporation of systems-based practice. Our results suggest that high fidelity in situ simulation sessions, even with their limits (cost, logistics, technologic limitation, and human capital needed) should play a role especially in acute care areas allowing the improvement prior system (interim staff, new medical devices, new protocols of care...) to implementation with live patients.

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In SITU Simulation: Challenges and results. Mary D Patterson, MD and all. Advances in Patient Safety: vol 4. AHRQ Feb 2005.

0243

DO DOCTORS KNOW ENOUGH ABOUT THE MANAGEMENT OF SEPSIS?

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INTRODUCTION. Sepsis is recognized as one of the major causes of morbidity and mortality in intensive care units throughout the world. The Surviving Sepsis Campaign (SSC)[1] sets out guidelines that give clinicians a framework to manage the septic patient by ensuring patients receive the appropriate bundles of care. Zambon et al.[2] have shown this management strategy reduces mortality in septic patients.

All patients showing signs of sepsis should receive the appropriate bundles of care as their clinical condition requires. However, it has been shown that in many clinical settings there are barriers that can prevent patients from receiving these interventions which include recognizing the clinical signs and seeking the appropriate help[3].

OBJECTIVES. 1. To ascertain different sets of clinicians knowledge of the principles of the surviving sepsis campaign as per hospital guidelines. 2. To investigate the effectiveness of focused teaching on the clinician's knowledge of the management of the septic patient.

METHODS. To ascertain clinicians' knowledge of the diagnosis and management of sepsis, an exam was formulated using the SSC and Hospital sepsis bundles as a guide.

Trainee Anaesthetists, Physicians and General Surgeons answered the exam. The Anaesthetic trainees then attended a specifically designed regional training day on managing the septic patient. Two weeks after attendance, they were followed up electronically and asked to complete the same questionnaire again.

RESULTS. Anaesthetists, surgeons and physicians answered the survey. The average scores were 57.7, 52.2 and 53.3% respectively. There was a statistically significant difference between the scores of surgeons and anaesthetists ($p < 0.05$) but not between physicians and anaesthetists ($p = 0.27$).

Following the anaesthetic training day on sepsis the average score had raised from 57.7 to 77.8%. This difference was statistically significant ($p < 0.01$).

Clinicians scores on the sepsis survey (% correct)

A Table showing a breakdown of how clinicians scored in the components of the Exam broken down by components of knowledge. (Numbers are percentages)

Clinician	Definitions	1 Hour Bundle	6 Hour Bundle
Anaesthetists Pre-Course (n = 26)	70	67	46
Anaesthetists Post-Course (n = 11)	94	79	69
Surgeons (n = 14)	60	53	55
Physicians (n = 12)	60	56	62

CONCLUSIONS. The results indicate that Anaesthetists had a better pre-test knowledge of the management of sepsis than surgeons but not physicians. In addition, they are consistent with published data which shows that the use of dedicated study sessions on topics such as sepsis can improve clinicians' understanding and knowledge and hopefully improve patient outcomes in protocolised care pathways[3].

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0244

RESIDENT AND MEDICAL STUDENT ATTITUDES TOWARD BEDSIDE THORACIC ULTRASOUND

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INTRODUCTION. Thoracic ultrasound (TUS) performed by intensivists to diagnose pleural effusion, pneumothorax, pulmonary edema and consolidation is becoming standard practice. Although house staff care for dyspneic patients and participate in rapid response and code teams, it is unclear whether they are aware of the utility of TUS and desire training in it.

OBJECTIVES. To assess knowledge of applications and interest in TUS among American medical students, medical and surgical residents.

METHODS. A 16 question online survey was developed and distributed to medical and surgical residents at our institution and to third and fourth year students at SUNY Downstate School of Medicine. The survey tested knowledge on uses of bedside TUS and motivation to learn it.

RESULTS. Five hundred surveys were sent. One hundred and sixteen were returned. Sixty-five medical residents, 16 surgical residents and 35 medical students replied. Eighty-five percent had received no prior training in TUS. Most knew that TUS can identify and help quantify the amount of pleural fluid present, and that TUS can diagnose pneumothorax. However, fewer than half knew that TUS can suggest pneumonia, pulmonary edema, atelectasis and ARDS (see Table). Ninety percent believed TUS performed by trained residents could be valuable in the initial evaluation of dyspnea. Of those who had served on a rapid response or code team, 84% believed training in TUS could prove useful in the initial assessment of critical patients. A majority of all groups were willing to do electives in TUS. Over 90% of all respondents would like training in TUS. Most would be willing to invest free time to learn these skills.

Can the following be diagnosed with ultrasound?

Pathology	Medical residents (n = 65) percent answering yes	Surgical residents (n = 16) percent answering yes	Medical students (n = 35) percent answering yes
Pleural effusion identification	97%	93%	97%
Estimation of volume in pleural effusion	88%	67%	46%
Pneumothorax	77%	93%	63%
Pulmonary edema	42%	53%	57%
Pneumonia	27%	27%	43%
Atelectasis	25%	13%	34%
ARDS	14%	13%	31%

Resident and medical student attitudes on TUS

Question	Medical residents (n = 65) percent answering yes	Surgical residents (n = 16) percent answering yes	Medical students (n = 35) percent answering yes
Should TUS be in residency curriculum?	97%	100%	97%
Could TUS prove useful if performed by trained residents in evaluation of dyspnea?	94%	93%	80%
Would you do an elective in TUS?	95%	88%	80%
Are you willing to invest time during a light rotation to learn TUS?	97%	94%	85%
If you have served on a rapid response or code team, do you think TUS could prove valuable in such situations?	90%	90%	56%
Are you comfortable with image acquisition on a portable ultrasound machine?	30%	50%	37%

CONCLUSIONS. Residents and medical students have a strong interest in bedside TUS yet do not realize all of its applications. Many want to know more about TUS and are willing to undertake an elective in this discipline. We recommend that TUS be incorporated into the curricula of medical and surgical residency programs and medical schools, and be taught to junior clinicians who often care for critically ill patients.

GRANT ACKNOWLEDGMENT. NY State Department of Health.

0245

THE USE OF ADULT LEARNING THEORY IN CRITICAL CARE CLINICAL TRIALS SITE INITIATION MEETINGS IMPROVES CONFIDENCE IN NEW RESEARCH SKILLS AND TECHNIQUES AND MAY ENHANCE STUDY CONDUCT

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INTRODUCTION. Failure to adhere to a clinical trial's treatment protocol may result in patient harm and may dilute statistical power. Evidence suggests that protocol violations are more likely to occur early during trial conduct, while research staff are still 'learning' new skills and study processes.

Adult learning theory places an emphasis on problem-based collaborative activities to enhance learning, rather than didactic lectures alone. Incorporation of interactive workshops into study site initiation meetings addresses the needs of research staff as adult learners and may lead to improved study conduct.

OBJECTIVES. The purpose of this project was to evaluate the utility of interactive workshops as part of clinical trial site initiation meetings.

METHODS. We recently commenced two novel multi-centre clinical trials (Study A and Study B) within 29 ICUs across Australia and New Zealand. We held 5 sequential site initiation meetings over 7 months. Each meeting was attended by research staff from 3 to 5 study sites. At each meeting we presented didactic lectures and conducted interactive group workshops to reinforce new skills and study processes. Both Study A and Study B introduced new study processes however only Study B taught a 'new skill', which involved a specific technique for measuring QT intervals. At the final site initiation meeting for each study, research staff were asked to evaluate the interactive workshops.

RESULTS.

Study A and Study B: New Study Processes

When asked whether the interactive workshops were useful for reinforcing the learning of new study processes, 16 of 16 (100%) participants responded YES.

Study B: New Skills

When asked whether the interactive workshops improved confidence with new skills, 8 of 8 (100%) participants responded YES.

When asked whether the interactive workshops should be held in future meetings if new skills were being taught, 10 of 10 (100%) participants responded YES.

CONCLUSIONS. Protocol violations are more likely to occur early during trial conduct, while research staff are still 'learning' new skills and study processes. An interactive workshop provides a protected learning environment for research staff to practice and reinforce new skills and study processes prior to enrolling their first patient.

Our survey demonstrates that the attitudes of research staff towards the use of interactive workshops were overwhelmingly positive: they reported that workshops were useful for learning new study processes and improved their confidence in new study skills.

We recommend the use of problem-based collaborative workshops to reinforce learning at study site initiation meetings to improve study conduct and reduce protocol violations.

GRANT ACKNOWLEDGMENT. The Australian National Health and Medical Research Council Grants 632614 and 632615.

0246

REAL-TIME EVIDENCE BASED DECISIONS IN CRITICAL CARE

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OBJECTIVES. Our aim was to pilot an 'evidence supported ward round' in the Critical Care Unit to improve access to the best available evidence for clinical decision-making.

METHODS. The 'evidence supported ward round' involves the Clinical Librarian attending ward rounds as part of the multidisciplinary team to discuss clinical questions and provide the best available evidence at the point of care. With the Clinical Librarian available as part of the multidisciplinary team, evidence can be made available at the patient's bedside within a timescale that allows it to be used for enhancing clinical decision-making.

RESULTS. During the pilot period (1st Jan 2010–31st Oct 2010) the Clinical Librarian attended the morning critical care ward round to pick up clinical questions relating to common patient situations (e.g. sepsis) as well as controversial topics (e.g. timing of tracheostomy).

The Clinical Librarian produced an evidence report for each question to summarise the best evidence on that topic, which is fed back to the ward on the same afternoon.

The results from the pilot show that if the Clinical Librarian had not been present, 45% of clinical questions would not have been pursued at all, and 55% would have been addressed with an internet search (e.g. Google). Clinicians reported that search results provided them with a better understanding of the treatment, aided treatment decisions and improved patient management. It was considered by clinicians that 47% of the search results would change their future practice.

CONCLUSIONS. The presence of the Clinical Librarian on the Critical Care Unit enabled access to the best evidence at the point of need to enhance decisions about patient care. The Clinical Librarian saved the time (and associated cost) of health care professionals undertaking evidence searches themselves.

0247

SEPSIS AWARENESS SURVEY AMONG MEDICAL DOCTORS AT A BUSY UK DISTRICT GENERAL HOSPITAL

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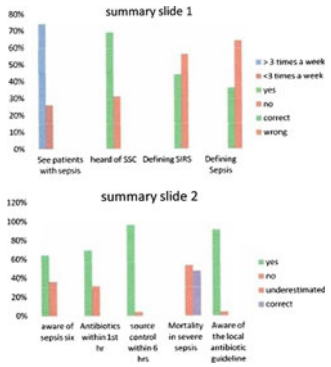
INTRODUCTION. Severe sepsis has an incidence of 1 case/1000 population/year and a quoted mortality of 20–50%[1]. Sepsis syndrome is a leading cause of mortality and led to the Surviving Sepsis Campaign (SSC)[2] which looked to reduce mortality by promoting recognition, prompt treatment and protocolised supportive care. Despite this the understanding of Sepsis appears poor amongst physicians leading potentially to substandard care.

OBJECTIVES. The purpose of this survey was to assess the understanding of Sepsis amongst physicians who participate in acute medical take in a busy DGH in South Wales.

METHODS. A written questionnaire was sent to 50 medical doctors. Doctors from all grades were included. Completed questionnaires were collected in person. A total of 45 (90%) completed questionnaires were received and analysed.

RESULTS. The survey confirmed that most physicians believe sepsis is very common and that doctors deal with it almost every day. 74% of doctors surveyed believe they see patients with sepsis more than 3 times a week. However 56% defined SIRS incorrectly while 8.88% then also defined Sepsis incorrectly. In total 64% of the doctors therefore did not know how to identify and define sepsis correctly. A third had not heard of Surviving Sepsis Campaign and 36% did not know about Sepsis Six. The majority of the doctors underestimated the high mortality from severe sepsis. More encouragingly 91% of the doctors were aware of local antibiotic guidelines.



Summary slides

CONCLUSIONS. Most physicians providing acute care to patients in this particular DGH do not have an adequate understanding of Sepsis. This potentially results in poor medical care to this cohort of patients, and may result in poor handover of care and inappropriate referral for Critical Care leading to worse outcomes. This highlights the need for urgent attention to improve the knowledge and understanding of sepsis among physicians so that quality care is ensured. This could be done via regular educational meetings and more importantly by incorporating sepsis teaching in the induction programmes. A recommendation was also made to introduce sepsis care pathway to the Acute Medical Admission Unit and educating all health professionals on these so that Sepsis care is standardised.

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0248

A FEASIBILITY STUDY OF TEAM PERFORMANCE IN REAL LIFE RESUCITATION EVENTS

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INTRODUCTION. Simulation studies have demonstrated the importance of human factors and team working in the performance of cardio-pulmonary resuscitation (CPR) (1), yet measurement of these factors in real life resuscitation events is challenging. The Mayo high performance teamwork scale(2) is used to evaluate the embedded in situ multi-disciplinary *SPRinT* (Simulated paediatric resuscitation team training) programme on our paediatric cardiorespiratory intensive care unit (PICU).

OBJECTIVES. Examine the feasibility of using a modified Mayo high performance teamwork questionnaire to study team behaviour during real resuscitation events on PICU. Secondary outcomes included participant perception of the *SPRinT* programme.

METHODS. Mayo high performance teamwork questionnaires were modified to investigate human factors within the cardiac arrest team and were distributed within 72 h of CPR events (CPR >2 min) to all participants during the 9 week study period. Both medical and nursing *SPRinT* faculty members were allocated to collect anonymous questionnaires in an attempt to ensure a high return.

RESULTS. 3 resuscitation events occurred during the study period, 21 questionnaires were returned (average 7/event). 47% were nursing staff, 38% physicians and 10% surgeons, 1 not stated. 90% felt that the balance of authority to team member participation was appropriate; 85% that the team prompted each other to attend to all clinical indicators; 76% that they could ask if they didn't understand; 71% that the team leader was recognized by all members of the team; 62% that guidelines were followed and 57% felt that team members repeated back instructions to ensure correct hearing and understanding. 100% had attended at least one *SPRinT* session and 67% reported that the session helped their performance at the real resuscitation event.

CONCLUSIONS. It is feasible to collect self evaluated multidisciplinary data on teamworking from real resuscitation events. There was a lower nurse/physician ratio in returned questionnaires than expected considering the ratio present at an event. Further studies will need to ensure higher return ratio of questionnaires especially from nursing staff. Further work is needed to elucidate why return is lower from the nursing discipline. *SPRinT* sessions subjectively improved teamwork in over 2/3 of participating cardiac arrest team members, closed loop communication with clarifications needs to be prioritised within the training programme.

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0249

POSTGRADUATE CRITICAL CARE NURSING STUDENTS' EXPERIENCES OF TEAM-BASED LEARNING

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INTRODUCTION. Australian registered nurses complete postgraduate studies to manage patients in critical care units. Team-Based Learning (TBL) is a teaching strategy (Michaelsen, Knight & Fink, 2004) used in business, health and science programs internationally (Michaelsen, Parmelee, McMahon & Levine, 2008; Thompson et al., 2007) that devotes class time for permanently formed learning teams to apply their newly acquired knowledge to real clinical problems. For students, TBL is a novel learning experience which challenges them to connect concepts and explore issues. In doing so, TBL may enhance nurses' critical thinking, problem solving and decision making skills.

OBJECTIVES. The aim of this study was to qualitatively evaluate post-graduate critical care nursing students' experiences of TBL.

METHODS. We undertook an exploratory study using an extended response questionnaire. Thirty-two students participated, following Ethics approval. Data were analysed thematically. Trustworthiness was established using peer debriefing to review data and to search for disconfirming evidence and thick description.

RESULTS. Compared to standard lecturing, tutoring or group work, TBL accelerated students' self-assessed acquisition of professional attributes and identity. All students indicated a preference for more TBL in the curriculum. Major themes to emerge where improved learning effectiveness, critical thinking motivation to learn, and engagement.

CONCLUSIONS. TBL was an extremely positive experience for students, professionally and personally. More TBL will be included in our nursing programs and will be introduced across other postgraduate degrees.

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GRANT ACKNOWLEDGMENT. This project was funded through the 2010 Deakin University Institute of Teaching and Learning Strategic Teaching and Learning Grant Scheme (STALGs).

0250

EVALUATION OF THE HEALTH PROFESSIONALS' GENERAL KNOWLEDGE ON THERAPEUTIC HYPOTHERMIA AFTER CARDIOPULMONARY RESUSCITATION

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OBJECTIVE. Describe the Health Professionals' knowledge that act in intensive therapy on mild hypothermia as therapeutics for unconscious adults patients with return of the spontaneous circulation after cardiac arrest (CA).

METHODS. Were included participant Health Professionals of scientific event in intensive therapy, accomplished in Salvador, Brazil, in 2010, that voluntarily accepted to fill out structured questionnaire containing information on the demographic profile, graduation and titration (specialization, Advanced Cardiac Life Support, ACLS) and objective questions on neuroprotection therapy after CA. The correct answer for specific questions on application, and technique on hypothermia after CA was essential for the professional to be considered an expert on the appropriated treatment.

RESULTS. Sixty eight participants of the symposium answered to the questionnaire, 56 (82.4%) of them were physicians, 04 (5.9%) nurses, and 08 (11.8%) students or psychologists. The average age of the participants was 33.27 $\pm$ 5.8 years, and those that had already completed the graduation, they had graduated 8.96 $\pm$ 5.4 years ago, on average. Twenty-eight (41.2%) participants had title, and 21 (30.9%) residence in intensive medicine. Ninety percent believed in the benefit of mild hypothermia after cardiopulmonary resuscitation, but only 4% of them knew which temperature and/or by how long the technique is used. Only 20 (29.4%) of the interviewees were considered experts on the appropriate treatment, 17 (85%) had attended ACLS course, no difference was observed in physicians who had attended the ACLS course or not ($p = 0.51$), 07 (35%) had title of specialist in intensive therapy and 09 (45%) residence in intensive care.

CONCLUSIONS. In this study, the complete theoretical knowledge about the use of the hypothermia was considered unsatisfactory. Most of the interviewees believed in the benefit of the hypothermia, but just a third knew the technique.

0251

EVALUATION OF THE THEORETICAL KNOWLEDGE ACQUIRED BY PHYSICIANS AFTER A CARDIOPULMONARY RESUSCITATION (CPR) SEMINAR

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OBJECTIVE. To evaluate whether the knowledge and skills acquired during an advanced CPR seminar, given in 2010 to physicians in our hospital, remains 45 days later. As secondary objectives, we wanted to assess their self-confidence applying the skills learned, forming part of a CPR team; and also know if they consider it useful to refresh their knowledge and skills every 6 months.

METHODS. Prospective study on 41 physicians who attended to our advanced CPR seminars in 2010. Before starting the seminar, the participants took a multiple-choice test, with 15 questions related to advanced CPR. After a 17-hour seminar, with theoretical and practical tutorials, they repeated the same test. They were asked to meet us 45 days later, for other reasons, and were given a repetition of the test. At this time three new questions were formulated about their personal perception of the knowledge acquired: whether they felt capable of performing a basic CPR, of becoming part of an advanced CPR team, and if they thought that refresher courses would be useful.

The results of the three tests were compared. The statistical analysis was carried out with a t of Student. The results are shown as means difference between the pre-seminar, the post-seminar and +45 days test, with a confidence interval of 95% (CI95%).

RESULTS. The 41 physicians had already attended previous CPR seminars. All of them completed the pre and post-seminar tests. The average grade was 12.37 out of 15 points, and seven students got the highest grade.

Comparing the pre and post-seminar tests, we observed that 39/41 improved their grade 1.95 points [CI95 (2.5–1.4), $p < 0.0001$] in the post-seminar test.

Seven participants did not repeat the test +45 days ($n = 34$). Comparing the pre-seminar test with the +45 days test, they improved their grade in 1.61 points [CI95 (2.27–0.96), $p < 0.0001$]. All of them (34/34) felt capable of performing a basic CPR, but, interestingly, one third of them (11/34) did not feel capable of forming part of an advanced CPR team. An 80% (27/34) of the participants believed that reinforcement courses every 6 months would be useful.

CONCLUSIONS. Despite the fact that all of the participants in our advanced CPR seminar had previous knowledge, and had good grades in the first test, a clear improvement in theoretical knowledge was obtained after our seminar. We also noticed that the knowledge acquired during the tutorial prevailed through time.

Nevertheless, despite this high level in theoretical knowledge, a third of our physicians did not feel capable of taking active part in an advanced CPR team. The majority thought that periodic recycling courses would be useful.

0252

PATIENT SAFETY WALK ROUNDS, CLOSING THE GAP BETWEEN HOSPITAL MANAGEMENT AND FRONT-LINE STAFF

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INTRODUCTION. After publication of IOM report *To Err Is Human*[3] patient safety is a worldwide critical healthcare issue. Many hospital care intervention programs have been started afterwards to reduce preventable adverse events. Improvement of patient safety culture (PSC) is an important objective of overall patient safety improvement strategies[4] and therefore included in the Dutch Patient Safety Management Program (VMS[5]). Implementing safety walk rounds in 2009 is one of several PSC interventions in VU University medical center (VUmc).

METHODS. Walk rounds are short (45 to 60 min) ward visits by hospital management (CEO's, directors, clinical leaders). Walk rounds are scheduled on weekly basis. All (clinical) wards are visited annually. Walk rounds have various aims: Increase awareness and discussion about patient safety; make safety a constant priority within the hospital; promote safety culture, improve communication between hospital management and front-line staff. Walk rounds are started with a site visit followed by a plenary discussion. One of the participating CEO's introduces and explains the walk round process and leads the discussion. All participants are encouraged to speak up about their patient safety concerns. Walk rounds are supported by VUmc patient safety advisors supporting staff.

RESULTS. VUmc started in February 2009 with walk rounds. Until March 2011 86 walk rounds are performed. A number of 125 common patient risk themes have been identified during walk rounds; Communication (29); Staffing (4); Medication (20); Equipment (58); Miscellaneous (14). Data were obtained from patient safety advisors walk round scribes. Reports of the walk round are send afterwards to visited wards. Wards take responsibility for improving identified patient risk themes. Specific improvement actions/plans are adopted by hospital directors or divisional managers of VUmc. Follow up and feedback loop is done during following walk rounds.

CONCLUSIONS. Walk rounds offer a direct opportunity for front-line staff to raise and discuss patient safety issues with their CEO's, directors and clinical leaders. Discussion improves awareness of PSC and its importance, evokes discussion about strengths and weaknesses and improvement measures. Participants are satisfied with the impact and effects of walk rounds. VUmc invests in development of PSC. Performing walk rounds only is not enough. More culture interventions are available and necessary for improving patient safety culture.

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0253

EMERGENCY CARE OF THE OBESE AND EXTREMELY OBESE (PREHOSPITAL AND HOSPITAL) THROUGH THE EYE OF THE MEDICAL TEAM

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INTRODUCTION. By the epidemical spread of obesity, treatment of the concerned means making it more difficult in all fields of medical attendance and in emergency care as well.
METHODS. In the course of our research, emergency and ambulance workers ($n = 80$) were enrolled searching for troubles of obesity (obese, extremely obese, morbid obese) and also difficulties in their hospital care. Data were obtained by descriptive statistics and correlations were analyzed.
RESULTS. By the experiences of suppliers, obesity means a severe problem from the point of ambulance service to anesthesiology, additionally 77.5% of attendants notice these problems every single day. 90% of the respondents thought that obesity effects difficulty under medical attendance and the reanimation of this group was reported just in the same ratio. Respiratory tract insurance was found problematic by 78.8% of suppliers, anesthesiology by 62.5% and oftener anesthesiological complications by 42.5%. There were significant relationship between the objected use of BLS Protocols and the weight of patients ($r = 0.93$; $p < 0.001$). The obesity of patient (BMI >25) also shows close relation and significance by the hardly implementable compression of the thorax, by respiratory tract insurance and by finding the suitable position ($r = 0.87$; $p < 0.01$). Unsuccessful reanimation in prehospital and hospital period showed significantly more frequency by obese ($30 \leq$ BMI) and by extremely obese ($40 \leq$ BMI) [kg/m^2], correlation could be found ($r = 0.76$; $p < 0.001$), while by 90.0% of the asked attendants' subjective opinion, obese people plead a group, that more difficult to be resuscitate. Factors that negatively influential resuscitation: complicated compression of the thorax (36.3%), difficult preparation of veins (27.5%), complicated intubation and respiratory tract insurance(18.8%).
CONCLUSIONS. By right of our results, obesity can cause serious problems during hospital attendance. Clinical picture and consequences arising from obesity often oppress this field of hospital attendance. From ambulance care to anesthesiology, extremely obese patient means special and hardly treatable group.

End-of-life care: 0254–0267

0254

WITHDRAWING MECHANICAL VENTILATION AND VASO-ACTIVE MEDICATION IN DUTCH NON-ACADEMIC ICU'S: A PROSPECTIVE STUDY FOCUSED ON SEDATIVE AND OPIOID USE, COMFORT OF THE PATIENT, SEVERITY OF ILLNESS AND TIME TILL DEATH

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INTRODUCTION. Although withdrawing treatment in incurable ill patients has become a generally accepted form of end of life management in many countries, misconceptions and controversies still remain present in this field. Since The Netherlands have been indicated as leading in the liberalization of end of life issues, as judged by the legalization of euthanasia, withdrawal of treatment on the Dutch ICU's is often presumed to be liberal as well. However, only one retrospective academic single centre study has been published until now to describe the Dutch situation[1]. In the study presented here, we show the preliminary results (*first 75 patients*) of a prospective study analyzing withdrawal of treatment in 2 different non-academic Dutch ICU's
OBJECTIVES. To describe and analyze the practice of end of life care and withdrawal of treatments in non-academic Dutch ICU's, focusing on medication use, severity of illness, level of patient comfort and time till death.
METHODS. A prospective, observational study in 2 hospitals for a 1-year period, including all patients in whom ventilation or vaso-active medication was withdrawn for reasons of futility. The study protocol was predominately nurse driven. Data were collected from electronic and paper patient files. Statistic analyses were made with Prism GraphPad v 5.0.
RESULTS. Mean age was 69 years and 59% of patients were male. Common reasons for withdrawal were failure to recover after out of hospital cardiac arrest and sepsis with MOF. Mean SOFA score on day 1 was 9.9 and 12.4 the day of withdrawal. Mean Apache II score was 31. All but one patient were ventilated; in 81% the ventilation was ceased, 29 patients were extubated. Sixty patients received vaso-active drugs; all these drugs were withdrawn. Most patients (55%) were sedated with propofol. Propofol was increased in 8 patients during withdrawal, resulting in a significant overall dosage rise ($p = 0.01$). Sufentanyl was the most used opioid (83%).
In 13 patients a change in sedation score was noted after treatment withdrawal. Signs of stridor after detubation were noted in 11 patients. The majority of patients (70%) died within an hour after therapy withdrawal.
CONCLUSIONS. Dutch patients in whom treatment is withdrawn are severely ill, as indicated by their levels of vaso-active medication, high Apache, high and even increasing SOFA scores. The patients are highly depend of vaso-active and ventilatory support and die therefore quickly after withdrawal. Patients are well sedated and show infrequently mild signs of discomfort. In a few cases sedatives or opioids are increased without demonstrable signs of discomfort. Nevertheless the dosages found do not seem to exceed the ranges described as usual in the international literature.
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0255

TIME TO DEATH AFTER WITHDRAWAL OF TREATMENT IN A MIXED GENERAL/NEUROSURGICAL UK ITU: A RETROSPECTIVE OBSERVATIONAL STUDY

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INTRODUCTION. Withdrawal of treatment accounts for 31.8% of UK ICU deaths. [1]Little data is available about time to death for different mechanisms of withdrawal. Greater accuracy predicting time to death would be beneficial when liaising with family members, for the logistics of non heart beating organ donation (where appropriate) and to aid decisions on suitable method of withdrawal.
OBJECTIVES. To review end of life practice within our unit and to determine whether method of withdrawal altered time to death.
METHODS. Retrospective review of case notes on all patients on whom treatment had been withdrawn in 2010 in a 22 bed mixed general/neurosurgical UK intensive care unit. The data collected included patient demographics, APACHE II score on admission, timing of withdrawal decision, mode of withdrawal and time to death.
RESULTS. Of the 1817 admissions to Derriford ITU in 2010, 149 had their treatment withdrawn (complete data available for 108). 197 patients died on the unit and a further 94 died in hospital. 73% of ITU deaths occured in patients on whom treatment was withdrawn. 60.4% were male. The median age was 67 years (3 months–92 years). The median APACHE II score on admission was 23 (6–43). The median time to withdrawal decision was 48 h (1 h–50 days). Time to death ranged from 1 min to 96 h (median 57 min), across all modes of withdrawal. Extubation accounted for 44% of cases. In the extubated group median time to death was significantly longer at 79 min (5–5760 min) compared to 35 min (1–1440 min) for other methods of withdrawal (Mann–Whitney test, $p = 0.0149$, CI 4.9–71). The results may be confounded by a lack of non-extubated neurosurgical patients. Across the general patients, time to death was still longer when extubated (68 min vs 35 min) however the difference is not significant (Mann–Whitney test, $p = 0.1014$ CI -2.1–62).

Time to death across groups

	All patients		Neurosurgical	General
	Extubated	Non-extubated	Extubated	Extubated
Number	57	51	27	30
Mean (min)	570	117	949	228
SD (min)	1179	232	1600	365
Median (min)	79	35	99	68
Range (min)	5–5760	1–1440	7–5760	5–1700
p value (Mann–Whitney)	Ext vs non $p = 0.0194$		Neuro ext vs general ext $p = 0.3217$	

17 of the 149 patients on whom treatment was withdrawn donated an organ or organs. 5 were brainstem dead donors. 19 patients were identified as suitable for non heart beating donation however 7 of these (37%) died in excess of the 2 h window and thus failed to be NHBD.
CONCLUSIONS. 73% of our ITU deaths were in patients on whom treatment had been withdrawn. Time to death from extubation was significantly longer compared to other methods of treatment withdrawal. 37% of potential NHBD were excluded as time to death exceeds 2 h.
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0256

DO-NOT-INTUBATED (DNI) ORDER AND NON-INVASIVE MECHANICAL VENTILATION (NIMV). CRITICAL CARE AND LONG TERM SURVIVAL

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INTRODUCTION. Currently NIMV can be considered as first-line respiratory support for most causes of acute respiratory failure (ARF). However its implementation still remains controversial in patients with "do-not-intubate" (DNI) order.
OBJECTIVES. To determine DNI order prevalence and outcome, safety, effectiveness and long-term survival from the use of NIMV in DNI patients with ARF.
METHODS. Prospective and observational study conducted between 1 October 1996 and 31 December 2008 in a medical-surgical-coronary intensive care unit (ICU).
Sample was divided into 2 groups depending on whether or not they had a DNI order on admission to, or during their stay in the ICU. Clinical follow-up was for 1 year.
Inclusion Criteria: ARF and NIMV required.
Exclusion Criteria: a) Agonic breathing or imminent cardiorespiratory arrest, b) Recent face, oesophagus or upper airway surgery, c) Severe active upper digestive bleeding, d) Haemodynamic instability secondary to malignant ventricular arrhythmias or without response to fluid therapy and low-dose of vasoactive drugs, e) Severe fixed upper airway obstruction, f) Facial deformity preventing the application of any type of mask; and/or g) Not respiratory coma.
Statistical analysis: Statistical analysis was carried out using the SPSS software package version 15.0 for Windows.
RESULTS. 2590 patients were recruited: 658 with DNI order (25,4%). Hospital mortality rate in DNI patients was 57.5%. DNI was the most important independent factor related to hospital mortality (OR 9.2; $p < 0.001$). Immunosuppression (OR 3.9; $p < 0.001$) and Cancer (OR 1.6; $p < 0.041$) were the main independent factors related to DNI order. NIMV-related complications rate was high in DNI patients (52.3%), although most of them do not reveal excessive clinical severity: nasofrontal injury (46.4%), ocular irritation (22.2%), claustrophobia (12.8%) and gastric distension (8.1%) were the most common complications in our DNI population. One year survival in DNI group was 27.2%.
CONCLUSIONS. DNI order is a prevalent clinical phenomenon and it is seen as the strongest independent factor for hospital mortality in patients with ARF. NIMV could be considered both effective and safe in this particular kind of patients.
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0257

IMPACT OF AN "AND" (ALLOW NATURAL DEATH) PROTOCOL ON END OF LIFE DECISIONS IN AN INDIAN ICU

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INTRODUCTION. End of life decision-making is known to be complex and perceived to be difficult in India (1). Education of the healthcare team and introducing a standard operating procedure (SOP) could facilitate End-of-life decisions (EOLD) and documentation (2).

OBJECTIVES. To assess the frequency, type and quality of EOLD before and after the introduction of formal "AND" (allow natural death) SOPs.

METHODS. 34 bedded Medical-Surgical Intensive Care and High dependency Unit
Study design: Prospective, interventional.
Data were gathered in the period 20th February 2009 to 19th February 2010 (Group A) and following the introduction of an AND procedure in the period 20th Feb 2010 to 19th Feb 2011 (Group B). All EOLDs were documented on a standardized AND form that was signed by the attending physician, next of kin, one witness and validated by a three-member AND committee. Measurements: Demographics, disease category, Acute physiology and chronic health evaluation (APACHE IV), ICU Length of stay (LOS), Mechanical ventilator days (MVD), hospital LOS, mortality rate, frequency and type of EOLD, time to EOLD, time from initiation of discussion to EOLD, time to death from EOLD, interventions within 3 day prior to death.

RESULTS.

Results

	Group A	Group B	P value
Total admissions	2328	2698	
Mortality	276 (11.8%)	353 (13.08%)	0.337
EOLD	21 (7.6%)	82 (23.2%)	0.000
Age/Sex	61.1 ± 15.2 62% M, 38% F	63.7 ± 18.1 56% M. 44% F	
DNR (Do not resuscitate)	12 (57%)	26 (31%)	0.000
WH (Withhold)	1 (4%)	20 (24%)	0.000
WD (Withdrawal)	8 (38%)	36 (44%)	0.14
APACHE IV	108.28 ± 32.23	95.89 ± 30.46	
ICU LOS	5.19 ± 4.05 days	7.17 ± 8.61 days	

In addition to the data summarized in the table there were following observations: The disease categories in group A vs group B: Sepsis 4 (19%),16 (19.3%), Respiratory 4 (19%), 16 (19.5%), Malignancy 7 (33%), 27 (33%), Neurological 6 (26%), 23 (28%). The mean time from admission to EOLD Group A vs Group B 6.51 ± 6.19 vs 6.53 ± 8.3 days; the time interval between initiation and final EOLD 1.36 ± 1.71 vs 1.57 ± 2.45 days and the mean time to death from EOLD 1.3 ± 2.5 vs 0.82 ± 1.57 days. There was no difference in the number of interventions in the 2 groups within 3 days of death. MVD in group A vs Group B: 4.42 ± 5.59, 3.72 ± 5.91 days (not significant). Hospital LOS group A vs Group B: 8.23 ± 7.32, 9.81 ± 10.63 days (not significant).

CONCLUSIONS. The above data suggest that introducing an SOP for EOLD significantly improves the frequency of EOLDs overall. The DNR decisions were more frequent before while withholding decisions were more frequent after the introduction of AND. There was no significant difference in the MVD, ICU or hospital LOS, or in interventions around the time of death.

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0258

THE ASSOCIATION BETWEEN ATTITUDES TOWARDS FAMILY-CENTERED CARE AND FAMILY PRESENCE DURING RESUSCITATION AMONG ISRAELI ICU NURSES

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INTRODUCTION. Family Centered Care (FCC) has been cited as important to patient care (1) however little is known about nurses' perspectives towards FCC. Family presence during resuscitation (FPDR) is an example of the implementation of FCC (2), however nurses do not necessarily agree with FPDR, especially those from non-western countries (3). It is unknown whether there is an association between FCC and FPDR.

OBJECTIVES. To determine: a. the attitudes of nurses towards FCC and FPDR.
b. whether there is an association between FCC and FPDR.

METHODS. A convenience sample of 96 Israeli ICU nurses completed 5 questionnaires: demographic data questionnaire; Nursing Activities for Communication with Families-Revised; Barriers to Providing Family Centered Care-Revised; Nurses' Experiences of Family Witnessed Resuscitation; and Attitudes to Family Presence during Resuscitation.

RESULTS. The item mean for the NAFC-R and the Barriers scales were only 3.7 out of 5 and a moderate 2.4 out of 4, respectively. Only 19 RNs (20%) had experienced FPDR, of which 17 reported a negative experience. Overall, nurses objected to FPDR (mean item score = 1.8 out of 5). No statistically significant relationship was found between FCC and FPDR. A significant negative correlation was found between the Barriers Scale and FPDR ($r = -.36$, $p = .001$).

CONCLUSIONS. While FCC has moderate support, objection still remains to FPDR. FPDR has been used as an example of FCC, but in this sample, this might not be applicable. Increased education and policy changes should be encouraged to promote FCC and FPDR.

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0259

CAN DECISIONS TO WITHHOLD OR WITHDRAW TREATMENT BE MADE IN THE EMERGENCY DEPARTMENT?

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INTRODUCTION. In 2009, the French language Society for Critical Care Medicine (SRLF) update its guidelines for withholding and withdrawing treatment in order to be coherent with the new legislation of 22 April 2005 regarding patients' rights and end-of-life decisions (1).

OBJECTIVES. To identify predictive factors of patients in whom a decision to withhold or withdraw treatment could have been made in the Emergency Department (ED) of Dijon University Hospital, France.

METHODS. Single-centre, retrospective study of all patients admitted to the ED and in whom a decision to withhold or withdraw therapy was subsequently made after the patient had been transferred to the intensive care unit (ICU) during the period 2008–2009. We recorded demographic characteristics, data from ICU and in-hospital stay, as well as main elements regarding the reflection about and justification for the decision to limit therapy.

RESULTS. Among the 73 eligible patients, we retained 22 patients in whom all relevant data was complete and reliable. Mean age was 80 years (range 63–85). All patients had 1 or more comorbidities likely to affect prognosis. Mean SAPS II score was 67 (range 51–92); Knaus score was III/IV in 85%. Indications for admission to the ED were cardiological in 59%, respiratory in 27% and neurological in 14%. Median length of stay in ICU was 2 days. At admission to the ED, no patient was in a position to express their own wishes or made their own decisions, and a family member or surrogate was identified in only 22%. The decision to limit or withdraw therapy was documented in 86% of the patient files. Two major arguments were advanced in justification of this decision, namely lack of any possible curative strategy in 36%, and very poor short-term prognosis as evaluated by objective criteria in 27%. A collegial decision-making procedure was used and documented in 95% of cases. In 77%, the patient died in the ICU, and the remaining 23% died in-hospital after transfer from the ICU to another unit. After careful analysis of each file, it was considered that 80% of the decisions to withhold or withdraw therapy could have been made directly in the ED after initial admission.

CONCLUSIONS. Decisions to withhold or withdraw therapy are now an integral component of management. Obstacles to such decisions being made in the ED are related to the high volume of activity in the ED, the paucity of information about the patient's prior history (comorbidities, lifestyle, previous quality of life) and difficulties evaluating the rapid effects of treatment. Although it is difficult to make decisions to withhold or withdraw therapy in the ED, it is essential from an ethical point of view to avoid unreasonable therapeutic obstinacy, and from an structural and economical point of view, given the limited number of ICU beds available.

REFERENCE. Limitations et arrêt des traitements en réanimation. www.srlf.org

0260

END OF LIFE DECISIONS IN A SPANISH ICU

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INTRODUCTION. Between 60–80% of all deaths in the Intensive care Unit (ICU), do happen after restricting life-sustaining therapies. The way these decisions are reached is very variable. Three aspects are more controversial: 1. How is family involved in end-of-life decision making processes? 2. To withhold or to withdraw, are they the same? The shortening of the dying process, is it ethics? 3. What criteria are used?

OBJECTIVES. To assess the frequency of such practices, the therapies that are withhold/withdrawn and the process leading to these decisions.

METHODS. A 1 year prospective observational study, in an polyvalent ICU of a Universitary Hospital, in Málaga (Spain). We analyse frequency of death after limited support adopted and decision making process.

RESULTS. Any form withholding/withdrawing of life support therapies was carried out in 40% (74 patients) of all deaths (81% withholding, 19% withdrawing). The shortening of the dying process was not registered. Most cited reasons for these decisions were poor expected quality of life and physiological futility (45 and 35%, respectively). In 85% of cases decision was taken unilaterally by the physician, and family was always informed.

CONCLUSIONS. Patient-physician relationship is dominated by the traditional paternalist pattern, where decisions are taken by the physician. Quality of life (previous or expected) is one of the most important decision criteria to limit therapy. It is necessary to elaborate guidelines for end-of-life decision making emphasizing the importance of involving patients (when possible) and their families.

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GRANT ACKNOWLEDGMENT. We acknowledge the technical support of Dr. Ruiz del Fresno.

0261

LIMITATION OF LIFE SUSTAINING THERAPY IN AN INTENSIVE CARE UNIT

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INTRODUCTION. The development in medical technology as well as the growing attention for the patients' autonomy lead to a scientific debate on the role of medicine in the patient's end-of-life. Clinicians generally agree that the indiscriminate use of intensive care should be avoided and should be withheld or withdrawn when deemed to be of no benefit.

OBJECTIVES. To describe the main features of all patients admitted to the Intensive Care Unit (ICU) who underwent limiting life sustaining therapy (LST) and the variables associated with that decision.

METHODS. A prospective and observational study was designed including all adults patients admitted in the Intensive Care Unit of a tertiary hospital (Gregorio Marañón Hospital, Madrid) during a period of 9 months. We considered withdrawing treatment as not to introduce life sustaining therapy, not to increase LST and to remove LST. We evaluated MOF with SOFA scale.

RESULTS. We considered withdrawing treatment in 103 (22%) of the 469 patients admitted to the ICU. We didn't initiate life sustaining therapy in 23 patients, didn't increase LST in 53 patients and we removed LST in 19 patients. We didn't withdraw treatment in 11 patients initially considered. The most often clinical features to propose LST were cardiorespiratory arrest, the presence of hematological diseases, worse functional status (Barthel score: severe disability 47% vs independent 15%), comorbidities (McCabe: 58% vs 11%) and those who developed MODS (35% vs 13%, $p < 0.05$) and respiratory failure (33% vs 12%, $p < 0.05$). Patients who underwent treatment limitation (LST) had APACHE II at admission of 23 and SOFA max. of 10; respiratory failure (32%), neurologic disease (24%) and septic shock (15%) as admission category. During their stay in ICU, they developed respiratory failure (63%), MODS (20%), VAP (16%), renal impairment (16%) and hemodynamic failure (36%). The variables independently associated with withdraw treatment decision were age, comorbidities (according to McCabe scale), severity illness (according to SOFA max) and the presence of MODS. In the subgroup of patients with MODS, we decided withdraw treatment to 67 (34%); 54 of whom died in the hospital. The remaining thirteen survived, but 18 months later, they had died or had severe disability (PAECC score $\geq$15).

CONCLUSIONS. Limiting LST is a common practice and is usually performed among the care team and the patients' surrogates. The main variables associated with limiting LST are those related to the severity of illness, previous quality of life, medical disease and patient's age.

0262

THE EXPECTATION OF THE FAMILY MEMBERS OF INTENSIVE CARE UNIT (ICU) PATIENTS ABOUT THE DEAD

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INTRODUCTION. In Brazil 70% of deaths occur in hospitals, and more specifically in the ICU. From these patients, thousands require palliative care, an innovative form of assistance in health. Palliative care is an approach that improves the quality of life of patients and their families, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual. For this care it is important valuing autonomy and good communication.

OBJECTIVES. To evaluate the expectation of the family members of ICU patients admitted in HU/UFSC, about the death and to assess their satisfaction regarding the information.

METHODS. Project approved by ethic committee. Transversal and non controlled study with quantitative and qualitative approach. During 6 months was applied a questionnaire to the family members, with demographic information and questions about their experiences and wishes in respect of the death and their impressions and understandings of the medical bulletins on routine visits in ICU.

RESULTS. The mean age of the 69 respondents was 43.8 years (18–82 $\pm$ 18.8), 75 had college and university level study, 60% was female, 46% had talked about death, 94% had lost a family member. Twelve answered that the relatives died at home, 26 (40%) in the hospital and 27 (41%) the ICU. Their worst memories were the pain and suffering (55%). Their best memory was the relief of suffering (41%). Between 18–40 years, 94% wished to be resuscitated in case of sudden death at age 85. Among those over 60 years, only 14% answered this question positively. Eleven percent would die in the ICU and 64% in hospital. The bad news was cited as the biggest fear when entering the ICU, and 76% affirmed that understood the doctor message in ICU/HU/UFSC. The doctor was named as the best communicator, and more presence of these professionals during the visits was suggested.

CONCLUSIONS. Most people want to move away from death and die in a hospital. Pain and suffering were the most prevalent feeling about the experience of death. The age had a direct impact on the acceptance of death. Information in the ICU was considerate satisfactory.

0263

THE EFFECT OF RELIGIOSITY ON END-OF-LIFE DECISIONS IN HUNGARIAN INTENSIVE CARE UNITS

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INTRODUCTION. Worldwide only a fraction of patients receives cutting edge medical therapy at intensive care units, hence therapy restriction has become an outstanding ethical, legal and financial issue. Based on several international studies religiosity affects end of life decisions, and its significance has been assessed with our study in Hungary.

OBJECTIVES. Our aim was to study the effect of religiosity on end-of-life decisions, and compare our data to results of European studies.

METHODS. We have performed a questionnaire evaluation among physicians of intensive care units. Letters containing 21 questions were delivered electronically to registered members of Hungarian Society of Anaesthesiology and Intensive Therapy, then the responses were processed anonymously. We have used a six grade scale (0–5) to estimate the importance of the examined factor. The retrieved 189 answers (response rate 24%) were statistically evaluated using the STATISTICA data analysis software system. Continuous variables were expressed as average and standard deviation. Since the distribution of the analyzed variables did not show normality, non-parametric tests (Mann–Whitney U test, Student's t-test and Kruskal–Wallis analysis of variance or chi-square tests) were used as appropriate. A P value< 0.05 was regarded as significant.

RESULTS. Among responders 25.1% was practicing religious, 39.3% was non-practicing religious, 15.7% was atheist and 17.8% did not comment. Religious responders were significantly more affected by the number of free beds at patient admission or therapy restriction, compared to those who did not comment ($p < 0.001$). Practicing religious physicians are the most affected by the opinion of relatives of incompetent patients during decision on therapy restriction. (3.0; SD 1.32). These physicians provided significantly higher score compared to non-practicing religious physicians (2.19; SD 1.36 $p = 0.023$), atheists (1.87; SD 1.57 $p = 0.007$) and those not commenting on being religious (1.58 SD 1.56 $p < 0.001$). Physicians considering themselves atheists choose therapy suspension significantly more often without informing the patient or relatives ($p = 0.007$) than expected.

CONCLUSIONS. Variations in the practice of therapy restriction decision due to religious belief is detectable among Hungarian anesthesia and intensive care unit physicians as well. Religious physicians are more affected by the number of free beds and the opinions of relatives. However, almost two decades after the democratic changes, the proportion of practicing believers was relatively low among intensive care unit physicians in our country.

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0264

LIMITATION OF THERAPEUTIC EFFORT, WITHHOLDING AND WITHDRAWING TREATMENT IN INTENSIVE CARE UNIT. ANALYSIS AND OUTCOME

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INTRODUCTION. Limitation of therapeutic effort (LTE) is a common practice in the Intensive Care Unit (ICU). We have specific protocols of LTE.

OBJECTIVES. Analyze the LTE decisions in our ICU and the characteristics of this group of patients.

METHODS. A prospective registry was made for patients admitted during five consecutive years, performing a retrospective analysis of de data.

SETTING. 6 general-ICU bed in a primary Hospital of 125 beds, without nephrology, neurosurgery, neither cardiac surgery Patients: 1378 patients (we excluded patients who died in the first 24 h).

We recorded patient data, severity of illness by APACHE II, long of stay, ICU and Hospital destination. Amounts of 9% of our patients were transferred from ICU to other hospital and 10.8% were transferred from general ward to other hospital.

We categorized LTE in three categories: do not resuscitation orders (DNR) 1 6.9% withholding supportive therapies (WHST) 56.6% and withdrawal supportive therapies (WDST) 26.4%.

RESULTS. There were 1378 patients; we applied LTE to 53 (3.8%). Main characteristics are in Table 1.

Table 1

Characteristics	LTE group	NO LTE group
Age	74.7 $\pm$ 9.6	64.1 $\pm$ 15.7
Gender	55.8% MALE	69.3% MALE
Apache II	24.8 $\pm$ 7	12.7 $\pm$ 9
SOFA	6.54 $\pm$ 3.4	5.0 $\pm$ 3.4
Long of stay	7.98 $\pm$ 17.1	3.3 $\pm$ 5.1
ICU mortality	63%	6.9%*
Hospital mortality	78.8%	10.8%**

*15.9% all patients transferred to other hospital would die
**24.5% all patients transferred to other hospital would die

In ICU during this period, 139 patients died. 105 received full treatment (75.53 of deaths) and 34 had LTE. Among LTE group ICU mortality was 44% in DNR, 62.1% in WHST and 78.6% in WDST.

The LTE orders were written at the first 2 days of admission in 27 patients (50%).

CONCLUSIONS. In our ICU patients in who we applied LTE are significantly older ($p < 0.05$), have more severity of illness ($p < 0.05$) and have significantly longer ICU stay ($p < 0.05$).Decision of LTE is early, probably because we admitted this patient to give a chance but no full treatment.

There are 22.2% of patients with LTE who are alive at Hospital forward.

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0265

WITHHOLDING OR WITHDRAWING THERAPY IN INTENSIVE CARE UNITS: IMPROVING INTERDISCIPLINARY COOPERATION

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INTRODUCTION. Decisions regarding withholding or withdrawing therapy are common in the intensive care units. The health care professionals involved in the decision-making process do not always assess the situation identically, leading to potential conflicts (1). Improving interdisciplinary cooperation is recommended to improve both quality of care and work environment for health care professionals (2).

OBJECTIVES. To test interdisciplinary audits as an intervention for improving interdisciplinary communication, cooperation and satisfaction with the decision-making process.

METHODS. Three interdisciplinary two-hour long audits (conducted at two hospitals) with participation of primary care physicians, anaesthesiologists (both with and without ICU as their main workplace) and intensive care nurses. A total of 29 participated in the audits. The participants received beforehand three complicated cases (from other hospitals) where withholding and withdrawing therapy decisions had been made. The participants were first asked to assess the cases and subsequently, based on the discussions, to formulate quality goals for withholding and withdrawing therapy decision-making, cooperation and care for patients and relatives. Form and benefit of the audit were evaluated in writing at the end of the sessions and by a short questionnaire 3 months later.

RESULTS. In all three audits the discussions were engaged. In the immediate evaluation 61% assessed this type of audit as "To a great extent" usable to promote interdisciplinary cooperation regarding end-of-life decisions, 36% "To some degree" and 4% "To a less extent". All staff groups emphasised the interdisciplinary form as one of the benefits of the discussions. The 3 months follow-up will be conducted at the end of April 2011.

CONCLUSIONS. The preliminary evaluation suggests that health care professionals find this type of audit usable to promote interdisciplinary cooperation regarding withholding and withdrawing therapy decisions at the ICU.

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GRANT ACKNOWLEDGMENT. The study was supported by The Region of Southern Denmark, Lillebaelt Hospital, Denmark, and the philantropic foundation TrygFonden, Denmark.

0266

NATIONAL SURVEY ON THE USE OF GUIDELINES IN THE WITHDRAWAL OF TREATMENT IN INTENSIVE CARE UNITS

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INTRODUCTION. Organ donation after circulatory death (DCD) is becoming increasingly common within the UK and now accounts for over one third of all cadaveric donors.[1] In spite of this, concerns still remain regarding the ethical issues surrounding the management of these patients pre-mortem. A recent case in the United States led to a doctor being accused of hastening a patient's death to allow donation to proceed after he administered morphine and lorazepam during withdrawal of care. In that case there had been no guidelines in place to validate his practice. UK guidelines for the management of the potential DCD donor state that withdrawal of treatment should proceed in accordance with the usual practice of the critical care unit and not vary because organ donation is being considered.[2]

OBJECTIVES. To establish whether a consistent approach to the withdrawal of care in DCD donors can be demonstrated in Intensive Care Units (ICU) across Scotland.

METHODS. We performed a telephone survey of all adult intensive care units in Scotland during January 2011. Each unit was asked whether they had guidelines in place for withdrawal of treatment. If the unit did use a guideline we established whether they extubated patients, discontinued NG feed and unnecessary drugs, and prescribed opiates for distress. Finally, we verified that these guidelines were used for patients being considered for DCD.

RESULTS. 27 ICUs in Scotland were identified, one was a neurosurgical ICU, three were cardiothoracic ICUs, and the remaining 23 were general ICUs. Of the 27 ICUs only 11 (40.7%) used a guideline for the management of withdrawal of treatment. We asked those units with guidelines about their extubation management during the withdrawal period. One unit routinely extubates all patients, seven units consider extubation at the discretion of the ICU Consultant, and three units never extubate. All units that use a guideline routinely prescribe opiates for distress and discontinue NG feeding and unnecessary drugs. All units with guidelines in place used these for the management of potential DCD donors.

CONCLUSIONS. At present less than half of ICUs in Scotland have a standard approach to the management of treatment withdrawal and therefore the management of the potential DCD donor. Of the ICUs that use guidelines there is a similar approach to most aspects of care except for the issue of extubation. At present there remains a great deal of debate concerning extubation at the time of treatment withdrawal and consensus opinion is unlikely to be found in the near future. Those units with a guideline were able to demonstrate uniform management of the potential DCD donor. We suggest that all units who are involved in DCD donation should have guidelines in place for the management of the withdrawal process.

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0267

BRAIN DEATH DETERMINATION IN PATIENTS WITH ACUTE BASILAR ARTERY OCCLUSION; SOME PITFALLS: A CASE SERIES

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INTRODUCTION. Acute basilar artery occlusion (ABAO) is a rare form of stroke. Mortality reaches 90% when treated conservatively. ABAO is very rare cause of brain death (BD) (less than 2%). Physicians can face difficulties and pitfalls determining BD in patients with ABAO.

METHODS. Case series of three patients who died from ABAO and who were regarded as potential BD organ donors.

RESULTS.

Case 1: A 46-year old male was admitted to the ICU. Angiography showed complete obstruction of the basilar artery. Intravenous administration of 20.000 units heparin was started. On day 2 the patient was tetraparalytic, showed absence of pupillary-, cornea- and ocucephalic reflexes, but still had spontaneous respiration. On day 3 all brain stem reflexes were absent. Apnea test was positive. A CT angiogram showed no apparent flow. The EEG made with 30 μV sensitivity showed no cerebral activity. The patient was declared dead and donated his organs.

Case 2: A 49-year old male was admitted to the ICU. A CT-scan showed left side brainstem infarction and bilateral infarction of the cerebellum. An ABAO was suspected and intravenous heparin was started. Later the patient deteriorated. All brain stem reflexes were absent except the cough reflex. Later that night all brainstem reflexes were absent. EEG was however not isoelectric. EEG was repeated the next morning and showed no cerebral activity. An independent neurosurgeon was in doubt because the patient showed severe spinal reflexes during his examination. The second mandatory EEG showed no cerebral activity and the patient was declared BD.

Case 3: A 52-year old female was admitted to the ICU with absent cornea- and oculocephalic reflexes. Because of respiratory insufficiency she was intubated and connected to a mechanical ventilator. CT-scan revealed a hypertense basilary sign. Alteplase was started as intravenous thrombolysis. In the evening the neurological examination revealed absent brainstem reflexes and no respiratory drive. The patient was registered as willing to donate. To comply with the Dutch Brain Death protocol the mandatory EEG was performed, which showed continuous cerebral activity. On day 2, the patient remained in the same neurological condition. A second EEG was performed but still showed continuous cerebral activity. The consulting neurologist stated that further treatment was deemed futile. The patient' family declined organ donation. The patient was sedated and extubated. Eighth minutes later she showed no circulation and was declared dead.

CONCLUSIONS. In some countries (United Kingdom, Portugal) patients are declared death after absence of brain stem reflexes and apneu, but without an EEG. It is recommended by some scholars that confirmatory testing is unnecessary. In patients with ABAO all brain stem reflexes can be absent in apneic coma, but with preservation of cortical activity. In ABAO EEG testing resulting in cortical silence should be mandatory.

Education & communication: 0268–0281

0268

NATIONAL SURVEY OF CRITICAL CARE NURSES' PAIN ASSESSMENT AND MANAGEMENT PRACTICES

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INTRODUCTION. Pain assessment of critically ill adults receiving mechanical ventilation has been shown to reduce the duration of ventilation and intensive care unit (ICU) stay. (1)

OBJECTIVES. To document Canadian ICU nurses' knowledge and practices of pain assessment and management for critically ill adults.

METHODS. Self-administered mailed questionnaire distributed in 2010 to ICU nurses identified through the 12 Canadian provincial/territorial nursing associations responsible for professional regulation. The questionnaire was developed from expert opinion, a review of existing literature and pain assessment tools, and then piloted in a single centre.(2)

RESULTS. Survey response rate was 842/3442 (24.5%). Exclusion of surveys with ≥ 25% incomplete responses provided 802 evaluable surveys. Most nurses had >5 years ICU experience (546, 68%), worked in ICUs with mixed patient populations (658, 82%) and in university-affiliated hospitals (446, 57%). Frequent assessment and documentation of pain was considered equally important for patients able and unable to communicate (750 [94%] vs 755 [94%], $p = 0.78$). However, nurses reported they were less likely to use a pain assessment tool for patients unable to communicate than for patients able to self-report (267 [33%] vs 712 [89%], $p < 0.001$). Also, nurses considered use of behavioural pain assessment tools less important than self-report pain assessment tools (595 [74%] [behavioural] vs 703 [88%] [self-report] nurses rated as moderately to extremely important) ($p < 0.001$). The most common behavioural pain assessment tools used were the: Behavioural Pain Scale (Payen) (122/294, 42%), Adult Non-Verbal Pain Scale (Ohdner) (111/294, 38%), and Critical-care Pain Observation Tool (Gelinas) (96/294, 33%).

From a list of 13 potential barriers to pain assessment and management, the 4 most frequently rated by nurses as occurring >50% of the time were: patient instability (317 40%), patient inability to communicate (254, 32%), sedation interfering with pain assessment (228, 29%), and nursing workload (223, 28%). Few nurses (235, 29%) were aware of published guidelines or practice recommendations for pain assessment and management; Society of Critical Care Medicine Sedation and Analgesia Guidelines (67, 8%), American Society of Pain Management Nursing (60, 8%), and the Registered Nurses Association of Ontario Best Practice Guidelines (178, 22%).

CONCLUSIONS. Our results suggest inadequate translation of evidence and practice recommendations for pain assessment and management of critically ill patients, particularly for those unable to communicate pain.

Grant Acknowledgement: AACN and St. Michael's Hospital 1. Payen et al. Anesthesiology. 2009;111:1308–16. 2. Rose et al. Intensive Crit Care Nurs. 2011 epub Mar 11.

0269

INTENSIVE CARE FOR BOTH BODY AND SOUL

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INTRODUCTION. Thanks to technological and medical advances over recent years, the numbers of patients surviving the acute stage of critical illness has risen. These form a new patient cohort, suffering from chronic critical illness.

The National Association of Medical Direction of Respiratory Care proposes a definition of chronically critically ill patients as those requiring six or more hours of ventilation for more than 21 days (1). These patients suffer from anxiety and depression (1).

In our Intensive Care Unit (ICU), this patient group is defined as those who are in the ICU for over 60 days (2).

OBJECTIVES. Staff must rise to the challenge of giving these patients quality care. We need to find ways to break the cycle of stress suffered by these patients and give them hope for recovery. Methods of care must be developed which improve the quality of life of the chronically critically ill. In our unit we have developed the practice of taking such patients out of hospital into fresh air.

METHODS. When haemodynamically stable and fully conscious, patients are transferred to a suitable chair; attached to a mobile monitor and ventilator and accompanied by a nurse, a doctor and a respiratory technician, taken into the grounds.

Family members are asked to join the patient for normal social contact and to help reduce anxiety.

RESULTS. Between 2000 and 2007, nine out of twenty-seven chronically critically ill patients were taken outside. Patients and families greatly appreciated the time out of the hospital. The reconnection to the 'outside world' left patients feeling optimistic about their return to health, less anxious and improved their sleep.

CONCLUSIONS. By finding ways to meet the challenge of this newly defined group of patients we can improve their care and hopefully reduce post traumatic stress disorder suffered by many ICU survivors.

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0270

PATIENTS' LIVED EXPERIENCES OF THE SOUND ENVIRONMENT WHEN CRITICALLY ILL

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INTRODUCTION. Previous studies have found that high sound levels and disturbing noise affect the physical health as well as the psychological wellbeing in a negative way. Many studies have measured the sound levels and investigated the sources of the noise in the ICU patient room, but there is a lack of knowledge regarding the patients' own experiences of being a patient surrounded by unwanted sounds and noise.

OBJECTIVES. The aim of this study was to illuminate the meanings of being a patient in a sound-intensive ICU patient room when critically ill as disclosed through patients' narratives

METHODS. Thirteen patients with an ICU stay between one and 65 days were interviewed regarding their experiences of the sound and noises in the ICU patient room. The qualitative data was analyzed using the phenomenological hermeneutical method.

RESULTS. In the first structural analysis the patients expressed their experiences in five themes: I feel safe and secure when being in a caring and well-known atmosphere, I am mobilizing strengths and internal security, I am struggling to regain control over the situation, I am an invisible auditor in an inflicted scenario/drama and I am left out alone in a strange and demanding world. In the final comprehensive understanding the meaning of being a patient in a sound intense patient room in ICU could be seen as never knowing what to expect of the next minute regarding sounds. This reality meant "feeling on edge" for shorter or longer periods never knowing when an unexpected sound or noise would appear. For some periods the environment was experienced as a calm, quiet and familiar place, but in a minute everything turned upside down, and peace was replaced with feelings of fear and discomfort. It was experienced like being in the middle of a hail of noise bullets, without protection

CONCLUSIONS. Being critically ill or injured and need care in an ICU means being in a completely vulnerable state. The physical weakness inhibits the critically ill patient to escape from the noise as well as obstruct the possibilities to express the needs and frustration related to noise. Therefore the patients' noise sensitivity is expected to be higher than usually.

0271

DEVELOPMENT OF RESTRAINT GUIDELINES AND EFFECTIVENESS ANALYSIS BY APPLYING

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INTRODUCTION. Physical restraints have been applied to patients to protect or control patients in ICU under the unethical indiscriminately but it's profit have not proven.

OBJECTIVES. The aims of this study is to analyze for the using effect by applying clinical practice after developed restraint guidelines for provide safe and effective nursing backed by the ethical considerations of the patients.

METHODS. By targeting on admitted patients and nurses in surgical intensive care unit, data is collected by two terms. One is for before educated restraint guidelines from 1 Jan 2010 to 30 Apr. The other is for after educated from 1 July 2010 to 31 Oct. Patients are compared by number of restraint application, average application times, and removal times of artificial airway through electronic medical records. In addition, nurses are compared by poll results for knowledge, awareness, attitudes, and nursing practice.

RESULTS. 1) Analysis of patient effect

Numbers of restraint ($p = .001$) and average application times ($p = .000$) are significantly reduced after educated than before educated. Removal time of artificial airway ($p = .000$) is also significantly reduced in restraint not applied patients than in restraint applied patients. 2) Analysis of nurse effect The knowledge and nursing practice for the restraint are improved. Awareness and attitudes as an education effect are showing negative view for applying the restraint. A statistical significance is only in terms of knowledge ($p = .000$).

CONCLUSIONS. The application of standard restraint guidelines is helpful to protect patients ethically and to establish evidence-based nursing practices. We think the continuing education for applying the correct restraint is necessary.

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0272

HOW DO ICU NURSES PERCEIVE THE SLEEP PROBLEMS OF THE PATIENTS?

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OBJECTIVES. In this study, it was aimed to search the perception of the ICU nurses about ICU patients' sleep problems and their applications to these patients.

METHODS. The study was carried out as a qualitative design with 20 voluntary nurses employed in five intensive care units of a research and training hospital. The data were collected using demographic characteristics form and a semi-structured interview form. Interviews with nurses were made individually and face to face. The data were evaluated by using Colaizzi's phenomenological data analysis method. As a result of data analysis into three categories and seven themes were identified.

RESULTS. The categories were (i) sleeplessness problems raised from patients, (ii) sleeplessness problems raised from the environment, (iii) the applications of nurses to prevent the sleeplessness problems of the patients. Nurses explained the reasons of sleeplessness raised from the patient as pain, agitation, anxiety about illness, having unknown prognosis, disrupt the chamber of night-day (circadian rhythm), fear of death in the ICU units not get daylight. They define the reasons of sleeplessness problems raised from the environment as bips and alarm sounds of the medical equipment, medical procedures to the other patients, voices of health care providers and other patients, and the lights which is on even on nights. Nurses told that they know the patients get sleeplessness, the reasons and they make interventions to solve this. ICU nurses told that the first intervention to provide patient regular and enough sleep, was assessing the patient individually and making the interventions. These interventions were reducing the anxiety, making patients active in day hours and preventing to sleep, giving sedative and analgesic medical treatment as ordered. The second intervention they told, arranging ICU environment, reducing the lights in nights, separating the patients according to the medical condition, degree of agitation and the cognition function.

CONCLUSIONS. ICU nurses told that ICU patients get sleeplessness problems because of themselves and environment and they explain that they try to provide regular and enough sleep to the patients with interventions first to the patient and second to the environment.

0273

THERAPEUTIC HYPOTHERMIA IN INTENSIVE CARE UNIT. HOW DO ICU NURSES COPE WITH THE IMPLEMENTATION AND THEIR ASPECT FOR COOLING METHODS

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INTRODUCTION. Fever control and Therapeutic hypothermia (TH) induction is becoming an increasingly accepted goal of therapy in patients with neurocritical illnesses. TH is been used with increasing frequency to prevent or mitigate various types of neurologic injuries. For the implementation of TH there are different methods: cold compresses-ice packs, air circulating cooling blankets, intravascular heat exchange catheters, fans, cooling caps and intravenous infusion of ice-cold fluids.

OBJECTIVES. In our intensive care unit (ICU) the application of TH is performed by the ICU nurses regardless the method that is chosen. This study compares three techniques of TH from the ICU nurses point of view regarding additional workload, ease of implementation, complications, temperature monitoring and selected target temperature achievement

METHODS. We distributed questionnaires to forty (n40) ICU nurses in order to evaluate three application techniques for TH: 1) intravascular heat exchange catheters, 2) air circulating cooling blankets and 3) cold compresses—ice packs, as for a) the ease of implementation, b) the additional workload c) the ease of temperature monitoring d) complications e) target temperature achievement.

The evaluation scale we used was from 1 to 5
(1 = very bad
2 = bad,
3 = moderate,
4 = good and
5 = very good).

Questionnaires were anonymous, within 15 days we collected and analyzed them.

RESULTS. Regarding a) the ease of implementation, cold compresses—ice packs gathered the best score ($p < 0.05$). Regarding b) additional workload, cold compresses—ice packs obtained the worst score, while the intravascular heat exchange catheters got the best score ($p < 0.05$). As for c) the ease of temperature monitoring and e) target temperature achievement the best score ($p < 0.05$) was collected by intravascular heat exchange catheters. As to d) complications, cold compresses—ice packs obtained the best score ($p < 0.05$) while the intravascular heat exchange catheters got the worst score ($p > 0.05$)

CONCLUSIONS. The best score out of the three application techniques for TH was gathered by the intravascular heat exchange catheters. The findings of our study are restricted due to small sample. But they are in accordance with the international literature as far as the intravascular heat exchange catheters is concerned for the induction of TH.

0274

THERAPEUTIC HYPOTHERMIA AFTER CARDIAC ARREST: RELATIVES EXPERIENCES DURING THE FIRST SIX WEEKS AFTER CARDIAC ARREST

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INTRODUCTION. The aim was to describe the relatives need for support and information during the acute phase when a next of kin has survived cardiac arrest treated with hypothermia at the intensive care unit (ICU). The aim was also to describe how everyday life is affected.

OBJECTIVES. Twenty relatives were interviewed at the time the person who had suffered a cardiac arrest was discharged from hospital, 1.5–6 weeks after the cardiac arrest.

METHODS. The interviews were recorded and transcribed verbatim and were analyzed with qualitative content analysis.

RESULTS. Support and information.

The relatives emphasized the importance of support from the family but they could also feel loneliness in difficult moments. The staff's presence in the ICU was supportive but how much of support the relatives experienced varied among the groups of relatives. Several of them experienced that the contact with other relatives and friends was a requirement and that all telephone calls to other relatives and friends took a lot of time and also that they could not cope with it. The relatives described that the information received at the ICU was adequate and correct. They felt, however, difficulties to assimilate the information because of difficulties in concentration and language confusion affecting the interpretation of the information. They appreciated the opportunity to ask questions but felt that the answers they sought for was not available. In comparison with ICU, the relatives experienced less information and contact with the staff in the medical ward. The relatives wished more written information and were missing information about prevention.

Impact on daily life.

The relatives experienced that every day life was affected through increased responsibility for the home. They also experienced that they had to support other relatives and had difficulty to take care of other relatives' worries. The injured person's disease resulted in a lot of practical things to take care of, like certificate, absence from work and travels to the hospital. They felt worry for the injured person and how the disease had affected them, mostly they were concerned about personality changes. They felt responsible for the injured person and were also concerned about how to cope with daily life after the person being discharged from the hospital. The relatives felt uncertainty about the future but hopeful. The interviews also revealed that many of the relatives had not discussed with the person stricken by the disease what really had happened.

CONCLUSIONS. The most important support when a next of kin had suffered a cardiac arrest was from other family members. The relatives wished repeated and more written information. Increased responsibility for the home and for the person stricken by the disease was the experience by the relatives on how everyday life was affected

GRANT ACKNOWLEDGMENT. We would like to thank the participants for sharing their experiences.

0275

ARE VENTILATED PATIENTS IN INTENSIVE CARE NURSED WITH APPROPRIATE HEAD OF BED ELEVATION?

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INTRODUCTION. Elevation of the head of the bed is an integral part of the ventilator care bundle[1] and is associated with a reduction in the incidence of ventilator associated pneumonia[2]. The recommended elevation is 30–45°.

OBJECTIVES. To assess compliance with head of bed elevation in ventilated patients on the intensive care unit (ICU).

METHODS. Head of bed angle measurements were recorded three times a day during designated time periods (morning, afternoon and evening). Exclusion criteria included acute head injury, suspected or actual spinal cord injury, acute abdominal conditions and severe haemodynamic instability.

RESULTS. 136 observations were made over 2 weeks. This included 25 patients, each seen a minimum of three times. Exclusion criteria were met in 21 observations. This included 3 patients in whom exclusion criteria were met at all times. There were subsequently 115 observations where patients should have been nursed in the semi recumbent position (30–45°). Head of bed elevation was at an appropriate angle in 83% of these observations.
13 patients (59%) were in the correct position throughout all observations.
5 patients (23%) were only in the correct position during part of their observations.
2 patients (9%) were never in the correct position when they should have been.
2 patients (9%) met exclusion criteria part of the time but were correctly positioned at all other times.

CONCLUSIONS. Ventilator-associated pneumonia (VAP) is the most common nosocomial infection in the ICU[3]. The consequences of VAP include prolonged duration of mechanical ventilation, longer ICU stay and consequent cost implications. Elevation of the head of the bed is a simple measure proven to reduce incidence of VAP by minimising aspiration of gastric contents[2]. This study shows 83% compliance in our unit. In units where there are visual indicators or protractors incorporated into the bed, reinforcing this knowledge to medical staff and physiotherapists may improve compliance. The use of a simple angle indicator by the bedside is another way of improving compliance. We also suggest placing indicator lines on the wall behind the bed, that can only be seen if the head of bed elevation is below 30° and reminder posters by the bedside. Families should be educated on the importance of head of bed elevation and should be encouraged to notify staff if the bed is not in the correct position.

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0276

SUPPORT AND IMPACT ON EVERYDAY LIFE AFTER SURVIVAL FROM CARDIAC ARREST: RELATIVES' DESCRIPTIONS 6 MONTHS AFTER A SIGNIFICANT OTHER'S CARDIAC ARREST

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INTRODUCTION. The aim was to describe relatives' need of support and information when a significant other has survived cardiac arrest and the impact on everyday life 6 months after the event.

OBJECTIVES. Interviews with 20 relatives were conducted 6 months after a significant other's cardiac arrest.

METHODS. The interviews were recorded and transcribed verbatim and were analyzed with qualitative content analysis.

RESULTS. The result illustrated various experiences by relatives. Six months after the significant other's cardiac arrest relatives experienced support mainly from other family members and friends. Relatives stated that the care, support and information in the intensive care unit had been good but that they felt abandoned by the health care when the significant other was discharged from the intensive care unit. There were various requests to get more support from the health care mainly around issues concerning prognosis, rehabilitation and follow-up care. There were also requests to meet others in same situation, like family groups where they could share experiences. They experienced that the everyday life was affected especially with increased responsibilities and requirements at home, restrictions in social life, a sense of abandoned and a lack of understanding from the surroundings and a constant concern for the significant other.

CONCLUSIONS. Relatives' everyday life was still affected 6 months after the event with increased responsibilities at home and a constant concern for the person stricken by a cardiac arrest. The study illustrates that health care personnel need to offer relatives follow-up appointments to clarify issues concerning support and information.

GRANT ACKNOWLEDGMENT. We would like to thank the participants for sharing their experiences.

0277

UTILIZATION OF A NURSING "JOURNAL CLUB" TO DISSEMINATE EVIDENCE-BASED PRACTICE

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INTRODUCTION. Nursing practice based on evidence improves patient outcomes. Research is needed to develop a scientific basis for critical care nursing practice. Understanding of research is needed for application of evidence-based practice. Education is fundamental to professional growth and to excellence in clinical practice and achieving optimal patient outcomes.

OBJECTIVES. To create a venue for nurses to disseminate information related to current topics in clinical practice.

METHODS. The monthly Journal Club was initiated in 2002, nearly a decade ago, to engage acute and critical care nurses from local and regional hospitals in discussion of current, relevant, recently published research findings. Monthly topics were selected based on clinical relevance, educational needs assessment, and requests by members. Schedule of topics were modified by emerging innovative approaches to patient care issues, including workplace environment issues, new treatment strategies, and other "hot topics". The gatherings were scheduled consistently on the same day of each month for member planning and convenience. Introduction and analysis of the journal article provided by a leader with emphasis on clinical significance and potential for adaptation into real clinical practice *based on facility characteristics and unit culture*. Discussions encouraged by Chapter members with expertise on topic or by invited interdisciplinary team member. Best practice models and/or outdated practices still utilized were shared and illustrated by anecdotal personal clinical examples, engaging interesting discussions.

RESULTS. The AACN Chapter "Journal Club" attendance has expanded over the past 9 years: Attendance increased from 4–6 members each month to 50–90 monthly attendees. Several members travel over 100 km to attend every month to attend. Community subgroups of interest have been formed to further review hot topics prompted by an initial Journal Club discussion. Many hospitals are willing to "share" their order sets, policies, guidelines, and other tools they have created with other institutions to facilitate implementation and avoid "reinventing the wheel" and enhance collaboration.

CONCLUSIONS. Regional Journal Club in Southern California has become a huge success and has been modeled in other areas in the United States. An award will be received at the annual US Critical Care Congress. There are numerous anecdotal accounts of the positive influence on professional practice and confidence in the workplace.

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0278

ADAPTATION OF EVIDENCE BASED SURGICAL WOUND CARE ALGORITHM

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INTRODUCTION. Development of evidence based surgical wound care algorithm using ADAPTE process.

OBJECTIVES. The purpose of this study was to adapt the surgical wound care algorithm and to provide evidenced-based surgical wound care in critical care unit.

METHODS. In this research, 'ADAPTE Process', an international clinical practice guideline development method was used. 'Bonnie sue wound care algorithm' of USA was taken as a draft of the new algorithm after getting a permission. A content validity index (CVI) test for 135 critical care nurses was conducted. 5-Likert scale was applied to CVI test and statistical criteria is .75. The data were analyzed using descriptive statistics with SPSS WIN 12.0 program.

RESULTS. Surgical wound care algorithm was consisted of 9 contents.
These are wound assessment, necrotic tissue debridement, wound classification by exudates and depth, local dressing application, systemic factors, follow up expected outcome, reevaluate non healing wound, special treatment modality for non healing wound. All of the content validity test scores about 9 contents were over .75 that brings about the confirmation of final surgical wound care and no additional revision after CVI. Compared to the existing wound care guidelines, new wound care algorithm has more advantages: (1) provides BWAT as wound assessment tool, (2) defines wound depth and exudates in detailed, (3) considers patient's systemic factors, (4) defines wound expected outcomes, reevaluation for delayed wound healing, and suggests treatment options, and (5) provides the level of evidences and strength of recommendations for specific algorithm contents.

CONCLUSIONS. The new surgical wound care algorithm will contribute to the advancement of evidence based nursing care, will provide high quality practice, and is expected to be used for nursing intervention in critical care.

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GRANT ACKNOWLEDGMENT. Doroty, D.D. (prof. Emory univ)

0279

COMMUNICATION DIFFICULTIES AND PSYCHO-EMOTIONAL DISTRESS IN MECHANICALLY VENTILATED INTENSIVE CARE PATIENTS

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INTRODUCTION. Difficulties in communication in mechanically ventilated intensive care patients are a source of stressful experiences and psycho-emotional distress.

OBJECTIVES. This paper is a report of a study designed to examine the association between communication characteristics and psycho-emotional distress among mechanically ventilated patients in a medical intensive care unit and to identify factors that may predict psychological outcomes.

METHODS. A total of 65 critically ill patients, extubated within the last 72 h, were included in this cross-sectional study. Data were collected by a structured interview. Three psycho-emotional outcomes (psychological distress, fear, and anger) were regressed separately for baseline variables, communication characteristics and stressful experiences.

RESULTS. Patients' psychological distress was predicted positively by difficulty in communication, and negatively with the length of anesthesia. The feeling of fear and anger were also positively related to difficulty in communication. In addition, the number of communication methods was negatively associated with feelings of fear and anger. Finally, the stressful experiences associated with the endotracheal tube (ETT) were positively related to feelings of anger.

CONCLUSIONS. Mechanically ventilated patients experience a moderate to extreme level of psycho-emotional distress due to being unable to speak and to communicate their needs. Nurses should be aware of their ventilated patients' need to communicate. Therefore, we suggest planning a program to reduce patients' distress by decreasing stressful experiences associated with the ETT and by implementing more appropriate communication methods.

0280

AFTER INTENSIVE CARE: THEN WHAT? PATIENT AND PARTNER PERSPECTIVES

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INTRODUCTION. In Denmark 15–25,000 patients are admitted to ICU annually. The number is increasing, and survival improving. Literature tells us that critical illness and admission to ICU radically affects both patients and their relatives during hospitalization and after discharge. Still, the long-term course after ICU-discharge for patients and their partners has not been adequately addressed to inform health care professionals in their efforts to prepare ICU-survivors and their families for the time following critical illness.

OBJECTIVES. 1) To describe the trajectories of ICU-patients and their partners during their first year after ICU-discharge 2) To identify patients' and partners' use of health care and social services and affiliation to the work force during the first year post discharge.

METHODS. The present study was a part of an observational, longitudinal study. Data were generated from semi-structured dyad interviews with patients and partners at 3 and 12 months following ICU-discharge, group interviews, and public registers. Participants were 18 post ICU-patients intubated >96 h aged 25–70 years and their partners. We excluded patients with appreciable chronic conditions prior to admission as this radically affects overall post-ICU quality of life.

RESULTS.
Patients: After hospitalization half of the patients were discharged to their home. The other half were transferred to specialized rehabilitation facilities for physical or neuropsychological training (median 51 days; IQR 22–94) before returning to their home. The majority of patients attended municipal rehabilitation programs for further training (median 10 weeks; IQR 8–24). Of 11 patients working 4 had returned to previous employment rate after 12 months. The number of patients' visits to outpatient clinics and admissions to hospital 12 months following ICU will be reported in Berlin.
Partners: During the ICU-stay the mean fulltime sick leave for non-retired partners was 11 days and 9 days part time. In the twelve months following ICU their mean fulltime sick leave was 17 days and 21 days part time.

CONCLUSIONS. For this small group of ICU-survivors, who were generally well before ICU-admission, their critical illness had a dramatic impact in terms of hospitalization and subsequent need for physical and/or neuropsychological training in the first 12 months following intensive care.
The partners too were on sick leave for weeks or even months. This bears evidence of the effects of critical illness not only on the patient, but also on the family and, consequently, on society.

GRANT ACKNOWLEDGMENT. The study is supported by grants from The Danish Nurses' Organisation, The Aase and Ejnar Danielsen Foundation, The Novo Nordisk Foundation, The Lundbeck Foundation, The Health Insurance Foundation, and The Central Jutland Region.

0281

EMERGENCY RESTERNOTOMY: ALGORITHM OF ACTUATION AND CHECK LIST

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INTRODUCTION. Emergency resternotomy (ER) is a multi-practitioner procedure, which should ideally be rapidly performed after cardiac surgery in the Intensive Cares Unit (ICU), due to tamponade and major bleeding. ER may be required in 0.8–2.7% of all patients undergoing cardiac surgery. As resternotomy is not an often procedure, it might be an integral part of successful resuscitation after cardiac surgery. Because of the absence of an actuation protocol and larger sets that could confuse staff unaccustomed to assisting in theatres, we decided to present an update protocol to improve our actuation in ER.

OBJECTIVES. To develop an operating procedure based on a multidisciplinary decision algorithm to supply a rapid and effective response to ER**.** And make a check list to evaluate the procedure.

METHODS. Literature review. Advice from nursing surgical personnel, cardiothoracic surgeon and intensive clinician personnel. Multidisciplinary meetings.

RESULTS. This protocol has been successfully created and has had a great acceptation among the ICU team. To evaluate the effectiveness of this protocol we have set a check list which allow the quality and health cares be checked.

CONCLUSIONS. Using the ER protocol and the update knowledge of the guidelines provide a structured actuation. The check list will improve the material management and the global actuation.

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0283

FETAL CARDIAC ARREST DUE TO ASPHYXIA IN LATE PRETERM LAMBS: PROPOFOL MEDIATES NEUROPROTECTION FOR THE FETUS WHEN ADMINISTERED DURING EMERGENCY CAESAREAN SECTION AND AFTER RESUSCITATION

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INTRODUCTION. Preterm and term-born infants suffering from severe perinatal asphyxia resulting in cardiac arrest are at high risk to develop brain injury and life-long disability. Until now, there is no therapy available to reduce severe cerebral injury in preterm infants.

OBJECTIVES. We hypothesized that propofol administration to the maternal-fetal-unit can diminish brain injury in preterm fetuses in states of progressive severe asphyxia.

METHODS. 44 late preterm lambs underwent standardized total umbilical cord occlusion (UCO) or sham-treatment in utero. UCO resulted in global asphyxia and cardiac arrest. After emergency Caesarean section under either propofol or isoflurane maternal anaesthesia the fetuses were resuscitated and anaesthetized the same way as their mothers. EEG measurements were performed in utero, during UCO and postnatally during 8 h of ventilation. Occurrence of apoptosis, reactive oxygen species (ROS) formation, and protein levels of GABA- and NMDA receptors were determined in fetal cerebral frontal cortex.

RESULTS. Lambs receiving isoflurane anaesthesia showed a profound increase of total spectral power in burst epochs (estimate for seizure activity) and marked increase of interburst intervals during UCO (more suppression), whilst lambs receiving propofol anaesthesia showed less EEG changes. Propofol treatment reduced cerebral ROS formation and protein levels of activated caspase-3, GABA- and NMDA-R after severe asphyxia.

CONCLUSIONS. Perinatal neuroprotection in the ovine maternal-fetal-unit can be achieved by pre- and postconditioning with propofol. The underlying mechanism is probably an avoidance of lipid peroxidation by ROS scavenging and the reduction of glutamate induced cytotoxicity by downregulation of NMDA receptors.

Pediatrics 1: 0282–0294

0282

PRIMARY CARDIAC TUMORS IN CHILDREN: DIAGNOSIS AND PROGNOSIS

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INTRODUCTION. Cardiac tumors (CT) are a rare pathology in children. Its prevalence is estimated between 0.0017 and 0.28 in autopsy series. Most primary CT in children are benign. Rhabdomyoma is the most common, followed by teratoma, fibroma and hemangioma. The initial diagnosis should be established by noninvasive testing (echocardiography, CT or MRI), and may be confirmed by biopsy. TC surgical resection should be considered in the presence of symptoms refractory to medical treatment.

METHODS. We analyzed cases of primary TC diagnosed by our department from January 1990 to February 2011, using noninvasive techniques, ultrasound, in all of them, MRI in four, and TAC in one. Macroscopic characteristics were reviewed per image, as well as clinical and epidemiological parameters, at the moment of diagnosis and after follow-up.

RESULTS. We diagnosed 32 cases of CT: 22 (68.7%) were rhabdomyomas, 5 (15.6%) fibromas, 2 (6.2%) teratomas, 1 (3.1%) myxoma and in 2 (6.2%) cases the diagnosis could not be established. Diagnosis of rhabdomyoma was established when the patient had other criteria of tuberous sclerosis, tumors were multiple, located in the septum or decreased in size during follow up. Fibroma was considered when it was unique, non-cystic and located in the apex of the LV or RV. Teratoma when cystic images inside (popcorn). Myxoma if it was pedicled and located in the left atrium. Undiagnosed cases were lost in the follow up. In 16 patients (50%) the diagnosis was established during the prenatal period. The main reason that led to the diagnosis was the screening of tuberous sclerosis (TS), occurring in 21 cases (65.6%), presence of symptoms in 6 cases (18.7%) and 5 cases (15.6%) had a casual finding. 3 patients required surgical resection: 1 teratoma, 1 fibroma, 1 myxoma. 16 patients had only one CT, while 5 had three or more. The most common location was the interventricular septum (52.2%), followed by the left ventricle and right ventricle. Secondary valve involvement was observed in 5 cases. Most patients were asymptomatic (78.1%). 5 patients (15.6%) presented documented tachyarrhythmias (2 supra and 3 ventricular). One patient suffered from heart failure and one developed pericardial effusion. 11 patients (34.3%) required medical treatment, 8 with antiepileptic drugs, 2 betablockers and 1 amiodarone. Follow-up was completed with a median of 63 months in 95.6% of patients. There was a total remission in 6 patients (18.7%), and partial in 9 (28.1%). There was only one death, secondary to extensive myocardial involvement (fibroma), while the other remained asymptomatic.

CONCLUSIONS. Primary CT are very infrequent in paediatrics. Rhabdomyomas are the most prevalent, accompanied by tuberous sclerosis, may be multiple and evolve with spontaneous remission. Rarely require specific cardiac treatment.

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0284

INITIAL EXPERIENCE WITH THE DEVICE AMPLATZER DUCTAL OCCLUDER II IN PEDIATRICS

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INTRODUCTION. Among the devices for percutaneous closure of patent ductus arteriosus (PDA), the most commonly used for easy handling and safety is the Amplatzer Ductal Occluder. It is a self-expanding, nitinol mesh occlusion device.

New device Amplatzer Ductal Occluder II improves treatment options for infants and young children, because it can be used with very small diameter catheters.

METHODS. We analyzed 10 consecutive patients who underwent percutaneous closure of PDA with the Amplatzer Ductal Occluder II (ADO II) during 2009–2010 period. The classical ADO device is situated at the PDA with a retention skirt on the aortic side that provides secure positioning in the ductal ampulla. The new ADO II has a central waist that is designed to fill the ductus. Two retention discs are deployed in the pulmonary and aortic ends of the ductus.

All the procedures were performed by femoral approach (venous), with a pigtail catheter in aorta (femoral artery approach) to measure the PDA previously and test the results before removing the device catheter.

RESULTS. The mean age was 3.6 (range 1.5–8.3) years old. There were 3 male and 7 female. The sizes of devices used were: 3–4 mm in 4 patients (40%), 4–6 mm in 2 patients (20%), 6–6 mm in 2 patients (20%), 5–6 mm in 1 patient (10%), 3–6 mm in 1 patient (10%). The choice of device size is made according to the diameter and length of the PDA (first and second number). There was no mortality or complications in our series. The mean time of follow up was 14 months. The diagnosis tests performed in this follow up were echocardiography and chest radiography. All devices were properly situated with no residual leaks and there were neither stenosis of pulmonary branches nor aortic coarctation.

CONCLUSIONS. ADO II is a safe and effective device in percutaneous ductal closure. In younger infants it opens new expectations to avoid the surgical treatment.

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0285

BIS INDEX MONITORING AND ASSESSMENT OF THE GLASGOW COMA SCALE IN CHILDREN WITH SEVERE TRAUMATIC BRAIN INJURY

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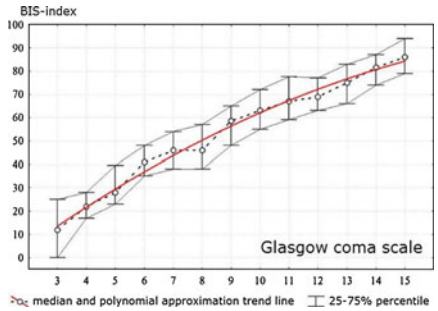
INTRODUCTION. Experience of using BIS index greater regard to the monitoring of patients awakening after general anesthesia or during controlled sedation than patients in a coma in the intensive care unit.

OBJECTIVES. The aim of our study was to compare the assessment of the level of consciousness on the Glasgow coma scale with the results of BIS-monitoring in children with severe traumatic brain injury.

METHODS. 20 children aged 1–15 years were included in the study. All of them had severe traumatic brain injury, mostly combined with multiple injuries. The levels of the Glasgow coma scale for infants and children have been compared with the results of the parallel continuous BIS-monitoring. The study was carried out 4–5 times per day within the 7 days after admitting to the ICU (total 881 studies). The BIS-index monitor A-2000 XP and BIS-module for Dräger Infinity Delta were used (Aspect Medical Systems, USA).

RESULTS. On admission, all patients had CNS depression with the loss of awareness and response to external stimuli due to cerebral edema or brain dislocation which have been verified by CT scan. Artificial or assisted ventilation was conducted in all children. We observed that the improvement of the patient accompanied by an increase of BIS-index. The first signs awareness were recorded by BIS index equal to 50–55 and productive contacts was observed in patients with the BIS-index, equal to 70–75. 5 patients died. All dead patients had the BIS index was equal to 0 even for 8–16 h before death. Correlation analysis revealed a high correlation between the indicators of BIS-index and the evaluation of Glasgow coma scale in children with severe traumatic brain injury. Spearman's rank correlation coefficient between the scoring of Glasgow coma scale and the BIS-index value reached $R = 0.85$, $p < 0.001$.



BIS-index level and the assessment on the GCS

CONCLUSIONS. Dynamics of change of the BIS-index in children after severe traumatic brain injury showed a high correlation with the data of neurological status (GCS levels). The BIS-monitoring can be used in intensive care for children with severe traumatic brain injury.

0286

SEVERITY OF ILLNESS AND INTERVENTION SCORING SYSTEMS IN CRITICALLY ILL CHILDREN WITH RESPIRATORY FAILURE: A RETROSPECTIVE STUDY

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INTRODUCTION/OBJECTIVES. The outcome of patients presented with respiratory failure (RF) admitted to Pediatric Intensive Care Units (PICUs) depends on the underlying disease. The aim of this study was to examine the usefulness of various severity of illness or intervention scoring systems in patients with RF.

METHODS. We retrospectively reviewed the records of the 177 pediatric patients with RF admitted in our PICU over the last four years, collecting data on demographics, admission diagnosis, clinical characteristics, severity of illness or intervention scoring systems, and outcome endpoints.

RESULTS. All patients were admitted with respiratory failure. The causes of RF differed between patients with or without co-morbidity, mechanical ventilation (MV), inotropes or antibiotics ($p < 0.001$), but not paralytic or sedative agents. ARDS (11.9%), acute on chronic (9.6%), and bronchiolitis (5.6%) were the leading causes of RF among patients with MV. Bronchiolitis (20.3%), pneumonia/empyema (11.3%), and acute on chronic (7.3%) were the leading causes of RF among patients without MV. The PeLOAD ($p < 0.0001$), TISS ($p < 0.0001$), and Time Nurse scores ($p < 0.03$), but not the PRISM, were significantly higher in patients who died (4/177, 2.3%), as were the Length of stay (LOS) or mechanical ventilation (LOMV) ($p < 0.0001$). The LOS, LOMV, GCS, severity of illness and intervention scoring systems were significantly influenced by the underline disease, co-morbidity, and the place of origin ($p < 0.05$).

CONCLUSIONS. In PICU patients with RF severity of illness and intervention scores differ by the underline disease or place of origin and are associated with mortality and co-morbidity. Support with mechanical ventilation, inotropes or antibiotics differ among the various causes of RF.

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0287

NORMALIZING CARDIAC OUTPUT AND BLOOD VOLUMES IN NEONATAL AND PEDIATRIC PATIENTS

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INTRODUCTION. Normalization of a hemodynamic parameter should allow interpreting the parameter and its changes independent of patient body size. Currently, hemodynamic parameters are either normalized on body surface area (BSA) or body weight (BW). Considering an adolescent as a reference, cardiac index normalized by BW vs. BSA could differ up to 4 times in the case of patients with body weight of about 3 kg. The question thus remains as to what normalization approach has the most clinical relevance. Criteria for evaluation: parameter that shows least correlation with the parameter over which it is being normalized should be considered the best normalization.

OBJECTIVES. Purpose of this study was to investigate the effect of normalizing by body surface area (BSA) and by body weight (BW) on cardiac output (CO) and two blood volume parameters measured by COstatus (Transonic Systems Inc, Ithaca, NY, USA) in neonatal and pediatric patients.

METHODS. Transonic COstatus archive comprising of 751 measurements from 96 neonatal and pediatric ICU patients was used. COstatus measured [1] CO, TEDV (total end diastolic volume: volume in the heart chambers at the end of diastole) and CBV (central blood volume: volume in the heart, lungs and major vessels) were normalized by BSA and BW for different weight ranges.

RESULTS. Table below summarizes the correlation between the parameter vs body weight.

Correlation: hemodynamic parameter vs body weight

Body weight	N	CI-BW	CI-BSA	CBVI-BW	CBVI-BSA	TEDVI-BW	TEDVI-BSA
Wt (0.9–12 kg)	401	0.053	0.21	0.06	0.21	0.004	0.16
Wt (12–40 kg)	222	0.178	0.09	0.008	0.05	0.004	0.009
Wt (41–102 kg)	128	0.051	0.0005	0.28	0.11	0.3	0.11

CONCLUSIONS. – This study showed that normalization of cardiac output and blood volumes by body weight is more suitable in neonates and children, in the range of 0.9–12 kg. – This study showed that normalization by BSA could lead to misinterpretation of the data and in turn may lead to wrong diagnosis, especially in newborns and low weight pediatric patients.

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GRANT ACKNOWLEDGMENT. NIH SBIR R44HL061994.

0288

CLINICAL AND LABORATORY FINDINGS AS PROGNOSTIC FACTORS OF MENINGOCOCCEMIA IN ALBANIA

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OBJECTIVES. To underline the importance of clinical and laboratory features as prognostic factors for meningococcemia.

METHODS. This is a retrospective study performed on patients with definite diagnosis of meningococcal infection admitted at Pediatric Intensive Care Unit, UHC "Mother Thereza" of Tirana between 2006 and 2010. For all patients we observed the clinical and laboratory findings and their correlation with the outcome of these patients.

RESULTS. During the study period 25 cases presented at our PICU with meningococcemia. Mean age of presentation was 3.3 years old, with a predominance of males (64% of cases) in a ratio M/F = 1.8/1. 64% of cases were associated with meningitis. Only 8% of patients with meningitis had fatal prognosis. 52% of cases presented with shock and severe acidosis, in 44% of cases it was necessary to use inotropic agents and in 40% of cases even hydrocortisone. All cases with refractory shock to inotropic agents had fatal end. The appearance of elements <12 h has been found in 72% cases, 55% of whom with fatal prognosis. All cases with thrombocytopenia <40000/mm^3 (5 cases) have died within 24 h. From 60% of cases that have been presented with leukopenia—66% had fatal end. The overall mortality rate was very high (40%). According to prognostic score of meningococcemia GMSPS: patients with 0–8 points (64% of cases) has had mortality rate 6,2%; patients with >8 points (36% of cases) has had 100% mortality rate.

CONCLUSIONS. Mortality rate is still very high and raises the need for meningococcal vaccination in our country. Clinical and laboratory findings are significant prognostic indicator, that's why it is important to evaluate carefully these data to determine the patient at high risk.

0289

CRRT FOR CRITICALLY ILL INFANTS AND CHILDREN

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INTRODUCTION. Continuous renal replacement therapy (CRRT) is an important treatment in children with critically illness including multi-organ failure (MOF) associated with acute kidney injury (AKI), drug intoxication and inborn error of metabolism. Over the last 20–30 years CRRT has been refined and through the last decade the preferred method of renal replacement therapy. Studies have demonstrated that CRRT is effective to all pediatric patients. However well defined indications, timing of initiation and cessation of treatment is still lacking. We evaluated the use of pediatric CRRT in a Danish PICU.

OBJECTIVES. To evaluate a cohort of critically ill children treated with CRRT. To determine the underlying diagnosis and compare children below and above 10 kg regarding mortality and renal recovery. Our hypothesis was that the mortality in infants was comparable to the mortality in children >10 kg.

METHODS. A prospective cohort study of all pediatric patients treated with CRRT over a period of 12 years. Data has been continuously registered since the debut of CRRT in PICU, and from the records we obtained gender, age, PICU admission weight, diagnosis, indication for CRRT, need for vasoactive drugs, days using CRRT, days in PICU, outcome (discharge from PICU ± renal recovery).

RESULTS. 36 critically ill children with a total of 41 CRRT cycles were registered. Age ranged from 1 day to 14 years (mean age 6 years 8 months) and weight from 3.1 to 60 kg. Sixteen children were in the group below 10 kg. The overall mortality was 39% (14 children), 6 patients below 10 kg. The main diagnosis were sepsis with MOF (11 patients), haemolytic uremic syndrome (6 patients), malignant disease (6 patients) and polycystic kidney disease (3 patients). In the group below 10 kg non-survivors were treated longer with CRRT (6.2 vs 4.8 days), while it was opposite in the group above 10 kg (5.5 vs 7.3 days). The predominant indication for CRRT was anuria/uraemia/fluid overload (80%, 29 patients). In the group below 10 kg all the survivors but one recovered their renal function. In the group above 10 kg twelve patients survived, but only 50% recovered normal renal function.

CONCLUSIONS. We experienced the same mortality rate in the two groups, 38% in the group below 10 kg and 40% in the group above 10 kg. In the group of patients above 10 kg 50% were discharged from PICU with renal recovery while 90% obtained renal recovery in patients <10 kg.

0290

CLINICAL CHARACTERISTICS SEVERITY OF ILLNESS AND OUTCOME END-POINTS OF PICU CHILDREN WITH CARDIAC DISEASE: A RETROSPECTIVE STUDY

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INTRODUCTION/OBJECTIVES. The outcome of patients presented with cardiac failure admitted to Pediatric Intensive Care Units (PICUs) depends on the underlying disease. The aim of this study was to examine clinical characteristics, severity of illness, and outcome endpoints of PICU children with cardiac disease (CD).

METHODS. We retrospectively reviewed the records of the 27 pediatric patients with CD admitted in our PICU over the last 4 years, collecting data on demographics, admission diagnosis, clinical characteristics, severity of illness or intervention scoring systems, and outcome endpoints.

RESULTS. Cardiac patients admitted to a multidisciplinary PICU had low mortality (4%). Age ($p < 0.02$) and GCS ($p < 0.05$) differed among disease sub cohorts, but none of the severity of illness or intervention scores. Also, mortality ($p < 0.02$) and antibiotic use ($p < 0.04$) but not PiCCO, mechanical ventilatory or inotropic support differed among disease groups. Supraventricular tachycardia (20%), myocarditis (20%), and congenital cardiac disease (12%) were the leading causes of CD among patients without MV. Cardiac arrest (20.3%), congenital cardiac disease (11.3%), myocardiopathy (4%), and supraventricular tachycardia (4%) were the leading causes of CD among patients with MV. The PRISM, PeLOAD, TISS, and Time Nurse scores ($p < 0.005$) were significantly higher and the GCS lower ($p<0.0001$) in patients who needed intubation before transportation (4/27, 14%), as were the Length of stay (LOS) or mechanical ventilation (LOMV) ($p < 0.01$).

CONCLUSIONS. In patients with CD severity of illness, intervention scores, LOS, and LOMV are higher among those who need intubation before transportation to PICU. Mortality, age and support differ among various causes of CD.

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0291

BEUREN-WILLIAMS SYNDROME: CARDIOVASCULAR COMPLICATIONS

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INTRODUCTION. Beuren-Williams syndrome is a complex syndrome caused by the deletion of genetic material from the region q11.23 of chromosome 7. It is characterized by developmental abnormalities, craniofacial dysmorphic features, and cardiac anomalies such as narrowing of major blood vessels as well as supraaortic and suprapulmonary stenosis, pulmonary branches stenosis, aortic coarctation and middle aortic syndrome. Cardiovascular complications are the major cause of death in those patients. A formal assessment of the life expectancy associated with Beuren-Williams syndrome is lacking.

METHODS. We studied 19 patients with confirmed genetic diagnosis with fluorescence in situ hybridization (FISH). We analyzed the clinical characteristics, specially cardiac anomalies and the therapies used if needed. Echocardiography was the first test we performed and in 6 patients a computed tomographic angiography was performed too.

RESULTS. We studied 19 patients, 12 male (63%) and 7 female. The mean age was 7 ± 4 years old (from 3 months to 19 years old), and the mean age at diagnosis was 3 months. 17 patients (89%) had cardiac anomalies: supravalvular aortic stenosis in 12 patients (63.1%), suprapulmonary in 15 patients (78.9%), aortic coarctation in 6 patients (31.5%), arterial hypertension in 3 patients (15.7%), middle aortic syndrome in 3 patients (15.7%), renal artery stenosis in 2 patients (10.5%). 6 patients needed surgery (31.5%): 3 pulmonary branches angioplasty, 1 aortic coarctation angioplasty, 3 surgical aortoplasty.
Others anomalies: global cognitive impairment in 8 patients (42%), musculoskeletal disorders 8 patients (42%), endocrines in 6 patients (31.5%) (hypothyroidism, hypercalcemia), ophthalmologicals in 4 patients (21%), gastrointestinals in 4 patients (21%), auditorys disorders in 1 patient (0.05%).
There was no mortality in our series but morbidity is elevated.

CONCLUSIONS. Beuren-Williams syndrome has different implications in systems, but cardiac complications may endanger the life of these patients. An early diagnosis can make us identify cardiovascular disorders in these patients to perform a effective treatment.

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0292

TRICYCLIC ANTIDEPRESSANT OVERDOSE IN A TODDLER TREATED WITH AN INTRAVENOUS LIPID EMULSION

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INTRODUCTION: We report a case involving the first use of an intravenous lipid emulsion as an antidote for a drug overdose in the pediatric setting.

A 20-month-old girl presented to the Emergency Department of a District General Hospital one hour after ingesting 45 mg/kg of the tricyclic antidepressant Dosulepin. She subsequently developed a tonic-clonic seizure that proved refractory to benzodiazepines.

Thiopentone (5 mg/kg) was administered and resulted in seizure termination.

Her QRS complexes progressively broadened despite the administration of a Sodium Bicarbonate infusion as per national guidelines.[1] She developed a ventricular tachycardia (VT) with a rate of 180/min. An intravenous lipid emulsion (ILE) was administered in view of recent case reports of its successful use in adults for TCA toxicity.[2]

Within minutes of administration of the ILE her QRS complexes narrowed.

Her heart rate continued to rise and when in excess of 200/min her blood pressure fell to 60/30 mmHg. A synchronised DC shock of 50 Joules was delivered with immediate restoration of a narrow-complex sinus tachycardia (150/min) and this was associated with a return of her baseline blood pressure. She was extubated the following day after an overnight stay in intensive care. She remains well.

There are published reports of ILE use in a pediatric population as an antidote to local anaesthetic toxicity.[3,4] There are no published reports (or registered cases on the Lipid Registry) of ILE use in pediatrics as a potential therapy for drugs in overdose outside of the remit of local anaesthetic toxicity.

CONCLUSIONS. In a pediatric setting, this is the first reported use of ILE as an antidote to drugs in overdose other than that of local anaesthetic toxicity.

This patient recovered fully and with no obvious sequelae to date.

This case adds weight to the growing body of evidence of the effectiveness of intravenous lipid emulsion as an antidote for cardiotoxic, lipophilic drugs in overdose and its favourable safety profile in pediatrics.

Recently updated guidelines published on TOXBASE now advocate the use of ILE 20% in severe pediatric cardiotoxicity following tricyclic antidepressant poisoning.

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0293

EPIDEMIOLOGICAL OVERVIEW ON PATTERN OF CONGENITAL ANOMALIES OF GASTRO-INTESTINAL TRACT OVER THE PERIOD 2006–2010 IN ALBANIA

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INTRODUCTION. Most congenital GI anomalies result in some type of intestinal obstruction, frequently manifesting with feeding difficulties, distention, and emesis at birth or within 1 or 2 days and are associated with a high mortality rate.
OBJECTIVES. To estimate the incidence, prevalence and highlight the epidemiological features of congenital anomalies of gastro-intestinal tract of newborns in Albania.
METHODS. Retrospective collection of data from the records in PCIU and Pediatrics Surgery Department.
RESULTS. The incidence of main congenial anomalies over the period 2006–2010 presented a downward trend from 8.5 per 10,000 live births in 2006 to 8.0/10,000 in 2010 yielding a prevalence of 0.8 per 1000 live births. Secondary anomalies counted for 60.3% of the main anomalies over the same time period. The frequency occurrence of main anomalies was highest on first day of birth in 89 (67.9%) cases with second day rating behind in 20 (15.3%) cases, $p < 0.01$. In regard with gender, males showed a slightly higher occurrence versus females with 72 (55%) cases and 59 (45%) cases respectively without significant difference between them, $p = 0.4$. The antenatal diagnosis was carried out only in 11 (8.4%) women. Most of cases 92 (70.2%) were delivered in term followed by 37 (28.2%) cases delivered preterm cases and 2 (1.5%) cases post term, $p< 0.01$. In 84 (91.3%) of in term deliveries the weight of fetus was >2500 g. In 32 (86.5) cases delivered preterm the weight of fetus was <2500 g. 81 (61.8%) cases survived while 50 (32.8%) cases had a fatal outcome, $p < 0.01$. The most frequent cause of death were esophageal and intestinal atresia with 17 (34%) and 10 (20%) cases respectively. Preterm delivered fetus is more likely to decease than in term fetus: OR = 2.5 (95%CI 1.3–5.1), $p< 0.01$. Only 5 (3.4%) anomalies were associated by a genetic syndrome.
CONCLUSIONS. Normal 0 false false false/* Style Definitions */table.MsoNormalTable {mso-style-name: "Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-parent: mso-padding-alt: 0 cm 5.4 pt 0 cm 5.4 pt; mso-para-margin: 0 cm; mso-para-margin-bottom: .0001 pt; mso-pagination:widow-orphan; font-size: 10.0 pt; font-family: "Times New Roman"; mso-ansi-language:#0400; mso-fareast-language:#0400; mso-bidi-language:#0400;} Males and females are equally affected from congenital anomalies. A low rate of antenatal diagnosis is noted. Low birth weight and preterm delivery are risk factor for the fetus to diseases.

0294

FLEXIBLE BRONCHOSCOPY APPLICATION IN DIAGNOSIS AND TREATMENT OF CHILDREN WITH RESPIRATORY PROBLEMS

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INTRODUCTION. Rapid technological advances in bronchoscopy have resulted in differences considering the indications of flexible and rigid bronchoscopes. The latter is used in paediatric practice for more than 30 years.
OBJECTIVES. The assessment of value of flexible bronchoscopy in diagnosis and treatment of respiratory problems in childhood.
METHODS. Retrograde study of 10 patients (aged 1 to 17 years old) in 2 years time period (1/1/2008-1/1/2010) with wheezing and/or chronic wet cough, lung atelectasis in chest x ray and history of recurrent pneumonia. All patients underwent laboratory investigation comprising full blood count, coagulation and gross biochemical control and chest x ray. Anaesthesia was provided by Midazolam and Fentanyl or propofol and continuous cardiorespiratory monitoring existed during bronchoscopy.
RESULTS. The analysis of results indicated 1 case of foreign body aspiration and 4 cases of distal airway obstruction due to secretions. In 1 child preexisting pathology with stenosis of right bronchus due to excised leiomyoma leading to recurrent pneumonias reevaluated and in 1 case, patient was investigated for possible right intermediate lobe syndrome. In the rest 3 cases no pathology was found. Biopsy was received when needed.
CONCLUSIONS. Flexible bronchoscopy play significant role in diagnosis and treatment of children with respiratory problems even in very young ages underlining the safety as the advantage of the method in conditions of proper monitoring.

Poster Corner Sessions
Prevention & treatment of ICU infections: 0295–0307

0295

FLUID LEAKAGE PAST TRACHEAL TUBE CUFF: EFFECT OF SUCTIONING MANOEUVRE. A CLINICAL STUDY

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INTRODUCTION. The leakage of oropharyngeal secretions around high—volume low—pressure tracheal tube cuffs is usually considered as a major risk factor for bacterial tracheal colonization. Positive end-expiratory pressure (PEEP) improves the sealing around the cuff towards fluid leakage. However, in vitro, tracheal suctioning, by decreasing tracheal pressure, enhances fluid leakage. This clinical pilot study aimed to evaluate the effect of a suctioning manoeuvre on fluid leakage, during conventional mechanical ventilation.
METHODS. Patients were eligible for the study if they were intubated with a Hi-Lo Evac (Covidien) tube with polyvinyl chloride cuff for less than 48 h, under mechanical ventilation with a PEEP higher or equal to 5 cm H_2O, and under continuous sedation. They were studied in the semi-recumbent position. At baseline, the cuff pressure was set at 30 cm H_2O. Then 0.5 ml blue dye (Guerbet) diluted in 3 ml saline was instilled into the subglottic space just above the cuff. Tracheal suctioning was performed without disconnection of the ventilator, using a 16 French suction catheter (Vygon) with a suction pressure of 400 mbar. A fiberoptic bronchoscopy was performed before and after the suctioning manoeuvre, looking for the presence of blue dye in the folds within the cuff wall or in the trachea. Fluid leakage past the cuff was deemed to have occurred if blue dye was visualized in the trachea caudal to the tube's tip.
RESULTS. 25 patients were included in the study, intubated for 20.5 ± 12 h. The size of the tracheal tube was 7 mm inner diameter for 5 patients, 7.5 mm for 16 patients and 8 mm for the 4 other. They were ventilated in volume-controlled mode with the following settings: tidal volume 455 ± 95 ml, respiratory rate 20.6 ± 5.7, PEEP level of 5.7 ± 2 cm H_2O. Blue dye was never seen in the trachea before suctioning and only in one patient after the suctioning manoeuvre. Blue dye was observed in the folds within the cuff wall in 6/25 patients before suctioning and 11/25 after (NS).
CONCLUSION. In patients intubated with a polyvinyl chloride high—volume low—pressure cuff and under mechanical ventilation with PEEP at or above 5 cm H2O, the leakage of subglottic secretions in the trachea occurs rarely after tracheal suctioning manoeuvre.
GRANT ACKNOWLEDGEMENT: Association Lyonnaise de Logistique Posthospitalière.

0296

COMPARISON OF TWO AUTOMATED ENDOTRACHEAL CUFF PRESSURE REGULATORS DEVICES IN INTUBATED CRITICALLY ILL PATIENTS: MECHANICAL AND ELECTRONIC

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INTRODUCTION. The endotracheal tube cuff has two main functions: ensuring airtightness and protecting the lower airway from the aspiration of contaminated oropharyngeal secretions. The endotracheal cuff pressure (Pcuff) must be maintained within a narrow therapeutic range: between 20 and 30 cmH_2O. Indeed underinflation, <20 cmH_2O, promotes aspiration of oropharyngeal secretions and so ventilator-associated pneumonia (1), and overinflation, >30 cmH_2O, causes ischemic damage to trachea. It is recommended to check Pcuff every 8 h. But it is well known that Pcuff is rarely stable and most of the patients present under and overinflation events (2).
OBJECTIVES. The aim of the study was to evaluate the efficiency of two kinds of automated Pcuff regulators: a pneumatic device (Nosten®) and an electronic device (Tracoe®).
METHODS. A prospective cross-over study design was used. For each patient, the Pcuff was continuously monitored and recorded during 3 consecutive periods of 3 h: a control period without a regulator device, a period with Nosten® and a period with Tracoe®. Normal Pcuff was defined as Pcuff between 20–30 cmH_2O, underinflation as Pcuff <20 cmH_2O, and overinflation as Pcuff >30 cmH_2O. Time spent with normal Pcuff, Pcuff >30 cmH_2O, and Pcuff <20 cmH_2O was measured using continuous recording data for each period. Comparisons between the groups were made by Mann–Whitney rank-sum test or Fischer's exact test. Data were described as median and 25%–75% interquartile range or mean ± standard deviation.
RESULTS. We studied 10 patients mechanically ventilated. Time spent within the normal range was significantly different comparing the 3 periods (Nosten® and Tracoe® vs control and Nosten® vs Tracoe®) with an advantage for Nosten®. Control: 97.1% (89.9–99.7), Nosten®: 100%, Tracoe: 99.1% (98.9–99.7) [control vs Nosten® $p< 0.001$, control vs Tracoe® $p = 0.045$, Nosten® vs Tracoe® $p = 0.001$]. Overinflation events were noticed for all patients during the control period. Nosten® reduced overerinflation events [100% vs 2%, $p = 0.001$], neither did Tracoe® [100% vs 90%, $p = 1$]. Underinflation events were noticed for 3% of patients during the control period. With Nosten® none of the patients developed an underinflation [3% vs 0%, $p = 0.2$]. Tracoe® induced underinflation events [3% vs 8%, $p = 0.07$] because of its lack of reactivity and over compensation of any elevated Pcuff.
CONCLUSIONS. Pcuff underinflation and overinflation were often noticed for intubated critically ill patients. Nosten® was efficient to reduce these events. Tracoe® induced more underinflation events.
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0297

THE EFFECT OF MEDICINAL HONEY ON SKIN COLONIZATION AROUND CENTRAL VENOUS CATHETERS

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INTRODUCTION. Catheter related bloodstream infections (CRBSI) are associated with higher mortality in ICU patients. [1] The introduction of "line bundles" led to an impressive reduction of CRBSI. [2] To further reduce the incidence of CRBSI, interventions that affect skin colonization around the insertion site are interesting, since this is the predominant route of infection of central venous catheters (CVC). [3] Topical application of antibiotics can reduce bacterial colonization, but is strongly discouraged due to the risk for development of antibiotic resistance. Honey has antibacterial activity against skin pathogens including antibiotic-resistant strains [4] and is proven to reduce skin colonization in healthy volunteers. [5] So it could be an effective topical agent to reduce skin colonization at the insertion site of CVC.

OBJECTIVES. To investigate whether medical honey (Revamil®) could reduce skin colonization around the insertion site of CVC.

METHODS. Prospective randomized controlled trial in which medicinal honey (Revamil®) was compared to conventional care of the insertion site. Eligible were CVCs in patients >18 years, who were expected to stay more than 48 h on the ICU. Only one CVC per patient was included. Dressing changes and application of the medicinal honey, in the intervention group, and swabs of the insertion site were performed on a daily basis. Primary endpoint was skin colonization at the last sampling point; secondary endpoints were ICU length of stay, ICU and hospital mortality.

RESULTS. Between June 2007 and June 2010, 255 CVC were included, 133 were randomized to honey and 109 to the conventional dressing. Due to missing data, 129 in the honey group and 106 in the control group were evaluated. There were no differences in patient and line characteristics among both groups. No differences were found on skin colonization outcomes, or on the secondary endpoints (Table 1).

Table 1 Results

	Honey	Control	P value
Last culture positive, N (%)*	44 (34)	36 (34)	$p = 1.000^a$
log CFU/swab, median (IQR)	0 (0–1.98)	0 (0–1.55)	$p = 0.592^b$
ICU Length of stay (days), median (IQR)	9 (4–18)	9 (5–16)	
ICU Mortality, N (%) died	31 (24)	25 (23)	
Total hospital mortality, N (%)died	46 (36)	36 (34)	

*the last sampling prior to end of study; [a] Chi square; [b] Mann–Whitney

CONCLUSIONS. Medicinal honey does not significantly reduce skin colonization around the insertion site of CVC. This negative result may be due to technicalities, like the leakage of the honey due to body heat or adsorption of honey in the gauze dressing. Newer application methods have been developed since this study was initiated and might be interesting for further research.

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0298

DE-ESCALATING STRATEGY IN SEVERE SEPSIS AND SEPTIC SHOCK IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The antibiotical de-escalating is a therapeutic strategy to improve the management of infective patients (pts). But most of studies show limited information about it.

OBJECTIVES. The main objective is to describe the impact of the de-escalating strategy (DS) in severe sepsis (SS) and septic shock (SO) pts included in our computerized protocol for the multidisciplinary management of sepsis (CPIMS) from 2006 and 2009 in ICU.

METHODS. Different specialists in Emergency Department, medical and surgical wards and ICU identify pts with a suspect of SS and SO and include them in our CPIMS. These pts receive a multidisciplinary and integral management of sepsis which includes rapid identification and diagnosis, prompt antibiotical therapy and other therapeutics according to their necessity. All patients included are followed by specialists of the Multidisciplinary Sepsis Unit (MSU) considering the possibility of DS if positive microbiology finding is present (PMF). In This study we only consider the DS in ICU pts. Statistical tests used were the Chi-Square, Kruskal–Wallis and Cox regression.

RESULTS. We included 1500 pts with SS and OS from the whole hospital, 650 pts were in ICU. The mean age was 63.5 (17.5) years; 63% were men. The mean APACHE at the time of inclusion was 19.92 (9.98) and SOFA was 6.35 (3.44). 62% pts had SS and 38% SO. The PMF were 71% (87% with appropriate antibiotic therapy and 13% inadequate). 33% of them had positive blood culture. In the PMF group, we performed DS in 31% of pts and the antibiotic remained unchanged (UA) in the 44% of them. We expanded coverage or did a kind of change in 25%. In the group of DS we reduced the spectrum in de 33% of the inpatient, reduced the number of the antibiotic 30% or we reduced both in 37% of them. There were no significant differences between DS and UA group in the following variables: sex, age, APACHE, SOFA, SS, SO or bacteriemia. The main cause of DS compared to UA was communitary and nosocomial pneumonia (0.03 and 0.04, respectively). But there were fewer DS in surgical patients ($p = 0.03$), abdominal focus infections (0.05), peritonitis (0.02) and polymicrobial infections (0.04).We compared pts with DS and UA only in PMF group.

Mortality-length of stay

Variables	DS (%)	WAC (%)	p
Crude mortality (CM)	21	24	0.21
CM in SS pts	16.7	18.9	0.43
CM in SO pts	31.3	34.4	0.55
LOS in ICU	12.2	15.5	0.06
LOS hospital	20.1	29.9	0.04

The DS was not in the multivariate analysis (OR 0.51; CI 95% 0.45–1.21) but with shorter hospital length of stay (LOS) (OR 0.42; 0.37–0.79)

CONCLUSIONS. The DS was a save strategy because it was not associated with mortality, however it was associated with shorter hospital LOS

0299

CAN NURSING STAFF IDENTIFY AIRWAY EQUIPMENT ON THE RESUSCITATION TROLLEY? IMPLICATIONS FOR PATIENT SAFETY AT RESUSCITATION ATTEMPTS

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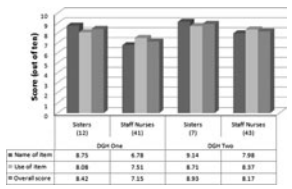
INTRODUCTION. Poorly functioning or missing equipment on cardiac arrest trolleys has previously been highlighted by the National Patient Safety Agency as a contributing factor to deaths relating to resuscitation attempts[1]. Resuscitation trolley equipment should be standardised throughout the institution, audited regularly and ideally checked daily by members of the department in which the trolley is located[2].

Staff who attend arrest calls or check equipment on the ward should be able to identify items on the resuscitation trolley and have a basic understanding of their use in order for checks to be carried out adequately. We report the results of a survey carried out in two district general hospitals, which aimed to assess nursing staff knowledge of airway equipment on the resuscitation trolley.

OBJECTIVES. To ascertain the ability of nursing staff to identify the name and use of airway equipment present on the resuscitation trolley.

METHODS. A face-to face survey was conducted with nursing staff at each hospital, covering medical, surgical and critical care areas. They were asked to identify the name and use of ten airway items present on the resuscitation trolley. A score of one was given for each correct answer thereby giving two sets of scores out of 10.

RESULTS. The graph and table below details average scores of 53 staff members from District General Hospital One and 50 staff members from District General Hospital Two.



Name of item	8.75	6.78	9.14	7.98
Use of item	8.08	7.51	8.71	8.37
Overall score	8.42	7.15	8.93	8.17

Average scores for each district general hospital

Scores out of 10 ranged from 2–10 for staff nurses and 4–10 for sisters.

The two most common items that staff could not identify across the two trusts were a Laryngeal Mask Airway and a Waters Circuit (Mapleson C).

CONCLUSIONS. Knowledge regarding airway equipment was less than expected in both hospitals surveyed with critical care areas achieving the higher scores.

We would expect a maximum score for nursing staff involved in checking and restocking the resuscitation trolleys.

We recommend that staff should receive regular education on airway equipment prior to taking responsibility for this important task, otherwise patient outcome could be seriously compromised.

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0300

THIRD LEVEL HOSPITAL'S GENERAL ICU ACQUIRED INFECTIONS. ENVIN STUDY: NATIONAL SURVEILLANCE STUDY OF NOSOCOMIAL INFECTION

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OBJECTIVES. To know the demographic characteristics, prevalence, risk factors and acquired infection rates in hospitalized patients in an ICU.

METHODS. A descriptive prospective study performed since 2002–2010 (3 months/year). Were included all patients over 18 years admitted consecutively in ICU with stay longer than 24 h. Variables: age, sex, underlying diseases, risk factors, severity index (APACHE II), type of ICU acquired infection, causative organisms and antibiotic therapy. The stay and mortality were calculated, incidence rate: infection rate/100 patients and infection rate/1000 days of ICU stay. The percentage of infections compared to the days of admission, in 2 intervals: ≤4 days stay or >4 days. Were considered ENVIN's study included infections: ventilator-associated pneumonia (NAVM) catheter associated urinary tract infection (CAUTI), primary bacteremia (PB), catheter-associated bacteremia (CAB) and secondary bacteremia(SB).The data were expressed as percentage or media ± DE. Statistical analysis through λ^2 or t-Student.

RESULTS. Of the 1306 evaluated patients, 194 (14.85%) had one or more ICU acquired infection and 123 (9.42%)had at least one nosocomial infection. The age was 59.3 ± 14.86 years. The stay was 25.27 ± 17.29 days. 68.66% were men. APACHE II was 17.99 ± 8.0; the incidence of nosocomial infection was 12.86 infections/100 admitted patients and 16.53 infections/1000 days of stay. 96.27%:urinary catheter carriers, 97.01%:central venous catheter and 87.31%:artificial airway; 27%:previous antibiotic treatment, 11.87%:urgent surgery. NAVM was the most frequent infection, in a 42.86%, followed in 23.81% by CAB, 12.5% were SB to another source infection, 11.90% were PB and 8.93% were CAUTI. A. Baumannii was isolated in 12.3%, coagulase-negative staphylococcus in 10.77%, P. Aeruginosa in 10.21%, S. Aureus methicillin resistant in 7.18%, S. Epidermidis and E. Coli in 6.67% and C. Albicans in 6.67%. Vancomycin:19.8%, piperacillin-tazobactam:16.04%, imipenem:8.77% and amikacina:6.02%. The global mortality rate in patients with infection was 35.07% vs 12.43% in patients without infection($p < 0.001$).When the infections were analyzed by the days of admission interval: all were more frequent from the 4° day of admission: NAVM:18.06% vs 81.94%($p < 0.001$); CAUTI 20% vs 80%($p < 0.005$); BP y CAB 18.33% vs 81.67%($p < 0.001$)y SB 4.76 vs 95.24%($p < 0.001$).All causes mortality:14.68%. The hospital stay of living vs dead was 12.57 in dead and 6.99 in living ($p < 0.01$); APACHE II 15.06 in dead vs 23.35 in living ($p < 0.01$). About the percentage of infected patients relationed to the APACHE II, we observed a progressive increase in the percentage of NAVM, CAUTI, PB and CAB consistent with APACHE II. Except SB that were more frequent in the APACHE II range between 16 and 20.

CONCLUSIONS. The nosocomial infection is a common complication and causes high mortality, being NAVM the most frequent and Gram negative germs are the most prevalent microbial group.

0301

WHAT IS FIRST? DELIRIUM OR INFECTION

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INTRODUCTION. Delirium is among the most frequent psychiatric diagnoses in the intensive care unit (ICU) and prolongs ICU stay, increases mortality and postoperative cognitive dysfunction. Pneumonia and sepsis are more often seen in patients with delirium than in patients without delirium.

OBJECTIVES. This study aims to analyse the time course of infection and delirium.

METHODS. Ethically approved, observational cohort study with expert audit at an University Hospital. Patients screened over 90 days on 3 surgical ICUs. Patients allocated to DTI (delirium then infection)-group and ITD (infection then delirium)-group. Inclusion criteria: age $\geq$ 60, ICU-treatment >36 h, surgery. Exclusion criteria: known cognitive disabilities, insufficient knowledge of German language, abuse of alcohol and nicotine, intracranial operation. Delirium diagnosed by Diagnostic and Statistical Manual of Mental Disorders DSM-IV criteria. Age, gender, former illnesses, ICU-scores (SAPS II, APACHE II, TISS-28, SOFA), performed operations, infections, adherence to standard operating procedures (SOPs) for antibiotic treatment and length of ICU-stay (LOS) were recorded.
Statistics: All numerical calculations were performed by SPSS, Version 13, SPSS, Inc., Chicago, IL; StatXact 5, CYTEL Software Corp., Cambridge, MA; and S-PLUS 2000 Professional Release 2, MathSoft, Cambridge, MA. Descriptive statistics were performed for all variables. Normal distribution was tested by the Shapiro-Test. Binary variables were expressed by means of absolute and relative frequency (in %). Continuous variables were characterized with the aid of arithmetic mean $\pm$ SD or median with interquartile range (percentile 25–75). On the basis of the missing normal distribution the nonparametric Mann–Whitney U-test and the chi-square test for the categorical characteristic were performed.

RESULTS. In total, 102 patients were evaluated, 37 patients developed delirium: 12 in the DTI and 25 in the ITD group. Basic characteristics did not differ between groups. Infection (25/67.6%) preceded delirium (12/32.4%) significantly more frequently ($p < .001$). In the DTI group delirium was seen significantly earlier on day 2 (1.25–3) and in the ITD on day 8 (4–13) after ICU admission ($p < .001$). There was no significant difference in adherence to SOPs (adherence rate 85(68–99) % in the DTI and 94 (76–100) % in the ITD group). Mortality and ICU LOS did not differ between groups.

CONCLUSION. Infection preceded delirium more often but time course did not significantly influence patients' outcome.

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0302

INCIDENCE AND RISK FACTORS FOR CATHETER-ASSOCIATED URINARY TRACT INFECTION IN A MEDICAL ICU

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INTRODUCTION. Catheter-associated urinary tract infection (CAUTIs) are the most frequently infection among hospitalized patients, representing 30–40% of all nosocomial infections. CAUTIs are associated with considerable morbidity, prolonged hospitalization, and greater health care expenditures. Identifying risks factors for acquiring a CAUTI is important to suggest methods for preventing them. Duration of catheterization, quality of catheter care, and length of hospital stay are among the preventable risk factors commonly identified.

OBJECTIVES. The aim of the present study is to evaluate the incidence of catheter-associated urinary tract infection and the risk factors for its development in a medical ICU.

METHODS. Prospective study performed in a 12 bed ICU (October 2007–December 2010). Data regarding all urinary catheters placed, urine cultures obtained and risk factors of interest for the study.

RESULTS. During the study period a total of 584 urinary catheters were placed with a total of 8019 days of catheterization and 35 urinary tract infections, with and incidence of 5.11 infections for 1000 days of catheterization. 63.1% of the infections were caused by Gram negatives, 29.7% by Gram positives and 7.2% by fungus. The risk factors for the development of a catheter-associated urinary tract infection identified with the univariate analyses were female sex (OR = 3.85, IC95% 1.92–7.71), mechanical ventilation (OR = 3.14, IC95% 1.19–8.25), length of stay (OR = 3.97, IC95% 1.71–9.25), use of catecholamines (OR = 3.19, IC95% 1.19–8.56) and blood transfusions (OR = 3.69, IC95% 1.43–9.57). All identified risk factors were then introduced in a maximum binary logistic regression model, eliminating in each step the variable with a non significant p value. The final model was composed by length of stay in ICU (OR = 1.04, IC95% 1.02–1.05), female sex (OR = 6.53, IC95% 2.85–14.97) and having an arterial catheter placed (OR = 2.62, IC95% 1.03–6.66).

CONCLUSIONS. Incidence of catheter-associated urinary tract infection in our unit is higher than that obtained in Spanish ICUs (ENVIN-UCI 2010). It is necessary to have an adequate care of the urinary catheter to try to diminish the amount of infections for 1000 days of catheterization. It is important to be aware of the risk factors of developing urinary tract infections in critical care patients to establish guidelines that account for this factors and point to the adequate care of patients with any of the risk factors identified in the present study.

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GRANT ACKNOWLEDGMENT. This research was funded by Fondo de Investigaciones Sanitarias grant PI10/02198.

0303

DEVICE ASSOCIATED NOSOCOMIAL INFECTION IN A NEWLY COMMISSIONED TERTIARY CARE CENTRE ICU IN NEW DELHI, INDIA

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INTRODUCTION. Health care associated infections, especially from invasive devices are an important cause of concern to the Intensive Care Units (ICUs). Regular surveillance of these infections has resulted in decrease in infection rates and improved health care quality in Unites states (US) of America [1].

OBJECTIVES. To ascertain the incidence of device associated infections (DAIs) in the ICU.

METHODS. Prospective cohort surveillance of DAIs was conducted in the ICU by applying the definitions of the US Centers for Disease Control and Prevention National Nosocomial Infections Surveillance System (CDC-NNIS).

RESULTS. Between January 2010 to March 2011, 1616 patients who were hospitalized in ICU, for an aggregate 5883 patient days acquired 71 DAIs for an overall rate of 4.3% (71/1616) or 12.06 infections per 1000 ICU days. The ventilator associated pneumonia rate was 56.3% (40/71) or 18.60 per 1000 ventilator days, catheter-associated urinary tract infections, 30.9% (22/71) or 5.87 per 1000 catheter days and central venous catheter-related blood stream infections was 12.6% (9/71) or 7.41 per 1000 catheter days respectively.

CONCLUSIONS. Our infection rates were lower in comparison with the study published earlier depicting data from ICUs of large number of developing countries [2] and were comparable with the rates shown in a single large Indian study [3].

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0304

EPIDEMIOLOGICAL TRENDS, RISK FACTORS AND PREDICTORS OF MORTALITY IN ICU ACQUIRED CANDIDEMIA IN COMBINED MEDICAL AND SURGICAL ICU PATIENTS

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INTRODUCTION. In spite of advanced diagnostic and therapeutic options available, ICU acquired candidemia is a nightmare for the intensivists. Though a long list of risk factors and predictors of mortality has been mentioned in the literature, uncertainties and doubts do exist.

OBJECTIVES. To analyse the epidemiological trends of ICU acquired candidemia, to identify probable risk factors, & to identify those factors which can predict the mortality of ICU acquired candidemia in combined medical & surgical ICU adult patients.

METHODS. Data were collected retrospectively for a period of 4 years (Jan 2007–Dec 2010). ICU acquired candidemia was defined as positive blood culture for Candida after 48 h of admission to the ICU. Following information was collected: demographic characteristics, microbiologic profile, risk factors, colonisation with Candida, timing of antifungal therapy and outcome. Predictors of mortality were identified using Fisher's exact test and 'two-tailed' P values.

RESULTS. Ours is a 280-bed tertiary care centre. During the study period, we identified 109 episodes of ICU acquired candidemia in 109 patients. Incidence was 1.12/1000 patient-days. Mean age of the patients was 63.1 years. M:F ratio was 2.03:1. Median length of ICU stay prior to obtaining the culture that yielded positive result was 9 days. *Candida tropicalis* was the commonest species identified (31.2%), followed by *C. albicans* (29.3%), *C. glabrata* (14.7%), *C. parapsilosis* (7%), *C. kreusi* (2.8%) and other Candida (14.7%). The following risk factors were identified: patient on broad spectrum antibiotics (99%), central venous line (98%), mechanical ventilation (88%), recent surgery (54%), patient's age >65 years (54%), diabetes mellitus (42%), colonization with Candida (38%), use of corticosteroids (37.6%), acute kidney disease(AKD) on dialysis (32%), chronic kidney disease (CKD) (14%), parenteral nutrition (9%) & anemia (6%). Overall mortality was 55%. The following predictors of mortality were found to be statistically significant: medical ICU patients ($p = 0.0001$), AKD with dialysis ($p = 0.0001$), mechanical ventilation (0.017), anemia ($p = 0.016$), use of corticosteroids ($p = 0.046$) and CKD ($p = 0.049$). We analyzed time to initiate antifungal therapy after obtaining blood cultures that yielded positive results. We found that 7 patients received therapy on day 1 (within 24 h), 24 patients on day 2, 30 patients on day 3, 11 patients on day 4 and 12 patients on day 5. In these patients, mortality recorded was 71%, 54%, 46%, 63% and 33% respectively.

CONCLUSIONS. Incidence of non albicans Candida like *C. tropicalis* and *C. glabrata* is on rise. Despite early effective antifungal therapy mortality remains high in ICU acquired candidemia. AKD, mechanical ventilation, anemia, use of corticosteroids & CKD are the significant predictors of mortality. Direct association between time to initiate antifungal therapy and mortality cannot be established.

0305

INFECTIVE ENDOCARDITIS IN A DEVELOPING COUNTRY: ARE WE ENTERING THE 'MODERN' ERA?

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INTRODUCTION. The clinical profile of infective endocarditis (IE) has been continuously evolving over last 3–4 decades. Many studies from developed parts of the world have already uncovered changes in the clinical profile and revealed the 'modern era' of IE.

OBJECTIVES. To evaluate the recent changes in the spectrum and clinical profile, and outcome of IE in a developing country; and to highlight the important differences from western and already available Indian subcontinental data, and to know whether the developing countries are also entering the 'modern era' of IE.

METHODS. This was an observational retrospective study with review of medical records. Demographic, clinical, microbiologic and echocardiographic characteristics, & treatment and outcome were examined in patients who fulfilled the Modified Duke criteria for 'definite' IE and were admitted at our institute between July 2004 & December 2009.

RESULTS. During the study period of 5½ years, 61 'definite' cases of IE were identified. Mean patient age was 49.3 ± 13.7 years. The male to female ratio was 3.3:1. Rheumatic heart disease was the underlying heart disease in 23 (37.7%) patients. There was no previously known heart disease in 9 (14.8%) patients. 1 patient had a history of intravenous drug abuse. Congestive heart failure was the commonest complication found in 29 (47.5%) patients. 33 (54.1%) patients had already received antibiotic therapy before presentation to us. Blood cultures were positive in 41 (67.2%) patients. Streptococci and staphylococci were the commonest microbial isolates, found in 9 (21.4%) patients each. Transesophageal echocardiography (TEE) was done for all the patients. Vegetations were detected in 54 (88%) patients. Mitral valve was involved in 38 (70%) patients. Right sided IE was seen in just 1 patient. 31 patients were treated only medically while early surgical treatment along with antibiotics was given to 30 (49.2%) patients. In-hospital mortality happened in 4 (6.5%) patients.

CONCLUSIONS. Along with many of the 'classical' developing world characteristics of IE, we recorded several new trends like: 1) increasing age category indicating RHD as a lesser common antecedent to IE, 2) an increasing percentage of IE in patients with no previously known heart disease, 3) gradually improving culture positivity rates, 4) a gradual rise in staphylococcal infections. 5) increased usage of TEE, 6) high elective surgical rate and 7) seemingly improved survival rates. These changes point to the fact that 'modern era' changes in the clinical profile of IE have started appearing in developing countries also.

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0306

OUTCOMES AND COMPLICATIONS OF XIGRIS (ACTIVATED PROTEIN C) IN A MIXED MEDICAL AND SURGICAL INTENSIVE CARE UNIT IN THE UNITED KINGDOM

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INTRODUCTION. Severe sepsis, defined as sepsis associated with acute organ dysfunction, results from a generalized inflammatory and procoagulant response to an infection. Activated protein C(Xigris) functions as an important endogenous regulator of haemostatic stress and immune response via its antithrombotic and profibrinolytic properties. Xigris is a recombinant human activated protein C indicated for the reduction of mortality in adult patients with severe sepsis who have a high risk of death.

OBJECTIVES. The aim of the study was to evaluate the outcomes and complications of Xigris in a mixed medical and surgical intensive care unit in the United Kingdom.

METHODS. A retrospective audit of patients given Xigris between 1/1/2006–31/12/2009. Following data was collected; patient demographics, date of admission and timing of administration, source of infection, microbiology data, APACHE II score, Outcomes and complications.

RESULTS. It is a 10 bedded unit in a tertiary teaching hospital. Approximately 550 patients are admitted per year and around 40% are severe sepsis related.

Results: patient demographics

Age group	Total (M+F)	Male	Female
17–20	1	0	1
21–30	3	2	1
31–40	5	1	4
41–50	17	13	4
51–60	13	7	6
61–70	20	13	7
71–80	23	17	6
81–90	6	3	3
Total	88	55(62.5%)	33(37.5%)

Results: source of infection

Apache score	Number	Source	Survivors (%)
<25	26	Pneumonia	19 (73.07%)
<25	19	Surgical	7 (36.84%)
<25	8	Septicaemia (?source)	7 (36.84%)
<25	5	Other causes	4 (80%)
>25	11	Pneumonia	7 (63.63%)
>25	6	Surgical	3 (50%)
>25	6	Septicaemia(?source)	3 (50%)
>25	7	Other causes	4 (57.14%)
Total	88		

Complications
2/88 patients (2.2%)
Anaphylactic reaction and Bruising (Low platelets 7000)

CONCLUSIONS. The data revealed that it may be especially beneficial in severely septic pneumonia patients. The incidence of bleeding (side effect) which is approximately 2.4% in the studies has not been found in our patients. Very low incidence of complications i.e.; 2.2%. None of it was bleeding or life threatening. The data couldn't be compared with similar group of patients not given Xigris, as it was done retrospectively.

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0307

INTERGROUP COMPARISON OF THE COMPLIANCE TOWARDS HAND HYGIENE PRACTICES AMONG DIFFERENT CATEGORIES OF HEALTHCARE WORKERS IN AN ICU IN A TERTIARY LEVEL MULTIDISCIPLINARY HOSPITAL IN INDIA

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INTRODUCTION. Effective hand hygiene practices have been found to be the most simple yet the most potent intervention in reducing the incidence and transmission of hospital acquired infections. Despite creation of awareness and continuous training programmes, adherence to hand hygiene practices among various healthcare professionals have been found to be poor by various studies.

OBJECTIVE. We conducted this study to measure and compare the compliance with hand hygiene practices among different groups of healthcare workers in an ICU in a tertiary level multidisciplinary hospital in India.

METHODS. This is a prospective observational study carried over a 2 month period. We studied the hand hygiene practices of doctors, nurses and other healthcare workers involved in care of pts in ICU during routine working hours (i.e. between 8.00 AM and 5.00 PM) 400 sessions of observation, each of 10–15 min durations were conducted and adherence to hand hygiene practices during routine contact with patient and during performance of invasive procedures were recorded by independent investigators who were constantly, physically present in the ICU.

RESULTS. Out of total 3261 opportunities of hand hygiene, adequate adherence to hand hygiene practices was found in 54.49% (1777 out of 3261). The compliance % was 49.5% (460 out of 928) among doctors, 61.15% (992 out of 162) among nursing staff and 53.19% (325 out of 611) among other healthcare workers. Adherence to hand hygiene practices during performance of invasive procedures was found out to be 64.3% (394 out of 612) and 55% (762 out of 1376) during personnel contact and contact with innate objects.

CONCLUSIONS. Compliance to hand hygiene practices was lowest among doctors and best among nursing staff. The adherence among various groups and adherence during procedures is significantly less than optimal. Our results will be helpful in better focusing of limited manpower resources towards training of more deficient groups.

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Sedation & pharmacological interventions in acute respiratory failure: 0308–0319

0308

CLARITHROMYCIN, BUT NOT LEVOFLOXACIN, DECREASES VENTILATOR-INDUCED LUNG INJURY

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INTRODUCTION. Among the antibiotics used in empiric treatment of community-acquired pneumonia, macrolides may have also immunomodulatory effects. Mechanical ventilation can cause lung injury by inducing a local inflammatory response.

OBJECTIVES. To study the antiinflammatory effects of clarithromycin, compared to levofloxacin or vehicle, in an experimental model of ventilator-induced lung injury.

METHODS. C57-BL6 mice were randomized into two experimental groups: high-pressure (peak 20 cmH2O, ZEEP) and low-pressure (peak 12 cmH2O, PEEP 2) ventilation. Both groups were again randomized to receive two doses of clarithromycin, levofloxacin or only vehicle before ventilation. After 150 min of ventilation, mice were sacrificed and the lungs removed. Histological lung injury, leukocyte infiltration (measured by immunohistochemistry), matrix remodeling (MMP-2 and -9 in lung tissue), nuclear factor-kB activation and E-selectin expression were measured. All the variables were compared using a two-way ANOVA, with a significance level of $p < 0.05$.

RESULTS. There were no differences in histological scores after low-pressure ventilation (1.58 ± 0.49, 1.30 ± 0.27, 1.30 ± 0.44 for vehicle-, levofloxacin and clarithromycin groups respectively). Ventilation with high pressures increased histological scores in vehicle and levofloxacin-treated mice, but not in those treated with clarithromycin (3.12 ± 1.11, 2.72 ± 0.66, 1.78 ± 0.91 respectively, $p < 0.05$ in ANOVA). This difference was related to lower leukocyte counts in clarithromycin-treated mice (64 ± 23, 48 ± 20, 45 ± 17 cells/field after low-pressure ventilation, 95 ± 48, 86 ± 26, 41 ± 21 after high-pressure ventilation for vehicle—levofloxacin and clarithromycin groups, $p < 0.05$). There were no differences among treatment groups in MMPs or nuclear factor kB expression. However, clarithromycin dampened the increase in E-selectin expression induced by high-pressure ventilation (1.22 ± 0.39, 1.15 ± 0.33, 1.07 ± 0.51 units after low-pressure ventilation, 1.69 ± 0.64, 1.68 ± 0.67, 0.94 ± 0.51 after high-pressure ventilation for vehicle—levofloxacin and clarithromycin groups, $p < 0.05$).

CONCLUSIONS. Clarithromycin protects against ventilator-induced lung injury, probably by decreasing recruitment of leukocytes mediated by E-selectin.

0309

CLINICIANS' PERSPECTIVES ON THE USE OF A SEDATION PROTOCOL OR DAILY SEDATIVE INTERRUPTION IN MECHANICALLY VENTILATED PATIENTS ENROLLED IN A MULTICENTER SEDATION TRIAL

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INTRODUCTION. The SLEAP Trial is an ongoing multicenter trial comparing protocolized sedation (PS) with a combined strategy of PS and daily sedative interruption (PS+DI) in mechanically ventilated adults.

OBJECTIVES. Within this study, we sought the perspectives of ICU nurses and physicians regarding the use of PS or DI in each randomized patient.

METHODS. In 5 participating sites, a one-page questionnaire was administered daily to the nurse and physicians caring for a patient enrolled in the SLEAP Trial. The questionnaire asked about the clinicians' comfort level with the assigned sedation strategy in that particular patient, the reasons for their response, and previous experience with PS or DI.

RESULTS.

Comparison of clinicians' perspectives

	Protocolized sedation			PS + Daily Interruption		
	RNs (N = 77)	MDs (N = 50)	p	RNs (N = 60)	MDs (N = 104)	p
Assigned strategy provided appropriate sedation	75.3%	88.0%	.08	66.7%	93.3%	<.001
Assigned strategy resulted in undersedation	22.7%	6.1%	.014	38.6%	13.1%	<.001
Sedation Protocol resulted in oversedation	13.3%	6.1%	.2	NA	NA	NA
Liked using the assigned strategy	70.3%	88.0%	.02	60.3%	94.1%	<.001

Clinicians (nurses and physicians) who liked using PS (n = 96) for their patient responded it was easy to use (71.8%), improved patient comfort (47.9%), and permitted more control over sedation level (37.5%). Clinicians who did not like using PS (n = 28) responded it was inappropriate for that particular patient (42.8%), reduced control over sedation level (28.6%), and that the patient was "too awake" (28.6%). Clinicians who liked using DI (n = 131) responded that it allowed better neurologic assessment (69.5%), greater control of sedation level (42.0%), and the patient was more awake (41.2%). Clinicians who did not like using DI (n = 29) responded it resulted in patient discomfort (82.8%), and was inappropriate for that particular patient (55.2%). 93.3% of physicians thought that DI resulted in appropriate sedation, compared with 75.3% of nurses; 52.2% of nurses felt that DI was difficult to coordinate with other care priorities, and 43.5% felt it increased their workload. Clinicians concerns during DI related to the potential risks of respiratory compromise or ventilator asynchrony (60.6%), pain or discomfort (47.5%), agitation (45.4%), and the fear of accidental device removal (26.3%).

CONCLUSIONS. In this randomized sedation trial, the majority of clinicians responded that a strategy of PS alone or PS+DI results in appropriate sedation. Nurses and physicians differ in their perspectives regarding the use of PS and PS+DI. Concerns about DI relate to potential respiratory compromise, pain, agitation, and accidental device removal.

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GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research, clinicaltrials.gov NCT00675363.

0310

MESENCHYMAL STEM CELLS ATTENUATE LUNG INJURY SEVERITY IN AN ACUTE REPAIR MODEL OF VENTILATOR INDUCED LUNG INJURY

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INTRODUCTION. Bone marrow derived mesenchymal stem cells (MSCs) show considerable promise as a therapeutic strategy in several pre-clinical models of acute lung injury[1–3]. We postulated that the recently described effects of MSCs on alveolar fluid clearance[4] and lung inflammation[5] would play a role in attenuation of early pathophysiological changes in ventilator induced lung injury (VILI). Preliminary studies of MSCs in a rodent model of VILI showed immunomodulation of the inflammatory response and enhanced repair at 48 h.

OBJECTIVES. We wished to assess the impact of MSCs on early repair processes following VILLI and advance our mechanistic knowledge of their role in this setting.

METHODS. An animal model of repair of VILI has recently been developed by our group. Male CD rats were anaesthetized, oro-tracheally intubated and subjected to high stretch mechanical ventilation until a defined worsening of compliance occurred. Once awake and spontaneously ventilating animals received an intra-venous injection of either MSCs (4 million), PBS, fibroblasts or conditioned medium. The animals were then extubated and housed in individually ventilated cages for 4 h to facilitate the inception of early repair processes. The level of ongoing injury/repair was characterised during harvest of the animals using blood gas analysis, compliance measurement, wet/dry ratio, BAL total protein, cytokines and cell count and histological analysis.

RESULTS. Treatment with MSCs, but not conditioned medium attenuated indices of lung injury including respiratory compliance and lung edema. Total lung water as assessed by wet:dry ratio, and bronchoalveolar lavage total inflammatory cell and neutrophil counts were reduced in the MSCs group. Oxygenation, as assessed by arterial pO2 and the alveolar-arterial oxygen gradient was also improved in the MSC group.

CONCLUSIONS. This animal model of acute repair in VILI confirms the potential of MSCs to modulate inflammation and pulmonary odema in this setting. Further analysis of our work, including BAL cytokine assay and histological assessment of injury, will provide insight into the utility of MSCs to enhance repair in the lung.

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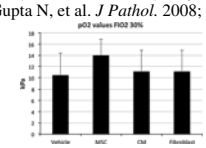

Fig. 1

0311

EFFICACY AND SAFETY OF PARENTERAL OMEGA 3 FATTY ACIDS IN VENTILATED PATIENTS WITH ACUTE LUNG INJURY

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INTRODUCTION. LCT fatty acids can alter pulmonary gas exchange due to their potentially proinflammatory properties. The MCT/LCT emulsions are oxidized faster and provide fewer amounts of PUFAs than a LCT emulsions. Thus MCT/LCT emulsions have been associated with a lower risk of lipid peroxidation and fewer alterations of membrane structures.[1] A meta-analysis of 12 randomized controlled trials comparing standard enteral nutrition with antioxidant nutrition found decreased rates of infection but again no effect on mortality.[2]In unselected critically ill medical patients, fish oil supplementation that increased the n-3/n-6 PUFA ratio to 1:2 did not affect inflammation or clinical outcome, compared to parenteral lipid nutrition with an MCT/LCT emulsion.[3] A small study showed that while the LCT emulsion induced no deleterious effects on oxygenation in ARDS patients, the LCT/MCT emulsion improved the Pao_2/Fio_2 ratio and had a further beneficial effect on oxygen delivery.[4] ted the effects of an intravenous lipid emulsion enriched with n-3 fatty acids in ventilated patients with acute lung injury.

OBJECTIVES. To determine the effects of parenteral Omega 3 fatty acids (10% Fatty acids) on respiratory parameters and outcome in ventilated patients with acute lung injury.

METHODS. We studied 86 consecutive patients with suspected ARDS in the first 48 h of admission. Patients were divided into 2 groups: Group 1: standard diet Group 2: standard diet + parenteral Omega 3 fatty acids, Omegaven® (Fresenius Kabi), for 14 days. Primary outcome measures included changes in oxygenation assessed at days 4, 7 and 14. Secondary outcomes included length of ventilation, length of ICU stay, length of hospital stay and in hospital mortality.

RESULTS. Compared with baseline PaO_2/FiO_2 ratio (control vs. drug group: 199 ± 124 vs. 145 ± 100; P = .06), by days 4, day 7 and day 14, patients receiving the drug did not show significant change in oxygenation (151.83 ± 80.19 vs. 177.19 ± 94.05; P = 0.26, 145.20 ± 109.5 vs. 159.48 ± 109.89; P = 0.61 and 95.97 ± 141.72 vs. 128.97 ± 140.35; P = 0.36). There was no significant difference in the length of ventilation (LOV), length of ICU stay (LOS) or survival at 28 days. There was no significant difference in the length of ventilation and ICU stay in the survivors as compared to the non survivors.

CONCLUSION. In ventilated patients with acute respiratory distress syndrome, intravenous omega 3 fatty acids alone do not improve ventilation, length of ICU stay or survival.

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0312

IS IT POSSIBLE FOR MECHANICALLY VENTILATED CRITICALLY ILL PATIENTS TO BE AWAKE AND COMFORTABLE WITHOUT CONTINUOUS SEDATION?

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INTRODUCTION. Evidence is growing that less sedation (1,2) or no sedation at all (3) of critically ill patients undergoing mechanical ventilation reduces the duration of ventilation and the time spent in the ICU. This can also be achieved using sedation protocols managed by the bedside nurse aiming at keeping the patient awake and comfortable. This results in more stable sedation levels (4). Never the less, standard treatment of these patients is still continuous sedation (5).

OBJECTIVES. To reduce the duration of mechanical ventilation by implementing a sedation-algorithm aiming at keeping the patients awake and comfortable. To relief the symptoms of delirium an algorithm for early diagnosis and treatment of delirium was also implemented.

METHODS. Single-centre implementation study. A sedation-algorithm, based on objective assessments of sedation level (RASS), pain (NRS or BPS), and an algorithm for the early diagnosis and treatment of delirium, based on CAM-ICU, were developed. Strategies for handling sleep-disorders and reducing environmental noise were discussed. Based on the sedation, pain and delirium scores the bedside nurse used the algorithms to titrate administration of opioids, sedative and psychoactive drugs. All patients admitted to the ICU undergoing mechanical ventilation for more than 24 h were included in the study. The patients admitted from April to July 2010 make out the Before Group, those admitted from Marts to June 2011 the After Group. Data collected include: Age, severity of illness (SAPS II), number of days without mechanical ventilation from admission to day 28, target sedation level, sedation-, delirium-, and pain assessments and medications (sedatives, opioids, pressors and psychoactives drugs).In October 2010 the healthcare staff received instructions in the use of the algorithms. From November all patients were treated using the algorithms. From November 2010 to April 2011 two project nurses were in the ward to help and guide the staff in doing the assessments and using the algorithms.

RESULTS.

Preliminary results

	Before group (April 2010 to July 2010) (n = 54)	After group (Marts 2011 to April 2011) (n = 18)
Average age, years [range]	55.6 [20–87]	60.7 [40–82]
SAPSII, mean [range]	Mean 50.8 [20–109]	51.3 [30–74]
Ventilator-free days (day 0–28), mean [range]	Mean 11.6 [0–26]	17.8 [0–26]
Prescribed target RASS. Number (percent of total number of ventilator days).	Total number of ventilatordays: 458. Prescribed target RASS: RASS 0 to −1: 312 (68%). RASS −2 to −5: 49 (11%). No target: 97 (21%)	Total number of ventilatordays: 91. Prescribed target RASS: RASS 0 to −1: 81 (89%). RASS −2 to −5: 7 (8%). No target: 3 (3%)
Number of RASS assessments at target	Expected number of assessment 1790. Performed assessments 1172 (65.5%). Assessments at target 603 (51.5%)	Expected number of assessment 388. Performed assessments 302. (77.8%). Assessments at target 273 (90.4%)

The study is ongoing. Data will be analysed in August 2011.

CONCLUSIONS. Preliminary results indicate that it is possible to treat mechanically ventilated patient without continuous sedation when using a sedation algorithm managed by the bed-side nurse aiming at keeping the patients awake and comfortable. It appears that using such algorithms is associated with more days without mechanical ventilation.

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0313

ACETYLSALICYLIC ACID DOES NOT PROTECT AGAINST ONSET OF TRANSFUSION-RELATED ACUTE LUNG INJURY IN CRITICALLY ILL PATIENTS: A NESTED CASE–CONTROL STUDY

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INTRODUCTION. Transfusion-related acute lung injury (TRALI) occurs in up to 5–8% of critically ill patients, contributing to mortality. Platelet activation plays a key role in TRALI pathophysiology. Acetylsalicylic acid (ASA) was found to improve outcome in an animal model of TRALI.

OBJECTIVES. We examined the association of ASA use before admission to the intensive care unit (ICU) and development of TRALI in critically ill patients.

METHODS. A nested case–control study was performed retrospectively in all patients with a first admission to the ICU of a tertiary referral hospital from November 1st 2004 until October 1st 2007, using propensity analysis. TRALI was defined using the NAECC consensus definition.

RESULTS. From a cohort of 2024 critically ill patients, 109 suspect cases of TRALI were identified. TRALI-cases were matched with controls (transfused patients not developing lung injury). Of these 218 patients, 66 used ASA (30%). Transfusion of platelets and total amount of plasma per patient increased the risk of TRALI with an OR of 2.07 (95% CI 1.07/4.00) and OR 1.5 (95% CI 1.39/1.63) resp.). ASA did not change the risk for TRALI after transfusion of platelets and plasma (OR 1.06 CI (0.59/1.91, P 0.85) and OR 1.06 (95% CI 0.59/1.92, P 0.84), nor did it alter the risk after red blood cell transfusion. Adjustment for confounding variables with a propensity score did not change the risk of acquiring TRALI (P 0.66).

CONCLUSIONS. ASA did not protect against transfusion-related lung injury in this cohort of critically ill patients.

0314

PHARMACOLOGIC THERAPIES IN ARDS

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INTRODUCTION. Acute respiratory distress syndrome is a common condition encountered in the intensive care unit. Whit a high mortality rate, there are still unanswered questions about the effectiveness of pharmacological treatment on ARDS mortality

OBJECTIVES. The primary outcome was to assess the effectiveness of pharmacological therapies associated to a lung protective strategy compared to standard therapy alone, on all-cause 30 day mortality in patients with ARDS. Secondary outcomes included ventilation-free days, ICU/HX LOS and development of MODS.

METHODS. We identified randomized clinical trials (RCTs) from electronic databases: Pubmed, Cochrane database of systematic reviews, OVID and EMBASE. We also search the Cochrane Systematic Review database and hand searched the selected articles for additional references.

We included only RCT comparing a pharmacological therapy that stated mortality as a primary or secondary outcome in adults with ARDS. We excluded RCT that included patients <18 years old, animals, fluid therapy, mechanical ventilation strategies, antibiotics, non-pharmacologic trials, reviews and therapies with known lack of effectiveness. No date or language restriction was applied.

For quantitative comparisons, the dichotomous outcomes were measured calculating the relative risk. Differences between studies were measured using the random effects model. Heterogeneity was assess calculating the *I2* statics. All included studies were evaluated using the Jadad scale.

RESULTS. We included 13 RCT's involving 2160 patients in ARDS patients treated with steroids (n = 271), enteral nutrition (n = 411), nitric oxide (n = 1138), and muscle relaxants (n = 340).

CONCLUSIONS. Steroid-treatment (methylprednisolone), nutritional therapy (EPA+GLA+antioxidants), and neuromuscular blocker (cisatracurium) showed a trend towards reduce mortality. All the pharmacologic therapies showed a trend towards reduce morbidity.

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ACKNOWLEDGMENT. Dr. Elena Carrasco and Dr. Joao M. Wardini Dantas do Amaral

0315

ASSESSMENT OF THE INFLAMMATORY EFFECT OF THE LOW-DOSE OXYGEN ROUTINELY ADMINISTERED IN MECHANICALLY VENTILATED PATIENTS WITHOUT RESPIRATORY FAILURE

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INTRODUCTION. Treatment of patients without respiratory failure under mechanical ventilation routinely includes administration of low-dose oxygen up to 40%. Its rationale is the supposed increase in safety against critical incidents, but, at present, pulse-oximetry probably warns advantageously. Generally, there is confidence in the non-toxic condition for the lung of this low-doses of oxygen, but recently, even lower doses, as much as 28%, have been reported to increase pulmonary inflammatory mediators in COPD patients and healthy volunteers.

OBJECTIVES. To evaluate the acute effect of reducing FiO_2 (from 0.40 to 0.21) in pulmonary inflammatory mediators in MV patients without respiratory failure.

METHODS. Patients under MV for >24 h without respiratory failure (PaO_2/FiO_2> 300) and hemodynamically stable. Variables will be recorded in 3 different periods: 1) Basal ($FiO_2 = 0.4$), 2) after FiO_2 reduction to 0.21, whereas SpO_2> 90%, and 3) after returning to basal 0.4 FiO_2. In top of the common clinical variables, exhaled breath condensate (EBC) were collected in each period for determination of inflammatory mediators (nitrites and nitrates and 8-isoprostane) and compared with plasma levels. Statistical analysis: One-way ANOVA for repeated measurements with FiO_2 as the grouping variable, for $p < 0.05$.

RESULTS. We screened 40 patients, but only 28 of them tolerated $FiO_2 = 0.21$. No changes were observed in heart rate, arterial blood pressure, and lung mechanics. Median (IQR) values of inflammatory mediators are shown in the table:

Inflammatory mediators

	FiO_2 0.40	FiO_2 0.21	FiO_2 0.40	p
EBC NO_2+NO_3	17.1(8.5–44.3)	14.1 (8.1–33.4)	11.0 (6.5–19.0)	0.2
EBC Isoprostane	4.4 (3.0–9.6)	8.2 (4.6–10.7)	5.3 (4.3–8.8)	0.6
Plasma NO_2+NO_3	12.6 (9.3–19.9)	16.3 (10.0–20.7)	15.0 (10.8–23.0)	0.9

CONCLUSIONS. In our setting, commonly administered 0.40-FiO_2 in MV patients without respiratory failure did not increase inflammation, neither locally (lung) nor systemic (plasma).

GRANT ACKNOWLEDGMENT. Research grant PI070019 from FIS (Spanish Ministry of Health).

0316

BUFFERING CAN KEEP BLOOD PH NORMAL FOR AT LEAST 4 HOURS DURING APNEA

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INTRODUCTION. Ventilation with low tidal volumes (VT) has been proven to reduce mortality in acute respiratory distress syndrome (ARDS). Further reduction of VT by using high frequency ventilation or combining conventional ventilation with extracorporeal CO_2 removal may be beneficial (1). Moreover, apneic ventilation (no VT) with arteriovenous CO_2 removal can keep PaO_2, $PaCO_2$ and pH normal for at least 7 h in an acute lung injury model (2).

OBJECTIVES. To test whether adequate buffering alone (i.e., no CO_2 removal) could keep pH normal during apneic ventilation for longer periods.

METHODS. Six piglets (26 ± 2.3 kg) were anesthetized, muscle relaxed, tracheotomised and ventilated to a $PaCO_2$ 4–5 kPa. The lungs were recruited (30 cmH_2O, 15 cmH_2O PEEP) and apneic ventilation was started (20 cmH_2O CPAP, O_2 100%) as well as administration of TRIS-buffer (20 mmol/kg/h). Mean arterial blood pressure was kept above 50 mmHg with Ringer's acetate and boluses of a HES solution at need. Body temperature was kept at 36–37°C. Apnea was ensured by continuously measuring CO_2 from the tracheal tube. The experiment ended after 270 min, when the animals were killed with a KCl injection. However, with one animal we continued the study for 6 h.

RESULTS. One animal died after 3.5 h due to hyperkalemia and another at 4 h due to circulatory failure. The remaining animals completed the experiment. Arterial pH and $PaCO_2$ changed from 7.52 ± 0.04 (mean ± SD) to 7.28 ± 0.04 at 270 min, and from 4.5 ± 0.3 kPa to 25.2 ± 4.9 kPa, respectively. Base excess changed from 4.4 ± 3.0 to 54.1 ± 6.9. The pig which was studied for 6 h had a pH 7.27 and $PaCO_2$ 27 kPa at that time.

CONCLUSIONS. It is possible, with buffering, to keep pH in a normal range for longer periods during apnea. This study shows that TRIS could be used for shorter periods when ventilation is not possible (e.g. severe asthma) and when other means to remove CO_2 are not immediately available. Whether TRIS should be used for longer periods as an adjuvant to remove CO_2 in ARDS must be investigated in further studies.

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0317

DEXMEDETOMIDINE SEDATION IN HYPERCAPNIC RESPIRATORY FAILURE WITH INTOLERANCE TO NONINVASIVE POSITIVE PRESSURE VENTILATION: A PRELIMINARY STUDY

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INTRODUCTION. Intolerance to mask and agitation remains an important cause of failure of Non-invasive Positive Pressure Ventilation (NIPPV). Although sedation therapy can play a role in improving the tolerance to NIPPV, but it has the potential risk of oversedation and inadvertent need for intubation. Alpha2 receptor agonist Dexmedetomidine with unique property of sedation plus analgesia without depressing respiratory drive has the potential to be an effective sedative agents in patients on NIPPV.

OBJECTIVES. To evaluate the feasibility and safety of Dexmedetomidine based sedation in patients of acute hypercapnic respiratory failure intolerant to use of Noninvasive Positive Pressure Ventilation.

METHODS. All the patients of Chronic Obstructive Pulmonary Disease (COPD) admitted with acute hypercapnic respiratory failure (AHRF), in the 16-bedded general medical surgical intensive care unit (ICU) of a tertiary care private hospital, between September 2010 and February 2011 were prospectively evaluated. Inclusion criteria were patient refusal to continue the NIPPV session due to discomfort despite optimal setting. Patients with inability to manage secretion, severe hemodynamic compromise requiring inotropic support, decreased level of consciousness (GCS <12), in the pediatric age group were excluded. Prior written consent was taken from all the patients enrolled in the study or next of kin. All study patients were noninvasively ventilated with facemask connected to a portable noninvasive ventilator as per unit protocol. Dexmedetomidine was administered as a 1 mcg/kg loading infusion over 10 min followed by 0.2–0.7 mcg/kg/h infusion rapidly titrated in <20 min to reach the goal of achieving patient comfort and Ramsay sedation score between 2 and 3. Intermittent boluses of Propofol were used as rescue sedation. Cardiorespiratory parameters, arterial blood gas results and adverse events were prospectively evaluated.

RESULTS. 14 of 62 patients screened were intubated before or on admission to ICU. 48 were given a trial of NIPPV-7 (14.58%) developed intolerance and were included in the trial. Mean age of the patients was 60 ± 15. Patients received 142 h (out of total 503 h of NIPPV) of Dexmedetomidine based sedation. One also received Propofol. Respiratory rate decreased from 36 ± 8 to 28 ± 6 and $PaCO_2$ decreased from 67 ± 20 mmHg to 57 ± 18 mmHg after 1 h of NIPPV with Dexmedetomidine sedation. 1 h after Dexmedetomidine sedation mean heart rate decreased from 120 ± 20 to 98 ± 10 and MAP decreased from 91 ± 34 mmHg to 73 ± 20 mmHg, but none of the patients required discontinuation of sedation. 1 patient (14.28%) required endotracheal intubation for no relief of dyspnea and inability to decrease $PaCO_2$ level.

CONCLUSIONS. This preliminary study shows that NIPPV intolerance is not uncommon in Acute Hypercapnic Respiratory Failure. The benefit of NIPPV can be extended to these intolerant patients with Dexmedetomidine sedation without limiting safety.

0318

EFFECTS OF GABEXATE MESILATE (FOY) ON ENDOTOXIN INDUCED ACUTE LUNG INJURY IN RABBIT

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AIMS. To clarify the effects of gabexate mesilate (FOY), a protease inhibitor, on endotoxin induced acute lung injury in rabbits.

METHODS. Animals were randomly assigned to one of four groups: rabbits receiving intravenous infusion of saline only (S–S group, n = 7), those receiving intravenous infusion of saline and Escherichia coli endotoxin (5 mg/kg over 30 min)(S-E group, n = 7), those receiving intravenous infusion of FOY (1 mg/kg bolus, followed by infusion at 1 mg/kg/h) and endotoxin (F1–E group, n = 7), those receiving intravenous infusion of FOY (2 mg/kg bolus, followed by infusion at 2 mg/kg/h) and endotoxin (F2–E group, n = 7). Infusion of saline or FOY was started 0.5 h before the start of infusion of saline or endotoxin and continued until 6 h after the start of infusion of saline or endotoxin when all rabbits were killed. The lung of rabbits were ventilated with 40% oxygen. Hemodynamics and arterial blood sample for blood gas, peripheral blood leukocytes and platelets were recorded and obtained at −0.5, 0, 1, 2, 3, 4, 5 and 6 h after the start of infusion of saline or endotoxin. The wet weight/dry weight ratio of lung, lung injury score and leukocytes, % polymorphonuclear(PMN) cells, and concentration of albumin, thromboxane B2(TxB2), and pro-inflammatory cytokines such as interleukin-8 (IL-8) in bronchoalveolar lavage fluid(BALF) were measured 6 h after the start of infusion of saline or endotoxin.

RESULTS. Endotoxin decreased arterial oxygen tension, and peripheral blood leukocytes and platelets. Endotoxin increased wet weight/dry weight ratio of lung, lung injury score and leukocytes, % PMN cells, concentration of albumin, TxB2, and IL-8 in BALF. FOY attenuated all these changes.

CONCLUSIONS. These findings suggest that FOY attenuated endotoxin induced acute lung injury in rabbits mainly by inhibiting neutrophil and pro-inflammatory cytokines (IL-8) responses, which may play a central role in sepsis related lung injury.

0319

NEUROMUSCULAR BLOCKERS IN ARDS: RETROSPECTIVE ANALYSIS IN UNIVERSITY HOSPITAL BIRMINGHAM

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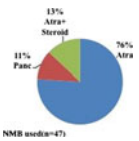
INTRODUCTION. The ACURASYS Study demonstrated early use of cisatracurium infusion in ARDS increased the number of ventilator free days and improved the adjusted 90-day survival [(1)]. This is contradictory to traditional teaching and practice, as use of muscle relaxants in critical care is decreasing. We, therefore, evaluated practice of administering neuromuscular blocking drugs (NMBD) in patients with ARDS at the University Hospital Birmingham NHS Trust (UHB).

METHOD. The following data was retrospectively collected over a period of 12 months from two intensive care units in the Trust: age, sex, APACHE score, advanced respiratory days, features of ARDS/ALI i.e. P/FiO2 ratios and CXR findings, use of oesophageal doppler and pulmonary artery catheter, NMBDs infusion, steroid usage, length of ICU stay and patient mortality.

RESULTS. Out of 668 ventilated patients analysed, 122(18.2%) patients fulfilled the criteria for ARDS/ALI. These patients were divided into 2 groups. Group 1 received NMBD infusion to facilitate mechanical ventilation and Group 2 did not receive NMBD.

Results

Data collected	NMB (n = 47)	Non NMB (n = 75)
Mean Age	19–81 (38)	19–90 (53)
Ventilation days	2–69 (18)	2–73 (11)
APACHE	6–33 (17)	6–32 (15)
Duration of ITU stay	1–71 (9)	1–79 (11)
Mortality in ITU	23 (48.9%)	30 (38.4%)
Pneumothorax	6 (13%)	7 (9%)
Hydrocortisone	18 (38%)	26 (35%)



Graph1

CONCLUSION. In this retrospective analysis, 18.2% were identified having ARDS/ALI. Thirty seven percent received NMBD. Atracurium was the most commonly used NMBD. Ten percent of the patients had a pancuronium infusion which is a surprising finding. The use of NMBD infusion was higher in the younger population. While the primary purpose of our data analysis was to capture usage of NMBD in ARDS/ALI in our local units, the results suggest that not infusing NMBD in ARDS can add survival benefit which is likely to be significant. We are reluctant to draw such conclusion from this retrospective data analysis but it is safe to say our current practice of cautious use of NMBD in ARDS need not change..

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Increasing efficiency of the cardiovascular ICU patient management: 0320–0332

0320

COMPARISON BETWEEN ARTERIAL-VENTRICULAR COUPLING AND CARDIAC CYCLE EFFICIENCY IN CRITICALLY ILL PATIENTS

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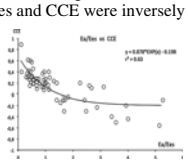
INTRODUCTION. The arterial-ventricular coupling is a major determinant of cardiovascular performance. It can be indexed by the ratio of arterial elastance (Ea, mmHg/ml), a measure of the net arterial load that is imposed on the left ventricle (LV), to LV end-systolic elastance (Ees, mmHg/ml), a load-independent measure of LV performance. The MostCare pulse contour system (Vytech Health, Padua, Italy) provides an index of arterial-ventricular coupling, the cardiac cycle efficiency (CCE), which represents the equilibrium between preload, arterial elastance and contractility. CCE is obtained from the ratio between the ideal pressure waveform and the waveform actually detected and is a dimensionless variable that ranges from -1 (the worst) to +1 (best possible arterial-ventricular coupling).

OBJECTIVES. We hypothesized that the CCE determined by arterial pressure waveform analysis would reflect the Ea/Ees determined by echocardiography (EC).

METHODS. We enrolled 70 patients (45 male/25 female, mean age 58 ± 15 years) who were admitted to a medico-surgical ICU, required an EC evaluation and were equipped with a standard arterial catheter-line for invasive arterial pressure monitoring. We simultaneously assessed the Ea/Ees ratio using EC (Toshiba, Xario SSA-660A, Japan) and the CCE. LV stroke volume, end-systolic and end-diastolic volumes were also simultaneously assessed by EC. Ea was approximated by the ratio of end-systolic pressure (ESP) to stroke volume (SV) [1]. ESP was estimated as 0.9× systolic blood pressure [2] and Ees was calculated as ESP/end-systolic volume [3]. To evaluate the relationships between Ea/Ees and CCE we used a nonlinear regression model.

RESULTS. Fifty-two (74%) of the patients were medical and 18 (26%) surgical; 23% had cardiogenic shock, 27% septic shock, 20% respiratory failure, and 30% heart failure. Fourteen patients were treated with norepinephrine, 12 with dobutamine, and 9 with both drugs. The LV ejection fraction was 53 ± 18%. Ea/Ees ranged from 0.11 to 5.30 (mean 1.29) and CCE from -0.56 to +0.89 (mean 0.16). Ea/Ees and CCE were inversely related (Figure).



Figure

CONCLUSIONS. CCE obtained using the pulse contour method correlated well with Ea/Ees values. This monitoring tool may allow continuous minimally-invasive assessment of arterial-ventricular coupling in critically ill patients.

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0321

ULTRASOUND GUIDED INFRACLAVICULAR AXILLARY VEIN CANNULATION: AN EVALUATION OF 2105 CASES

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INTRODUCTION. Ultrasound (US) reduces complications and increases accuracy during cannulation of the internal jugular vein (IJV). Intuitively, US should be as effective at other sites. Whilst the subclavian vein (SCV) is a popular choice, and is suggested as a route to reduce catheter related blood stream infections, it is not amenable to US guidance. The axillary vein (AV), a continuation of the SCV, is an alternative but it is not clear whether the AV offers advantages over the SCV and IJV. Few large scale studies have assessed US guided central venous access at sites other than the IJV, however, small case series of US guided AV access have been promising.

OBJECTIVES. To assess the efficacy and procedural complications of US guided AV cannulation.

METHODS. Procedural data was collected on 2611 sequential unselected patients referred for insertion of long term tunnelled central venous access devices at a UK tertiary centre. The patients were being treated for a range of malignancies, chronic immunosuppressive or nutritional disorders. Data was collected on demographics, techniques, and complications. All routes of central access were considered in each patient and the initial site was chosen after considering patient anatomy, pathology, preferences, and operator experience.

RESULTS. Following removal of non-relevant procedures 2105 patients who underwent cannulation of the AV or IJV were analysed. Demographics: mean age 59.8 (10–93 years), male 53.5%, female 46.5%. 99.5% of patients were cannulated successfully: right AV 62.2%, left AV 9.1%, right IJV 22.7%, left IJV 4.4%. Where the AV was the first choice site 99.1% were successfully cannulated. In patients where a central catheter had previously been sited 92.8% were cannulated easily. 99.8% of patients tolerated the procedure under local anaesthesia either with or without intravenous sedation, 6 had general anaesthesia, 17 (0.8%) patients were anti-coagulated, had abnormal clotting, or were thrombocytopenic. Contrast venography was used in 16.0% of cases at all sites. 28 (1.3%) procedural complications occurred including 6 arterial punctures (1 during AV access), 4 cases of arrhythmia, 1 pneumothorax (during IJV cannulation). There were no cases of significant haematoma. Technical problems were recorded in 9 cases (0.4%). X-Ray fluoroscopy led to catheter manipulation in 728 patients (34.8% of all cases) of which 392 (26.1% of AV cases) underwent AV access. Mean length of the catheter: right AV 19.93 cm, left AV 23.04 cm, right IJ 16.46 cm, left IJ 19.25 cm.

CONCLUSIONS. This is a large, pragmatic, analysis of US guided central venous access on unselected complex patients. We have demonstrated that US is effective: the vast majority of patients were cannulated successfully, and safe: less than 1% of patients had serious complications. The subset of patients undergoing AV cannulation demonstrated the lowest incidence of serious complications and needed fewer peri-procedural manipulations.

0322

THE ACCURACY OF TRANSTHORACIC ECHOCARDIOGRAM FOR DIAGNOSIS OF RIGHT VENTRICULAR DYSFUNCTION IN CRITICALLY ILL PATIENTS: COMPARING WITH PULMONARY ARTERY CATHETER PARAMETERS

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INTRODUCTION. Assessment of right ventricular (RV) function in critically ill patients is crucial in many situations because right ventricular dysfunction (RVD) is responsible for hemodynamic instability in various conditions, including septic shock, pulmonary embolism, ARDS and etc. The hemodynamic parameters, measured by pulmonary artery catheter (PAC), is considered as the definite diagnosis, however, it may associates with serious adverse events. Bedside echocardiography is a non-invasive tool that can be used as an alternative method for evaluation of RV function.

OBJECTIVES. To evaluate the sensitivity and accuracy of transthoracic echocardiography (TTE) for diagnosis of RVD in critically ill patients by comparing with the diagnosis by PAC.

METHODS. A single center, Cohort analysis study design for diagnostic test was performed in a 12-bed medical intensive care unit. The patients who received PAC insertion during August 2009 and October 2010 were included. The TTE was performed by an investigator (WS. or ST.) who was not alert about patients' diagnosis. The hemodynamic parameters were measured within 1 h before or after TTE examination. The RVD was considered it the hemodynamic profiles met the following criteria: RA pressure $\geq$ 8 mmHg in spontaneous breathing or $\geq$ 12 mmHg in mechanically ventilated patients, PAOP $<$ 18 mmHg, mean PA pressure $\geq$ 25 mmHg, and pulmonary vascular resistance $\geq$250 dyne.sec.cm^{-5}.

RESULTS. The PACs were inserted in 59 patients during the study period. Total of 83 pairs of TTE compared with hemodynamic parameters deriving from the PAC were measured. The TTE parameters, including LV D-shape (sensitivity 58.8%, specificity 83.3%), loss of RV apical triangle (sensitivity 47.1%, specificity 80.3%) and RVESA:LVESA $\geq$ 0.65 (sensitivity 94.1%, specificity 38.5%) were correlated with RVD, diagnosed by PAC. We develop echocardiographic criteria for diagnose RVD, as the following equation.

RVDscore = (3.5 $\times$ LV D-shape)+(1.5 $\times$ Loss RV triangle)+(5 x [RVESA:LVESA$\geq$0.65])

The present of LV Dshape, loss of RV triangle and RVESA:LVESA $\geq$ 0.65 were considered as 1 point. After multiple with fix factors, the summation of RVD score $\geq$ 6 correlated with RVD, with area under the ROC curve 0.77, sensitivity 70.6% and specificity 76.9%.

CONCLUSIONS. TTE is an accurate tool for diagnosis RVD in critically ill patients. It can be used as an alternative of PAC with acceptable sensitivity and accuracy.

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GRANT ACKNOWLEDGMENT. Mahidol University and Siriraj Hospital

0323

CARDIAC BIOMARKERS AND ECHOCARDIOGRAPHIC DIASTOLIC PARAMETERS: RELATION TO LONG-TERM OUTCOME IN PATIENTS WITH SHOCK

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INTRODUCTION. Impaired left ventricular dysfunction is well documented in the critically ill. Echocardiographic markers of diastolic dysfunction and cardiac biomarkers such as B-natriuretic peptide (BNP) and high sensitive troponin T (hsTNT) may offer new contributions to prognosis in these patients.

OBJECTIVES. The purpose of this study was to investigate whether BNP, hsTNT and echocardiographic diastolic parameters provide prognostic information for longer-term survival in patients with sepsis/SIRS and shock.

METHODS. 50 patients with severe sepsis/SIRS with circulatory failure despite fluid resuscitation were included. BNP, hsTNT were measured and transthoracic echocardiography (TTE) was performed within 24 h of study inclusion. Diastolic function was assessed by transmittal pulsed Doppler (E, A, E/A), tissue velocity imaging (TDI) in the mitral annulus (É, Á, E/É), deceleration time (dt) and measurement of left atrial volume (La). After univariate analysis, ROC curves and risk ratios for 1-year mortality were calculated.

RESULTS. HsTNT, BNP and E/É were elevated in the majority of patients (88%, 98% and 84% respectively). HsTNT and E/É were significantly higher in non-survivors (151 [99–260] ng/l and 11.7 [9.9–14.5]) than in survivors (45 [16–79] ng/l and 9.9 [7.9–10.4]). HsTNT and E/É significantly predicted 1-year mortality ($p = 0.000$ and $p = 0.027$ respectively). The area under the curves were 0.821 (95% CI 0.691–0.950) for hsTNT (cutoff 80 ng/l) and 0.703 (95% CI 0.535–0.871) for E/É (cutoff 10). The unadjusted risk ratio for hsTNT was 2.34 (95% CI 1.32 to 4.16; $p = 0.004$) and for E/É 2.08 (95% CI 1.23–3.52; $p = 0.006$). Neither BNP nor anyone of the other diastolic echocardiographic parameters was predictive.

CONCLUSIONS. HsTNT, BNP and E/É were elevated in the majority of patients. HsTNT and E/É, but not BNP, were univariate predictors for 1-year mortality in patients with SIRS/sepsis and shock.

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GRANT ACKNOWLEDGMENT. Supported by grants from the Scandinavian Society of Anaesthesiology and Intensive Care and the Region Skane County Council, Sweden

0324

TRANSTHORACIC ECHOCARDIOGRAPHY IN A DISTRICT GENERAL HOSPITAL INTENSIVE CARE UNIT

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INTRODUCTION. Echocardiography is being increasingly used to aid clinical management in critically ill patients, due to the wealth of information provided, ease of use and non-invasive nature.

OBJECTIVES. This study aimed to identify usage of a bedside transthoracic echocardiogram (TTE) within our intensive care unit within a district general hospital.

METHODS. Prospective audit of 50 consecutive patients requiring TTE over 6 months. Data collection included timing of scan, experience of echocardiographer, ventilation, image quality, indications and management changes as a result of the scan.

RESULTS. Thirty-eight (76%) were performed by an ITU Consultant trained in echocardiography, with 35 (70%) being performed when no routine echocardiography service was available. 37 (74%) patients were ventilated—33 were intubated with mean PEEP 7.8 cmH_2O, 4 had non-invasive ventilation with mean PEEP 6 cmH_2O.

Eight (16%) scans obtained sub-optimal or poor views; 24 (48%) obtained good images.

Six (12%) cases could have used another diagnostic method to provide the same information, with 2 (4%) needing to be repeated, and 2 (4%) limited by obesity.

43 (86%) and 16 (32%) aimed to identify left and right ventricular function respectively. 10 (20%) aimed to identify features of massive PE or pericardial effusion, and only 4 (8%) aimed to identify valvular lesions.

34 (68%) assisted in assessment of fluid management, and 8 (16%) led to changes in inotropic usage. 9 (18%) assisted in decisions to limit or withdraw medical therapy.

Twelve (24%) cases did not have a change in management documented after the echocardiogram.

CONCLUSIONS. TTE by a trained operator is a useful, non-invasive diagnostic tool and can be used in the majority of critically ill patients. It may also avoid other diagnostic techniques with associated complications. Left ventricular function assessment was the commonest indication, although a significant number aimed to identify alternative pathology. TTE usefully assisted clinical decisions in the majority of cases, although availability was probably limited by appropriately trained personnel. Our widespread usage of transthoracic echocardiography closely mirrors that of other intensive care units(1), and supports the argument for training intensivists to perform scans independently(2).

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0325

THE INTRODUCTION OF CRITICAL CARE LED ECHOCARDIOGRAPHY INTO A TERTIARY CRITICAL CARE UNIT

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INTRODUCTION. Transthoracic Echocardiography (TTE) can be used to provide a detailed assessment of cardiac function; measurement of haemodynamic parameters such as stroke volume and cardiac output correlate well with thermodilution techniques in critically ill patients. TTE is non-invasive and can be rapidly performed by skilled personnel. In our intensive care unit, two consultant intensivists have undergone 18 months training for TTE accreditation by the British Society of Echocardiography. In addition, a trainee in cardiology and intensive care with full BSE transthoracic accredition joined the department shortly before the start of this study.

OBJECTIVES. To evaluate the feasibility and effect on patient care of a critical care led TTE service.

METHODS. All patients, admitted to the unit between February 1st and August 1st 2010 who had a TTE requested as part as their clinical care, and whose scan was undertaken by an intensivist either accredited with or undergoing accreditation with the British Society of Echocardiography (BSE). ECG, echocardiographic findings, technical difficulties and any change in management as a result of a TTE were recorded.

RESULTS. Of 125 attempted scans, 120 patients had full studies (96%), 4 had limited studies (3%) and 1 was not possible. TTE changed management in 61 (49%) cases.

CONCLUSIONS. Critical care led TTE was feasible and led to change in management in almost half the patients studied.

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0326

INFLUENCE OF THE ARTERIAL HYPERTENSION IN THE VALUATION OF THE VALVULAR AORTIC ESTENOSIS

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INTRODUCTION. Hypertension not only can modify the exploratory findings in aortic stenosis, also it can interfere with the assessment of its severity and impact in the management of these patients. The impact of hypertension on the assessment of the severity of valvular aortic stenosis are inconsistent.

OBJECTIVES. To evaluate the influence of blood pressure and sex in assessing the severity of valvular aortic stenosis.

METHODS. We analyzed retrospectively patients with severe aortic stenosis were admitted to our cardiology department between the years 2003–2006. All patients were valued by cardiac catheterization, left ventriculography and Doppler echocardiography.

RESULTS. The sample comprised 60 patients, 31 men (51.7%) and 29 women (48.3%). 32 patients (53.3%) had a blood pressure >130/85 mmHg. The maximum and mean gradient by echocardiography was 71.35 and 43.80 mmHg in men and 80.54 and 46.56 mmHg in women. The Mean peak Gradient evaluated by cardiac catheterization was 66.39 in men and 75.68. The mean ejection fraction by echocardiography was 56.55% in men and 66.23% in women. The average mean arterial pressure in males was 86.71 and 87.57 mmHg in women.

CONCLUSIONS. In our sample we found no influence of HBP and sex in echocardiographic and hemodynamic assessment of severe aortic stenosis. ü It is possible that increased afterload that hypertension is to offset the effect on the transvalvular gradient increased burden posed by the intrinsic valve lesion.

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0327

EARLY INVASIVE STRATEGY IN PATIENTS WITH NSTE-ACS. FORECAST AND INFLUENCE OF GENDER

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INTRODUCTION. In recent years there have been multiple studies, observational and clinical trials, which compared the routine early invasive strategy (EIS) with conservative strategy, recently renamed the selective invasive strategy. The benefit of EIS in the prognosis of acute coronary syndrome without ST-segment elevation (NSTE ACS) and its influence by gender of the patient are controversial issues.

OBJECTIVES. The aim of this study is to analyze the impact of early invasive strategy (coronary angiography within 72 h of acute coronary event) in the prognosis of NSTE ACS, and the influence of gender on the potential benefit of it.

METHODS. Retrospective analysis of all patients admitted consecutively in our hospital with NSTE ACS, in the period from January 2007 to December 2008, and followed with a median of 24 months. Specific prognostic variables were studied during this period. It established a adjusted analysis of impact of early invasive strategy and gender on these variables.

RESULTS. Were collected a total of 715 patients (68.1% male). Mean age 66.2 $\pm$ 11.2 years. 63.1% were hypertensive and 40.3% diabetics. We found a hospital mortality of 5.6% and 8.3% after follow-up. 14.8% of patients developed heart failure (HF) in the acute phase and 9.7% after follow-up. 31.9% of patients had major cardiovascular event (MACEs) after follow-up. 287 patients (40.1%) received an EIS (71.8% male), no differences in relation to hospital mortality rates or long-term strategy for the group of late ($p > 0.3$). By contrast, EIS was associated with lower risk of HF both in-hospital and after follow-up (12.2% vs. 16.6%, $p = 0.06$ and 6.2% vs. 12%, $p < 0.009$ respectively), a difference that disappeared after adjustment. Gender analysis showed a beneficial effect of EIS on the development of HF during the initial phase and after follow-up in men (OR 0.4, 95% CI, 0.2–0.9 and OR 0.2, 95% CI, 0.5 to 0.7). By contrast, EIS showed a deleterious effect on women, greater risk of a global MACEs (OR 2.2, 95% CI, 1.1 to 4.4).

CONCLUSIONS. The early invasive strategy was not changed in the prognosis of patients with NSTE ACS, giving opposite effects by gender of the patient.

0328

HEMOVISCOELASTOGRAPHY—A NEW METHOD OF MONITORING HEMOSTASIS

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INTRODUCTION. It's known that deep vein thrombosis of lower extremities and pulmonary embolism occupies an important place in the structure of postoperative morbidity and mortality.

OBJECTIVES. After Ethics approval and informed consent, was studied the functional state of hemostasis in a group of 40 healthy volunteers, who were not receiving drugs affecting coagulation and 37 patients with postphlebothrombotic syndrome (PPTS).

METHODS. In patients PPTS conducted baseline studies coagulation state and daily monitoring of dynamic changes in the functional state of hemostasis, a comparative evaluation of performance low-frequency piezoelectric vibration hemoviscoelastography (LPVH) and platelet aggregation test (PAT), standard coagulation tests (SCT), thromboelastogram (TEG).

RESULTS. It was found that the LPVH correlated with SCT, PAT and TEG. However, our proposed method is more voluminous: indexes ICC (the intensity of the contact phase of coagulation), t1 (the time the contact phase of coagulation), and A0 (initial rate of aggregation of blood) consistent PAT indexes, indexes ICD (the intensity of coagulation drive), CTA (a constant thrombin activity) and CIP (the clot intensity of the polymerization)—SCT and TEG. In addition, the advantage of this method is to determine the intensity of fibrinolysis—with indicator IRLS (the intensity of the retraction and clot lysis).

CONCLUSIONS. LPVH allows make the total assessment of all parts hemostasis: from initial viscosity and platelet aggregation to coagulation and lysis of clot, as well as their interaction. His figures are objective and informative, as evidenced by close correlation with the performance of traditional coagulation methods.

0329

USING OF THE 6% HES 140/0.4 IN COMPLEX CORRECTION HEMOCOAGULATION DISORDERS IN PATIENTS WITH ACUTE DESTRUCTIVE PANCREATITIS

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INTRODUCTION. According to many authors, the acute destructive pancreatitis (ADP), still remains one of the difficult problems of abdominal surgery. The complexity of the pathogenesis of the disease, abdominal hypertension, high mortality necessitate search for new ways to treat this disease. Despite the use of minimally invasive technologies of modern methods of intensive therapy of postoperative mortality in the range of 30–70%.

METHODS. The study was conducted in 66 patients with the ADP, which were divided into 4 groups according to type of drug therapy, analgesia (extended epidural or opioids) and to the use of HES third generation Voluven, in a planned manner on the background of stable hemodynamics.

The hemostatic system was evaluated using indicators Analyzer ARP-01 "Mednord" (viscocoagulography).

RESULTS. It was found that all patients with violation of the ADP initially have hemocoagulation type amplitude and chronometric hypercoagulation, fibrinolysis inhibition. Use of new instrumental method—viscocoagulography can quickly and reliably identify violations hemocoagulation patients ADP. Expression of IAH correlates both with the degree of hemostatic disorders, and with the number of thrombohemorrhagic complications in patients with ADP.

CONCLUSIONS. Using a complex correction of hemocoagulation patients ADP using HES Voluven and prolonged epidural anesthesia can reduce the number thrombohemorrhagic complications in 58.8%, and reduce the mortality rate from 23.5% to 10%.

0330

HEMODYNAMIC MONITORING DURING ORGAN HARVESTING FROM BRAIN DEAD DONORS. USE OF ESOPHAGEAL DOPPLER IS SUPERIOR TO CLINICAL ASSESSMENT AND IMPROVES HEMODYNAMIC MANAGEMENT

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INTRODUCTION. Keeping brain dead organ donors circulatory stable is challenging intensive care therapy requiring adequate fluid resuscitation, intense vasoactive medication (inotrops and vasopressors), and sufficient hemodynamic monitoring. Assessing the adequacy of these measures on arrival for organ harvesting may be difficult, especially when advanced hemodynamic monitoring is lacking.

OBJECTIVES. To compare clinical judgement of global hemodynamics with esophageal Doppler measurements and investigate if the use of this device, could improve hemodynamic management during organ procurement.

METHODS. In 63 consecutive brain dead donors a clinical assessment of global hemodynamics was performed by the anesthesiologist of the harvesting team on arrival. Subsequently a CardioQ (Deltex, Brighton, UK) esophageal Doppler probe was inserted, and the hemodynamic variables derived, were compared to the clinical assessment. The Doppler derived variables were then used to guide therapy aiming at mean arterial pressure (MAP) $\geq$ 65 mmHg, cardiac index (CI) $\geq$ 2.5 l/min, systemic vascular resistance index (SVRI) = 1300–1700 dyne*s/cm^5*m^2, and flow time corrected (FTc) $\geq$ 350 ms as an estimate of adequate intravascular volume.

RESULTS. The Doppler probe was successfully placed in 60 donors. Forty-seven were clinically assessed to be hemodynamically stable. Of the other 13, five was assessed to be hypovolemic and vasodilated. According to the CardioQ variables, only 2 of these were hypovolemic and 4 were vasodilated. Their CI was between 3.2 and 7.1 l/min. Two donors were assessed to be hypovolemic and vasoconstricted, and this was confirmed by the CardioQ for one of them. Doppler guided therapy normalized his hemodynamic variables. The other was normovolemic and vasodilated with CI = 6.5 l/min. Four donors were clinically assessed to be hypoperfused. Hypoperfusion was confirmed for two of them (CI = 2.2 l/min and SVRI >3200 dyne*s/cm^5*m^2 for both), and subsequent Doppler guided therapy normalized their CI and SVRI. The other two had CI of 4.7 and 5.0 l/min, respectively, and SVRI between 1000 and 1100 dyne*s/cm^5*m^2. The initial CardioQ measurements revealed 10 donors as hypoperfused, assessed by an CI $\leq$2.2 l/min. Of these, eight were clinically assessed to be hemodynamically stable. Doppler guided therapy normalized CI in eight of them and improved CI in the other two, but their CI remained <2.2 l/min.

CONCLUSIONS. Clinical assessment of global hemodynamics in brain dead donors ready for organ procurement is difficult and often wrong, and thus may lead to inadequate therapy and probably suboptimal organ quality. Esophageal Doppler is easy to perform and improves hemodynamic management in this setting.

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0331

HEMODYNAMIC RESPONSES TO TRACHEAL INTUBATION USING DOUBLE-LUMEN TUBES: A RANDOMIZED TRIAL COMPARING THE AIRTRAQ™ AND THE MACINTOSH LARYNGOSCOPE

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INTRODUCTION. Stimulation of oropharyngeal structures exerted by direct laryngoscopy often causes a rise in blood pressure (BP), heart rate (HR) and catecholamine levels. As these changes may lead to adverse events in patients with cardiovascular diseases they ought to be avoided. Via reflexion the Airtraq™ Laryngoscope (Prodol Meditec S.A., Vizcaya, Spain) allows indirect vision of the glottis and tracheal intubation without alignment of the oral, pharyngeal and tracheal axes. Therefore the impulse to trigger hemodynamic changes is diminished. In prior studies [1, 2] intubation of a single-lumen tube using the Airtraq caused less hemodynamic changes than conventional intubation using direct laryngoscopy.

METHODS. In our study 43 patients (ASA II or III) requiring general anaesthesia and ventilation via a double-lumen tube were randomly assigned to two groups and intubated with either the Airtraq (AL-group, n = 20) or the Macintosh Laryngoscope (ML-group, n = 23). During induction of anaesthesia and intubation we measured invasive BP and HR continuously as well as levels of Epinephrine, Norepinephrine and Dopamine prior to induction and 2 min after successful intubation.

RESULTS. Induction of anaesthesia was followed by a significant, but between the groups comparable decline in BP. HR significantly fell in the Macintosh-group only. Laryngoscopy and intubation caused a significant rise in the Airtraq-group in BP (+30.9 $\pm$ 28.7 mmHg) and HR (+14.7 $\pm$ 20.6 bpm) and a significant rise in the Macintosh-group in BP (+30.4 $\pm$ 21 mmHg) and HR (+16.8 $\pm$ 12 bpm) (see Fig. 1).

However, there was no difference in the magnitude of changes between the Airtraq and the Macintosh-group in BP ($p = 0.95$) or HR ($p = 0.69$).

Blood levels of Epinephrine declined significantly in the Macintosh-group (−75%, $p = 0.016$) and stayed unchanged in the Airtraq-group. Blood levels of Norepinephrine and Dopamine did not change in either group.

CONCLUSIONS. In our setting laryngoscopy and insertion of a double-lumen tube using the Airtraq Laryngoscope caused a significant hemodynamic response similar to conventional intubation with a Macintosh Laryngoscope. Therefore the Airtraq appears not to reduce the risk of cardiovascular stress caused by intubation with a double-lumen tube.

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GRANT ACKNOWLEDGMENT. The study was sponsored by departmental funding and in part by H.H.

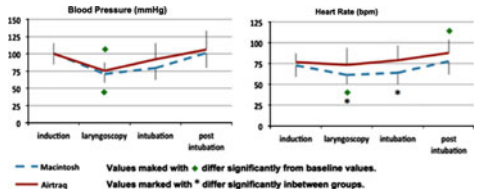

Figure 1 Shows changes in blood pressure (left) and heart rate (right). Standard deviations are given as vertical lines

0332

VASOPRESSOR USE AND MORTALITY ASSOCIATION IN A DISTRICT GENERAL HOSPITAL INTENSIVE CARE SETTING

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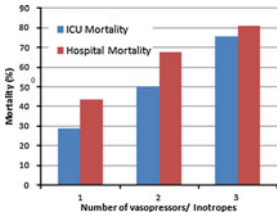
INTRODUCTION. Inotropes and vasopressors are routinely used on Intensive Care Units (ICU) in the management of shock. Circulatory shock carries a high risk of death despite advances in organ support. Our objective was to assess patterns in the use of inotropes and vasopressors over 6 years from 2005 to present within a district general hospital ICU and the association with in-hospital mortality

METHODS. Data were collected for all patients admitted to ICU between Jan 1st 2005 and Nov 19th 2010 and retrospective analysis undertaken. Inotrope and vasopressor type and duration of therapy were recorded for all patients. Use of vasopressin receptor agonists was not recorded. Survival and death on ICU were recorded and all patients were followed to hospital discharge. Fisher's exact test was used to calculate significance of outcomes.

RESULTS. 908 out of a total 2667 patients (34.0%) were treated with inotropes/vasopressors during their ITU admission over this 6 year period. The mean APACHE II score was 20.6($\pm$9.9). 339 patients (37.3%) of patients treated with inotropes died on ICU. A further 136 patients (15%) died before hospital discharge leading to a hospital mortality of 52.3%. The ICU mortality rate for all patients over the period was 18.1%. The most commonly used drug was noradrenaline (as the first line agent) which was used in 872 (96.0%) patients, followed by dobutamine 390 (43.0%) and adrenaline 121 patients (13.3%).

CONCLUSIONS. Use of inotropes or vasopressors is associated with significantly increased ICU mortality ($p < 0.0001$).

Usage patterns of inotropes in our institution have remained similar over the last 6 years. Current evidence supports use of noradrenaline as a first-line agent in shock and this is reflected in our practice. Increasing numbers of inotropes and vasopressors are associated with increased mortality risk, reflecting the severity and refractory nature of the disease pathology.



Vasopressors/Inotropes & Mortality Association

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Optimalisation of loading conditions: 0333–0346

0333

PLETH VARIABILITY INDEX, PULSE PRESSURE AND STROKE VOLUME VARIATION DO NOT PREDICT FLUID RESPONSIVENESS IN VENTILATED PATIENTS WITH SEPTIC SHOCK TREATED WITH VASOPRESSORS

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INTRODUCTION. Stroke volume (SVV) and pulse pressure variation (PPV) are used to predict fluid responsiveness in ventilated patients [1]. Pleth Variability Index (PVI, MASIMO Corp., USA) quantifying the respiration induced cyclic changes in peripheral pulse oximetry plethysmographic waveform amplitude has been shown to predict fluid responsiveness in anaesthetised patients [2].

OBJECTIVES. We investigated whether PVI can be used to predict fluid responsiveness in patients with septic shock treated with vasopressors.

METHODS. After ethical approval we enrolled 30 patients. All patients were ventilated with a tidal volume of at least 8 ml/kg estimated lean body weight, had no spontaneous breathing activity, were in sinus rhythm, had a heart rate (HR)—respiratory rate ratio of >3.6, had no sign of cor pulmonale and were treated with Noradrenaline or a combination of Noradrenaline and Vasopressin. One set of the following measurements (PICCO 2, Pulsion, Germany) was obtained for each patient at baseline and 5 min after a fluid bolus (500 ml Gelofusine® over 30 min): HR, arterial (MAP) and central venous blood pressure (CVP), systemic vascular resistance index (SVRI), global enddiastolic volume index (GEDI), stroke volume index (SVI), cardiac index (CI), PPV, SVV and central venous oxygen saturation ($ScvO_2$, blood gas analysis). PVI was measured with a pulse oximeter probe (Masimo, LNCS Adtx) attached to an index finger. Patients were classified as responders if CI increased by ≥15%.
Statistics: Mann–Whitney U-test to compare baseline values and Wilcoxon signed ranks test to compare percentage changes from baseline after fluid in responders and non-responders.

RESULTS. 10 patients were responders and 20 were non-responders. There were no statistically significant differences in any measured variable (Median, IQR) between responders vs non-responders at baseline (HR in bpm: 91 (85–106) vs 91 (72–99); MAP in mmHg: 83 (69–89) vs 78 (69–89); CVP in mmHg: 11 (9–12) vs 14 (10–17); SVRI in dynes/sec/cm^{-5}/m^2: 1443 (1264–1876) vs 1669 (1174–1798); GEDI in ml: 708 (621–882) vs 714 (675–834); CI in l/min/m2: 3.7 (2.6–4.3) vs 3.5 (3.0–4.3); PPV in %: 11.5 (8.3–15.8) vs 8.5 (5–10.8); SVV in %: 14 (10.5–19) vs 10 (5–14); PVI: 13 (10.5–19) vs 11.5 (6.5–16.3); $ScvO_2$ in %: 78.0 (71.3–81.0) vs 79.7 (74.1–84.3). Volume expansion induced a significant increase in GEDI by 9% (4–38), SVI by 34% (11–40) and CI by 27% (20–47) in responders with no significant change in any other variable. No parameter changed significantly in non-responders.

CONCLUSIONS. PVI, PPV and SVV did not predict fluid responsiveness in patients with septic shock treated with vasopressors.

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GRANT ACKNOWLEDGMENT. Funded by R&D Department, South Tees NHS Foundation Trust, UK.

0334

THE PASSIVE LEG RAISING AND END-EXPIRATORY OCCLUSION TESTS PERFORM BETTER THAN PULSE PRESSURE VARIATION IN PATIENTS WITH LOW RESPIRATORY SYSTEM COMPLIANCE

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INTRODUCTION. We tested whether the poor ability of pulse pressure variation (PPV) to predict fluid responsiveness in cases of acute respiratory distress syndrome (ARDS) was related to low lung compliance. We also tested whether the changes in cardiac index induced by passive leg raising (PLR) and by an end-expiratory occlusion test (EEO) were better than PPV for predicting fluid responsiveness ARDS patients.

METHODS. We included 54 patients with circulatory shock (63 ± 13 years, SAPS2 = 63 ± 24). Twenty-seven patients had ARDS (compliance of the respiratory system, Crs = 22 ± 3 mL/cmH_2O). In non-ARDS patients, the Crs was 45 ± 9 mL/cmH_2O. We measured the response of cardiac index (transpulmonary thermodilution) to fluid administration (500 mL saline). Before fluid administration, we recorded PPV and the changes in pulse contour analysis-derived cardiac index induced by PLR and EEO.

RESULTS. Fluid increased cardiac index ≥15% (44 ± 39%) in 30 "responders". PPV was significantly correlated with Crs (r = 0.58) but not with tidal volume. The higher the Crs, the better the prediction of fluid responsiveness by PPV. A Crs of 30 mL/cmH_2O was the best cut-off for discriminating patients regarding the ability of PPV to predict fluid responsiveness. If Crs was >30 mL/cmH_2O, the area under the receiver operating characteristics curve for predicting fluid responsiveness was not different for PPV, the PLR and the EEO tests (0.98 ± 0.03, 0.91 ± 0.06 and 0.97 ± 0.03, respectively). By contrast, if Crs was lower than 30 mL/cmH_2O, the area under the ROC curve was significantly lower for PPV than for the PLR and EEO tests (0.69 ± 0.10, 0.94 ± 0.05 and 0.93 ± 0.05, respectively).

CONCLUSIONS. The ability of PPV to predict fluid responsiveness was inversely related to Crs. If Crs was lower than 30 mL/cmH_2O, PPV became less accurate for predicting fluid responsiveness. However, the PLR and EEO tests remained valuable in such cases.

0335

ASSESSMENT OF FLUID RESPONSIVENESS BY CHANGES IN PARTIAL END-TIDAL CO_2 PRESSURE DURING PASSIVE LEG-RAISING MANEUVER

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INTRODUCTION. Passive leg raising (PLR) test provides a dynamic assessment of preload dependence inducing a transient and reversible increase in cardiac preload. This maneuver has demonstrated to predict fluid responsiveness in a large series of studies over a wide population[1]. However, to assess the hemodynamic effects of this maneuver a continuous cardiac output monitoring is needed.

OBJECTIVES. In this study we tested the hypothesis whether, assuming a constant tissue CO_2 production, under fixed minute ventilation, acute changes in cardiac output induced by passive leg raising (PLR) maneuver is reflected by changes in partial end-tidal CO_2 pressure ($PetCO_2$) and could be used to predict fluid responsiveness in mechanically patients.

METHODS. 24 patients with acute circulatory failure and monitored with an esophageal Doppler (CardioQ-ODM). A 2-min passive leg-raising test was performed from semirecumbent to supine position. Fluid responsiveness was defined according to cardiac output increase (≥ 15%) after volume expansion (500 mL of synthetic colloid infused during 30 min).

RESULTS. PLR-induced increase in cardiac output and $PetCO_2$ were strongly correlated (R^2 = 0.80; P < 0.0001). The areas under the ROC curve for PLR-induced increase in cardiac output and $PetCO_2$ (0.99 ± 0.02 SE; CI 95%: 0.83–1 and 0.96 ± 0.04 SE; CI 95%: 0.79–1; respectively) were not significantly different. An increase >4% in $PetCO_2$ or an increase ≥ 10.5% in cardiac output measured by esophageal Doppler during PLR predicted fluid responsiveness with a sensibility of 92.3% and a specificity of 100%.

CONCLUSIONS. Induced-changes in $PetCO_2$ during passive leg raising maneuver could be used to track changes in cardiac output for prediction of fluid responsiveness.

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0336

IS CARDIOPROTECTIVE BETABLOCKADE FEASIBLE IN SEVERE SEPSIS? A PILOT STUDY

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INTRODUCTION. The subject of myocardial protection has not been explored in critically ill patients who suffer from various shock states including sepsis and septic shock. The imbalance of DO_2/VO_2 within myocardial tissue is further aggravated by tachycardia and low afterload.

OBJECTIVES. The authors performed a pilot study testing impact of esmolol infusion on systemic haemodynamics in severe sepsis and septic shock. The study has been carried out in 20 bed university hospital ICU.

METHODS. Bolus (0.5–0.2 mg/kg) plus continuous 24 h infusion of esmolol was administered in patients with sinus or supraventricular tachycardia (HR > 120/min) after correction of preload and inclusion echocardiography. Exclusion criteria were severe LV systolic dysfunction (EFLV ≤ 35%), AV blockade, noradrenaline infusion at rates over 0.5 ug/kg min and signs of DO_2/VO_2 imbalance. Monitoring with echocardiography and PAC before, at 2, 6, 12, 24 h following the start of esmolol and 6 h after ceasing of the drip. Patients maintained in normovolaemia throughout the study, eventual manipulation with noradrenaline dosage was allowed. Statistics was performed with Levene's Test followed by one way ANOVA.

RESULTS. 10 patients were included (6 females, mean age 54.4 ± 18.7). Mean APACHE II 21.5 ± 6.2, SOFA at start of esmolol was 10.4 ± 2.6, at the end of study 10.1 ± 2.1. Means of CRP and PCT were 274.7 ± 77.7 and 14.5 ± 10.1, respectively. Mean rates of esmolol drip varied between 212.5 ± 63.5 mg/h at start to 272.5 ± 89.5 mg/h at 24 h. Esmolol slowed down the hearts from mean 142.4 ± 11.2/min to 111.9 ± 8.6/min (p < 0.001) with parallel insignificant reduction of cardiac output and index (9243 ± 1906 ml/min to 8172 ± 1719 ml/min, 4.94 ± 0.76 to 4.35 ± 0.72 l/min m^2). Stroke volume insignificantly increased from 67.1 ± 16.3 ml to 72.9 ± 15.3 ml also due to mild increase of velocity time integral of transmittal A wave (1) (4.5 ± 0.5 cm to 7.2 ± 0.45 cm). No parallel change of PAWP was observed (15.9 ± 3.2 to 15.0 ± 2.4 mmHg) as well as no significant change of noradrenalin infusion (0.13 ± 0.17 to 0.17 ± 0.19 ug/kg min), SvO2 (69.8 ± 8.3 to 60.2 ± 4.2%) or arterial lactate (1.7 ± 0.5 to 1.7 ± 0.3 mmol/l). 7 patients (70%) experienced rebound in heart rate after ceasing of esmolol, in 9 (90%) therapy with betablocker continued. 28-day mortality was 10% (1/10).

CONCLUSIONS. Slowing the heart rate did not demonstrate an impact on global haemodynamics, and balance of DO_2/VO_2. The reason could be extension of diastolic filling time and improvement of diastolic function. Saving the heart excessive tachycardia might be preventive in development of sepsis induced cardiomyopathy and more severe arrhythmias. The data need to be confirmed by further study.

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0337

FLUID RESPONSIVENESS IS RESTORED IN PATIENTS WITH ACUTE DECOMPENSATED HEART FAILURE (CHF) WHO RESPOND TO STANDARD TREATMENT

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INTRODUCTION. Although it is known that BNP secretion is proportional to the myocardial stretch, the relationship between BNP and preload reserve has not been not established.

OBJECTIVES. We designed a study to test whether changes in preload reserve as clinically detectable by the fluid responsiveness (FR) during a passive leg raise (PLR) correlate with response to CHF therapy as indexed by a change in BNP serum concentration.

METHODS. We included 50 consecutive patients admitted for CHF and BNP>1000 pg/ml. We assessed the FR at the entrance by the changes in stoke volume (SV) and cardiac output (CO): i) at baseline, ii) during a 3 min PLR and iii) after return to baseline. We used a bioreactance system (1) that also measures the heart rate and the blood pressure (BP), allowing to derive the cardiac power (CP) and the left ventricle stroke work (LVSW).

Standard therapy was then optimized. At day 4, BNP and FR were reassessed similarly. We compared the change in the studied variables before and after therapeutic optimization using the Pearson's correlation coefficient (CC).

RESULTS. There were 16 females, 34 males, age = 77 ± 24 years. Nine patients had diastolic dysfunction with left ventricle ejection fraction (LVEF) =60 ± 10%; 41 had systolic dysfunction with LVEF = 31 ± 8%. The overall FR was not changed by the treatment optimization. However, the change in FR was correlated with the changes in BNP. The best relationship was found with CP, then with LVSW, CO, SV and BP (R = 0.40, 0.33, 0.26, 0.20, 0.15; CC = 0.83, 0.57, 0.50, 0.45, 0.39, respectively). These relationships were reinforced when restricted to patients with systolic dysfunction: R = 0.47, 0.41, 0.29, 0.22, 0.16; CC = 0.68, 0.64, 0.56, 0.54, 0.41 for CP, LVSW, CO, SV, BP respectively.

When patients were classified into two categories (BNP responders vs. BNP nonresponders), the FR as assessed by the change in CP was higher in BNP responders than in BNP nonresponders: 9 ± 24 to 23 ± 22 W m^2 vs. 15 ± 15 to 2 ± 9, $p < 0.001$.

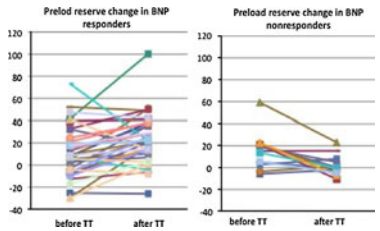

Figure 1

When the FR was assessed by a change in CO the difference was still significant: 0.11 ± 0.21 to 0.21 ± 0.22 L/min m^2 vs. 0.11 ± 0.20 to 0.03 ± 0.14, $p < 0.05$.

CONCLUSIONS. In this population of decompensated CHF, the FR was related to the changes in BNP serum concentration after 4 days of optimized treatment. This relationship was established whether considering the CP or LVSW, CO, SV and BP.

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0338

PASSIVE LEG RAISING TEST WITH THE NEXFIN MONITOR PREDICTS FLUID RESPONSIVENESS IN HIGH-RISK SURGICAL PATIENTS (PREFERENCE STUDY)

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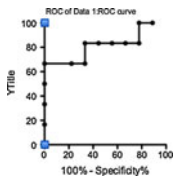
INTRODUCTION. A number of tests have been developed to predict fluid responsiveness (increase in SV after a fluid challenge). In spontaneously breathing patients the passive leg-raising (PLR) test has been demonstrated to be a good indicator of fluid responsiveness. Nexfin is a new CO monitor that measures and tracks SV and CO by analysing the arterial pressure pulse contour completely non-invasively from a finger probe.

OBJECTIVES. To evaluate whether responses in stroke volume (SV) measured by Nexfin during a PLR predict fluid responsiveness.

METHODS. Postoperative patients admitted to the ICU were enrolled. A PLR (45 degrees bed tilt from the 30–45° head up) was started prior to SV optimisation and at the end of SV optimisation. Changes in SV during PLR and after administration of a fluid challenge were monitored with the Nexfin monitor. A positive response to a FC was considered a raise in SV of more than 15%. Receiver operator characteristics (ROC) analysis was performed.

RESULTS. 12 patients were enrolled and 15 fluid challenges (FC) analysed. 6 FC increased the SV >15%. PLR test in responders and non-responders produced different changes in SV (responders median SV change 9.5%, IQR 0 to 11% vs non-responders median change −2%, IQR −7.5 to 6.5%, p = 0.05). The area under the curve for the ROC analysis was 0.81 (SE 0.13) p = 0.045. Figure 1. A SV increase >8% during a PLR test predicts the fluid responsiveness with a sensitivity of 67% and a specificity of 100%.



ROC curve

CONCLUSIONS. These preliminary data suggest that the PLR with Nexfin monitor is a totally non-invasive test that accurately predicts fluid responsiveness in high risk surgical patients.

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0339

HOW TO PREDICT FLUID RESPONSIVENESS WITH A PULMONARY ARTERY CATHETER

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INTRODUCTION. In critically ill patients, static measurements of preload with a pulmonary artery catheter (pulmonary artery occlusion pressure and right atrial pressure) can not reliably predict fluid responsiveness (1). On the other hand, cyclic changes in alveolar pressure induced by mechanical ventilation lead to a pulmonary artery pressure variation. Which is why changes in pulmonary artery pulse pressure should predict fluid responsiveness in the same way as systemic artery pulse pressure does (2).

OBJECTIVES. In mechanically ventilated patients, we investigated whether the respiratory changes in pulmonary artery pulse pressure could predict fluid responsiveness.

METHODS. Nineteen volume expansions in 17 patients were prospectively studied. Artery and pulmonary artery curves were recorded throughout the respiratory cycle before and after volume expansion. Maximal and minimal values of pulmonary artery pulse pressure (PAPmax and PAPmin) were determined over one respiratory cycle with a pulmonary artery catheter. The respiratory changes in pulmonary artery pulse pressure (dPAPP) were calculated as the difference between PAPmax and PAPmin divided by the mean of the two values and were expressed as a percentage.

RESULTS. Eight volume expansions increased cardiac index by more than 15% (responders). Before volume expansion, dPAPP was higher in responders than in nonresponders (30% versus 10% ±5%, p = 0.003). Pulmonary artery occlusion pressure was at 10 ± 3.2 mmHg in non responders and 10.5 ± 3.3 mmHg in responders (p = 0.61). Right atrial pressure was at 11 ± 5.1 mmHg in non responders and 7.5 ± 5.4 mmHg in responders (p = 0.32). A dPAPP value of 22% allowed discrimination between responders and non-responders with a sensitivity of 87.5% and a specificity of 90.9%.

CONCLUSIONS. dPAPP is a simple and accurate method for predicting fluid responsiveness when a pulmonary artery catheter is used.

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0340

QUANTITATIVE ASSESSMENT OF MICROCIRCULATION IN HEALTHY VOLUNTEERS AND IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Microcirculatory alterations play a major role in sepsis and arise as an attractive therapeutic target. Nevertheless, a quantitative assessment of the microcirculation in normal and septic conditions has never been accomplished.

OBJECTIVES.

(1) To compare quantitative measurements of sublingual microcirculation in normal volunteers and in septic shock patients.

(2) To verify that the presence of hyperdynamic blood flow is a component of the microcirculation in septic shock.

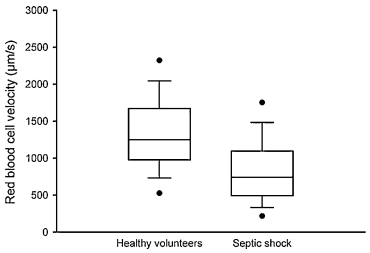
METHODS. The sublingual microcirculation of 23 healthy volunteers and 22 resuscitated septic shock patients was evaluated by SDF imaging and AVA 3.0 software. Red blood cell velocity (RBCV) was measured by space/time diagrams. Capillary microvascular flow index (MFI) was calculated as the average of each individual vessel. Data are shown as median [25th–75th percentiles], and compared by Mann–Whitney *U* test.

RESULTS. Compared to normal volunteers, patients in septic shock showed decreased capillary MFI, proportion of perfused vessels (PPV), RBCV, and perfused capillary density (PCD). In addition, septic shock patients displayed higher heterogeneity flow index (HFI) and coefficient of variation of RBCV. There were no differences in capillary total vascular density (TVD).

Table 1

	TVD (mm/mm²)	MFI	PPV	RBCV (µm/s)	PCD (mm/mm²)	HFI	CV of RBCV
Healthy volunteers	16.7 [15.5–17.6]	2.98 [2.96–2.99]	1.00 [0.99–1.00]	1367 [1266–1470]	16.6 [15.4–17.6]	0.01 [0.00–0.02]	0.39 [0.34–0.48]
Septic shock patients	16.4 [15.8–17.8]	2.24 [1.89–2.48]	0.84 [0.71–0.94]	846 [718–950]	13.8 [11.9–14.9]	0.17 [0.07–0.40]	1.79 [1.59–2.10]
P-value	0.672	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

MFI was strongly correlated with PPV (r = 0.95, $P < 0.001$) and with RBCV (r = 0.85, $P < 0.001$). In the septic patients, 6% of the capillaries of showed a RBCV higher than the 75th percentile in normal volunteers.



RBCV in both groups

CONCLUSIONS. The main findings in the sublingual microcirculation of patients with septic shock were increased heterogeneity and reduced perfusion. Neither decreased total capillary density nor hyperdynamic flow was found.

GRANT ACKNOWLEDGMENT. Supported by the grant PICT-2007-00912, Agencia Nacional de Promoción Científica y Tecnológica, Argentina.

0341

THE RELATIONSHIP BETWEEN MICROCIRCULATORY FLOW ABNORMALITIES AND SYSTEMIC HEMODYNAMIC VARIABLES IN SEPTIC SHOCK PATIENTS. A MULTICENTRE CROSS-SECTIONAL STUDY

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INTRODUCTION. Recent studies have challenged the view that microcirculatory abnormalities may not be predicted by systemic hemodynamic parameters during septic shock. In contrast, parallel changes in microcirculatory flow and lactate during septic shock resuscitation have been reported (1,2). Our aim was to explore potential relationships between systemic hemodynamic and microcirculatory parameters in a large cohort of septic shock patients.
METHODS. We conducted a retrospective cross-sectional study in 3 academic centers (Argentina, Chile and The Netherlands) where septic shock patients are treated with perfusion-oriented management protocols. In each patient, sublingual microcirculation (MC) was assessed as soon as technically feasible during the first 24 h of resuscitation. Cardiac index (CI), MAP, lactate, mixed venous O2 saturation (SvO2) and norepinephrine (NE) dose were registered simultaneously with microcirculatory (MC) assessment. MC images were analyzed following a recent consensus proposal (3). Statistical analysis included Mann–Whitney test.
RESULTS. 156 patients were included (Age 64 ± 15; SOFA 9 ± 3; APACHE 21 ± 6; NE dose 0.3 ± 0.6 ug/kg/min; Lactate 3 ± 3 mmol/l; CI 4.1 ± 1.4 l/min/m2; SvO2 71 ± 9%; hospital mortality 33%). Patients with a hyperlactatemia ≥2 mmol/l and norepinephrine (NE) dose >0.1 μg/kg/min exhibited significant lower values of perfused vessel density (PVD) and proportion of perfused vessels (PPV). Patients with low CI (< 2.5 L/min) presented higher microvascular densities.

Table 1

Variable	PVD (n/mm^2)		p	PPV (%)		p
Lactate (mmol/l)	=or <2: 14 [11–17]	>2: 10 [8–13]	0.0001	=or <2: 93 [84–100]	>2: 82 [71–99]	0.011
Lactate (mmol/l)	=or <4: 14 [11–16]	> 4: 9 [6–12]	0.0001	=or <4: 92 [82–100]	>4: 75 [57–82]	0.0001
NE Dose (ug/kg/min)	=or <0.1: 14 [11–17]	>0.1: 12 [8–15]	0.0014	=or <0.1: 100 [90–100]	>0.1: 80 [70–91]	0.0001
NE Dose (ug/kg/min)	=or <0.3: 14 [11–16]	>0.3: 10 [6–13]	0.0001	=or <0.3: 95 [81–100]	>0.3: 74 [55–88]	0.0001
SvO2 (%)	=or <65: 13 [11–15]	>65: 13 [9–16]	0.62	=or <65: 84 [73–99]	>65: 90 [73–100]	0.51
Cardiac Index (l/min/m2)	=or <2.5: 17 [11–20]	>2.5: 13 [9–15]	0.07	=or <2.5: 93 [77–100]	>2.5: 90 [73–100]	0.61

CONCLUSION. We observed an early and significant association between microcirculatory flow abnormalities, hyperlactatemia and NE requirements in septic shock. Interestingly, we could not demonstrate an association between SvO2 and microcirculatory flow in this multicentric cohort.
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0342

TETRAHYDROBIOPTERIN (BH4) ADMINISTRATION IMPROVES MICROCIRCULATORY DYSFUNCTION IN EXPERIMENTAL SEPTIC SHOCK

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INTRODUCTION. Microcirculatory dysfunction in sepsis is associated with a poor outcome. Tetrahydrobiopterin (BH4), a nitric oxide synthase (NOS) cofactor, may reduce microvascular endothelial dysfunction.
OBJECTIVES. We studied whether administration of BH4 could improve abnormalities of the microcirculation in an ovine model of septic shock.
METHODS. Fourteen sheep were randomized to receive BH4 (n = 7) or placebo (n = 7). Peritonitis was induced by injection of feces (1.5 g/kg body weight) into the abdominal cavity. A combination of Ringer's lactate and 6% hydroxyethyl starch solutions was titrated to prevent hypovolemia. In the treated group, a 20 mg/kg IV bolus of BH4 was infused at a rate of 2 g/h, 4 and 12 h after injection of feces. The sublingual microcirculation was evaluated at baseline and 4, 6, 12, 14, 18 h, thereafter using sidestream dark-field (SDF) videomicroscopy. The proportion of perfused small vessels (sPPV), perfused small vessel density (sPVD), mean flow index (MFI) and heterogeneity index of the sPPV (htPPV) were measured. Sheep were followed until death or for a maximum of 30 h.
RESULTS. BH4 significantly attenuated the decrease in sPVD, sPPV and MFI already at 6 h after sepsis induction (Table 1). Furthermore, BH4-treated animals had decreased htPPV at 12 h and 18 h compared with the control group. Survival time was significantly prolonged in the BH4 group (25.0 vs 17.8 h, p< 0.05).

Microcirculation results

		Baseline	4 h	6 h	12 h	14 h	18 h
sPPV*(/mm)	Control	89.0 6.4±	85.2 6.1±	79.3 9.1±	66.3 17.7±	62.0 11.6±	53.5 18.5±
	BH4	89.5 4.5±	82.0 5.1±	83.9 5.0#±	81.1 6.9#±	78.9 7.1#±	69.4 9.4#±
sPVD* (%)	Control	43.8 8.9±	39.5 6.5±	34.2 9.7±	28.2 8.7±	26.4 7.4±	21.6 10.0±
	BH4	44.8 8.7±	38.4 5.7±	39.6 7.4#±	32.9 8.2#±	32.6 6.5#±	25.9 6.4±
MFI*	Control	2.96 0.11±	2.97 0.13±	2.70 0.52±	2.21 0.82±	2.1 0.86±	1.58 0.93±
	BH4	2.97 0.08±	2.86 0.23±	2.920.20#±	2.89 .25#±	2.81 0.30#±	2.410.59#±
htPPV (%)	Control	16.3 10.2±	15.2 5.0±	25.1 18.6±	56.7 6.3±	44.2 36.2±	78.7 52.4±
	BH4	12.9 2.1±	16.7 5.3±	15.5 5.7±	21.5 6.4#±	21.1 7.6±	25.6 8.1#±

CONCLUSIONS. Administration of BH4 improved microcirculatory dysfunction and prolonged survival time in this clinically relevant septic shock model.

0343

DECREASED LACTATE CLEARANCE IS ASSOCIATED WITH MICROCIRCULATORY DISTURBANCES IN A PORCINE SEPTIC SHOCK MODEL

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INTRODUCTION. Persistent hyperlactatemia despite normal hemodynamic at a macrocirculatory level in critically ill patients with septic shock is common and it is related to occult hypoperfusion. Microcirculation is the main anatomic structure involved in the physiopathology of sepsis.
OBJECTIVES. We studied time course of lactate alterations in a porcine model of shock in order to investigate the relationship between lactate clearance and microcirculatory alterations.
METHODS. With permission of the local Animal Experimental Committee and in accordance with the National Guidelines for Animal Care and Handling, 14 female pigs were included in our study. Eight pigs were used for septic shock model (SS), and six pigs for obstructive model (OS). Systemic hemodynamic variables included cardiac output (CO), mean arterial pressure (MAP), central venous pressure (CVP), SvO2. Microcirculation was evaluated in the sublingual, muscle and the intestinal mucosa, using an SDF-imaging device (Microscan, Microvision Medical, Amsterdam, Netherlands). In the microvascular analysis, perfused vessel density (PVD; mm perfused vessel/mm^2 image), proportion of perfused vessels (PPV; mm perfused vessel/mm vessel) and the microvascular flow index were analyzed blindly and randomly using a modification of a semiquantitative score. Measurements were performed at baseline, during shock induction and after resuscitation. Data are presented as median (25–75%).
RESULTS. There were no differences among study groups in mean weight (30.1 ± 2.4 vs. 30.1 ± 2.4 kg). Hemodynamic values between the two experimental groups are presented in Table 1.

Hemodynamic in the two shock models

	Obstructive shock (N = 6)	Septic shock (N = 8)	*P* value
CO (L/min)	3.6 (2.9; 3.9)	3.6 (3.3; 4.1)	0.45
MAP (mmHg)	92 (82; 104)	91 (72; 103)	0.58
HR (bpm)	138 (110; 162)	150 (132; 165)	0.38
CVP (mmHg)	8 (5; 16)	10 (8; 11)	0.94
SvO2 (%)	59 (58; 62)	58 (43; 61)	0.17
Fluids (ml)	335 (180; 600)	700 (542; 1075)	0.38

After initiation of resuscitation, hemodynamic increased towards normalization; lactate clearance was significant lower in septic shock model and was correlated to altered microcirculatory parameters.

Microcirculation and clearance of lactate

	Obstructive shock (N = 6)	Septic shock (N = 8)	*P* value
MFI	2.9 (2.7; 3.0)	1.9 (1.8; 2.7)	0.001
PVD	23 (22; 25)	15 (11; 20)	0.005
PPV	102 (95; 144)	64 (27; 95)	0.002
Clearance of lactate, %	−18 (−20; −15)	+66 [−16; +86)	0.02
Lactate, mmol/L	4.4 (3.6; 4.8)	6.4 (3.1; 6.7)	0.28
BE	−3.4 (−4.0; −2.6)	−4.4 (−6.3; −2.7)	0.22

CONCLUSIONS. Decreased lactate clearance is associated with microcirculatory disturbances in a porcine septic shock model.

0344

MODIFICATION OF TISSUE OXYGENATION MEASURED BY NEAR INFRARED SPECTROSCOPY DURING SEPTIC SHOCK AND BRAIN DEATH

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INTRODUCTION. Vasoplegia due to brain stem cardiovascular regulatory failure in brain-dead patients (BD pts) may lead to a distributive shock similar to septic shock (SS). Covert tissue hypoxia may occur with few clinical techniques to monitor O_2 deficit.
OBJECTIVES. To compare muscle oxygenation in BD and SS pts by measuring microvascular O_2 saturation (StO_2) and microvascular reactivity using a vascular occlusion test (VOT).
METHODS. Prospective, observational pilot study evaluating standard care. 5 BD pts were matched according to age, gender and body mass index with 5 SS and 5 healthy volunteers as control (C). Thenar StO_2 and total hemoglobin index (THI, arbitrary units AU) were measured using a near infrared spectroscopy probe (NIRS, Hutchinson®). VOT was performed as follows: an adult-size pressure cuff was kept inflated for 3 min to 50 mmHg above systolic blood pressure (BP), and occlusion and reperfusion slopes (Δoccl and Δreperf in %/s) of StO_2 were calculated, as well as area under curve (AUC, AU) for occl and repef. O_2 consumption (NIR-VO_2, AU) was calculated as the product of 1/Δoccl and the mean THI over the first min of TOV (1). Demographic and hemodynamic data were collected. Data were expressed as median (min;max), non parametric tests.
RESULTS. BD and SS had occurred respectively for 27 (12; 36) et 24 (24; 48) hrs when StO_2 was measured. Mean BP was 77 (51; 98) mmHg with 0.52 μg/kg/min (0.24;1.1) of norepinephrine (NE) while Hb was 11 (7.3; 13) g/dL and lactates 2.5 (1.5; 4.9) mmol/L for BD. For SS, mean BP was 81 (66; 107) with 0.78 μg/kg/min (0.28; 2.33) NE with Hb at 11.9 (10.8; 12.1) and lactates 4.1 (1.7; 6.7). StO_2 was 82 (67; 89)% and THI 11.1 (5.5; 15.1) for BD vs 84 (50; 93) et 10.8 (8.7; 12.9) for SS. Δoccl were similar in the 3 groups. NIR-VO_2 was higher in this early phase of SS, AUCoccl was larger in BD; Δreperf and AUCreperf were altered in SS (Fig. 1, p < 0.01).

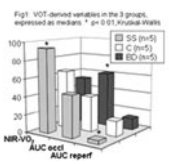

Fig. 1

CONCLUSIONS. Among NIRS derived-tissue oxygenation variables, AUCoccl could appear as a surrogate for O_2 debt during TOV, while NIR-VO_2 seems relevant to describe O_2 utilization disorders. These metabolic differences between BD and SS will need to be confirmed in larger series to test if microcirculation could become a valid therapeutic endpoint for BD resuscitation.
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0345

PASSIVE LEG RAISING CAN PREDICT FLUID RESPONSIVENESS IN PATIENTS PLACED ON VENO-VENOUS EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)

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INTRODUCTION. In mechanically ventilated intensive care patients, fluid responsiveness can be predicted by using passive leg raising (PLR). Veno-venous extracorporeal membrane oxygenation (ECMO) could probably prevent the blood transfer from lower limb and splanchnic compartment induced by PLR.

OBJECTIVES. The purpose of this study was to determine whether PLR can be used to predict fluid responsiveness in patients with acute respiratory distress syndrome (ARDS) treated by veno-venous ECMO.

METHODS. A prospective study was conducted in a teaching hospital surgical intensive care unit. All patients with ARDS treated by veno-venous ECMO exhibited clinical and laboratory signs of hypovolemia. Clinical parameters (heart rate, blood pressure), echocardiographic (aortic velocity–time integral ratio (VTIAo)) and ECMO values were measured at baseline, during passive leg raising and after volume expansion (VE). Stroke volume (SV), cardiac output (CO) and mean pump flow (PO) were measured. Responders were defined by an increase in stroke volume >15% after volume expansion.

RESULTS. Twenty-five passive leg raising maneuvers with volume expansion were performed in 20 patients: 52% (n = 13) were responder to volume expansion (ΔSV > 15%). Clinical characteristics appeared to be similar between responders and non-responders. In the responder group, passive leg raising significantly increased the aortic velocity–time integral ratio (VTIAo), SV, CO and PO ($p < 0.001$). SV variations were most closely correlated with VE-induced SV variations ($r^2 = 0.71$, $p = 0.0001$). A 10% increase in SV during passive leg raising predicted fluid responsiveness with an area under the receiver-operating characteristic (ROC) curve of 0.88 ± 0.07 ($p < 0.0001$), 62% sensitivity, and 92% specificity.

CONCLUSIONS. Passive leg raising predicts fluid responsiveness in intensive care patients supported with veno-venous ECMO for ARDS.

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0346

EFFECTS OF DOBUTAMINE ON MICROCIRCULATION, REGIONAL AND PERIPHERAL PERFUSION IN SEPTIC SHOCK PATIENTS: A RANDOMIZED DOUBLE BLIND CROSSOVER TRIAL. PRELIMINARY REPORT

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INTRODUCTION. The role of dobutamine during septic shock resuscitation is still controversial since most clinical studies have been uncontrolled, and no physiological study has unequivocally demonstrated a beneficial effect on tissue perfusion.

OBJECTIVES. Our aim was to explore the acute effects of dobutamine on microcirculatory parameters during early septic shock resuscitation. In addition, we evaluated effects on cardiovascular, metabolic, peripheral and regional perfusion parameters. A change in perfused vascular density (PVD) was considered as the primary outcome parameter.

METHODS. We designed a randomized, double blind crossover, placebo-controlled study looking at the acute physiologic effects of 2.5 h infusion of dobutamine (5 mcg/kg/min fixed-dose) or placebo. Major inclusion criteria were early septic shock with current NE requirements, hyperlactatemia, cardiac index (CI) > 2.5 l/min/m2, and sinus rhythm. At baseline and after each infusion period, the following parameters were determined: transthoracic echocardiography; PAC-derived hemodynamic variables; metabolic parameters such as lactate, mixed venous O2 saturation (SvO2), venous-arterial pCO2 gradient; NIRS thenar StO2 and vascular reactivity after a vascular occlusion test (VOT); SDF microcirculatory assessment; peripheral perfusion including capillary refill time (CRT) and central-toe temperature gradient (Tc-toe); gastric tonometry; plasma disappearance rate of indocyanine green (ICG-PDR). We calculated that 20 septic shock patients would be required to detect a difference of 0.6 perfused vessels (n/mm2) with a SD of 0.9 (n/mm2). Statistical analysis included Wilcoxon test.

RESULTS. The first 8 patients (age 63 ± 17, APACHE 30 ± 7, SOFA 12 ± 3, abdominal source 50%, ICU mortality 1/8) are presented. Dobutamine compared to placebo significantly increased microvascular flow index (MFI) (1.8 ± 0.7–2.4 ± 0.4), CI and left ventricular ejection fraction. No other microcirculatory parameter exhibited significant changes. Dobutamine exhibited also non-significant trends to reduce Tc-toe (9.4 ± 3.3–8.3 ± 3.9°C), CRT (5.6 ± 3.3–4.6 ± 3.3 s), venous-arterial pCO2 gradient (5.6 ± 2.2–4.6 ± 1.2), and lactate 3.0 ± 1.1–2.8 ± 1.3. In contrast, ICG-PDR and gastric tonometry tended to deteriorate during dobutamine infusion and did not change during placebo. Thenar StO2 recovery slope after VOT significantly increased with placebo (2.2 ± 1.3–2.6 ± 1.6%/s).

CONCLUSIONS. In this preliminary report we observed a significant effect of dobutamine in improving cardiovascular performance, but only MFI within microcirculatory parameters. Divergent effects of dobutamine on peripheral and metabolic perfusion parameters compared to hepatosplanchnic-related perfusion parameters were observed, but should be confirmed with the whole sample. (ClinicalTrials.gov Identifier: NCT01271153).

GRANT ACKNOWLEDGMENT. FONDECYT 1100610 (Chile).

Airway management & ventilatory manoeuvers in acute respiratory failure: 0347–0357

0347

EFFECTS OF RECRUITMENT MANEUVER AND DIFFERENT TIDAL VOLUME ON ENDOTHELIUM-DEPENDENT RELAXATION OF PULMONARY ARTERIES RINGS IN RATS WITH ACUTE LUNG INJURY

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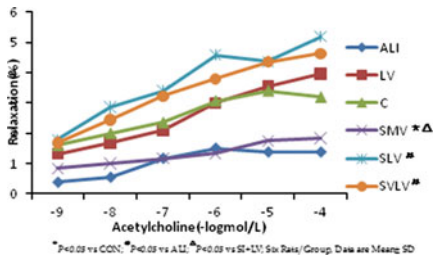
INTRODUCTION. As the primary factor inducing pulmonary hypertension, pulmonary arteries vasomotor dysfunction is caused by impairing the function of pulmonary arterial endothelium in ALI patients. Recruitment maneuvers (RMs) and low tidal volume(Vt) were effective on ALI/ARDS patients. However, effects of RMs and low Vt on the pulmonary arterial vasomotor function are unknown.

OBJECTIVES. To evaluate pulmonary arterial vasomotor function and discuss the mechanisms at post-recruitment maneuvers with low Vt ventilation in rats with ALI model.

METHODS. ALI rat model was induced by intravenous infusion lipopolysaccharide (6 mg/kg). Thirty-six rats were randomly divided into, (1) control group; (2) ALI group; (3) low Vt group (Vt 6 ml/kg); (4) sustained inflation(SI) with low Vt group (Vt 6 ml/kg); (5) SI with moderate Vt group(Vt 12 ml/kg); (6) SI with very low Vt group(VT 3 ml/kg).
RMs was carried out by SI, airway pressure 30 cmH_2O for 30 s; PEEP was set to 5 cmH_2O. Mean arterial blood pressure (MAP) and blood gas analysises were monitored during the experiment process. The rats were killed by exsanguinations after 5 h. The pulmonary levels of Endothelin-1 (ET-1), endothelial nitric oxide synthase(eNOS) and TNF-α were assessed. Acetylcholine(Ach)-induced endothelium-dependent and sodium nitroprusside(SNP)-induced endothelium-independent relaxation response of isolated pulmonary artery rings were measured by tensiometry.

RESULTS. There was no difference within groups concerning blood pressure and PCO_2 and SNP-induced endothelium-independent relaxation response of isolated pulmonary artery rings. Compared to the other groups, LPS could impair the Ach-induced endothelium-dependent relaxation response in pulmonary vascular. Compared to SI with moderate Vt groups, SI with low Vt could reduce ET-1 level (113.79 ± 7.33 vs. 152.52 ± 12.75 pg/ml, $P < 0.05$) significantly, tended to increase the expression of eNOS (IOD: 15032.05 ± 5925.07 vs. 11454.32 ± 6035.47, $P > 0.05$), reduce the level of TNF-α (3305.09 ± 334.29 vs. 4144.07 ± 608.21 ng/ml, $P < 0.05$) and ameliorated dysfunction of endothelium-dependent relaxation in pulmonary vascular.



Ach-induced endothelium-dependent relaxation

CONCLUSIONS. RMs with low Vt could protect the lung vascular endothelial diastole function from ALI, the mechanisms were they might decrease the vasoconstrictor factors, increase the expressions of vasodilator factor and inhibit the inflammation reactions. It suggested that RMs and low tidal volume should improve pulmonary hypertension of ALI/ARDS patients.

0348

VENTILATORY DEMANDS AFTER RECOVERING OF ACUTE RESPIRATORY FAILURE IN CONSCIOUS VENTILATED PATIENTS

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INTRODUCTION. Ventilatory parameter on volume assist-control mechanical ventilation (ACV) during weaning are not easy to define.

OBJECTIVES. In non sedated mechanically ventilated patients we study the ventilatory parameters for completed respiratory unload on ACV and compare with the respiratory pattern during a CPAP trial

METHODS. Patients who needed assisted mechanical ventilation for weaning were studied. During a daily spontaneous breathing trial using CPAP, signals were registered from the ventilator (flow, volume, airways pressure and maximal diaphragmatic electrical activity (EAdi.max) and change to ACV mode setting the same parameters registered during CPAP. Tidal volume (Vt) and inspiratory flow (V'I) were increased on 100 ml and 0,1 l/s steps respectively until complete respiratory unload, defined as no clinical respiratory distress, EAdi.max lower than 10 microV and lineal airways pressure during the constant phase of inspiratory flow.

RESULTS. 10 patients were studied, after recovering of acute respiratory failure (n.6), acute on chronic respiratory failure (n.2), acute heart failure (n.1) and polineuropaty (n.1). Ers was 32 ± 8 l/cmH2O and Rrs 26 ± 10 cmH2O/l/s. On CPAP all patients showed respiratory distress, with high work of breathing (WOB) and EAdimax 24 ± 11 micrV. After change to ACV patients showed higher respiratory distress, EAdimax increased to 29 ± 15 mcrV ($p < 0.05$), although WOB and respiratory rate did not increased (2.1 ± 1.0 vs. 1.9 ± 0.9 j/l and 30 ± 6 vs. 31 ± 6 bpm). For completed respiratory unload tidal volume and inspiratory flow were increased from 5.2 ± 1.4 to 10.6 ± 1.9 ml/k and 0.5 ± 0.1 to 0.7 ± 0.2 l/s ($p < 0.05$). The respiratory rate decreased from 30 ± 6 to 17 ± 2 bpm and EAdi waves were not evident, minute ventilation and inspiratory time were 9.1 ± 1.7 vs 10.6 ± 2.1 l/m and 0.60,1 vs. 0.7 ± 0.1 s ($p = 0.03$) in both modes.

CONCLUSIONS. Ventilatory needs are similar in ventilated patients compare with spontaneous breathing, however the ventilator parameters should be optimized in order to keep synchrony with the ventilator.

0349

ALVEOLAR RECRUITMENT MANEUVERS IN PATIENTS WITH COMPLICATED THORACIC TRAUMA

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INTRODUCTION. Quite often ALI is followed by development of unilateral or bilateral pneumothoraces either as a result of the traumatic injury to lung tissue or as a result of CMV. In this situation, clinicians are faced with two problems. On the one hand, it may be necessary to utilize high airway pressure to provide a satisfactory oxygenation. On the other hand, these high airway pressures may worse the underlying pneumothorax and delays its evacuation. Poor pulmonary compliance prevents the use of modern highly effective methods of respiratory therapy such as alveoli recruitment maneuvers, prone position and others.

OBJECTIVES. To study the efficiency of BIPAP and SIMV with alveolar recruitment maneuvers (ARM) in patients with acute lung injury and concomitant pneumothorax.

METHODS. 74 patients with ALI and concomitant pneumothorax secondary to blunt thoracic injury were studied. All patients fulfilled criteria for the first stage of acute respiratory distress syndrome (ARDS), which consisted of acute onset dyspnea, isolated rales, an extravascular lung water index >7 ml/kg, and an oxygenation index <300 mmHg in the absence of left-ventricular dysfunction. After evacuation of the pneumothorax, ARM were performed using BIPAP or SIMV 3-5 times a day with a peak pressure of 36.4 ± 0.2 cmH_2O and a PEEP 16.1. ± 0.2 cmH_2O. We defined the groups and subgroups as follows: Group A: BIPAP (n = 38), Group B: SIMV (n = 36), Subgroup A1: BIPAP + ARM (n = 19), Subgroup A2: BIPAP without ARM (n = 19), Subgroup B1: SIMV + ARM (n = 18), Subgroup B2: SIMV without ARM (n = 18).

RESULTS. The use of BIPAP in patients with ALI and concomitant pneumothorax reduced the time to resolution of the air leak allowing application of earlier ARM.M with peak pressures of 35–40 cmH_2O effectively improved oxygenation and biomechanical properties of lungs in patients with serious complicated thoracic trauma and did not cause pneumothorax relapse thus reducing the rate of complications and the duration of controlled ventilation.

CONCLUSIONS. Since BIPAP allowed for spontaneous ventilation during the breathing cycle and limited Ppeak, its use was associated with more rapid sealing of air leaks with the ability to conduct earlier alveolar recruitment. The use of BIPAP compared with SIMV improved outcome in the presence of complex thoracic trauma.

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0350

NASAL HIGH FLOW OXYGEN ADMINISTRATION MIGHT BE RISKY IN CONJUNCTION WITH ENDOTRACHEAL INTUBATION

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INTRODUCTION. Endotracheal intubation in patients with acute respiratory failure is associated with about 20 percent complication rate and many of the complications are caused by hypoxemia during the apneic period at the intubation attempt. Thus, it would be advantageous to improve and prolong the time for adequate oxygenation during this period. Non-invasive ventilation with positive end-expiratory pressure (PEEP), continuous positive airway pressure (CPAP), and pharyngeal oxygenation administration have all separately been found to reduce the incidence of hypoxemia during intubation. Nasal high flow oxygen (NHFO) has been found to create CPAP in the pharynx in addition to ensuring high oxygen concentration in the nasopharynx. We therefore hypothesized that NFHO would be an ideal method to prevent hypoxemia in conjunction with intubation.

OBJECTIVES. The aim of this pilot study was to test this hypothesis in an acute respiratory failure model.

METHODS. Six anesthetized, paralysed, endotracheally intubated and mechanically ventilated pigs (24.5–26 kg) were lung-lavaged. This created an intrapulmonary shunt of 24–45%. The animals received in randomised order after extubation (with the laryngoscope positioned in the pharynx) nasal low flow oxygen (NLFO) (10 L/min) and NHFO (65 L/min) or vice versa, and the time to desaturation to 60% as obtained by pulse oximetry was registered. If desaturation to 60% did not occur the experiment was stopped at 10 min. The pressure in the pharynx was measured ("CPAP") and any gastric distension was assessed by emptying the stomach with a gastric catheter.

RESULTS. In only half of the occasions CPAP > 3 cmH_2O could be achieved with NHFO. The lowest calculated shunt at ZEEP was 24% in one pig. In this pig both NLFO and NHFO gave adequate SpO_2 as well as PaO_2 (>8 kPa) for 10 min. The other pigs had a shunt 27 percent or higher. In two of these pigs CPAP with NHFO could be kept above 4 cmH_2O and SpO_2 could be kept >8 kPa for 10 min compared with NLFO where SpO_2 decreased to below 60% at 105 and 107 s. In the other pigs desaturation occurred within 90 s both with NHFO and NLFO. In the two pigs with highest CPAP (4 and 5 cmH_2O) marked gastric distensions occurred as evaluated by tense bags connected to a gastric catheter.

CONCLUSIONS. In this porcine ARF model, we found that NHFO provides an unpredictable effect on CPAP and oxygenation during apnea, as well as a marked gastric distension. Although the results may not be directly translated to man, they do not encourage the clinical use of NHFO during laryngoscopy at endotracheal intubation.

0351

A CLINICAL PATHWAY LEADS TO SMALLER TIDAL VOLUMES, BUT NOT TO TARGET TIDAL VOLUMES, IN PATIENTS WITH, OR AT RISK FOR, ACUTE RESPIRATORY DISTRESS SYNDROME

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INTRODUCTION. The acute respiratory distress syndrome (ARDS) is characterized by acute onset, severe hypoxemia (PaO_2/FiO_2 ratio <200 mmHg) and bilateral infiltrates on the chest X-ray, not caused by cardiac failure. Patients with sepsis, trauma, multiple transfusions, (aspiration)pneumonia, burns, etc., are at risk for ARDS.

Mechanical ventilation strategies in patients with, or at risk for, ARDS should be aimed at reduction of tidal volumes (1,2). In daily practice tidal volumes (TV) are often too large (3).

OBJECTIVES. To investigate if a clinical pathway leads to smaller TV in mechanically ventilated patients with, or at risk for, ARDS.

METHODS. This prospective single centre study included 104 patients (18 years and older) with, or at risk for, ARDS. Pressure control and pressure support ventilator modes were used. TV were monitored in the first 24 h of mechanical ventilation.

In the study group, 50 patients, a clinical pathway was used to attain the target TV of 6 ml/kg PBW (predicted body weight). Arm span was used to determine body height, PBW and target TV (4). TV was checked at least every hour and, when required, inspiration pressure was adjusted by the ICU nurse. Minimum inspiration pressure was 5 cmH_2O above PEEP. Patients *not* at risk for ARDS were ventilated with a target TV of 8 ml/kg PBW.

In the control group, 54 patients, a standard ventilation policy was used.

RESULTS. Average TV in the studygroup was 7.9 (±1.0 SD) ml/kg PBW as opposed to 8.8 (±1.1 SD) ml/kg PBW in the controlgroup ($p < 0.0001$). Average TV in the subgroup of ARDS patients (n = 7) was equal to the entire studygroup (n = 50), 7.9 ml/kg PBW (p 0.44). All 7 ARDS patients were correctly assigned to 6 ml/kg PBW while only 27 of 43 patients at risk for ARDS were correctly assigned to 6 ml/kg PBW. Apparently there is a strong motivation to order small TV in ARDS but considerably less in patients at risk for ARDS.

Actual TV exceeded target 6 ml/kg TV in 28 of 34 patients, caused by inadequate alertness in adjusting inspiratory pressure. Strikingly (wrongly ordered) 8 ml/kg target TV were much better attained than (rightly ordered) 6 ml/kg, 88 versus 18%.

In 2 patients actual TV exceeded target 6 ml/kg TV despite minimum inspiratory pressure caused by large respiratory drive.

CONCLUSIONS. A clinical pathway leads to smaller tidal volumes, but not to target tidal volumes, in patients with, or at risk for, acute respiratory distress syndrome.

What is needed to attain the target 6 ml/kg TV? Firstly, more studies confirming the benefits of small TV in patients *at risk* for ARDS so physicians will be more motivated to order them. Secondly, TV alertness and frequent adjustment of inspiratory pressure or perhaps the use of pressure regulated volume control modes.

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0352

SPECIFIC INSPIRATORY MUSCLE TRAINING IS SAFE IN SELECTED VENTILATOR-DEPENDENT PATIENTS: A CASE SERIES

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INTRODUCTION. Mechanical ventilation of intensive care patients results in inspiratory muscle weakness (Chang et al. 2005) which may hinder ventilatory weaning and contribute to high healthcare costs. Inspiratory muscle training has been used effectively to treat inspiratory muscle weakness in patients with chronic lung disease, as well as to improve exercise performance in endurance athletes. Several studies have demonstrated favourable outcomes for inspiratory muscle training in ventilated patients, including increased inspiratory muscle strength and a reduction in weaning duration (Cader et al. 2010), however, no studies have specifically described the physiological response to training and there is little data regarding the incidence of adverse outcomes as a result of training.

OBJECTIVES.

1. To determine whether inspiratory muscle training is safe in selected ventilator-dependent patients in terms of both physiological variables (heart rate, mean arterial pressure, oxygen saturation and respiratory rate) and incidence of adverse events. 2. To determine whether inspiratory strength improves from baseline to weaning as a result of a high-intensity, strength-based inspiratory muscle training regime.

METHODS. Under supervision from the physiotherapist, 10 medically stable ventilator-dependent adult patients, who were alert and able to cooperate with training, completed inspiratory muscle training 5–6 days per week. A commercially available threshold device was attached directly to the tracheostomy without supplemental oxygen. Each session comprised 3–6 sets of 6 breaths at an intensity of between 6 and 8 out of 10 (rate of perceived exertion, modified Borg scale), increased by 2–4 cmH_2O incrementally to maintain rate of perceived exertion ≥6.

RESULTS. No significant changes in heart rate (MD 1.3 bpm, 95% CI −2.7 to 5.3), mean arterial pressure (MD -0.9 mmHg, 95% CI -6.4 to 4.6), respiratory rate (MD 1.2 bpm, 95% CI −1.1 to 3.5 bpm) or oxygen saturation (MD 1.2%, 95% CI −0.6 to 3.0) were detected. Of the 195 sessions studied, no adverse events were recorded. Training pressures increased significantly (MD 18.6 cmH_2O, 95% CI 11.8–25.3).

CONCLUSIONS. Threshold-based inspiratory muscle training can be delivered safely in selected ventilated patients and is associated with increased inspiratory muscle strength. Inspiratory muscle training should be considered a safe and feasible treatment option for stable and co-operative ventilator-dependent patients.

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0353

COMPLIANCE WITH ARDSNET TIDAL VOLUME VENTILATION STRATEGY

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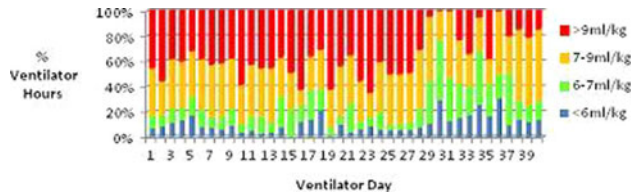
INTRODUCTION. Large tidal volumes (Vt) of 10–15 ml/kg may result in stretch induced lung injury. The Adult Respiratory Distress Syndrome Network (ARDSnet) found reducing Vt to 6 ml/kg reduced hospital mortality[1]. Determann studied patients without acute lung injury (ALI) and found sustained cytokine release in the high Vt group[2].
Roche found many intensive care units across the UK slow to implement the ARDSnet strategy[3].
OBJECTIVES. This study aimed to review current Vt delivery and assess compliance against ARDSnet guidelines.
METHODS. All ventilated patients admitted to University Hospital Aintree (01/09/2010-30/11/2010) critical care unit had their Vt recorded hourly. Their height was measured and ideal body weight calculated. The ideal Vt (7 ml/kg) was compared to the actual recorded hourly tidal volume.
RESULTS. 63 patients were reviewed accruing 6,499 ventilator hours. 77.6% of all ventilator hours were above 7 ml/kg and 43.1% were above 9 ml/kg.



Tidal volume delivery per ventilator day

There was no difference according to ventilatory mode when delivering 7–9 ml/kg. 21.2% of assisted spontaneous and 30.3% of pressure control delivered volumes were greater than 12 ml/kg. Volume delivery did not vary with duration of ventilation.
CONCLUSIONS. 10 years on there is a failure to adhere to ARDSnet guidelines. Education is required to improve delivery of lung protective Vt and impact on the development of new ALI, duration of ventilation and ICU length of stay.
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0354

REASONS FOR AND OUTCOME OF MULTIPLE INTUBATIONS IN A MEDICAL ICU

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INTRODUCTION. Multiple intubations are a risk factor for nosocomial pneumonia and can be used as an indicator of quality of care in ICU. Analysis of the cases of multiple intubations is mandatory to set up a program of prevention of multiple intubations.
METHODS. All patients undergoing at least one intubation during ICU stay were prospectively enrolled over a 1-year time period. Patients were excluded from analysis if mechanical ventilation was withdrawn for ethical reason. Mechanical ventilation weaning was performed in our 18-bed medical ICU according to a standardized protocol, in respect with the guidelines of the 2007 international consensus on weaning of mechanical ventilation [1].
RESULTS. Among the 197 patients requiring mechanical ventilation between February 2010 and February 2011 who could be extubated at least once, 38 (19%) endured multiple intubations: 33 were reintubated once, three twice and two three times. Reintubation was performed during the first day after extubation for 21 (55%) patients. Reasons for reintubation were: pneumonia (26%), coma (16%), weaning failure of COPD patients (13%), laryngeal dyspnea (13%), respiratory distress after unplanned extubation (11%), cardiac arrest (8%), pulmonary oedema (5%), need for an invasive procedure (5%), septic shock secondary to catheter infection (3%). Reintubation was required in 9 of the 19 (47%) unplanned extubation versus 29 of the 178 (16%) planned extubations (p 0.03). Post-extubation non invasive ventilation was performed in 12 patients; seven were reintubated. Nosocomial pneumonia occurred in 18 (47%) patients with multiples intubations, versus 11 (7%) of the patients who had not been reintubated ($p < 0.001$). ICU mortality rate was 50% among patients with multiples intubations, versus 16% among the patients who had not been reintubated ($p < 0.001$).
CONCLUSIONS. Multiple intubations are frequent and are associated with morbidity and mortality. Most of the reintubations occurred during the first 24 h following extubation. Studies investigating specifically the risk factors for extubation failure should be performed to improve the currently used "ready to extubate" criterion.
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0355

PRONE POSITION VENTILATION IN A PORTUGUESE INTENSIVE CARE UNIT

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) is a challenging condition leading to the study of many different ventilation strategies among which prone position ventilation (PPV) is included. In our intensive care unit (ICU), PPV is frequently used to improve oxygenation of patients with ARDS or acute lung injury (ALI).
OBJECTIVES. To evaluate the results of our PPV protocol for ARDS/ALI.
METHODS. We performed a retrospective observational study of all patients submitted to prone position ventilation (PPV) in our ICU, between January 2004 and December 2009. Review of clinical information and data collection in a Filemaker Pro® database. Statistical analysis was performed with PASW Statistics 18.
RESULTS. We reviewed 31 patients, of which 1 was excluded. PPV was used for 34 times. Thirteen patients were females with a median age of 60 years (18–91). The median Simplified Acute Physiology Score II (SAPS II) was 48.0 with a mean Acute Physiology and Chronic Health Evaluation II (APACHE II) score of 26,0. The median Sequential Organ Failure Assessment (SOFA) before PPV was 9.0 and the median delta SOFA was 0,0. The mean tidal volume before supine positioning was 6.3 ml/kg and the mean PEEP was 11.6 mmHg. The median time of PPV was 22.5 h with a minimum of 3.5 h and a maximum of 78. The median PaO_2/FiO_2 ratio before PPV was 78 with a maximum of 138. The median increase in PaO_2/FiO_2 ratio with PPV was 77.9 mmHg.
When we analyze the difference between volume (VM) and pressure (PV) modalities, we found that 53.1% of patients were ventilated in a VM before PPV.
When comparing the differences in the SOFA before PPV, APACHE II, SAPS II and the PaO_2/FiO_2 ratio between this two groups, we found no significant differences (p values were respectively 0.08, 0.587, 0.55 and 0.82). The mortality was 63.2% in the ones ventilated in a VM and 81.8% for the ones ventilated in a PM. This difference wasn't statistically significative ($p = 0.36$).
Seven patients maintained a PaO_2/FiO_2 ratio below 100 and 9 increased this ratio above 200 mmHg. In the group of patients with a positive delta PaO_2/FiO_2 ratio (25 patients) 36% survived, while the ones with a negative ratio (4) died. Complications were edema or skin lesions of support zones in the torso and face.
CONCLUSIONS. Prone positioning improved PaO_2/FiO_2 ratio with the majority of the patients improving this ratio to above 100 mmHg. Evident oxygenation benefit associated with absence of severe complication makes PPV a good option for allowing ARDS recovery situation. This study cannot predict benefits in mortality, as it wasn't controlled.

0356

AUDIT OF THE ADDITION OF TRIGGERS FOR OXYGEN REQUIREMENTS AND OXYGEN SATURATION TO MEWS

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INTRODUCTION. MEWS has been used on the wards at the Royal Liverpool University Hospital for several years. However it has been suggested that some elements are too sensitive and there has been some criticism that supplementary oxygen required or oxygen saturation are not included in the score. Following recommendations in NICE CG 50 "Recognition of and response to acute illness in adults in hospital" regarding the use of early warning scores and calling criteria, it was decided to modify the current scoring system to incorporate oxygenation and also to improve the calling criteria.
OBJECTIVES. To determine the effect of the proposed changes to the MEWS and also to determine the effectiveness of the proposed calling criteria.
METHODS. A multiprofessional group set up to act on NICE CG 50 proposed changes to the MEWS to include oxygen saturation on room air, oxygen or non invasive respiratory support or FiO_2 required. It was felt that whichever component gave the highest score should be included in the patient's total MEWS score. The respiratory rate component was also changed to make it less sensitive.
200 sets of observations were collected from a range of level 0, 1 and 2 patients within the hospital. The MEWS was calculated using the current scoring system and the proposed new one, comparing the score achieved if oxygen saturation was used to the score achieved if FiO_2 was used. The number of patients who triggered on respiratory rate was also investigated to ensure that the changes made did not mean that appropriate patients failed to trigger.
RESULTS. Using the current MEWS 9 patients triggered. Using oxygen saturation as an additional component 19 patients triggered, and using FiO2 required 13 patients triggered. Changing the respiratory rate component did not alter the number of patients who triggered. It was felt that for the patients reviewed in this audit, the proposed calling criteria was appropriate.
CONCLUSIONS. The introduction of an oxygen component to the MEWS, in the form of FiO2 required or oxygen saturation, does increase the number of patients who will trigger further input ensuring that some patients who may not have triggered using the previous scoring system receive timely review and intervention.
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0357

LUNG-PROTECTIVE VENTILATION 10 YEARS AFTER THE ARMA-TRIAL. AUDIT OF A LUNG-PROTECTIVE VENTILATION STRATEGY IN A GENERAL ICU

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INTRODUCTION. The ARMA study [1] and a subsequent systematic review [2] demonstrated a mortality benefit when patients with ARDS or ALI were ventilated with lower tidal volumes and lower plateau pressures. "Lung-protective ventilation" has since been widely adopted in the care of general ICU patients.

OBJECTIVES. After a survey of the practice in our ICU at the Royal Cornwall Hospital in 2007 a lung-protective ventilation strategy was introduced. We audited compliance with this strategy.

METHODS. Data was collected for the first 72 h of invasive, mandatory ventilation on ICU in all patients admitted during April 2010. Audit criteria were set from the current departmental guideline as follows: (1) Documentation of patient's height; (2) Adherence to ideal tidal volume range (6–8 ml/kg); (3) Minimum PEEP of 5 cmH2O; (4) Plateau airway pressure <35 cmH2O.

RESULTS. 20 patients with a variety of medical and surgical presentations were audited. Data was collected for a total of 544 ventilator hours. Median age was 64.5 years (range 33-84). 16 patients were male and 4 female. 1) 19/20 patients had their height documented on the chart (95% compliance). 2) The percentage of total patient hours audited where recorded tidal volumes were inside the range 6–8 ml/kg was 56%. However the tidal volume only exceeded 8 ml/kg 24% of the time (56% compliance). 3) PEEP was <5 cmH_2O for 5/544 patient hours ventilated (99% compliance). 4) Peak pressures were <35 cmH2O in all patients at all times (100% compliance)

CONCLUSIONS. The results of this audit are encouraging and demonstrate an overall improvement in lung-protective ventilation. The audit process highlighted the complexity of auditing tidal volumes where pressure support and assisted support breath modes are used. It revealed a discrepancy in our bedside guideline which may have contributed to the lower compliance to the tidal volume range. It led to the development of a more efficient data collection tool for use in future audits. Lung protective ventilation remains an important dimension of ICU care and this audit provokes new discussion of the topic which will lead to refinement of the departmental guidelines and hopefully an improvement in compliance during future audits.

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0359

ADULT RESPIRATORY DISTRESS SYNDROME IN PREGNANCY AND IMMEDIATELY POSTPARTUM POPULATION COMPARED WITH A NON-PREGNANT COHORT

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INTRODUCTION. ARDS has been associated with high mortality. Pregnancy is associated with hormonal anatomical and immune changes. We present our experience in 23 patients with ARDS occurred during pregnancy or with an immediately postpartum period compared with a historical non-pregnant female cohort with ARDS.

OBJECTIVES. To establish influence of pregnancy over mortality and outcome of ARDS.

METHODS. A retrospective review of prospectively collected data was performed on all admitted obstetric patients who developed respiratory failure. From January of 2002 until December of the 2010, twenty-three pregnant and immediately postpartum patients of a total of 300 obstetric patients developed ARDS defined according ARDS net criteria. We compared this group with an historical comparable cohort group with a similar APACHE index, same sex, and age between 18 and 50 years old. Twenty-three pregnant patients (G1), and 19 non-pregnant patients (G2: control group), were compared. We analyze among others variables: age, APACHE II score, initial diagnostic, cause of ARDS, week of pregnancy, Multiple Organic Failure, corticotherapy (Meduri protocol), use on non invasive mechanical ventilation, ICU complications, days in ICU, days of mechanical ventilation and ICU mortality. The Fisher Test and Spearman correlation was used for the study of the variables. A $p < 0.05$ was considered statistically significant.

RESULTS. Twenty-three pregnant patients (G1), with ARDS were compared with 19 non-pregnant patients (G2: control group). Compared with control group, pregnant patients with ARDS had a less mortality (G1: 7%, G2; 42% $p = 0,012$). Instead of differences in the mean of each age group (33 ± 6.286 G1; 38 ± 8.082 G2 $p = 0,004$), both groups had a similar APACHE score (12 ± 5.469 G2; 11 ± 4.905 G2 $p =$ NS). Shock was more frequent associated with pregnant woman (G1: 70%, G2; 37% $p = 0,034$). We did not found differences among other studied variables.

CONCLUSIONS. Mortality in pregnant women who developed ARDS was lower than those non-pregnant female patients with ARDS. Maybe physiologic changes observed during pregnancy or other unknown factors could be exert a protective effect against inflammatory response associated to ARDS.

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Ventilation in different conditions, fluid management & lung water measurements: 0358–0371

0358

RESPIRATORY MANIFESTATIONS OBSERVED IN HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS

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INTRODUCTION. Respiratory manifestations seem to be frequent in the course of hemophagocytic lymphohistiocytosis (HLH) but have never been described precisely.

METHODS. Retrospective analysis of 64 patients fulfilling the HLH-2004 criteria, admitted to Saint-Louis hospital intensive care unit between 2000 and 2010. We report 59 patients with respiratory manifestations.

RESULTS. Median age was 48 years (35–56) and 88% of the patients were male. Sixty-two episodes of HLH were analysed for the 59 patients. Respiratory manifestations existed at the onset of HLH for half of the patients or occurred within the first 7 days (3.75–16]. Dyspnea (77%) and cough (40%) were the more frequent symptoms. Six patients had hemoptysis. The median respiratory rate was 30/mn (24–36). Lung auscultation revealed diffuse (37.7%) or focal (23%) crackles or pleural syndrome (39%). Chest radiographs showed bilateral alveolar or interstitial infiltrates (60%) and pleural effusions (31%). High-resolution computed tomography, performed for half of the patients, revealed consolidations (45%), nodules (42%), ground glass opacities (18%) or pleural effusions (57%). ICU admission was justified by respiratory failure for 40 cases. Median SOFA score at admission was 6 (4–7). Thirty-four (54%) patients required mechanical ventilation during 4 days (2–9) with a median PaO_2/FiO_2 ratio at admission of 214 (138–330). The median number of organ failures (respiratory and haematological failures excluded), was 2 (1–3). Fever, bicytopenia, spleen enlargement, hypofibrinemia and hypertriglyceridemia were present in respectively, 53/62, 45/62, 44/62, 11/45 and 18/40 cases. Median lactate deshydrogenase and ferritin concentrations were 1,200 UI/L (664–2,554) and 4,689 µg/L (2,788–9,027]. The immune deficiency underlying HLH was known for 54 patients: HIV infection (40%), haematological malignancy (46%), other (3%). Precipitating factor was diagnosed for 59/62 cases: one or more infections for half of the cases (bacteria 12, virus 12, fungi 8, tuberculosis 6, parasite 3) and the onset of an haematological malignancy (30). The origin of respiratory manifestations was infections (26/62), specific pulmonary involvement by the malignancy (10), overload (16) and pulmonary embolism (2). Among 20 bronchoalveolar lavages, 8 led to diagnosis, mainly infections. Diagnosis of 7 hematological malignancies was obtained through 12 pleural fluid examinations and was associated with pleural HHV8 replication in 4 cases. For 11 cases, there was no cause but HLH to explain respiratory manifestations. Fifty-five patients received specific HLH treatments and 57 received antimicrobial therapy. Respiratory improvement occurred in 31 cases and mortality rate was 45%.

CONCLUSIONS. For patients with HLH who require an ICU admission, respiratory manifestations occur frequently and early. Their origins are multiple but can sometimes be a specific HLH feature.

0360

A DIAGNOSTIC CHALLENGE: AN INTENSIVIST PERCEPTIVE OF INTERSTITIAL LUNG DISEASE

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INTRODUCTION. Interstitial lung disease(ILD) seems to be a more frequent manifestation in patients with polymyositis and dermatomyositis than previously reported.

METHODS. 29 year Zimbabwean lady presented with progressive SOB. She presented with a type1 respiratory failure with pO2-8, pCO2-4.6, HCO3-24, BE:-4, pH7.33, lactate 2.4 on FiO2 of 1. She was transferred to HDU for CPAP. In view of persistent hypoxia, CTPA revealed no pulmonary embolus, but extensive consolidation with ground glass shadowing. She was treated empirically as an atypical pneumonia awaiting investigation. However, her gas exchange deteriorated and had to be intubated, ventilated and paralysed. Investigations revealed ESR 36, creatinine 67, normal LFTs, calcium, Hb. 14, WCC 5.3, platelets 300, MCV 85.6, normal TSH, CRP 36, ANA, anti Jo and RF negative with normal C3C and C4and raised cRP100. ANA, rheumatoid factor, anti CCP and ANCA negative She is asthma with good control. She was not known diabetic, no TB. Her HIV test was negative. She developed joint pain felt in the wrists, PIP, MCP and TIP joints. Magnetic resonance imaging of upper limb showed inflammatory change in the triceps muscle bilaterally. She was diagnosed to have connective tissue disease- polyarthralgia. Her FEV1 was 47.3%, FVC 48.8%, TLCO 44.5%, KCO 100.2%.

Patient gas exchange deteriorated and her Pinsp.support 35 to improve oxygenation and gas exchange. She was switched over to oscillator on day 5. Respiratory syncytial virus RNA, parainfluenza virus RNA, Adenovirus DNA, Rhinovirus RNA and Meta-pneumovirus DNA, Influenza A, B RNA, Swine-lineage Influenza A RNA were not detected by RT-PCR in the right upper lobe bronchial washing. Bronchial washings showed large numbers of degenerate respiratory and inflammatory cells, alveolar macrophages and rare multinucleated cells. A further CT confirmed progressive fibrosis. She was started on high dose steroids, cyclophosphamide in view of aggressive pulmonary fibrosis. She was discussed for a lung transplant with a tertiary centre. Unfortunately, she died on day 8.

RESULTS. Atypical presentation, subtle signs and symptoms, significantly varied spectrum poses a diagnostic challenge to the Intensivists. A high suspicion index and early immunosuppression, referral to lung transplant could make significant difference to prognosis.

CONCLUSIONS. 27% of the patients with myositis with ILD were asymptomatic; inversely, two-thirds of the patients without any signs of ILD on radiograph/HRCT or reduction of lung volumes had either cough or dyspnea. The strongest predictive factor for ILD in patients with myositis is the presence of positive anti-aminoacyl tRNA synthetase antibodies, of which the anti-histidyl tRNA synthetase antibody (anti-Jo1) is the most frequently found. The reported frequency of ILD in patients with anti-Jo1 antibodies is more than 70%. Lung transplant is only definitive treatment required in this cohort.

0361

EFFECTS OF POSITIVE END-EXPIRATORY PRESSURE ON INTRA-ABDOMINAL PRESSURE IN PATIENTS WITH ABDOMINAL SURGERY

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AIM. To investigate the effects of positive end-expiratory pressure (PEEP) on respiratory function and hemodynamics in patients with abdominal diseases associated with intra-abdominal hypertension (IAH).

METHODS. Sedated and mechanically ventilated patients with abdominal pathologies, both surgical and medical. At different PEEP levels (0, 5, 10, 15 cmH2O), we measured intra-abdominal pressure (IAP), abdominal perfusion pressure (APP), respiratory mechanics, gas-exchange and hemodynamics. IAP was measured at end-expiration with using an instillation volume of 50 ml in the bladder, according to the modified Kron technique.

RESULTS. Ten patients were enrolled, 7 women and 3 men. Age average was 62.3 and the simplified acute score II was 60. Main causes of admission were peritonitis, acute pancreatitis, haemorrhagic shock, retroperitoneal hematoma, and appendicitis.

Increases in PEEP involved an improvement in the parameters of oxygenation and a decrease in the dynamic compliance but none of them statistically significant. A rise in the airway pressure was found. The increase in PEEP did not affect either median arterial pressure (MAP) or APP.

CONCLUSIONS. Optimization in the values of PEEP involves an improvement of oxygenation in patients with IAH, with affecting neither the hemodynamic nor APP.

0362

IMPACT OF THE VENTILATORY STRATEGY ON THE OUTCOME OF CRITICALLY-ILL HEMATOLOGICAL PATIENTS: A MULTICENTER STUDY

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INTRODUCTION. Hematological patients are commonly admitted to intensive care units due to respiratory failure. In this population, intubation is a risk factor for death, so non-invasive mechanical ventilation (NIMV) is proposed as an alternative therapeutic strategy. However, NIMV failure may delay the onset of the effective respiratory support.

OBJECTIVES. To study the impact of the initial ventilatory management and the role of NIMV failure on the outcome of critically-ill hematological patients.

METHODS. All the hematological patients admitted in 34 intensive care units in Spain for a 17 months period were prospectively studied, and a database created. Those who required any kind of mechanical ventilation, either invasive or non-invasive, were included in the analysis. We registered demographic data, previous diagnosis, data on hematological disease, severity, organ failures and therapies during their ICU stay. After univariant comparisons between survivors and non-survivors, a logistic regression analysis were performed to evaluate variables related to ICU outcome. Additionally, a second logistic regression analysis was done to identify the variables related to NIMV failure. Results are presented as Odds Ratio (OR) with the 95% confidence interval. Gas exchange among groups was assessed using the respiratory item of the SOFA scale (mean $\pm$ SD) and compared using an ANOVA.

RESULTS. 300 patients were included. Overall mortality was 69%. Variables independently related with death were APACHE-II score (OR 1.06 [1.02–1.10]), allogeneic bone marrow transplantation (OR 6.78 [1.78–25.85]), invasive ventilation (OR 3.12 [1.49–6.67]) and NIMV failure (OR 5.74 [2.40–13.73]). However, congestive heart failure at admission (OR 0.26 [0.08–0.85]) was a protective factor. Variables related to a decreased risk of NIMV failure were age (OR 0.96 [0.93–0.99]), congestive heart failure (OR 0.16 [0.03–0.78] and bacteriemia at admission (OR 0.42 [0.18-0.99]). Failure of NIMV was related to a more severe impairment of gas exchange after 5 days of ICU stay compared to elective invasive ventilation (respiratory SOFA scores 2.2 $\pm$ 1.3, 1.8 $\pm$ 1.2 and 2.9 $\pm$ 1 for electively intubated, NIMV success and NIMV failure groups respectively, $p < 0.05$).

CONCLUSIONS. Although NIMV may improve survival in hematological patients with respiratory insufficiency, its failure is also associated to an increased risk of death. Those causes of respiratory failure with a rapid response to therapy may increase the probability of NIMV success.

GRANT ACKNOWLEDGMENT. Astra-Zeneca.

0363

ECHOCARDIOGRAPHY IN ARDS/ALI: A RELIABLE METHOD IN PREDICTING PATIENT TOLERANCE TO NEGATIVE FLUID BALANCE?

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INTRODUCTION. In ALI, conservative strategy of fluid management has been shown to improve lung function and shorten the duration of mechanical ventilation. However, it could jeopardize extrapulmonary organ perfusion. Usual fluid management is based on clinical examination, chest X-ray, biologic values or invasive monitoring.

OBJECTIVES. The aim of this study was to evaluate the diagnostic accuracy of echocardiography (EC) in predicting tolerance of negative fluid balance (NFB) in ARDS/ALI.

METHODS. We conducted a prospective, observational pilot study in an adult ICU over 5 months. All patients with ARDS/ALI, hemodynamic stability and requiring NFB (according to the view of the attending physician and based on usual fluid management criteria) were included. Each patient was weighed and an EC was performed by an experienced operator before introduction of furosemide or hemodialysis and once again after 24 h. The tolerance of NFB was evaluated with the serum lactate and creatinine variations, occurrence of hypotension or atrial fibrillation or need for fluid expansion. The two patient groups (tolerate or not) were compared using Wilcoxon test for quantitative variables.

RESULTS. 20 patients were included with a median (Q1–Q3) age of 62 (56–65) y, SAPS II 44 (32–60), PaO2/FiO2 206 (176–268) mmHg. In 3 cases (15%), respiratory variation of inferior vena cava (IVC) diameter could not be explored. The introduction of furosemide (n = 17) or hemodialysis (n = 3) induced a median NFB of 1100 (518–1,340) ml within 24 h. Complications included hypotension, atrial fibrillation or acute kidney injury, were seen in 8 cases (Not Tolerate group, 40%).

Results

Variable	Tolerate (n = 12)	Not tolerate (n = 8)	p value
Change of weigh between inclusion and admission (kg)	10.5 (5.25–19.5)	5 (4–6)	0.199
IVC respiratory variation (cm)	0.25 (0.075–0.55)	0.55 (0.25–0.93)	0.193
IVC collapsibility (%)	11.85 (3.98–35.2)	30.6 (15.6–33.6)	0.65
E/A	0.79 (0.75–0.97)	0.74 (0.71–0.85)	0.268
E/Ea lateral	7.89 (6.13–8.54)	7.7 (6.9–8.8)	0.61

E E wave velocity, *A* a wave velocity, *Ea* mitral annular tissue velocity

Diagnostic performances

Cut off for: "NFB not tolerate"	Sensitivity	Specificity	PPV	NPV
Change of weigh between inclusion and admission $\leq$5 kg	71	80	71	80
IVC respiratory variation $\leq$0.5 cm	50	62	50	62

CONCLUSIONS. Poor tolerance of NFB is frequent when management is based on usual parameters. We did not identify any isolated clinical or EC parameters which could predict tolerance of NFB in ARDS/ALI. These results are preliminary pending the inclusion of more patients.

0364

SUBMASSIVE PULMONARY EMBOLISM: RISING EVIDENCE IN FAVOUR OF "PRIMARY" LYTIC THERAPY

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INTRODUCTION. Thrombolytic therapy (TLT) is considered the standard of care in patients with massive pulmonary embolism (MPE), and it is also accepted for the near 10% of submassive PE cases with right ventricle dysfunction (RVD) but preserved hemodynamics (SPE), that develop PE-related shock in the short-term follow-up ("rescue-TLT"). Less evidence supports the initial "primary-TLT" for SPE.

OBJECTIVES. We sought to describe the short and long-term follow up of a monocenter prospective cohort treated with early primary TLT.

METHODS. A total of 105 consecutive patients with documented PE were admitted to the intensive care unit (ICU) during a ten-year period (2000–2010). A transthoracic echocardiography (TTE) was performed within the first 30 min of ICU admittance after clinical suspicion and tomography confirmation. Just 96 of the critically ill (mean age 63 $\pm$ 16 years and APACHE II 12 $\pm$ 6.Male 40%) received systemic alteplase on ICU admission (100 mg continuous infusion over a period of 2 h) and were analyzed. The other 9 patients received heparin due to TLT contraindication or a patient negative to informed consent. There were 31 MPE and 65 SPE with RVD. A TTE and deep vein thrombosis (DVT) echo monitoring was performed within 36 h of treatment.

RESULTS. A total of 96 patients were prospectively evaluated. Among the 65 SPE the mean initial troponin T was 0.78 $\pm$ 0.23, and right-heart thrombi (RHT) was detected in 6 of this patients during the initial TTE. The in-hospital mortality was 1.5% among SPE versus 3.2% among MPE. The only patient with SPE who died, did it abruptly 90 min after TLT and had RHT. One-year mortality was 11% and 13% respectively in the SPE and MPE, being the age and malignancy the most important predictive factors using the stepwise logistic regression. No hospital recurrence was observed and 65% of the initially associated DVT disappeared in the 36 h control. Near 6% were readmitted due to a new PE in the one-year follow up. With respect to bleeding complications, 35% of the analyzed patients presented minor bleeding (vascular access and mucosal), while major bleeding appear in 3% of SPE (1 patient with non-fatal hemorrhagic stroke and 1 patient who required blood cell transfusion).

CONCLUSIONS. The low mortality rate observed in submassive PE patients with RVD compared with their expected mortality related to the risk stratification and APACHE, as well as the absence of fatal bleeding complication, situates the early "primary-TLT" in a promising step of care in this group considering its good risk–benefit profile.

0365

EARLY MECANICAL ASSISTENCE IN INFLUENZA A (H1N1) ASSOCIATED WITH SEVERE ARDS

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INTRODUCTION. The appearance of influenza A (H1N1) has induced a global pandemic with catastrophic results. It quickly conduces to acute lung injury and acute respiratory distress syndrome (ARDS), with an elevated morbid- mortality.

OBJECTIVES. To determinate the therapeutic utility of early strategies of pulmonary protection and the prone position.

METHODS. We performed a multicenter retrospective study of all patients with severe influenza A (H1N1) confirmed, realized from July 1st, 2009 to July 1st, 2010, in 2 hospitals were referral centers. We included 109 patients with influenza A (H1N1) confirmed, were admitted to hospitals in the study. Of these, 32 (29%) had severe disease, with criteria of early ARDS (American-European consensus) (24 h ICU). We documented demographic data (age, gender, days of ventilation, severity, mortality, delta of PaO2/FiO2 (1–24–72 h), SvcO2 (1–24–72 h), urine output ml/kg/min (1–24–72 h), Qs/Qt (0–24–72 h), tidal volume, plateau pressure, PEEP, prone position.

RESULTS. The mean age was 52.2 ± 10.7 (26–68 years), 63% males, 46.2% with previous lung disease. Severity scales: Murray 77% (>2.5), APACHE 23 ± 4 (14–27). Length of stay in ICU (days): 11.3 ± 2.8 (6–18), hours of ventilation: 183.4 ± 69 (108–370), 50% of that in prone. Tidal volume: 6.5 ± 0.4 (6–7), PEEP: 18.5 ± 2.6 (12–21), Central Venous Pressure in the first 6 h: 17 ± 2.4 (12–20), Delta (Δ) of PaO_2/FiO_2 1 h versus 24 h versus 72 h: 73 ± 6.5 (55–90) versus 118 ± 11.4 (93–139) versus 213 ± 66 (134–324) $p < 0.01$. Delta (Δ) of Qs/Qt 41.2 ± 8.6 (30–51) versus 33.4 ± 4.6 (30–47) versus 26.7 ± 3.5 (22–30)$p < 0.01$. Delta (Δ) of SvcO2: 59.6 ± 4 (53-67) vs 68 ± 4.6(60-73) vs 72 ± 8.6 (62-84), delta (Δ) of diuresis (ml/kg/hr): 0.55 ± (0.3–0.7) versus 0.98 ± 0.27 (0.5–1.3) versus 1.3 ± 0.34 (0.8–1.8) $p < 0.01$. Mortality was 30%.

CONCLUSIONS. The influenza A (H1N1) virus can trigger a severe respiratory infection and ARDS. Its early detection shows a good response to the pulmonary protection strategies, it improves the PaO_2/FiO_2, decreases the Qs/Qt and decreases the morbid-mortality.

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0366

FEATURES OF PATIENTS WITH INTERSTITIAL LUNG DISEASE REQUIRING INTENSIVE CARE UNIT AND THE FACTORS AFFECTING THE MORTALITY

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INTRODUCTION. The prognosis of the ILD patients who require intensive care unit (ICU) and ventilatory support is poor and mortality rate is high.

OBJECTIVES. To determine the characteristics of patients diagnosed with interstitial lung disease (ILD) monitored in intensive care unit and investigate the risk factors affecting the mortality.

METHODS. Records of 66 patients diagnosed with ILD followed in intensive care unit between 2002 and 2010 were retrospectively reviewed. In addition to demographic data, duration of ILD, etiology for admission to ICU, APACHE II score, mechanical ventilation method, duration of ICU and hospital stay, comorbidities and outcomes were recorded. The risk factors affecting mortality were investigated.

RESULTS. 27 Patient (41%) were female, 39 patient (59%) were male, the median age was 71 (63–76), and the median APACHE II score was 28 (23-36). 58% of the cases had COPD as an additional disease. All the patients had respiratory failure and 58% of the patients had infection. All patients except one had mechanical ventilation support (invasive and/or noninvasive mechanical ventilation) and 75% of the patients died. Prolonged invasive ($p = 0.000$) and noninvasive ($p = 0.002$) mechanical ventilation support and high APACHE II score were found important factors affecting in mortality.

CONCLUSIONS. We found a very high mortality rate in ILD requiring intensive care support. Prolonged mechanical ventilation support and high APACHE II score were important risk factors affecting mortality.

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0367

HELIOX ADMINISTRATION IN PATIENTS WITH COPD EXACERBATION BY USING MODIFIED ANESTHESIOLOGIC CIRCUIT WITH REBREATHING

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INTRODUCTION. Heliox is a mixture of helium and oxygen, whose density is significantly lower than that of air and/or oxygen. The easier flow of gases in the airways when using heliox is relevant for patients with airway obstruction or narrowing, including those with chronic obstructive pulmonary disease (COPD).

OBJECTIVES. The technical-clinical part of the project tests the use of a modified anesthesiologic circuit with rebreathing allowing for safe and less expensive heliox administration in patients with spontaneous ventilation.

The clinical part of the project is a prospective randomized study designed to identify data supporting rational heliox use in COPD exacerbation based on a retrospective analysis of baseline functional parameters obtained in patients in stable phase of the disease as against the effect of heliox therapy during severe exacerbation.

METHODS. The aim of the experiment was to determine whether the flow resistance rates of the inspiration and expiration arms of the designed semi-closed circuit with rebreathing do not pose a challenge to and a significant increase in the flow resistance rate for the spontaneously breathing patient. Measurements of the flow rates of the ventilation circuit was undertaken for separate parts of the ventilation circuit and, subsequently, for both ventilation sections of the circuit.

RESULTS. As compared with pure air, the flow resistance rates of various parts of the ventilation circuit declined by 21–72% when using heliox. The mean flow resistance rates of the inspiration arm of the designed circuit are 370 Pa s/l and 280 Pa s/l for air and heliox, respectively. When using heliox, the flow resistance rate of the circuit decreased by 25%. The highest factor for additive resistance rate is the bacterial filter. Removal of bacterial filters from the circuit arm will decrease the resistance rate of either arm by another third.

CONCLUSIONS. Airway resistance has been shown to increase significantly in patients with COPD exacerbation. Results of our analysis show that, the resistance flow rate in the present system does not pose a major problem for the patient with COPD exacerbation.

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GRANT ACKNOWLEDGMENT. *Supported by grant NS 10087-4/2008 awarded by IGA of the Ministry of Health of the Czech Republic, MSM grant project 6840770012 and grant 102/08/H018 awarded by the GACR.*

0368

IN-ICU BRONCHOALVEOLAR LAVAGE IN THE TREATMENT OF ALVEOLAR PROTEINOSIS

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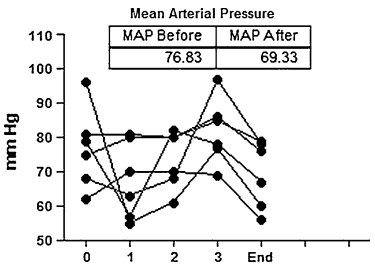
INTRODUCTION. Because manpower and material facilities, ICU may be an alternative place to operation theatre to perform bronchoalveolar lavage (BAL) in the treatment of alveolar proteinosis (AP).

OBJECTIVES. To describe our experience in 6 BAL (corresponding to two patients ♀ 37; ♂ 45) with confirmed diagnosis of AP with special attention to clinical, haemodinamic and gasometric complications during the procedure.

METHODS. After profound sedation and muscular blockade, a selective intubation with a Carlens's tube was performed. We perform a BAL, using an average of 12 l of saline with re-changes of 500 ml while we use a protective ventilatory strategy in the counterpart lung. Each re-change last 5 min on average and was repeated until a clear fluid was obtained. We evaluate the haemodinamic, electrolitic and arterial blood gases (ABG) variations during the whole procedure as well as general clinical results. We used a repeated measures ANOVA with Newman-Keuls (All pairwise comparations) and Dunnet's (All against basal) post-tests. *Prism* statistical packet was used.

RESULTS. Regarding disnea patients improve their subjective status in the long follow up. During the procedures only mean arterial pressure shows a statistical decreasing tendency ($p = 0.09$) while ABG and electrolitic status remain unchanged.



Mean arterial pressure

One patient presented a difficult weaning due to a complex infection.

CONCLUSIONS. These preliminary data suggest that BAL is a safe procedure in the treatment of the AP and may be performed in ICU without serious complications.

0369

EXTRAVASCULAR LUNG WATER INDEX: DIAGNOSTIC ACCURACY AND RELATION TO LUNG INJURY AND MORTALITY IN PATIENTS WITH SHOCK

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INTRODUCTION. The diagnosis of acute lung injury may be more robust if more accurate physiological markers can be identified. Extravascular lung water index (EVLWI) may be useful and has been shown to correlate with respiratory function and mortality in patients with sepsis and ARDS. Whether this applies to a wider population, and which index performs best, are unclear.

OBJECTIVES. We hypothesized that EVLWI correlates with respiratory function and mortality in patients with documented systemic inflammation and shock. We investigated EVLW indexed to actual and predicted body weight, and pulmonary blood volume. We investigated the diagnostic accuracy of EVLWI for lung injury.

METHODS. In 51 patients with shock and SIRS, EVLWI was measured within 6 h of ICU admission and indexed to actual weight (EVLWI/ABW), predicted body weight (EVLWI/PBW) and pulmonary blood volume (EVLWI/PBV). Relationships to lung injury and ICU-mortality were investigated. Positive and negative likelihood ratios, pre- and post-test odds and ROC curves were calculated.

RESULTS. EVLWI was higher among patients with lung injury and was significantly correlated with respiratory parameters. EVLWI/ABW was higher among non-survivors and gave the best positive likelihood ratios for diagnosing ALI/ARDS. In contrast, EVLWI/PBV gave better diagnostic value for severe lung injury according to Murray's LIS criteria. The post-test odds for ALI and ARDS increased threefold when using EVLWI/ABW as a bedside test. The post-test odds of severe lung injury increased eightfold using EVLWI/PBV. EVLWI/ABW and EVLWI/PBV generated the best ROC curves for mortality prediction with a sensitivity of 68% and specificity of 63–72%.

CONCLUSIONS. EVLWI was associated with degree of lung injury, regardless of the index used, supporting its usefulness as a bedside indicator for disease severity. EVLWI/PBV and EVLW/ABW gave the best diagnostic accuracies for the diagnosis of lung injury, and generated the best ROC curves for mortality prediction. EVLWI/ABW was significantly increased in non-survivors. Further studies are needed to confirm the additional value of EVLWI for the early identification of lung injury.

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GRANT ACKNOWLEDGMENT. Supported by a research grant from the Scandinavian Society of Anaesthesiology and Intensive Care.

0370

EFFECT OF MAINTAINED NEGATIVE FLUID BALANCE IN HYPOXEMIC AND HIGH EXTRAVASCULAR LUNG WATER PATIENTS

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BACKGROUND. The fluid management in hypoxemic patients with Acute Lung Injury (ALI) continues being discussed. Although there are not conclusive data, a negative fluid balance may be useful in these type of patients.

OBJECTIVES. To analyze the effect of negative fluid balance in hypoxemic patients with high Extravascular Lung Water index (EVLWi).

METHODS. Observational and prospective study realized between June 2010 and April 2011 including ALI patients with high EVLW (EVLWi $\geq$ 9 ml/kg) in post-resuscitation phase and hemodynamically stable and that were considered by the attending physician to requiring monitoring with PiCCO. We applied a protocol to achieve negative fluid balance of between 500 and 1,500 ml/day depending on the EVLWi. We collected information within a period of 7 days. The protocol was stopped if the hypoxemia or the EVLWi normalized or if any hypovolemic sign appeared. We analyzed the EVLWi evolution and respiratory, hemodynamic and renal parameters.

RESULTS. In 20 out of the 22 ALI patients, EVLWi was $\geq$9 ml/kg and were included in the protocol. 74% were male and 26% were female. The mean age was 52 $\pm$ 17 years. The mean protocol duration was 4.3 days (range 1–7) and the protocol was accomplished 52% of the days. 7 patients did not get negative fluid balance and in these patients, EVLWi did not vary (initial EVLWi 11.3 $\pm$ 5 and final EVLWi 11.4 $\pm$ 5, p: NS). 14 patients got negative fluid balance of -4,122 $\pm$ 2,962 ml (range: $-$1,000 to $-$9,385 ml) and EVLWi decreased from 13.67 $\pm$ 4 to 10.33 $\pm$ 3 ($p < 0.002$). No patient from de negative fluid balance group developed renal failure, while in the positive fluid balance group, 3 patients presented a renal failure. The requirement of vasoactive drugs did not increase in negative fluid balance group (73% at the beginning and 60% at the end of the protocol). Chest X-ray improved in negative fluid balance group (the improvement was 1 $\pm$ 1 quadrant) and stayed similar in the positive fluid balance group. The ICU mortality was 20%, 4 out of 20 patients and 3 of them were in the negative fluid balance group.

CONCLUSIONS. Although the sample was small, we considered this protocol effective and secure and it may be applied in ALI patients in post-resuscitation phase.

0371

EXTRAVASCULAR LUNG WATER IN ACUTE LUNG INJURY PATIENTS

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BACKGROUND. The pathophysiological mechanism of acute lung injury (ALI) consists of an increase in the permeability of the alveolocapillary membrane, leading to an elevation in extravascular lung water index (EVLWi). However, some studies suggested the existence of patients with ALI but normal EVLWi.

OBJECTIVES. To analyze EVLWi in ALI patients and its evolution over a 7-day period.

METHODS. Prospective and observational study of ALI patients under mechanical ventilation with placement of PiCCO® catheter prescribed by the attending physician. Two groups were considered: those with normal EVLWi (<9 ml/kg) at ALI onset and those with high EVLWi ($\geq$9 ml/kg), analyzing the course of EVLWi and other cardio-respiratory parameters over the 7-day study period.

RESULTS. Between June 2010 and April 2011, 22 ALI patients were included in the study (74% males), with a mean age of 52 $\pm$ 17 years. The initial EVLWi was normal in 7 of these patients (mean of 7 $\pm$ 1 ml/kg) and high in the remaining 15 (14 $\pm$ 4 ml/kg). A further EVLWi increase was observed between days 2 and 6 in 5 out of the 7 patients with normal initial EVLWi, reaching a maximum of 11 ml/kg (range 9–11 ml/kg). The EVLWi continued to rise in 10 out of the 15 patients with high EVLWi (range: 15–21 ml/kg). In the normal EVLWi group, the mean initial PO_2/FiO_2 was 218 $\pm$ 53 and the mean PO2/FIO2 on day 7 was 244 $\pm$ 33. In the high EVLWi group, the mean initial PO2/FiO2 was 176 $\pm$ 72 and the mean value on day 7 was 196 $\pm$ 78. Chest X-ray was improved in 29% of the normal EVLWi group and 44% of the high EVLWi group.

CONCLUSIONS. One out of three patients meeting ALI criteria showed normal EVLWi, but most of them experienced a further increase in EVLWi. Results may depend on the timing of EVLWi measurements, given that alveolar collapse is predominant in the initial phase of ALI.

Glucose control: 0372–0382

0372

SPN STUDY: SUPPLEMENTAL PARENTERAL NUTRITION (PN) TO REACH ENERGY TARGET DOES NOT COMPROMISE GLUCOSE CONTROL

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RATIONALE. Energy delivery by the enteral route is difficult in ICU patients: the use of top up PN may prevent building of energy deficit, but risk of hyperglycemia with potential deleterious effects is a frequent objection. The purpose of the sub-study was to test if the use of combined EN + PN (SPN) worsened glucose control using a well implemented nurse driven glucose protocol.

METHODS. Bicentric prospective randomized controlled trial in ICU patients requiring >5 days of treatment, having a functional gut, but not reaching 60% of their energy target by day 3 (D3) assessed by indirect calorimetry (ID). Intervention: top up PN to 100% of ID-defined target from D4 until D8, versus EN alone. Glycemia by blood gas analyzer (nurse decided); target < 8 mmol/l. Glycemia extracted from the computerised database. Statistics: X $\pm$ SD, glucose area under the curve (AUC).

RESULTS. The 102 centre B patients (of total 275) were similar at inclusion aged 62 $\pm$ 15 yrs, BMI 26.1 $\pm$ 4.2, SAPS II 46 $\pm$ 15. Measured D3 energy requirements were similar: 1707 $\pm$ 368 kcal/d. Cumulated D3 energy balance was $-$3,972 $\pm$ 995 (ns); on D8 $-$ 3,203 $\pm$ 1,399 vs $-$5,804 $\pm$ 2,430 kcal ($p < 0.0001$). Energy target was achieved with SPN (mean 104 $\pm$ 14 vs. 75 $\pm$ 30%; $p < 0.0001$) but not with EN. Mean Insulin delivery was 43 $\pm$ 59U/d (EN) versus 38 $\pm$ 70 u/d (SPN). Altogether 8,067 glycemia were performed (ns): glycemic profile was similar until D3: during intervention there were more episodes of hyperglycemia in SPN patients, but no increase of the AUC_D4-8: EN 1414 $\pm$ 217 mmol versus SPN 1391 $\pm$ 213 mmol/l (ns).

CONCLUSION. While supplemental PN covered energy requirements, it did not worsen glycemic control as reflected by the similar area under the curve of all glycemia D4 to D8, showing that this technique is safe with a nurse driven glucose protocol.

DISCLOSURE OF INTEREST. M. Berger Grant/Research Support from: FreseniusKabi, Baxter, BBraun, Aguettant, Consultant of: Baxter, V. Brancato: None Declared, S. Graf: None Declared, C. Heidegger: None Declared, P. Darmon: None Declared, C. Pichard Consultant of: Abbott, Baxter, BBraun, FreseniusKabi, Nestlé-Novartis.

0373

HYDROXYETHYL STARCH PLASMATIC METABOLITES INTERFERENCE WITH FORMER GLUCOSE DEHYDROGENASE PYRROLOQUINOLINE QUINONE BASED GLUCOSE METERS: IN VITRO DEMONSTRATION OF EXISTENCE AND OF ITS RESOLUTION WITH THE NEW ACCU-CHEK STRIPS

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INTRODUCTION. Maltose, a glucose dimer, causes analytical interference with glucose dehydrogenase pyrroloquinoline quinone (GDHPQQ) based glucose meters (1). Hydroxyethyl starch (HES), an intravenous resuscitation fluid widely used, is a modified glucose polymer. Plasma amylase activity reduces long polymers in shorter chains even in tetramaltose, trimaltose, maltose and glucose (2).

OBJECTIVES. We concepted a model in which spontaneous glycolysis mainly driven by the red cells should lowers the glucose content of the samples while the presence of HES submitted to the plasma amylase should produce sugars interfering with GDHPQQ based glucose meters.

METHODS. Heparinized blood samples were taken from 3 healthy volunteers. Each sample was divided in two parts and then mixed with the same volume of HES, or NaCl 0.9% (the vehicle of the HES) in order to obtain a hematocrit of 32%. The mixtures were maintained at 37°C and smoothly waved. Each 90 min blood glucose was measured in duplicate with the former Accu-Chek Aviva, the new Accu-Chek Aviva and the new Accu-Chek Inform2 strips and compared to the reference method using hexokinase. Mean differences between the point-of-care methods and the hexokinase were plotted over time.

RESULTS. In vitro spontaneous glycolysis was measured with all the meters, except when the sample contains HES for the former GDHPQQ based glucose meter. The Fig. 1 shows the evolution of the measured glycemia of the samples from one volunteer. Glucose values decrease except when measured by a former generation of GDHPQQ Accu-Chek Aviva strip for the sample containing HES. The difference between the results of these device and the reference methods (and the new strips) raise over time suggesting a production of interfering substance in the sample. The measurements after 270 min reveal severe hypoglycemic range (45.33 and 28 mg/dL) while this device did not detect it with readings of 77, 75 and 71 mg/dL respectively. The table 1 shows the mean differences (glucose meter result—hexokinase result) over time. After time + 180 min, the difference is statistically significant ($p < 0.05$; paired *T* test). The clinical relevance of such HES metabolites induced interference may be observed in severe acute or end-stage chronic renal disease when glomerular filtration do not allow short chain starch and maltose to be excreted; icodextrin interference was first described in these patients.(1)

Differences glucose meter—hexokinase (mg/dL)

	T0	T +90 min	T +180 min	T +270 min	T +360 min	T +450 min
Former Aviva (NaCl 0.9%)	−5.5	−6.5	−6.6	−4.5	−6	−5.5
Former Aviva (HES)	1.6	13.7	23.7	30.8	38.5	41.8
New Aviva (NaCl 0.9%)	−1.8	−1.5	−2.3	0	0	−0.2
New Aviva (HES)	−1,8	−3,3	−0,1	0.7	3.2	3.2
New Inform2 (NaCl)	−1.5	−2.7	−2.3	1	.2	.7
New Inform2 (HES)	0	−0.5	−0.8	1	3.2	3.5

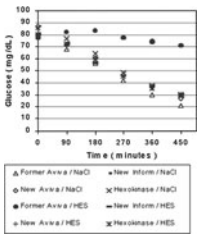

Fig. 1

CONCLUSIONS. In vitro HES metabolites cause analytic interference with former GDHPQQ based glucose meter strips. New modified GDHPQQ based glucose meters are free of these phenomenon that can mask hypoglycemia.

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ACKNOWLEDGMENT: Strips were kindly supplied by ROCHE.

0374

IMPACT OF BLOOD GLUCOSE ON BLOOD LACTATE LEVELS IN A MEDICAL INTENSIVE CARE UNIT- A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Although blood lactate and glucose both represent important markers in the intensive care setting, they have been considered quite independently. Especially the ideal glucose target range has been topic of several recent studies with partly conflicting results [1.2]. On the other hand blood lactate is an acknowledged predictor of outcome in critically ill patients [3].

OBJECTIVES. The aim of this study was to establish a possible correlation between elevated blood glucose and lactate levels in medical intensive care patients.

METHODS. Blood gas data of 1,170 patients, who were admitted to the Medical Intensive Care Unit of the Department of Medicine III, Medical University Vienna, between the years 2001 and 2009, were analysed retrospectively. The association of circulating blood glucose levels with corresponding lactate levels was investigated using a linear regression model. The impact of different blood glucose intervals (<80, 80–120, 120–160, 160–200, >200 mg/dl) on bood lactate levels was analysed using ANOVA. Moreover the influence of blood glucose variability, expressed as blood glucose standard deviation, on mean lactate concentrations for the complete period of ICU-stay was analysed using a linear regression model. To adjust for the severity of illness, a multivariate regression analysis was conducted including SAPS II and APACHE II scores.

RESULTS. Blood glucose and lactate presented a u-shaped curve with a minimum blood lactate (1.5 mmol/l) between 80 and 120 mg/dl blood glucose. ANOVA and linear regression demonstrated a significant influence of blood glucose and blood glucose variability on blood lactate ($p = 0.0001$). The identification of this relation was supported by the result of a multivariate regression analysis, adjusting for severity of illness ($p = 0.0001$).

CONCLUSIONS. The results demonstrate an influence of blood glucose and blood glucose variability on blood lactate, independent of severity of illness, in medical critically ill patients.

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0375

THE ACCURACY OF CONTINUOUS REAL-TIME GLUCOSE MEASUREMENT BY MICRODIALYSIS

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INTRODUCTION. The value of glucose control has been debated for nearly a decade. Severe hyperglycemia is known to augment the risk for infection, myocardial infarction, neurological and renal damage. However managing a tight glucose control has been proven difficult and studies suggest an increased risk for hypoglycaemic episodes. The variability of glucose over time may have an even greater impact on morbidity. An accurate and feasible on-line/continuous measurement is therefore desired. Previous studies have disclosed a good accuracy and validity of continuous microdialysis in peripheral veins. Unfortunately it also disclosed a difficulty in obtaining reliable peripheral vascular access in ICU patients.

OBJECTIVES. To disclose the accuracy of on-line real time intravenous microdialysis for monitoring of circulating glucose by the central route.

METHODS. 10 patients scheduled for upper major abdominal surgery received a microdialysis catheter in addition to a standard two-lumen central venous catheter placed in the right jugular vein. Continuous microdialysis measurement proceeded for 20 h and on-line values were recorded every minute (Eirus, CMA, Solna, Sweden). The microdialysis measurements were retrospectively calibrated to the plasma measurement every eighth hour. Plasma samples were collected every hour, stored at −20°C and later analysed using a automated analyser (Konelab 20). Plasma measurements were correlated to the microdialysis measurement at the same time.

RESULTS. A total of 193 individual values were collected. For each patient there was a close agreement between the continuous reading and the reference plasma glucose values as illustrated by an absolute difference of 0.6 ± SD 0.75 mmol, or 6.6 ± 9.4%. The two measurements had a good correlation ($r = 0.93$). In a modified Bland–Altman plot ± 22% contained 95% of all values. When presented in a Clark Error Grid 94% (182/193) of the measurements were in the A area (clinically correct) and 6% (11/193) in the B area (benign).

CONCLUSIONS. Continuous real-time microdialysis measurement in a central vein showed a high accuracy in comparison to plasma glucose. The device may be a useful tool for glucose monitoring of ICU patients.

GRANT ACKNOWLEDGMENT. The study was partly sponsored by CMA, Solna, Sweden.

0376

SAFETY AND PERFORMANCE OF STOCHASTIC TARGETED (STAR) GLYCEMIC CONTROL OF INSULIN AND NUTRITION - FIRST PILOT RESULTS

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INTRODUCTION. Tight glycemic control (TGC) has been difficult to achieve consistently. STAR (Stochastic TARgeted) is a flexible, model-based TGC approach that directly accounts for intra- and inter-patient variability with a stochastically derived maximum 5% risk of blood glucose (BG) below 72 mg/dL.

OBJECTIVES. To assess the safety, efficacy and clinical burden of a STAR TGC controller modulating both insulin and nutrition inputs in pilot trials.

METHODS. Seven patients covering 660 h. Insulin and nutrition interventions are given 1-3 hourly as chosen by the nurse to allow them to manage workload. Interventions are designed to maximize overlap of the model-predicted (5-95th percentile) range of BG outcomes with the 4.0–6.5 mmol/L band, and thus guarantee a maximum 5% risk of BG < 4.0 mmol/L.

All measurements were taken with bedside glucometers. Interventions are calculated using clinically validated computer models of human metabolism and its variability in critical illness. Carbohydrate intake (all sources) was selected to maximize intake up to 100% of SCCM/ACCP goal (25 kg/kcal/hour). Insulin doses were limited (8U/h maximum), with limited increases based on current rate (0.5–2.0U/h). For context, BG results are compared to those for the SPRINT TGC cohort at the same hospital (current standard of care), which reduced mortality 25–40% for LoS ≥ 3 days. Written informed consent was obtained for all patients; approval was granted by the NZ Upper South A Regional Ethics Committee.

RESULTS. 402 measurements over 660 h (1.65 hourly or 14.5/day); nurses showed a preference for 2-hourly measurements (<10 3-hour intervals chosen). Median [IQR] cohort BG was 5.9 (5.2–6.8) mmol/L. Overall, 63.2, 75.9 and 89.8% of measurements were in the 4.0–6.5 mmol/L, 4.0–7.0 mmol/L and 4.0–8.0 mmol/L bands. There were no hypoglycemic events (BG < 2.2 mmol/L) and the minimum recorded BG was 3.5 mmol/L with 4.5% <4.0 mmol/L. Only 0.2% (1 measurement) >10.0 mmol/L. Per-Patient, the median [IQR] hours of TGC was 92 (29–113) hours using 53 (19–62) measurements (median: ∼13.5 measurements/day). Median [IQR] per-patient results were: BG, 5.9 (5.8–6.3) mmol/L; Carbohydrate Administered, 6.8 (5.5–8.7)g/h (∼70% goal feed median using low CHO enteral nutrition); Insulin Administered, 2.5 (0.1–5.1) U/h. All patients achieved BG < 6.1 mmol/L. For comparison, the SPRINT cohort BG was 5.7 (5.0–6.6) mmol/L, and per-patient median BG was 5.8 (5.3–6.4) mmol/L, with a 2% (by patient) rate of hypoglycemia.

CONCLUSIONS. STAR TGC modulating insulin and nutrition inputs provided very tight control with minimal variability by managing intra- and inter-patient variability. Performance and safety exceed that of SPRINT, which reduced mortality and cost in the Christchurch ICU. The use of glucometers did not appear to impact the quality of TGC. Finally, clinical workload was self-managed and reduced 20% compared to SPRINT.

GRANT ACKNOWLEDGMENT. Canterbury Research and Education Trust.

0377

DIFFERENCES OF GLUCOSE COMPLEXITY IN SURVIVING AND NON-SURVIVING CRITICALLY ILL PATIENTS

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INTRODUCTION. Glucose complexity is a dynamic measure of glucose time series and therefore seems to provide more powerful information on glucose regulation than conventional glycemic analysis. Glucose complexity has been found as an independent predictor of mortality in a small group of critically ill patients.

OBJECTIVES. We investigated glucose complexity in a large group of surviving and non-surviving critically ill patients on intensive insulin therapy (IIT) in a medical ICU.

METHODS. This is a post-hoc analysis of two prospective, randomized controlled trials conducted in an eight-bed ICU at the University Hospital of Vienna, Austria. 174 consecutive, mechanically ventilated and sedated patients were enrolled in the study within 48 h after ICU admission. Patients either received IIT according to a real time CGM system ($n = 63$) or according to an algorithm ($n = 113$) guided by selective arterial blood glucose measurements with simultaneously blinded CGM for 72 h. To investigate glycemic dynamics and its relation with mortality we used glucose complexity as primary endpoint. Glucose complexity was calculated using detrended fluctuation analysis (DFA). DFA is a unitless metric that estimates the degree of long-range correlations within a signal analyzing how the time series and its linear regression diverge as the "time window" considered increases. Higher complexities are displayed as lower DFA. Data are shown as median (25^{th}–75th percentile).

RESULTS. Glucose complexity was significantly lower in non-survivors compared to survivors (ICU survivors($n = 138$) versus non-survivors ($n = 36$): 1.52 (1.44–1.58) versus 1.61 (1.46–1.68); $p = 0.003$; hospital survivors ($n = 125$) versus non-survivors ($n = 49$): 1.52 (1.44–1.58) versus1.61 (1.47–1.68); $p = 0.0002$).

CONCLUSIONS. Loss of glucose complexity was significantly associated with mortality. Thus, glucose complexity is an excellent measure of glucose regulation and a robust parameter of severity of disease in critically ill patients.

0378

GLUCOSE VARIABILITY ASSESSMENT USING CONTINUOUS GLUCOSE MONITORING

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INTRODUCTION. High glucose variability (GV) has increasingly been shown to be associated with adverse outcomes in critically ill patients [1, 2, 3]. Furthermore, escalating GV was recently shown to be associated with an increased risk for hypoglycemia [4], indicating the need to monitor GV. Current practices of many European institutions are to collect 4-h Blood Glucose (BG) samples and may not provide enough granularity to understand and manage GV.

OBJECTIVES. To demonstrate the ability of Continuous Glucose Monitoring technology to provide important and relevant data in the management of critically ill patients, especially glucose variability.

METHODS. A feasibility study was conducted in critically ill subjects in an ICU. Each subject wore a blinded investigational subcutaneous glucose sensor system designed for hospital use (Medtronic, Northridge, CA USA). Chemistry analyzer BG values (Yellow Springs Instruments, Yellow Springs OH, USA) were collected as hourly and then processed as 4-h reference points, as a comparison to the investigational system that records Sensor Glucose (SG) every minute. SG data and BG data were analyzed for GV in each subject using two definitions of GV, as defined in the reference papers—Standard Deviation (SD) [1], and Mean Absolute Glucose (MAG) [3]. The data was also analyzed for mean glucose, as well as time spent in range (5.6–7.8 mmol/L or 100–140 mg/dl), and time spent above or below range, for further data characterization.

RESULTS. Data from 10 subjects were analyzed. Comparing BG and SG respectively, the subjects mean glucose was 138 and 140 mg/dl, they spent on average 41 and 41% time in range, 45 and 46% time above range, and 14 and 14% below range. The overall mean SD based on BG was 27 mg/dl and based on SG was 32 mg/dl. The overall MAG for BG was 6.2 mg/dl/h, while the MAG for SG was 9.3 mg/dl/h.

CONCLUSIONS. The data from this blinded study suggests that 4-h reference measurements equate to continuous glucose sensing for broad comparisons such as time spent in range and out-of-range or the mean glucose and SD; However, continuous sensing may be better suited for the time-based GV analyses such as MAG. In the future, real-time SG could also assist in reducing mean glucose, GV, and increasing time spent in the target glucose range, for better patient outcomes.

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0379

VARIABILITY OF INSULIN SENSITIVITY FOR DIABETICS AND NON-DIABETICS DURING THE FIRST 3 DAYS OF ICU STAY

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INTRODUCTION. Safe, effective tight glycemic control (TGC) can improve outcomes, but is difficult to achieve consistently. Glycemic level and variability, particularly early in a patient's stay, are a function of variability in insulin sensitivity/resistance resulting from the level and evolution of stress response, and are independently associated with mortality.

OBJECTIVES. To examine the daily evolution of variability of insulin sensitivity in ICU patients, and determine if critically ill diabetic patients display different metabolic levels or variability.

METHODS. Retrospective analysis of patient data ($N = 257$ patients, 26201 h) from the SPRINT TGC study where SPRINT was commenced within 12 h of ICU admission. Model-based insulin sensitivity (SI) was identified each hour and hour-to-hour percent changes in SI were assessed for days 1–3 individually and day 4 onward. Diagnosed (T1DM and T2DM) diabetics ($N = 59$) are compared to non-diabetic patients ($N = 198$) on both cohort and per-patient bases to assess differences in metabolic level or variability. Cumulative distribution functions, median values, and 90% range (5^{th}–95th percentiles) are used to assess differences between groups and their evolution over time.

RESULTS. In both diabetic and non-diabetic groups, SI increases significantly over the first 24 h ($p < 0.02$). For days 2–3, further increases are not clinically or statistically significant. However, median insulin sensitivity is 18–42% lower for diabetics compared to non-diabetics over days 1–3 and 4 onward ($p < 0.05$).

SI Variability (hour-to-hour percentage change) is higher on day 1 than days 2, 3 and 4 onward ($p < 0.0001$) for both diabetic and non-diabetic groups. SI variability decreases during days 2–3, but the reduction is much smaller and not clinically or statistically significant. Diabetics are significantly more variable than non-diabetics on days 1–3 of ICU stay ($p < 0.05$).

CONCLUSIONS. ICU patients have lower insulin sensitivity and are more variable on day 1 of stay compared to days 2–3 and 4 onward. Diabetic patients have even lower and more variable SI compared to non-diabetics during days 1-3. Greater variability with lower SI early in a patient's stay greatly increases the insulin required, potential glucose flux due to variation in SI, and thus the risk of greater glycemic variability and hypoglycemia—all of which reduce potential positive outcomes. Clinically, these results suggest that TGC patients, particularly those with a diabetic history, will require greater measurement frequency, reduced reliance on insulin, and more explicit specification of carbohydrate nutrition in Days 1–3 to safely minimize outcome glycemic variability.

0380

PILOT TRIALS OF STAR TARGET TO RANGE GLYCEMIC CONTROL

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INTRODUCTION. Tight glycemic control (TGC) has shown benefits in cardiac surgery ICU patients. STAR (Stochastic TARgeted) is a flexible, model-based TGC protocol accounting for patient variability with a stochastically derived maximum 5% risk of blood glucose (BG) below 90 mg/dL.

OBJECTIVES. To assess the safety, efficacy and clinical workload of the STAR TGC controller in pilot trials.

METHODS. Each trial was 24 h with BG measured 2-3 hourly. Nine patients were recruited; one was stopped by the clinician after 7 h after a diagnosis of pancreatic disease. Insulin interventions every 2–3 h are selected to maximize the overlap of potential (5–95th percentile) range of glycemic outcomes with the 100-140 mg/dL band = Target to Range.

Interventions are calculated using clinically validated computer models of human metabolism and its variability in critical illness. Carbohydrate intake (all sources) was monitored, but not changed from clinical settings. Insulin infusion rates were limited (6U/h maximum), with limited increases based on current infusion rate (0.5–2.0 U/h). All measurements were taken with a mix of bedside glucometers and blood gas analyzer as chosen by the attending nurse and availability. Approval was granted by the Ethics Committee of the Medical Faculty of the University of Liege (Liege, Belgium).

For context, BG results are compared to 24-h pre-trial and 24-h post-trial BG results of the same nine patients (control results).

RESULTS. A total of 91 measurements over 194 h were taken (every 2.1 h (11/day) on average; range: 10.5–11 measurements/day). Initial BG median [IQR] was 155.0 mg/dL [126.5–165.0]. Median [IQR] cohort BG was 134.0 [117.2–150.8] mg/dL. The percentage of BG measurements within 100–140 mg/dL was 54.9%, where 40.7% were $\geq$140 mg/dL and 4.4% (4 measurements) had BG < 100 mg/dL. There were no hypoglycemic events (BG < 40 mg/dL) and the minimum recorded BG was 70 mg/dL.

Median [IQR] per-patient results were: Median BG, 137.0 [120.3–142.4] mg/dL; Median Carbohydrate Administered, 0.0 [0.0–4.7] g/h; Median Insulin Administered, 1.4 [0.2–2.6] U/h. The median [IQR] time to BG < 140 mg/dL was 1.8 [0.0–2.6] h (7.5% of trial length on average) and 6.6 [1.9–9.0] h to BG < 125 mg/dL. Longer trials would have increased time in glycemic bands and overall performance.

For comparison, the control BG was 144.0 [118.5–167.0] mg/dL, and per-patient median BG was 144.0 [142.0–156.1] mg/dL, with no hypoglycemia.

CONCLUSIONS. STAR with Target to Range effectively controlled all patients with reduced effort. STAR effectively managed intra- and inter- patient variability with no hypoglycemia, and provided tight safe control. Clinical workload was acceptable (10–11 measurements per day) and are expected to drop slightly as patients become more stable. The use of glucometers did not appear to impact the quality of TGC.

GRANT ACKNOWLEDGMENT. F.R.S-FNRS (Belgium).

0381

INTENSIVE GLYCEMIC CONTROL DOES NOT REDUCE INFLAMMATORY RESPONSE SYNDROME IN BRAIN INJURED PATIENTS

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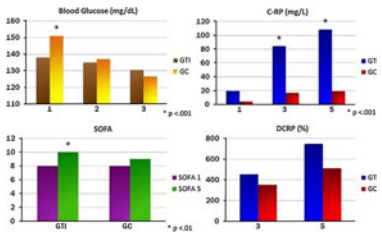
INTRODUCTION. It has been suggested that hyperglycemia can develop and maintain a significant pro-inflammatory role in brain injured patients patients and that insulin is able to counteract these effects.

OBJECTIVES. In order to test this hypothesis, we compared two groups of critical neurological patients treated with different doses of insulin to achieve different target of blood glucose.

METHODS. The goal of glycemic intensive treated group (GTI, n° 79 pts) and of the control group (GC, n° 84 pts) was respectively <140 and < 180 mg/dL. The two groups (GTI vs. GC) were similar per age [63 years (45.7–71.2) vs. 62 years (51–74.2)] and GCS on admission [8 (6–11.5) vs. 7 (4–12)]. We measured C-RP (mg/L) on the 1st, 3rd and 5th day (d1, d3, d5), calculated delta C-RP (DCRP) of d3 and d5, APACHE II on admission and SOFA on d1 and d5. The presence of SIRS was calculated as absolute frequency. Data are expressed as median (1st–3rd quartile). Statistical analysis included non-parametric tests (*U* Mann–Whitney test) and multiple regression analysis. Significance was considered as $p < .05$.

RESULTS. There is a significant difference in blood glucose (mg/dl) on d1 between the two groups [GTI vs. GC: 136.5 (118–162) vs. 151 (128-187), $p < .0001$)] but not on d2 [135 (117.2–164.7) vs. 137 (120–171)] and d3 [130.5 (115.5–153) vs. 126.5(112–147)].
There is no significant difference in APACHE II, SOFA on d1 and d5 among groups; moreover there is a significant difference in SOFA's trend (d1 vs d5) in GTI ($p < .01$).
Compared to the d1 C-RP (mg/l) [GTI vs GC: 19.6 (7.3–43.2) vs 4.3 (1–11.8)] there is a significant increase in d3 (62.2–154.5, 84.5 $p < .0001$ vs. 11.1–116, 17 $p < .0001$) and d5 [108.7 (42–185), $p < .0001$ vs. 19.3 (11–88.6), $p = .009$] but not between d3 DCRP [GTI vs. GC: 452.5 (189.3–1485.9) vs. 350.8 (198.8–1338.8)] and d5 DCRP [746.4 (224.1–2028.5) vs. 512.1 (188.4–1098.5)]. Absolute frequencies (%) of SIRS on d3 and d5 not show any difference between groups [GTI vs GC (day 3–day 5): 78–84 vs 71–79].



Graphs

In the multiple regression analysis (dependent variable: d5 C-RP) insulin infused on d1, d2 and d3 is not an independent variable in either GTI or in GC.

CONCLUSIONS. The GTI group demonstrated an initial inflammation significantly higher than the GC with a similar increase in both groups (calculated as delta C-RP). Despite an earlier and significant glycemic control in the GTI, insulin does not appear to affect the systemic inflammatory response measured as C-RP or presence of SIRS.

0382

INTENSIVE INSULIN THERAPY: AN AUDIT TO THE GLYCAEMIA CONTROL IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Hyperglycemia in critically ill patients is associated with increased mortality.Our ICU has implemented a new protocol for intensive insulin therapy in order to achieve a better glycaemic control in our patients, trying to approach the target value recommended by the best current scientific evidence. The glycaemia target was set in 120–180 mg/dl and the average between 80 to 180 mg/dl was considered as a safe level of glycaemia. We analyze the results in a retrospective way by auditing the use of our protocol.

OBJECTIVES. Evaluation of a new intensive insulin protocol in critically ill patients admitted to a 7 beds medical-surgical ICU in southern Portugal. The set objectives are based on scientific evidence from different published studies.

METHODS. Retrospective analysis of glycaemia control, 6 months after the implementation of a new protocol on tight glucose control. All the patients admitted during the months of November and December in 2010 were enrolled. The quality indicators were: the patients rate with hyperglycemia that start the protocol; the rate and incidence of hyperglycemia; the rate and incidence of hypoglycemia; the glycaemic records rate set in considered safe values (80-180 mg/dl). It was also evaluated the mean blood glucose levels in hypoglycemic patients.

RESULTS. The mean age of the 46 patients studied, was 64.1 years, with a total of 334 days of income (7.3 days of mean length of stay). The mean SAPS II score was 43, with an ICU mortality of 17.4% and 21.7% of hospital mortality. There were a total of 3,598 records analyzed, which gives a mean of 10.8 records per patient day. The rate of protocol application in hyperglycemic patients was 100%, the percentage of records that were in the average of safe values (between 80–180 mg/dl) was 66.8%, and the target glycaemia was achieved in less than 12 h in 93.5% of patients. In spite of 28.3% of hypoglycemic records, the number of patients that had at least one episode of hypoglycemia was only 1%, with 0.2% of critical hypoglycemia (glycaemia <50 mg/dl) and the mean blood glucose of hypoglycemic records was 57.9 mg/dl. The incidence of hyperglycemia records was 30.2%.

CONCLUSIONS. With these results we can ensure that blood glucose control is safe and effective with this protocol, as they are not far from the objectives, that were achieved in less than 12 h in most patients, as well as there was a good rate of records in a considered safe range of blood glucose. Total number of daily measured blood glucose was high, which means a high charge of nursing work. Maybe continuous monitoring of subcutaneous glucose would help to solve this problem.

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Oral Sessions
Imaging, modeling & renal outcome in ARDS: 0383–0387

0383

NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY IN VENTILATOR INDUCED LUNG INJURY

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INTRODUCTION. Currently there is no molecular biomarker indicative of pulmonary epithelial cell injury in acute lung injury (ALI).

OBJECTIVES. To assess nuclear magnetic resonance (NMR)-based metabolomics as a diagnostic biomarker in ALI induced by high tidal volume (VT) mechanical ventilation (ventilator-induced lung injury, VILI).

METHODS. Male Sprague$\Gamma\zeta\hat{o}$Dawley rats underwent for 2.5 h two ventilatory strategies using low and high VT: VT = 9 mL/kg, PEEP = 5 cmH_2O (n = 14); and VT = 25 mL/kg, PEEP = 0 cmH_2O (n = 12). Lung tissue, serum and bronchoalveolar lavage (BAL) fluid spectra were obtained by high-resolution magic angle spinning and 1H-NMR spectroscopy. Principal components analysis (PCA) was performed on the processed spectra to highlight lung injury biomarkers. A partial least squares (PLS) model for the diagnosis of VILI was constructed using the biomarkers detected by PCA. Peak inspiratory pressure (PIP) and PaO2 were monitored.

RESULTS. NMR-based metabolic profiling discriminated characteristics between the low and high VT groups. Nine chemical shift positions, including lactate, glucose, creatine, glycine and hydroxybutyrate signals, changed markedly in lung tissue and BAL fluid from rats with VILI. The PLS diagnostic model classified cases with a sensitivity and specificity of 100%. The coefficient of determinations (r^2) of the concentration in BAL fluid of the different metabolites with PIP and PaO2 at the end of the experiment were, respectively, for glucose 0.92 and 0.77, for lactate 0.81 and 0.60, for creatine 0.89 and 0.79, for hydroxybutirate 0.64 and 0.35, and for acetate 0.65 and 0.28 (all p values < 0.05). Changes in these metabolites suggest abnormalities in energy pathways, and in collagen and phospholipid metabolism.

CONCLUSIONS. NMR-metabolomics is a potentially useful diagnostic technique for VILI. The concentration of metabolites involved in energy production and collagen and phospholipid metabolism change in this model.

GRANT ACKNOWLEDGMENT. Instituto de Salud Carlos III (FIS 08/1726). Spanish MICINN (SAF2008-05412). PI-NET European Network (ITN-FP7-264864).
Fundación Mutua Madrileña (AP/67842009), Lilly Foundation Spain.

0384

MOLECULAR IMAGING IN VENTILATOR-INDUCED LUNG INJURY: RETHINKING THE REGIONAL MECHANISMS

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INTRODUCTION. Recently, positron emission tomographic (PET) imaging of the glucose analog 2-deoxy-2-[^{18}F]fluoro-D-glucose (^{18}F-FDG) is increasingly used to assess metabolic activity of pulmonary inflammatory cells. Novel information about the dynamics of regional lung inflammation by using this method can increase our understanding of the mechanisms and sequence of events involved in ventilator-induced lung injury (VILI). This knowledge will help to improve the strategies aimed at prevent or reduce its occurrence. So far ventilation strategies are only based on the reduction of the overall airway pressure and volume. This so called $\Gamma\zeta\pounds$lung protective ventilation$\Gamma\zeta\phi$ is mostly empirically based rather than founded on experimental or clinical data on the evolution of inflammation.

OBJECTIVES. We aimed at studying the location and evolution of inflammation using PET/CT imaging of ^{18}F-FDG and to relate inflammation to morphology as assessed by Computed Tomography (CT) in a porcine experimental model of ARDS.

METHODS. We established a two-hit injury ARDS model in seven pigs. Repeated lung lavages were applied until a PaO_2/F_IO_2 <100 mmHg was reached followed by 210 min of VILI using low positive end-expiratory pressure and high inspiratory pressures/tidal-volume. Afterwards, animals were studied with PET/CT imaging of ^{18}F-FDG. PET images were obtained dynamically after injection of 150 MBq of ^{18}F-FDG. The CT enabled attenuation and tissue density corrections. We performed regional analysis by ten equally spaced **isogravitational** levels, and also by the following CT density compartments: hyperinflated, normally aerated, poorly aerated and non aerated. We analyzed the dynamic PET data by the graphical analytic approach, the Patlak$\Gamma\zeta\ddot{O}$s method. We submitted also three healthy animals to the same protocol of PET/CT imaging of ^{18}F-FDG (control group).

RESULTS. Inflammation was more pronounced in the intermediate gravitational zones as well as in normally and to a lesser extent poorly aerated regions that presented the highest specific ^{18}F-FDG uptake (K_{is})$\Gamma\zeta\ddot{o}$see Figure.

CONCLUSIONS. Dynamic PET imaging of ^{18}F-FDG provides new information on the distribution of inflammation in VILI. The present findings suggest that normally and poorly aerated regions$\Gamma\zeta\ddot{o}$corresponding to intermediate gravitational zones$\Gamma\zeta\ddot{o}$are the primary target of the inflammatory process accompanying VILI. These findings challenge the notion that the best ventilatory strategy should be ideally adapted to the size of the aerated lung.

0385

ACUTE KIDNEY INJURY IN PATIENTS WITH ALI/ARDS: RESULTS OF A MULTICENTER COHORT STUDY

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INTRODUCTION. Experimental studies have suggested that acute kidney injury (AKI) may promote or increase distant organ dysfunction. Conversely, ALI/ARDS has been demonstrated as a potential risk factor for AKI, as consequences of hemodynamic changes induced by mechanical ventilation, renal vascular resistances induced by hypoxemia and hypercapnia, and distant organ inflammatory response [1,2]. However, association between ALI/ARDS and AKI has been suspected to be a risk factor of AKI, this association has not been demonstrated remains unclear in critically-ill patients. The aim of this study was to evaluate this association.
METHODS. Prospective observational multicenter cohort study performed in twelve intensive care units. Patients admitted for more than 24 h between 1997 and 2009 in the participating ICUs were included.ALI/ARDS was defined as the need for mechanical ventilation with a PaO_2/FiO_2 ratio <300 in the absence of cardiogenic pulmonary oedema.AKI was defined as any degree of renal dysfunction according to the RIFLE criteria. Patients with underlying chronic renal dysfunction, AKI previous to ALI/ARDS and for whom intensivists were not committed to provide supportive care were excluded from this study. Factors independently associated with occurrence of an acute kidney injury were evaluated using a multivariable logistic regression.
RESULTS. Of the 10865 patients admitted during the study period, 8029 were included in this study. Of the included patients 1879 had an ALI/ARDS (hospital mortality 27.9 vs. 10% in patients without ALI/ARDS). Incidence of acute kidney injury was 44.3% in patients with ALI/ARDS compared to 27.4% in patients without ALI/ARDS ($P < 0.0001$). Patients developing secondary AKI were more frequently of female gender (41.5 vs. 37.8%, $P = 0.002$), were older (mean age 65.9 ± 16 vs. 55.1 ± 18.4, $P < 0.0001$), were more severely ill (mean SAPSII 50.1 ± 19.8 vs. 33.6 ± 16.5, $P < 0.0001$), and had also more frequent underlying fatal comorbidities (McCabe 2 or 3 in 40.1 vs. 28.7%, $P < 0.0001$). ALI/ARDS was associated with secondary AKI in univariate analysis (33.1 vs. 19%, $P < 0.0001$) and remained a significant risk factor in multivariable logistic regression (OR 2.26, 95%CI 1.46ΓÇô3.48). Other risk factors independently associated with secondary AKI were shock (OR 5.05, 95%CI 4.05ΓÇô6.29), myeloma (OR 1.87, 95%CI 1.62ΓÇô2.16), and diabetes (OR 3.28, 95%CI 1.81ΓÇô5.94). Hospital mortality was higher in patients with secondary AKI than in patients without AKI (27.6 vs. 8.1%, $P < 0.0001$).
CONCLUSIONS. This study suggests that ALI/ARDS may be an independent risk factor for AKI. Several information are however lacking to determine whether this association is due to lung-kidney cross-talk, setting of mechanical ventilation or degree of hypoxemia [1, 2].
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0386

MINIMAL MODELING OF PULMONARY GAS EXCHANGE OF OXYGEN AND CARBON DIOXIDEΓÇÖMODELING COMPLEXITY REQUIRED IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Predominant pulmonary gas exchange measurements in clinical practice and research such as the PaO_2/FiO_2 ratio and $PaCO_2$ vary with extrapulmonary factors such as FiO_2 and ventilation. The gas exchange model of the multiple inert gas elimination technique does not have this limitation [1], but requires an experimental procedure rendering it inappropriate for clinical use. To improve pulmonary gas exchange quantification, the challenge therefore remains to find an appropriate mathematical model [2], preferably a ΓÇÿminimalΓÇÖ model, that is a model complex enough to describe patients adequately, yet simple enough to be identified from available clinical data. However, the appropriate model complexity (number of model parameters) is not evident.
OBJECTIVES. To perform systematic evaluation of the necessary minimal model complexity to describe pulmonary gas exchange of O_2 and CO_2 in severely ill intensive care patients.
METHODS. Three models of varying complexity were retrospectively evaluated in 30 intensive care patient cases [3]. The measurements used for identifying model parameters include a single arterial blood gas measurement, and ventilation (minute volume, FiO_2, end-tidal O_2 and CO_2) and oxygenation (pulse oximetry) measured at 4-8 different FiO_2 levels in an automated procedure taking 10-15 min. The modelsΓÇÖ fit to measured data were compared using chi-squared and F tests taking modeling complexity into account. The modelsΓÇÖ ability to provide adequate description of pulmonary gas exchange abnormalities were compared by evaluating the range of ventilation/perfusion (V/Q) ratios the models could describe.
RESULTS. Pairwise F-tests showed that a two parameter model of shunt and V/Q mismatch gave superior fit to patient data compared to a one parameter shunt-only model ($p < 0.001$), and that a three parameter model of shunt and V/Q mismatch gave superior fit compared to a two parameter model ($p < 0.1$), and could describe larger ranges of V/Q ratios.
CONCLUSIONS. When end-tidal measurements of O_2 and CO_2 are available, the presented three parameter model may be used for patient specific interpretation of pulmonary gas exchange at a level much closer to the true physiological picture than predominant clinical measurements, perhaps representing an optimal compromise between complexity and feasibility.
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GRANT ACKNOWLEDGMENT. This work was partially supported by the Programme Commission on Nanoscience, Biotechnology and IT under the Danish Council for Strategic Research.

0387

EXTRAVASCULAR LUNG WATER (EVLW): WHICH INDEXATION TO USE? A PROSPECTIVE STUDY WITH 696 TRANSPULMONARY THERMODILUTION (TPTD) MEASUREMENTS IN 50 MECHANICALLY VENTILATED PATIENTS AND COMPARISON TO AN EVALUATION COLLECTIVE INCLUDING 181 PATIENTS AND 1426 TPTDS

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INTRODUCTION. Large variability of body weight (BW) and height strongly calls for scaling and indexation of hemodynamic parameters including extra-vascular lung water (EVLW). *Ideally*, indexation should result in consistent normal values for patients with different height, weight, age, gender and race. The *minimum requirement* for appropriate indexation is an improvement of inter-individual comparability and better correlation to established *functional* parameters *compared to no indexation at all.* Traditionally EVLW has been indexed to actual BW (BW_{act}) termed EVLW-index (ELWI). Three recent studies gave hints that in obese patients indexation to BW_{act} might inappropriately diminish $ELWI_{act}$. Furthermore, these studies suggest that *indexation to predicted BW* improves prediction of mortality by ELWI. However, these studies were inconsistent regarding the optimized correlation of ELWI and pO_2/FiO_2, which might be more relevant for indexation of EVLW than mortality.
OBJECTIVES. Therefore, it was the aim of our study to evaluate the predictive capabilities of EVLW, $ELWI_{act}$, $ELWI_{pred}$ as well as ELWI indexed to ideal BW ($ELWI_{id}$), adjusted BW ($ELWI_{ad}$), BMI, body surface area (BSA), height and total lung capacity (TLC) with regard to pO_2/FiO_2.
METHODS. In 50 patients 696 triplicate TPTDs were performed using the PiCCO device. EVLW and ELWI according to different indexations were correlated to simultaneous pO_2/FiO_2 (partial correlations) and ROC-analyses regarding pO_2/FiO_2 <200 (primary endpoint) were performed. The findings were evaluated in an independent collective from Antwerp University including 1426 TPTDs in 181 patients and in the merged data pool.
RESULTS. In the study collective the greatest ROC-AUCs regarding $pO_2/FiO_2 < 200$ were found for un-indexed EVLW (AUC 0.758; 95%-CI: 0.637–0.880) and $ELWI_{height}$ (AUC 0.746; CI: 0.622–0.869). The AUC for $ELWI_{pred}$ was lower (0.713; CI: 0.585–0.841). $ELWI_{act}$ provided the lowest AUC of 0.685 (CI: 0.554–0.817);This was confirmed in the validation collective: $ELWI_{height}$ provided the highest predictive capabilities (AUC 0.735; CI: 0.674–0.796) and $ELWI_{act}$ (0.710; CI: 0.648–0.773) the smallest AUC.In the merged data-pool, the greatest AUC was found for $ELWI_{height}$ (0.729; CI: 0.674–0.784). The AUC was significantly greater for $ELWI_{height}$ compared to all other indexations including $ELWI_{act}$ (0.683; 95%-CI: 0.626–0.741; $p = 0.007$) and $ELWI_{pred}$ (0.707; 95%-CI: 0.650–0.763; $p = 0.0015$). Only un-indexed EVLW (0.728; 95%-CI: 0.673–0.783) was not significantly inferior to EVLW$_{height}$.These findings were confirmed by the analyses regarding the correlation to pO_2/FiO_2 with the highest coefficients of correlations for $ELWI_{height}$ and EVLW in study and validation collective (r values between −0.67 and −0.74).
CONCLUSIONS. $ELWI_{act}$ is inappropriate for predicting pO_2/FiO_2. $ELWI_{pred}$ provides a slight improvement. The highest predictive capabilities were found for $ELWI_{height}$ and un-indexed EVLW.

Bacteremia & VAP in ICU patients: 0388–0392

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INFLUENZA-INDUCED LUNG INJURY RESULTS IN SEVERE BACTEREMIA FOLLOWING SECONDARY PNEUMOCOCCAL INFECTION

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INTRODUCTION. Both seasonal and pandemic influenza infection are associated with secondary bacterial complications within the lung. Previous studies have indicated that a preceding influenza infection results in enhanced colonization, excessive pulmonary inflammation and increased mortality as compared to primary bacterial infection [1]. However, little is known about the kinetics of bacteremia during secondary bacterial infection following influenza. We hypothesized that mice with a preceding influenza infection show accelerated dissemination after intranasal challenge with *S. pneumoniae*.
OBJECTIVES. To investigate the kinetics of bacterial dissemination in a mouse-model for secondary pneumococcal pneumonia following influenza infection.
METHODS. Adult male C57Bl/6 mice were inoculated with $10TCID_{50}$ influenzaA/PR/8/34 (H1N1) or PBS (control mice) followed by 20,000 cfu *S. pneumonaie* (serotype 3) intranasally in both groups on day 14, a time-point at which virus-infected mice had recovered (as reflected by bodyweight). Mice were sacrificed 12 and 24 h later to collect the right lung, blood, spleen, liver and right kidney for microbiological analysis (percent culture-positive, log cfu/ml, min–max). Statistics were done by one-way analysis of variance and Bonferroni post-hoc test.
RESULTS. Mice recovered from influenza showed dissemination of bacteria towards the spleen (37.5%, 0.00–4.23, $p < 0.05$ vs control mice) at 12 h after intranasal challenge with *S. pneumoniae*. At 24 h, mice with secondary pneumococcal infection showed dissemination towards the spleen (100%, 3.62-6.10), the liver (100%, 2.26–4.93), the kidney (100%, 2.14–5.03) and blood (100%, 2.78–4.61), while control mice showed no dissemination towards liver, kidney and blood (all $p < 0.001$) and only little dissemination towards the spleen (37.5%, 0.00–3.07, $p < 0.001$). Of note, bacterial loads in the lung did not differ significantly at 24 h between pneumococcal infection in control mice and pneumococcal infection after preceding influenza.
CONCLUSIONS. Preceding infection with influenza virus results in enhanced dissemination of bacteria in pneumococcal pneumonia, despite recovery from influenza infection. These data point towards a loss of barrier-function within the lungs of influenza-infected mice.
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GRANT ACKNOWLEDGMENT. N/A (internal funding).

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OUTCOME OF BACTEREMIA IN INTENSIVE CARE UNIT PATIENTS: A SUBGROUP ANALYSIS FROM THE EPIC II STUDY

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INTRODUCTION. Sepsis is associated with increased morbidity/mortality rates and longer length of ICU stay. The importance of positive blood cultures in prognosis is still debated.

OBJECTIVES. The present study was designed to determine whether there are significant outcome differences between bacteremic and non-bacteremic critically ill infected patients.

METHODS. The Extended Prevalence of Infection in the ICU (EPIC II) Study was a 1-day, prospective, point prevalence study conducted on May 8, 2007, which included 13,796 adult patients treated in 1,265 ICUs from 76 countries.

RESULTS. Of the 7087 infected patients on the study day, 4,947 (69.8%) had samples taken for blood cultures, and 971 patients (13.7%) had positive blood cultures. The bacteremic group was more severely ill on the day of the study than non-bacteremic patients (SOFA and SAPS II scores 8.0 ± 4.5 vs. 7.0 ± 4.1 and 40.7 ± 16.3 vs. 38.1 ± 15.3, respectively) (Table 1). Bacteremic patients had been in the ICU for a longer time than non-bacteremic patients [10 days (range, 3–22 days) vs. 8 days (range, 2–19 days); $p < .05$]. Bacteremic patients were more likely to have respiratory and abdominal infections than non-bacteremic patients ($p < .05$). Bacteremic patients had a longer ICU length of stay (median 23.0 days, IQR 10.0–44.0 vs. 20.0 days; IQR 9.0–38.0; $p < .05$) and longer hospital length of stay (Table 2) than non-bacteremic patients. More bacteremic patients needed vasopressor support (36.5 vs. 30.0%) and renal replacement therapy (18.8 vs. 12.9%), but use of mechanical ventilation was similar in the two groups (70.9 vs. 69.5%). There were no significant differences in ICU and hospital mortality rates between bacteremic and non-bacteremic patients (ICU 28.6 vs. 25.8% $p = .87$; hospital 36.1 vs. 33.6% $p = .86$) (Table 2).

CONCLUSIONS. In infected patients, bacteremia is associated with greater severity of illness and longer hospitalization, but not with increased mortality

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TABLE 1 BASELINE CHARACTERISTICS OF INFECTED ICU

PATIENT CHARACTERISTICS/	No culture (30.2%)	Microbial infection (n = 7087) Culture (69.8%)	BC−(56.1%)	BC + (13.7%)
Age, years (mean [SD])	62.1 (±17.7)	60.4 (±17.0)	60.5 (±17.2)	59.8 (±16.2)
Male (%)	60.9	63.0	64.4	61.6
SOFA score (mean [SD])	7.1 (±4.2)	7.2 (±4.2)	7.0 (±4.1)	8.0 (±4.5)#
SAPS II score (mean [SD])	39.1 (±16.1)	38.6 (±15.6)	38.1 (±15.3)	40.7 (16.3)#
Days in ICU prior to study day (median [IQR])	3 (1–8)	8 (2–19)	8 (2–19)	10 (3–22)#
Abbreviations: IQR, interquartile range; SD, standard deviation;	SAPS, Simplified Acute Physiology Score; SOFA, Sequential Organ Failure Assessment.	#p < .05 compared with non-bacteremic patients; BC: blood culture.		

TABLE 2 ICU AND HOSPITAL OUTCOMES

OUTCOMES/	No culture	Microbial infection (n = 7087) (30.2%)	Culture	(69.8%)
BC–(56.1%)		BC + (13.7%)		
ICU mortality (n, %)	461	(23.0%)	1227	(24.8%)
962 (25.8%)	265	(28.6%)		
Hospital mortality (n, %)	615	(30.6%)	1586	(32.05%)
1251 (33.6%)	335	(36.1%)		
ICU LOS (median [IQR])	10 (4–21)	20 (9–39)	20 (9–38)	23 (10–44)#
Hospital LOS (median [IQR])	20 (9–40)	33 (17–62)	33 (17–62)	37 (18–64)#
#p < 0.05 compared with non-bacteremic patients. LOS: length of stay				

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RESOLUTION OF VENTILATOR-ASSOCIATED PNEUMONIA: PROSPECTIVE EVALUATION OF CLINICAL, RADIOLOGICAL AND LABORATORY PARAMETERS

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OBJECTIVES. To describe the evolution of infectious, respiratory and clinical variables in patients with ventilator-associated pneumonia (VAP) under appropriate empirical antimicrobial therapy and precise the time-point of resolution.

METHODS. 2-year, prospective, cohort, single center study. Diagnosis of VAP was established with blinded protected telescoping specimens (PTC, cfu $\geq 10^3$/ml) in patients with clinical suspicion of VAP, only the first VAP per patient was included. The following data were recorded on days 1, 3, 7 and 10 of VAP onset: fever, white blood cell count, presence of purulent aspirates, PaO_2/FiO_2 ratio (P/F), radiologic score (RS), Lung Injury Score (LIS), SOFA and ODIN scores. A time-dependent analysis was performed. Mean values on day 1 (D1) were separately compared to those on days 3 (D3), 7 (D7) and 10 (D10) respectively, using paired-t test. For tracheal aspiratesΓÇÖ comparison, x^2 test was used. $p < 0.05$ was considered significant.

RESULTS. Clinical and bacteriological evidence of VAP was present in 58 patients from a cohort of 585 mechanically ventilated patients (with >48 h MV), 3 were excluded as not received appropriate empirical antimicrobial therapy and 1 due to death within 24 h. Responsible bacteria were: A. baumannii 34/54 (63%), *P. aeruginosa* 9/54 (17%), *S. aureus* 3/54 (6%), *K. pneumoniae* 2/54 (4%) and other 6/54 (11%). No considerable change was found in white blood cell count, radiologic score and LIS from day 1 to day 10. Fever, quality of purulent aspirates, SOFA and ODIN scores showed time-dependent significant improvement: fever (D1 → D3, $p < 0.001$, D1 → D7, $p < 0.001$, D1 → D10, $p < 0.001$), aspirates (D1 → D7, $p < 0.023$, D1 → D10, $p < 0.001$), SOFA (D1 → D7, $p < 0.01$, D1 → D10, $p < 0.001$), ODIN (D1 → D7, $p < 0.001$, D1 → D10, $p < 0.001$). P/F ratio showed a tendency towards improvement after 7 days of therapy (D1 → D7, $p < 0.048$).

CONCLUSIONS. Fever, clearance of purulent aspirates and hypoxemia are useful variables, where as leucocytes and persistence of pulmonary infiltrates in chest radiography should probably be ignored in monitoring VAP resolution. In our setting, day seven could be considered as an important time-point on the clinical course of VAP and could guide the duration of antimicrobial therapy.

0391

VAP PATIENTSΓÇÖREALITY OF A PORTUGUESE MIXED CASE ICU

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INTRODUCTION. Diagnosis of Ventilator Associated Pneumonia (VAP), besides the clinical relevance and impact on ICU mortality, is a benchmarking tool for Intensive Care management. The knowledge of each ICU VAP data should lead to measures such as implementation of bundles towards better results and deciding best antibiotherapy strategy.

OBJECTIVES. This study aims to describe the reality of our ten bed ICU regarding VAP, we use routinely as a self-auditing tool.

METHODS. This retrospective study enrolled all patients admitted from the 1st August 2001 to 31 July 2009 (n = 2378) to our mixed case ten bed ICU. VAP first episode patients were selected according to ATS/IDSA Guidelines (2005). We compared VAP patients (n = 167) to a control group of patients submitted to mechanical ventilation for more than 48 h (n = 1243). Demographic and clinical data, including severity indexes, ICU Mortality, ICU length of stay (LOS), Length of ventilation (LOV), Microbiological confirmation were collected from clinical registries. SPSS for Windows was used for data analysis.

RESULTS. From a total of 2,378 patients, 167 had a diagnosis of VAP (first episode). Globally we found 11.9 VAP per 1000 ventilation days. When compared to control group they had no differences regarding Age, SAPS II, APACHE II; they exhibit differences regarding Gender and Diagnosis. ICU LOS, LOV and ICU mortality was significant higher on VAP group. Tables 1 and 2 show comparison of VAP and control group. Microbiological detection on 74.7% (124) of patients and bacterial data as follows: *Pseudomonas aeruginosa* 43.1% (56), *MRSA* 15.4% (20), *Enterobacteriacea* 13.1% (17), *Acinetobacter spp* 4.6% (6), *others* 23.8% (31).

TABLE 1 BASELINE ICU VARIABLES

ICU variables	Total (n = 2378)		Ctrl (n = 1243)		VAP (n = 167)		
	mean	Sd	Mean	Sd	Mean	Sd	p
Age (years)	59.6	16.7	60.2	16.4	58.8	16.5	
Apache II	15.8	7.2	17.1	6.3	17.4	6.7	
SAPS II	42.9	15.9	45.9	13.6	47.0	13.5	
ICU LOS(days)	7.8	10.5	10.3	8.6	27.0	18.9	0.000
LOV (days)	7.34	10.2	9.0	8.1	25.0	17.6	0.000

TABLE 2 BASELINE ICU VARIABLES

ICU variables	Total (n = 2378)		Ctrl (n = 1243)		VAP (n = 167)		
	n	%	n	%	n	%	p
Gender male	1,471	61.9	803	64.6	126	75.4	.006
ICU outcome dead	469	19.7	235	18.9	45	26.9	.014
Diagnosis medical	1,276	53.7	791	63.6	119	71.3	.041

CONCLUSIONS. We found a significantly higher ICU mortality, ICU length of stay, ICU length of ventilation in PAV group *Vs* control group of mechanical ventilated patients for more than 48 h, data consistent with most series published. Number of VAP episodes per invasive ventilation days benchmarking are not stable over years reflecting policy making. We found an acceptable rate of microbiological isolations in low respiratory tract cultures.

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COMBINED AEROSOLIZED AND INTRAVENOUS COLISTIN FOR THE TREATMENT OF VENTILATOR ASSOCIATED PNEUMONIA DUE TO MULTIDRUGRESISTANT GRAM-NEGATIVE PATHOGENS

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INTRODUCTION. Ventilator Associated Pneumonia (VAP) due to Gram-negative Multi-DrugResistant (GnMDR) bacteria has forced clinicians to reconsider old antibiotics and new delivering strategies.

OBJECTIVES. Evaluate the efficay of aerosolized (AS) and intravenous (IV) colistin versus IV colistin alone for the treatment GnMDR VAP.

METHODS. We conducted a retrospective matched (1:1) case–control study in the 18-bed Intensive Care Unit (ICU) of our university hospital, between 1th of January 2007 and 31th of December 2010. SAPSII score, SOFA score and age were the criteria used to match patients (pts) treated with AS plus IV colistin (group 1) with those ones treated with IV colistin alone (group 2).

RESULTS. During the study period 854 pneumonia (on admission and during the ICU stay) were diagnosed over 2,831 patients admitted to the ICU. Forty-eight patients had a MDR VAP and were treated with IV and AS colistin. Mean age, SAPSII and SOFA score were comparable between the two groups (65 ± 16 vs. 64 ± 18 years, 46 ± 15 vs. 44 ± 14, 9.7 ± 0.8 vs. 8.3 ± 0.5; p = NS). The principal reason of admission was medical (65% in AS plus IV group and 71% in control group) and presented a mean ICU length of stay of respectively 34.5 ± 29 and 33.9 ± 22.5 days. 39% of all episodes were polimicrobial and MDR causative agents isolated were Acinetobacter baumanni (71.5% of VAP), Pseudomonas aeruginosa (29% of VAP) and Klebsiella pneumoniae (9% of VAP). Presence of comorbidities (renal, cardiac, hepatic, respiratory, neoplastic, metabolic and immunitary) and mean duration of colistin treatment (10.3 ± 7.4 days) were comparable between the two groups. The outcome between the two groups was similar: overall mortality (42 vs. 46%, p = 0.8), VAP-related mortality (31 vs. 29%, p = 0.8), duration of mechanical ventilation after VAP (16.5 ± 19 vs. 14.9 ± 16 days, p = 0.7) and nephrotoxicity (41 vs. 35%; p = 0.7).

CONCLUSIONS. The addition of AS colistin to intravenous route, although apparently safe, did not seem to significantly improve the outcome of patients affected by VAP due to GnMDR. However larger prospective trials using new generation nebulizers are needed in order to better elucidate the role of AS colistin in the management of difficult to treat VAP.

Improving haemodynamic management: 0393–0397

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HEART RATE CONTROL WITH ESMOLOL IN SEPTIC SHOCK: A RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. Beta-blocker treatment may be an interesting option to attenuate the deleterious effects of prolonged catecholamine exposure during septic shock. In this regard, preclinical and clinical studies report that beta-blockers may have cardioprotective and anti-inflammatory effects. Nevertheless, there are concerns that beta-blockers may have negative inotropic effects leading to inappropriately low cardiac output and pulmonary congestion.
OBJECTIVES. To investigate the effects of the beta-1 adrenoreceptor blocker esmolol on systemic hemodynamics, oxygen transport and norepinephrine requirements in septic shock.
METHODS. After 24 h of initial hemodynamic stabilization, 42 septic shock patients with a heart rate >of 95 bpm and requiring norepinephrine to maintain mean arterial pressure (MAP) between 65 and 75 mmHg despite adequate volume resuscitation, were randomized to be treated with either (a) a continuous esmolol infusion to maintain heart rate between 95 and 80 bpm (b) to a standard treatment without heart rate control (control; each n = 21). In both groups, norepinephrine was titrated to achieve a MAP between 65 and 75 mmHg, if needed. Data from right heart catheterization and norepinephrine requirements were obtained at baseline and after 24, 48, 72, and 96 h.
RESULTS. In 100% of patients, targeted heart rates between 80 to 95 bpm were achieved with esmolol. Apart from heart rate, there were no differences in systemic hemodynamics, oxygen transport and acid–base homeostasis, as well as norepinephrine requirements between the study groups. Principal results are summarized in Tables 1 and 2 (Symbols: # $p < 0.05$ between groups; * $p < 0.05$ vs. baseline; § $p < 0.05$ vs. 24 h).

TABLE 1

	GROUPS	Baseline	24 h	48 h	72 h	96 h
CI (L/min/m^2)	Treated	4.5 ± 1.3	3.8 ± 0.8	3.3 ± 0.9*§	3.5 ± 0.8	3.7 ± 0.8
	Controls	4.2 ± 1.2	4 ± 1.4	4 ± 1.3	4 ± 1.4	3.9 ± 1.3
SVI (ml/beat/m^2)	Treated	40 ± 11	42 ± 10	38 ± 12	42 ± 10	42 ± 10
	Controls	37 ± 12	37 ± 14	39 ± 15	38 ± 13	40 ± 14
Norepi-nephrine (γ/kg/min)	Treated	0.82 ± 0.97	0.73 ± 0.86	0.74 ± 0.97	0.63 ± 0.78	0.62 ± 1
	Controls	0.56 ± 0.59	0.46 ± 0.24	0.71 ± 0.5	1.13 ± 1.37	0.79 ± 0.47
Heartrate (Bpm)	Treated	113 ± 15	89 ± 7*	85 ± 8*	83 ± 9*	87 ± 8*
	Controls	114 ± 12	111 ± 14#	108 ± 17#	108 ± 20#	102 ± 17#

TABLE 2

	Groups	Baseline	24 h	48 h	72 h	96 h
SvO2 (%)	Treated	68 ± 9	67 ± 8	67 ± 11	68 ± 8	68 ± 11
	Controls	66 ± 6	64 ± 10	63 ± 10	63 ± 11	64 ± 10
Lactate (mmol L^{-1})	Treated	1.9 ± 1.5	1.6 ± 1.0	1.5 ± 0.9	1.8 ± 1.1	1.8 ± 1.1
	Controls	1.8 ± 0.8	1.8 ± 0.7	1.7 ± 0.8	2.1 ± 1.0	2.6 ± 2.9

CONCLUSIONS. In septic shock patients, titration of esmolol to achieve a predefined HR threshold did neither affact MAP, nor norepinephrine and inotrope requirements. Beta-1 adrenoreceptor blockade may be useful to economize myocardial function in septic shock.
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0394

THE ESTIMATION OF CARDIAC OUTPUT BY THE THIRD GENERATION OF THE VIGILEO DEVICE IS NOT RELIABLE FOR TRACKING THE CHANGES IN CARDIAC OUTPUT INDUCED BY NOREPINEPHRINE

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INTRODUCTION. The Vigileo device, a system estimating cardiac output by an uncalibrated analysis of the arterial waveform, has been shown to be less reliable than the PiCCO device, which estimates cardiac output through a calibrated pulse contour analysis, for tracking the changes in cardiac index (CI), especially when induced by norepinephrine (1). Nevertheless, these results were obtained with the previous version of the device (Vigileo2). A recent study suggested that an upgraded version of the Vigileo (Vigileo3) is more precise than the previous one (2). We compared the ability of the Vigileo3 and the PiCCO devices for tracking the changes in CI induced by volume expansion and changes in the dose of norepinephrine.
METHODS. In sixty patients with an acute circulatory failure, we administered volume expansion (20 patients), decreased norepinephrine (20 patients) or increased norepinephrine (20 patients). We measured the pulse contour-derived CI provided by the PiCCO device (CIpcPiCCO), the arterial pressure waveform-derived CI provided by the Vigileo3 device (CIVigileo3) and the transpulmonary thermodilution CI (CItd) before and after therapeutic interventions.
RESULTS. The changes in CIpcPiCCO accurately tracked the changes in CItd induced by volume expansion (r = 0.74, p = 0.0001, bias = -0.14 ± 0.42 L/min/m^2) as well as by norepinephrine decrease (r = 0.75, p = 0.0002, bias = 0.00 ± 0.41 L/min/m^2) and norepinephrine increase (r = 0.82, $p < 0.0001$, bias = -0.03 ± 0.41 L/min/m^2). The changes in CIVigileo3 were less reliable for tracking the fluid-induced changes in CItd (r = 0.56, p = 0.007, bias = –0.08 ± 0.56 L/min/m^2), the changes in CItd induced by the norepinephrine decrease (r = 0.42, p = 0.06, bias = –0.19 ± 0.58 L/min/m^2) and the changes in CItd induced by the norepinephrine increase (r = 0.05, p = 0.81, bias = 0.36 ± 0.82 L/min/m^2). The area under the ROC curve describing the ability of the devices to detect an increase in CItd ≥ 15% induced by volume expansion was significant for CIpcPiCCO (0.861 ± 0.08, $p < 0.0001$) but not for the CIVigileo3 device (0.639 ± 0.123, p = 0.26).
CONCLUSIONS. The uncalibrated Vigileo3 device reliably tracked the trends in CI induced by volume expansion but not by norepinephrine. By contrast, the calibrated PiCCO device accurately detected the changes in CI induced by both therapeutic interventions.
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0395

EVALUATION OF THE BENEFIT OF DIFFERENT CATHECHOLAMINE REGIMES IN CARDIOGENIC SHOCK: GENERALIZED PROPENSITY SCORE APPROACH

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INTRODUCTION. The optimal regime of catecholamine for hemodynamic support during cardiogenic shock has been poorly evaluated. It remains unclear whether ino-dilators (such as dobutamine or Phospho-diesterase 3 inhibitors) should be preferred to ino-pressors (such as epinephrine or dopamine) or if they should be combined.
OBJECTIVES. We aimed at comparing the impact of such different strategies on 30-day mortality in patients hospitalized for cardiogenic shock.
METHODS.
Patients: International cohort of 550 cardiogenic shocks extracted from the ALARM-HF cohort
Design: A generalized propensity-score (PS) model to predict the individual probability to receive one of the four regimes (ino-dilators, ino-pressors, combination or no drug), conditionally on baseline-measured covariates, was obtained by fitting a multivariate multinomial regression. The *no-drug* regime corresponded to strategies based on intra-aortic counterpulsion balloon pump or immediate PCI for example. Each observation was weighted by the inverse of the probability to receive the treatment actually delivered. The benefit of the treatment regime on 30-day mortality was then estimated by fitting a weighted logistic regression model. Such an approach allowed a one-to-one comparison of each different treatment regime to the others, and to a no catecholamine strategy.
RESULTS. The use of drugs with a vasopressor activity (epinephrine, norepinephrine or dopamine) was associated with an increased 30-day mortality, as compared to ino-dilators (OR: 1.91, 95%CI: 1.05–3.47, p = 0.03). The *combination* regime was also associated with increased 30-day mortality as compared to ino-dilators (OR: 1.70, 95%CI: 1.11–2.61, p = 0.01). No difference between the *combination* regime and the *ino-pressor* regime was observed in terms of 30-day mortality (OR: 1.12, 95%CI: 0.62–2.04, p = 0.71).
CONCLUSIONS. The use of drugs with a vasopressor activity seems to alter the prognosis of patients admitted for cardiogenic shock.
GRANT ACKNOWLEDGMENT. Abbott funded the ALARM-HF survey.

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RESPIRATORY CHANGE IN ECG-WAVE AMPLITUDE IS A RELIABLE PARAMETER TO ESTIMATE INTRAVASCULAR VOLUME STATUS

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INTRODUCTION. Electrocardiogram (ECG) is a common monitoring in intensive care medicine. Several studies suggest that changes in ECG morphology may reflect changes in volume status. The ΓÇ£Brody effectΓÇø, a theoretical analysis of left ventricular (LV) chamber size influence on QRS-wave amplitude is the key element of this phenomenon. It is characterized by an increase in QRS-wave amplitude induced by an increase in ventricular preload. [1]
OBJECTIVES. This study investigated the influence of changes in intravascular volume status on respiratory variations of QRS-wave amplitude (ΔECG) compared with respiratory pulse pressure variations (ΔPP).
METHODS. In seventeen pigs, ECG and arterial pressure were recorded. QRS-wave amplitude was recorded using an analog/digital interface converter (MP100; Biopac Systems), ensuring that in all animals ECG-electrodes were always at the same location. Maximal QRS amplitude (ECGmax) and minimal QRS amplitude (ECGmin) were determined over one respiratory cycle. ΔECG was calculated as 100x [(ECGmax-ECGmin)/(ECGmax + ECGmin)/2]. ΔECG and ΔPP were simultaneously recorded. Measurements were performed during normovolaemic conditions, after haemorrhage (25 mL/kg) and following re-transfusion (25 mL/kg) with constant tidal volume (10 ml/kg) and respiration rate (15/min).
RESULTS. At baseline (normovolemic condition), ΔPP and ΔECG were both <12%. ΔPP was significantly correlated with ΔECG ($r^2 = 0.89$, $p < 0.001$). Volume loss induced by haemorrhage increased significantly ΔPP and ΔECG. Moreover, during this state, ΔPP was significantly correlated with ΔECG ($r^2 = 0.86$, $p < 0.001$). Retransfusion significantly decreased ΔPP and ΔECG and ΔPP were significantly correlated with ΔECG ($r^2 = 0.90$, $p < 0.001$) (Figure).

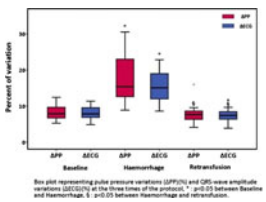

Fig.

CONCLUSIONS. In conclusion, available correlations between ΔPP and ΔECG at each time of the study were observed, meaning that ΔECG is a reliable parameter to estimate the changes in intravascular volume status and provide experimental confirmation of the ΓÇ£Brody effect.ΓÇø [2]
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0397

CIRCULATING CARBAMOYL PHOSPHATE SYNTHASE-1 LEVELS ARE A NEW MARKER OF LIVER CELL NECROSIS IN PATIENTS WITH CARDIOGENIC SHOCK

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INTRODUCTION. Acute hepatic injury is a common finding in critically ill patients. Hypoxic liver injury is a frequent finding at the intensive care unit (ICU) and associated with significantly increased mortality. Carbamoyl phosphate synthetase-1 (CPS-1) is an enzyme primarily confined to liver mitochondria that catalyzes the first step in the urea cycle.

OBJECTIVES. To evaluate the clinics and prognostic impact of circulating levels of CPS-1 in critically ill patients suffering from cardiogenic shock and HH

METHODS. Blood samples were collected after ICU-admission in patients with cardiogenic shock (CS) and hypoxic hepatitis (HH). CPS-1 levels of critically ill patients with CS but without HH matched for age, severity of disease using the SAPS II score and proBNP levels treated at the same ICU during the same time period acted as control group. Relative concentrations of CPS-1 in plasma samples were measured using a chemiluminescence label-coated tube-based sandwich immunoassay.

RESULTS. 17 patients with cardiogenic shock and HH and 17 matched patients with cardiogenic shock (CS) but without HH were included in the analysis.
Patients with CS and HH had significantly higher CPS-1 levels (883.3 $\pm$ 553 vs. 6.9 $\pm$ 11.2, $p < 0.05$). CPS-1 levels correlated significantly with AST ($r = 0.9$, $p < 0.001$), ALT ($r = 0.907$, $p < 0.001$), LDH ($r = 0.824$, $p < 0.001$), bilirubin ($r = 0.62$, $p < 0.001$) and INR ($r = 0.629$, $p < 0.001$) in the total study population. Correlation of CPS-1 levels with AST ($r = 0.657$, $p = 0.004$), ALT ($r = 0.674$, $p = 0.003$) and LDH ($r = 0.534$, $p < 0.027$) were also significant in patients with HH and but neither for bilirubin nor INR. CPS-1 levels correlated significantly with AST ($r = 0.57$, $p = 0.017$) and ALT ($r = 0.629$, $p = 0.007$), but neither with LDH, bilirubin nor INR in patients with CS but without HH. CPS-1 levels did neither differ significantly between in surviving and non-surviving patients of the total cohort.

CONCLUSIONS. Circulating CPS-1 levels are a suitable marker of acute liver cell necrosis in patients with CS suffering from HH. CPS-1 levels correlate with established markers of hepatocellular necrosis and may offer a new opportunity of early diagnosis of acute hepatic injury in CS.

Ethical issues in behaviour & communication: 0398–0402

0398

OBJECTIVE AND SUBJECTIVE QUALITY OF FAMILY MEETINGS IN THE ICU: A SINGLE-CENTER STUDY

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INTRODUCTION. Effective communication improves family satisfaction, clinical decision-making and the psychological well being of family members.

OBJECTIVES. The aims of this study was to assess the objective and subjective quality of communication during family meetings in the Ghent University Hospital ICU (14 medical and 28 surgical beds).

METHODS. Eighty family meetings were randomly attended by 4 independent observers who used a checklist of 18 objective quality of communication indicators that were retrieved from the literature and further refined by experts in communication using the Delphi method. The degree of family satisfaction < 24 h after the family meeting was measured using a five-point Likert-scale (from 1 = low to 5 = high) in order to assess the subjective quality of communication. This scale was subsequently dichotomized as high ($\geq$4) or poor (<4) for the final analysis.

RESULTS. Family meetings fulfilled to a median of 13 (interquartile range 11-14) objective items. Thirteen (16.5%) families did not provide feed-back which resulted in a total of 67 meetings for inclusion in the final analysis. We found no difference in objective quality of communication between family who provided versus who did not provide feed-back ($p = 0.14$). Satisfaction was excellent in 34 (50.7%), good in 21 (31.3%), neutral in 10 (14.9%), and poor or very poor in 2 (3%). High family satisfaction was associated with a higher objective quality of communication as compared to low family satisfaction (13 (12–15) vs. 13 (10.25–14.75) $p = 0.05$). Meetings that took place in a separate room were not associated with higher family satisfaction as compared to meetings in other places (35/42, 83% vs. 20/25, 80%, $p = 0.75$) although these meetings were of longer duration (20 min (15-35) vs. 15 min (13–20), $p = 0.026$) and of better objective quality (12.5 (11–14) vs. 12 (10–13), $p = 0.036$). ΓÇ£Physician acknowledge strong emotions and encourage the families members to talk about these emotionsΓÇø was the only separate objective quality of communication item that was associated with family satisfaction; 15 of the 22 (68%) relatives who were encouraged were satisfied about the meeting as compared to 40 of the 45 (89%) who were not encouraged ($p = 0.049$). Even after adjustment for the place where the meetings took place by logistic regression analysis, this item remained associated with poorer family satisfaction (OR 0.26, 0.07–0.95, $p = 0.042$) .

CONCLUSIONS. The overall objective and subjective quality of communication during family meetings in this medico-surgical ICU was good. However, this study suggest that decision to encourage family members to talk about emotions should be made individually as this was perceived as detrimental by the average family member <24 h after the meeting. Whether this item remains detrimental for the psychological well being of family members at long-term should be evaluated in future studies.

0399

FREQUENCY AND DOCUMETATION OF "ADVANCE DIRECTIVES" IN ICU PATIENTS

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INTRODUCTION. In 2009 the German jurisdiction strengthened the importance of advance directives. In Germany advance directives can be distinguished in "Patientenverfügung" ("living will") and "Vorsorgevollmacht" ("durable power of attorney for health care"). Despite the vibrant public discussion data on the frequency of advance directives in ICU patients are rare. With this legal background we aimed to obtain data on frequency, documentation status of such directives in patient records and how often and why the necessity for following an advance directive occurred.

METHODS. For a 3-month period all patients admitted to the 22 bed part of our 58 bed operative ICU or their relatives were asked if an advance directive exists. Admitting specialty, kind of illness, intervention performed, demographic data, admission scores, documentation status, as well as the kind of advance directive were recorded. If the necessity to follow the directive occurred reason and simplified acute physiology score (SAPS) at this time were documented.

RESULTS. 249 patients or the relatives were interviewed. The majority of patients were admitted after major cancer surgery (34%) or organ transplantation (20%). 15% (38/249) of the interviewed patients had an advance directive whereas 85% had none. Of all patients with an advance directive n = 7 underwent major cancer surgery and n = 12 organ transplantation. Patients without a directive were significantly younger (median 58 years, range 18–91) then patients with one (median 70 years, range 44–84, $p < 0,001$). There was no significant difference in SAPS upon admission, for patients without a directive SAPS was 29 (range 2-99) and for patients with a directive 36 (range 12–105, p = 0,118). The existence of an advance directive could be retrieved from the records of 7 patients. In 11 out of 38 patients the advance directive had to be followed, in n = 6 for additional operations, and in n = 5 in the context of limitation of treatment.

CONCLUSION. Our survey shows that patients as well as health care providers are largely unaware of the importance, the liability and the meaning of the different forms of advance directives as a tool to guide and to improve medical care. Specifically in the field of possible high risk operations such as organ transplantation or major cancer surgery the information concerning the opportunity of advance directives should become routine part of the preoperative follow up. Patients should actively be encouraged to consider advance directives well before scheduled surgery. Major limitations of our survey are the short observation period and the relatively small number of patients included.

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0400

NURSE BEHAVIORS IN CRITICALLY ILL DYING PATIENTS

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INTRODUCTION. Little is known about nurse perspectives on the period that follows decisions to withhold/withdraw life sustaining therapies.

OBJECTIVES. To assess nurseΓÇÖs satisfaction and burnout, as well as nurseΓÇÖs behaviors when caring for patients dying after decisions to forgo life sustaining therapies.

METHODS. Cross sectional study proposed to 186 ICUs in France. Nurses were asked to fill in a specific questionnaire on their relationship with other ICU clinicians, job strain and practices when caring for patients dying after end-of-life decisions.

RESULTS. 1721 nurses (140 ICUs) completed the questionnaire. There were 262 (15.2%) men and 1459 women, aged of 30 years (26–36), and working in ICU since 30 (12–72) months. On the study day, 40% of the nurses were caring for dying patients and half the nurses had just shared end-of-life decisions. Nurses ranked (on a 10-point scale, 0 abominable, 10 excellent) their satisfaction at work at 8 (6-8). They attributed a rank of 6 to unit staff levels, shared decisions with doctors, and recognition of their professional value by other nurses and doctors. Half the nurses were thinking about leaving the ICU. Relationship between nurses and non-physicians clinicians were ranked at 8, but this with physicians was ranked at 7 (6–8), $P < 0,0001$.
Nurses were asked to report on their behaviors when caring for patients in whom end-of-life decisions had been implemented. They reported that they prioritized patients who were not dying for nursing (25%), global ICU care (29%), or monitoring (39%). Nurses stated that they also increased sedation doses without medical agreement (30.1%), or that they withdrew on their own treatments that were still prescribed (antibiotics 4% and vasopressors 1.5%). Nurses whose behaviors were not at odd with medical prescriptions were ranking lower their satisfaction at work (7 (6–8) vs. 8 (7–9), $P < 0.0001$), as well as relationship with and recognition from other ICU-clinicians. They also ranked lower the quality of communication within the ICU staff, as well as the quality of the decision making process. Those nurses had also a higher job strain (more particularly in the domains "demand" and "social support".
By multivariate analysis, five factors were associated with increased discrepant behaviors: 1) ICUs admitting >500patients/year, 2) nurse reporting the feeling of loneliness during end-of-life care, 3) caring for a DNR patient, 4) being smoker, 5) working in ICU since a longer period.
Six factors were associated with decreased discrepant behaviors: (1) working in a trauma ICU, (2) having a psychologist dedicated to the ICU, (3) being a woman, (4) caring for a high number of patients, (5) having good relationship with head nurses and (6) finding unit staff levels as good means to communicate.

CONCLUSIONS. Strategies to improve communication and to increase nurse-physicians cooperation and collaboration are warranted as to avoid ethically and medically unacceptable behaviors.

0401

WHY INTENSIVISTS CONTINUE DISPROPORTIONAL PATIENT CARE. RESULTS FROM THE APPROPRICUS STUDY

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INTRODUCTION. Advances in medical technology enable more lives to be saved but may prolong the dying process and the suffering of patients and families at the end of life.

OBJECTIVES. To determine the prevalence of inappropriate or non-beneficial care in ICU patients as perceived by ICU healthcare providers (HCP) (nurses and physicians), as well as the reasons why disproportional care is continued.

METHODS. A single-day cross-sectional evaluation of perceptions of inappropriate care among ICU nurses and physicians providing bedside care to adult ICU patients in 10 European countries. Healthcare providers who reported inappropriate care were requested to complete the Perceived Inappropriate Care Questionnaire for each patient perceived as receiving inappropriate care. This additional questionnaire evaluated the reasons leading the healthcare provider to consider care as inappropriate.

RESULTS. A total of 445 Inappropriate Care Questionnaires were completed. Providing disproportional care was the most frequent situation perceived as inappropriate care (290/445, 65%), of which 89% were classified as providing ΓÇÿtoo much careΓÇÖ and only 11% as ΓÇÿtoo little careΓÇÖ.The ICU related-factors associated with disproportional care were: prognostic uncertainty (49%), lack of consensus concerning the prognosis (33%), no one in the ICU team taking initiative to challenge the appropriateness of care (32%) or no one taking action to limit therapy despite consensus (31%). Inadequate communication within the ICU team was identified in 34% of the cases. Patient/Family-related factors that were associated with disproportional care were: patient and/or family not ready to withdraw therapy (37%) and asking to continue care (32%). Requests from the referring physician to continue disproportional care were also identified in 28% of the questionnaires.
More ICU physicians as compared to nurses reported prognostic uncertainty as a reason to continue disproportional care (61% versus 42%, p = 0.003), while inadequate communication within the ICU team was less frequent among physicians as opposed to nurses (19 vs. 42% in nurses, $p < 0.001$), and the lack of initiative to challenge inappropriate care was also lower among physicians (19 vs. 42% in nurses, p = 0.001).

CONCLUSIONS. Providing ΓÇÿtoo much careΓÇÖ is the most frequent situation evoking the perception of inappropriate care both in ICU nurses and ICU physicians. Factors both internal and external to the ICU lead healthcare providers to continue patient care that is perceived as disproportional.

GRANT ACKNOWLEDGMENT. ESICM/ECCRN award (Vienna 2009).

0402

PERCEPTION BY FAMILY MEMBERS AND ICU STAFF OF THE QUALITY OF DYING AND DEATH IN THE ICU. A PROSPECTIVE MULTI-CENTER STUDY IN THE NETHERLANDS

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INTRODUCTION. Admission to the intensive care unit (ICU) is a major event in a patientΓÇÖs life, also for family members. During ICU treatment, a situation may evolve where the perspective on a reasonably recovery with expected well-being is no longer achievable. We tried to elucidate how family members and ICU care-givers experience the dying process of Dutch ICU patients.

METHODS. The study took place in three Dutch mixed medical-surgical ICUs, i.e. MCL (20 beds), GH (12 beds) and HMC (18 beds). All patients who had stayed >48 h and died in the ICU were eligible for study participation. The previously published and validated Quality of Dying and Death (QODD) questionnaire was translated and back-translated from Dutch by a native English speaker. Several items pertaining to the patientΓÇÖs autonomy regarding decision making in the period directly preceding death were added. We aimed for inclusion of 100 patients in the study. Values indicate median and interquartile range.

RESULTS. In a period of 6 months, 100 patients were included. Age was 73 (65–80) years with 66% males, and ICU stay before death was 8 (3–16) days. APACHE-II score was 24 (19–31). The questionnaire showed that families were satisfied [score 8 (7–9)] with the overall quality of death and dying. They felt supported by the ICU care-givers [score 8 (7–9)]. Pain control was appreciated differently by family members [8 (6–8)] when compared to nurses and physicians [9 (8–10); p = 0.002].This also applied to the appraisal of comfort in breathing [family score 6 (4–7) vs. physicians 7 (3–8); p = 0.011), and the feeling that the patient was at peace with dying [family score 7(5–8) vs. physicians 8(7–9); p = 0.001]. Almost always, physicians discussed the patientΓÇÖs end-of-life wishes with family members, although families (7 [6–9]) and physicians (9 [7–10]) rated the quality of the discussion significantly different (p = 0.005). The majority of the families (89%) felt included in the decision making process. They felt supported by the team (82%) and had enough time for questions (89%). Half of the family members (46%) felt that the physician took the final decision alone after they had been informed, while 36% of the family members felt that they had participated in taking the decision on end of life care.

CONCLUSIONS. Families of patients dying in Dutch ICUs are satisfied with the quality of end-of-life care as well as the quality of the dying process. The families felt strongly involved in the decision making process regarding the final outcome.

Metabolism & nutrition: 0403–0407

0403

INSULIN SIGNALING IN SKELETAL MUSCLE DURING EARLY CRITICAL ILLNESS: IMPACT ON DEVELOPMENT OF CRITICAL ILLNESS MYOPATHY

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INTRODUCTION. We observed a significant decrease in insulin sensitivity in ICU patients during early critical illness (CI). Patients with critical-illness-myopathy (CIM) displayed even lower insulin sensitivity than Non-CIM ICU-control patients.

OBJECTIVES. To investigate changes at the transcriptional level of the insulin signaling cascade in skeletal muscle biopsies from ICU patients during early CI, categorized in CIM and Non-CIM patients compared to non ICU-controls.

METHODS. Patients with SOFA scores $\geq$ 8 on 3 of 5 consecutive days within the first 7 days after ICU admission were eligible for inclusion into this prospective, observational study. Surgical muscle biopsies were taken from vastus lateralis muscles at median day 5.5 (4.0/7.0) after ICU admission in 30 ICU patients and in 16 Non-ICU prediabetic control patients. Real-time PCR experiments were done. Cyclophilin was used as endogenous reference to normalize the expression of the target gene. Critical illness myopathy was defined according to electrophysiological criteria with a CMAP amplitude < 3.0 mV in tibialis anterior or extensor digitorum communis muscles after direct muscle stimulation. Nonparametric tests were used for statistical analyses, results expressed as median and (25; 75) percentiles, alpha = 0.05.

RESULTS. Except for PI3 K-p110a, transcriptional levels of genes analysed were significantly decreased in ICU patients when compared to Non-ICU prediabetic controls. CIM patients displayed significantly decreased levels of PI3 K-p110a, SHIP2 and PGC1a compared to Non-CIM.

Insulin signaling in skeletal muscle

	Non-ICU-controls	Non-CIM	CIM	p
IGF1R	1.2387 (0.9866; 1.6708)	0.9207 (0.5807;1.0771)	0.6449 (0.4788; 0.7364)	a < .001, b .059
IRS1	3.7424 (2.9888;4.6803)	0.7238 (0.3860; 1.0678)	0.3145 (0.2360; 0.7226)	a < .001, b .053
PI3 K-p110a	0.6444 (0.4381; 0.8837)	0.7098 (0.3608; 0.8985)	0.5133 (0.1933; 0.5618)	a .162, b .016
GLUT1	9.3252 (5.7955; 22.6600)	1.3004 (0.6477; 1.6829)	1.6580 (0.7202; 1.9669)	a < .001, b .608
GLUT4	1.5604 (1.1518; 2.1535)	0.1280 (0.0124; 0.8892)	0.0653 (0.0021;0.1453)	a < .001, b .325
SHIP2	2.4447 (1.7092;3.0841)	0.9363 (0.5774; 1.2100)	0.4385 (0.3244; 0.7200)	a < .001, b .014
PGC1a	0.6385 (0.5662; 1.2372)	0.5188 (0.4245;0.9107)	0.3284 (0.2986; 0.5686)	a .010, b .034
PPARa	1.0079 (0.7556; 1.2427)	0.5000 (0.1685; 0.9277)	0.3623 (0.2007; 0.5277)	a < .001, b .280
PPARg	1.5171 (1.0882; 3.0397)	0.8069 (0.6170; 1.1061)	0.7822 (0.6764; 1.0309)	a .001, b .904

p(a) significance between Non-ICU-controls and ICU patients, p(b) significance between CIM and Non-CIM; insulin like groth factor-1 Receptor (IGF1-R), insulin receptor substrate 1 (IRS1), Phosphatidylinositol 3-kinases Isoform P110a (PI3 K-p110a), glucose transporter 1 (GLUT1), glucose transporter 4 (GLUT4), Phosphoinositol Phosphatase SHIP2 (SHIP2), Peroxisome Proliferator-Activated Receptor Coactivater 1a (PGC1a), Peroxisome Proliferator-Activated Receptor 1 alpha (PPARa), Peroxisome Proliferator-Activated Receptor gamma (PPARg).

CONCLUSIONS. Systemic insulin resistance in ICU patients is reflected by a significant down regulation of components of the insulin signaling cascade at mRNA levels in skeletal muscle samples when compared to Non-ICU prediabetic controls. This downregulation of insulin signalling cascade transcription is even more pronounced in CIM patients.

GRANT ACKNOWLEDGMENT. Supported by DFG, KFO 192.

0404

VITAMIN D DEFICIENCY, PLASMA IL-18 LEVELS AND CRITICAL ILLNESS

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INTRODUCTION. Activated vitamin D ($1.25(OH)_2D_3$) stimulates innate immunity, promotes induction of T Regulatory cells, induces autophagy activation and has a therapeutic effect on pro-inflammatory cytokines. Vitamin D deficiency may play a role in mortality and infection in critically ill patients (1).

OBJECTIVES. To investigate the association between plasma 25(OH)D and the proinflammatory cytokine IL-18 at the initiation of critical care, all cause mortality and bloodstream infection.

METHODS. We conducted a prospective cohort study on 97 patients, age $\geq$ 18 years, who received critical care between 2008 and 2010 in a Medical ICU in Boston, USA. All patients had plasma IL-18 and 25(OH)D measured within 48 h of ICU admission. The exposure of interest was plasma 25(OH)D and categorized as deficiency in 25(OH)D (Γëñ15 ng/mL).(1) Logistic regression examined 30-day mortality and bloodstream infection. Adjusted odds ratios were estimated by logistic regression models. Adjustment included age or APACHE II score.

RESULTS. In the cohort, 78.4% had SIRS, 43.3% had sepsis and 14.4% had ARDS. The 30-day mortality was 27.8%, APACHE II mean (SD) was 24.2 (8.0). 31% of the study cohort had vitamin D deficiency at the time of critical care. 25(OH)D was a non-significant predictor of all cause mortality 30 days following critical care initiation (age adjusted OR 1.93 95%CI 0.69–5.42; P = 0.2). 25(OH)D deficiency was associated with a significant increase in bloodstream infection risk (age adjusted OR 8.88 95%CI 1.11–71.28; P = 0.04). Plasma IL-18 > 500 pg/ml was a significant predictor of all cause mortality 30 days following critical care initiation (age adjusted OR 4.06 95% CI 1.48–11.16; P = 0.007). Plasma IL-18 > 500 pg/ml was associated with a significant increase in bloodstream infection risk (age adjusted OR 4.23 95%CI 1.24–14.37; P = 0.02). In patients with 25(OH)D deficiency, there is a strong negative correlation between plasma IL-18 and plasma 25(OH)D levels ($r = -0.66$; $P < 0.001$). The study is underpowered to detect differences in mortality. The wide confidence intervals are related to the small sample size and reflect some statistical instability.

CONCLUSIONS. These data demonstrate that 25(OH)D deficiency is common in the medical intensive care unit and negatively correlates with IL-18 levels which themselves associate with the risk of death in critical illness. Both 25(OH)D deficiency and elevated IL-18 are individually associated with the risk of bloodstream infections. Our findings suggest that deficiency of 25(OH)D is associated with increased inflammation in critical illness as reflected by increased IL-18 levels. Vitamin D may play a role in reducing excessive inflammation via possible cross-talk between autophagy and inflammasome production of IL-18.

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GRANT ACKNOWLEDGMENT. NIH K08AI060881.

0405

IGF 1 IN ICU PATIENTS IS ASSOCIATED WITH SELECTIVE TYPE II MUSCLE FIBRE ATROPHY IN EARLY STAGE OF SEPSIS

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INTRODUCTION. It has been shown, that in the state of sepsis, Insulin-like growth factor 1 (IGF-1) is suppressed in the animal model (1).

OBJECTIVES. We investigated whether plasma levels of IGF1 are associated with muscle atrophy representing as the median cross sectional area (mCSA) of muscle fibres in early state of sepsis in patients with an elevated risk for CIM with and without septic shock.

METHODS. Due to an elevated risk for CIM, patients with SOFA scores $\geq$ 8 on 3 of 5 consecutive days within the first 7 days were eligible for inclusion into this prospective, observational study. Preexisting IDDM or neuromuscular disorder, pregnancy, BMI $\geq$ 35 kg/m2, age $<$ 18 years, or pretreatment $>$ 4 days on other ICU constituted exclusion criteria. Septic shock was defined as more than 50% of the time before biopsie in state of shock. Surgical muscle biopsies were taken from vastus lateralis muscles at median day 5.5 [4/7]. Muscles were postprocessed according to standardized procedures (isopentane, liquid nitrogen, ATPase staining, mCSA quantification by ImageJ).

Nonparametric tests were used for statistical analyses, results expressed as median and (25th/75th) percentiles for continuous variables.

Spearman (Rho) test was performed for statistical correlation.

RESULTS. 33 patients were enrolled and subsequently biopsied. Reliable mCSA quantification within biopsies could be attained from 26 patients. IGF1 was suppressed in patients with septic shock compared to patients without septic shock (p.001). IGFBP1 was upregulated (p.001) in state of septic shock during early stage of critical illness.

Selective type II but not type I muscle fibre atrophy is significantly correlated with plasma levels of IGF1 in the early phase (day 5–8 after 1st SOFA $\geq$ 8) in critically ill patients (Rho .49 p.001)

CONCLUSIONS. The suppression of the anabole hormone IGF1 and the upregulation of its counterpart of IGFBP1 in the early phase of critical illness may endorse muscle wasting in critically ill patients.

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GRANT ACKNOWLEDGMENT. This study was supported by Grant KFO 192, WE 4386/1-1 from the Deutsche Forschungsgemeinschaft.

0406

OMEGA-3 FATTY ACIDS DOES NOT BLUNT IMMUNE RESPONSE OR INFLAMMATORY RESPONSE TO AN ENDOTOXIN CHALLENGE IN HEALTHY VOLUNTEERS

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INTRODUCTION. Fish oil is known for its anti-inflammatory properties. Fish oil has been reported to blunt inflammatory responses when given prior to endotoxin in healthy volunteers.We have shown earlier that endotoxin affect in vivo protein synthesis rate (FSR) in immune cells of healthy volunteers by decreasing FSR in lymphocytes and increasing FSR in leukocytes. The aim of the present study was to investigate if fish oil can modulate this response.

METHODS. Healthy male volunteers (n = 16) were randomised to receive either a fish oil (Omegaven®) (0.2 g/kg) or a saline infusion for 5.5 h. All volunteers received an endotoxin injection (4 ng/kg) 3 h after start of the infusion. FSR was determined by a stable isotope technique in circulating T lymphocytes, mononuclear cells and the granulocytes during the last 90-min of the infusion. Cytokine levels in plasma were measured by luminex cytokine assay. Groups were compared using Student's t-test.

RESULTS. There was no difference in the vivo protein synthesis rate in immune cells between the groups. The FSR of circulating T lymphocytes was 7.7 $\pm$ 2.5%/24 h (mean $\pm$ SD) in the fish oil group and 8.5 $\pm$ 2.6%/24 h in the saline group, the FSR of mononuclear cells was 3.4 $\pm$ 1.4%/24 h and 3.1 $\pm$ 1.8%/24 h, respectively and the FSR of granulocytes was 4.9 $\pm$ 0.8%/24 h in the fish oil group and 4.6 $\pm$ 0.9%/24 h in the saline group. Plasma concentrations of cytokines (IL-1b, IL-4, IL-6, IL-8, IL-10, GMCSF, TNF-α) increased in response to endotoxin injection in both groups.

CONCLUSIONS. In the present study 5.5-h fish oil infusion failed to modulate immune competence as measured by in vivo protein synthesis in several populations of immune cells in healthy volunteers challenged by an endotoxin injection. No blunting of plasma cytokines response was observed.

0407

SUPPLEMENTAL PARENTERAL NUTRITION (SPN) IN INTENSIVE CARE UNIT (ICU) PATIENTS FOR OPTIMAL ENERGY COVERAGE: IMPROVED CLINICAL OUTCOME

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INTRODUCTION. Enteral Nutrition (EN) recommended as first choice of nutritional support in ICU* patients, is associated with difficulties for achieving targeted nutritional goals in the critically ill. A bicentric prospective controlled randomized study has investigated if delivery of 100% of energy target from day 4 by EN + SPN could optimize clinical outcome.

OBJECTIVES. The aim of this study was to show that the use of SPN to cover the energy target is not related to higher infection rate, but contrary to former believes, is associated to better clinical outcomes for ICU patients.

METHODS. All patients on EN having $\leq$60% energy coverage by day 3 after ICU admission, staying $>$5 days, with a vital prognostic $>$1 week, were included. Energy target was determined by indirect calorimetry on day 3 or set as 25-30 kcal/kg body weight/day for women and men, respectively.* Multivariate model was used to determine the impact of the EN group vs. the SPN group on the number of new infection, antibiotic days (AB), AB free days, duration of mechanical ventilation during 28 days following ICU admission and ICU length of stay (LOS).

RESULTS. At inclusion, EN and SPN groups were similar in age (60 $\pm$ 15 vs. 62 $\pm$ 16 years); gender: women/men (44/98 vs. 39/94); BMI (26.6 $\pm$ 4.7 vs. 25.7 $\pm$ 4.0 kg/m^2); medicine vs. surgery (77/65 vs. 73/60); APACHE II (22 $\pm$ 8 vs. 22 $\pm$ 8); SAPS II (46 $\pm$ 17 vs. 49 $\pm$ 17). Energy intake between day 4 and 8 for EN and SPN group was respectively 73 $\pm$ 27 and 100 $\pm$ 16% of energy target. Being in SPN group reduces the risk of developing new infection, AB days, hours of mechanical ventilation and LOS (see table).

EN group versus SPN group and clinical outcome

N = 275	Coefficient	95% CI	p
New infection	−0.27	−0.50 to −0.04	0.019
AB	−3.4	−5.71 to −1.04	0.005
AB free days	3.48	0.94–6.01	0.007
Hours of mechanical ventilation	−87.4	−131 to −43.8	<0.001
LOS	−2.70	−4.72 to −0.69	0.009

$p < 0.05$, normalized for age, gender, SAPS II

CONCLUSIONS. EN alone is related to insufficient energy coverage. SPN allows optimal coverage of energy target and is associated with reduced infection rate, antibiotic prescription and duration of mechanical ventilation.

REFERENCE. * ESPEN Guidelines.

GRANT ACKNOWLEDGMENT. M. Berger Grant/Research Support from: FreseniusKabi, Consultant of: Baxter.C. Pichard Grant/Research Support from: Fondation Nutrition 2000plus, Abbott, BBraun, Baxter, Fresenius-Kabi, Nestle, Novartis.

Caring for the ventilated patient: 0408–0412

0408

MECHANICAL VENTILATION AND WEANING RESPONSIBILITIES: AN INTERNATIONAL SURVEY

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INTRODUCTION. Optimal management of mechanical ventilation and its weaning requires dynamic and collaborative decision making to minimize complications and avoid delays in the transition to extubation.

OBJECTIVES. To develop a profile of interprofessional responsibility, and nursing scope of practice, for key ventilation and weaning decisions.

METHODS. We conducted a multi-centre, self-administered survey sent by mail to nurse managers of adult intensive care units (ICUs) in Denmark, Greece, Italy, Norway, Switzerland, the Netherlands and the United Kingdom (UK). The original survey [1] was translated and contextually adapted for each country.

RESULTS. Response rates ranged from 39% (UK) to 94% (Italy), providing surveys from 385 ICUs. Nurses were involved in decisions about titration of ventilator settings (354/381, 92.9%) in more ICUs than decisions to determine weaning failure (334/378, 88.4% relative risk [RR] 0.95 [95% CI 0.91-1.00]) weaning readiness (328/382, 85.8%, RR 0.92 [0.88-0.97]), weaning method (295/382, 77.2%, RR 0.83 [0.78–0.88]), extubation readiness (266/382, 69.9% RR 0.75 [0.70–0.81]) and initial selection of ventilator settings (242/382, 63.4%, RR 0.68 [0.63–0.74]). Nurses were more likely to be involved in setting initial ventilator settings in Switzerland (81.9%) and the UK (79.8%) compared to other countries, where the percentage of ICUs ranged from 32.4% (Italy) to 55.0% (Denmark) (x2 46.7, df = 1, $p < 0.001$). In the majority of Swiss and UK ICUs, nurses frequently (>25% of required adjustments) independently titrated all ventilator settings including change of mode. In Denmark, Norway and the Netherlands, PEEP was the least likely of all ventilator settings to be changed independently by nurses. Nurses rarely titrated ventilator settings in Italy and Greece. Nursing autonomy and influence on ventilator decisions (rated on two 11-point numerical scales) were moderate (median score 7, IQR 5-8 and 8, IQR 7–8 respectively). Nurse:patient ratios were predominantly 1:1 in Swiss (67.1%), UK (93.0%), Danish (73.2%)and Norwegian (89.7%) ICUs, 1:2 in Dutch (52.1%) and Italian (76.5%) ICUs, and either 1:2 (41.7%) or 1:3 (41.7%) in Greek ICUs. Nurse:patient ratios were independently associated with nurse involvement in selection of weaning method (OR 3.65, 95% CI 1.07–12.5) but not for other ventilator decisions when controlling for country, ICU type and size, presence of a protocol, teaching hospital and rating of autonomy. Protocols for mechanical ventilation, weaning and non-invasive ventilation were available in 247/381 (64.8%) 233/381 (61.2%) and 218/381 (58.0%) ICUs respectively. Automated weaning modes were not used in 169/365 (53.7%) ICUs.

CONCLUSIONS. Considerable variation exists in the interprofessional responsibility for management of mechanical ventilation and weaning across and within countries.**REFERENCES.** 1. Rose L et al. J Clin Nur. 2008;17:1035–1043.

0409

ORAL HEALTH CARE IN INTUBATED PATIENTS: EXPLORATION OF KNOWLEDGE AND PRACTICE AMONG 663 ICU NURSES

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INTRODUCTION. Critically ill intubated patients depend on intensive care unit (ICU) nurses for receiving oral health care. While a patient's oral status is considered a good index of the general standard of care provided, oral health is also key to prevent infection. No evidence-based recommendations, however, are currently available to guide ICU staff[s daily practice (1).

OBJECTIVES. To explore knowledge and daily practice regarding oral health care for adult intubated patients in Flemish ICU nurses.

METHODS. Questionnaire survey at the Flemish Society for Critical Care Nurses' annual congress (November 2010) to assess knowledge (via a 10-item multiple choice test) and daily practice.

RESULTS. 663 questionnaires were collected.(response rate 75.4%); 72.5% of respondents were females; 51.9% had >10 years working experience; 50.7% worked in a mixed ICU and 44.3% in a hospital with >15 ICU beds; 85.1% had a specialized degree in intensive care nursing. The most reported frequency of oral health care was every 4 h (n = 225; 40.1%), followed by every 8 h (n = 192; 34.2%). Oral health care was generally provided using foam swabs (n = 365; 65.1%). Also manual toothbrushes for adults (n = 351; 63.0%) and toothpaste (n = 314; 56.7%) were frequently used. Electric brushes (n = 65; 9.8%) and toothbrushes for children (n = 32; 5.8%), however, were seldom used. Prepacked oral care sets were available for 29.2% (n = 162) of respondents. In 62.6% (n = 355) brushing was combined with chlorhexidine rinse. Of these, rinsing followed brushing immediately in 53.0% (n = 184). The reported duration of oral health care interventions widely ranged between $\leq$10 and $\geq$90 s. A protocol for oral health care was available in 53.8% (n = 357). The oral cavity was most frequently assessed every 8 h (37.1%; n = 211); this evaluation comprised various aspects including redness (70.7%), siallorhea (78.6%), xerostomia (89.6%), bleeding (83.9%) and debris (94.3%). Strikingly, plaque (9.3%; n = 52) and caries (9.8%; n = 55) development were rarely assessed. Most (54.5%; n = 310) considered oral health care to be a high priority. The mean score on 10 knowledge questions was 5.40 (standard deviation 1.47).

CONCLUSIONS. Flemish ICU nurses reported a large variety in oral health care practices for intubated patients. They considered oral care a high priority but had only moderate knowledge of this topic. Multidisciplinary collaboration could enhance the assessment of the oral cavity and thereby the oral health care of intubated patients. Our findings support the need for evidence-based procedures in order to provide optimal oral hygiene.

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GRANT ACKNOWLEDGMENT. S. Labeau holds a doctoral grant from University College Ghent, and the ESICM ECCRN-Edwards Nursing Science Award 2008.

0410

MANUAL HYPERINFLATION PARTLY PREVENTS REDUCTIONS OF FUNCTIONAL RESIDUAL CAPACITY IN CARDIAC SURGICAL PATIENTS: A RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. Cardiac surgical patients are kept in an iatrogenic state of physical and pharmacologic immobilization for several hours after surgery, to facilitate intubation and weaning from mechanically ventilation. Immobilization reduces mucociliary transport, which can lead to retention of sputum at atelectasis. Manual hyperinflation (MH) aims at preventing airway plugging by mobilization of airway secretions in mechanical ventilated patients, and as such could improve functional residual capacity (FRC) and oxygenation after surgery.

OBJECTIVES. We performed a randomized controlled trial in patients after cardiac surgery with the aim to compare a strategy using routine MH maneuvers with a strategy only using MH if clinically indicated.

METHODS. Patients after elective cardiac surgery and admitted to the ICU of a university hospital were randomly allocated to "routine" (MH within 1/2 h after arrival in the ICU and every 6 h until tracheal extubation) or "on demand" MH (MH only in case of failed endotracheal suctioning while sputum is obviously present, or in case of oxygen de-saturation not responding to 3 min hyper-oxygenation) during mechanical ventilation. FRC was measured pre-operatively and 1, 3, and 5 days after extubation. Chest radiographs were obtained, both pre-operative and on the third post-operative day. Peripheral hemoglobin saturation (Spo2) was measured at day 1, 3, and 5 after extubation while the patient was breathing room air.

RESULTS. Hundred patients were enrolled. Patients in the "routine" group received median [IOR] 2 [2–3] MH procedures compared to 0 [0–0] MH procedures in the "on demand" group. In the "routine" group FRC decreased to 72% of the pre-operative measurement compared to 57% in the "on demand" (P = 0.002). Post-operative chest radiographs showed more patients without signs of atelectasis in the routine MH group (17%) compared to patients in the control group (0%) (P = 0.002). There were, however, no differences in oxygenation.

CONCLUSIONS. "Routine" MH attenuates reduction of FRC in the early post-operative days after cardiac surgery. In accordance, occurrence of atelectasis on post-operative chest radiographs was significant lower in patients who received MH.

0411

INFLUENCE OF PATIENT POSITION CHANGES ON ENDOTRACHEAL TUBE CUFF PRESSURE: RESULTS OF A PILOT STUDY IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Maintaining the endotracheal tube (ETT) cuff pressure within the target range (20-30 cm H_2O) is important to avoid microaspiration of subglottic secretions or tracheal pressure lesions.

OBJECTIVES. To assess effects of changes in patient positioning on ETT cuff pressure in sedated and mechanically ventilated adult patients.

METHODS. A convenience sample of 6 patients was selected. Patients needed to be orally intubated (ETT: Taperguard EVAC®; Covidien©) and adequately sedated (RASS -5). Additionally, patients received neuromuscular blockade. Patients were positioned in a neutral start position (backrest, head of bed elevation [HoB] 30°, head in line with trunk) and cuff pressure was set at 25 cm H_2O. Subsequently the patient was positioned in 16 different postures: anteflexion and hyperextension head, left & right lateral flexion of head, left & right rotation of head, recumbent position HoB 45° and 10°, horizontal recumbent position, trendelenburg, left and right horizontal lateral positioning over 30°, 45° and 90°. Once the patient was positioned in a predefined posture, an end-expiratory ventilatory hold was executed for a few seconds and cuff pressure was recorded. Cuff pressures observed at distinct positions were compared with pressure at start position by means of the Wilcoxon paired samples test. Also the number of measurements outside the target range were reported.

RESULTS. No measurements <20 cmH_20 were noted. Results are shown in the table.

ETT cuff pressure according to patient positioning

Position	Mean ETT cuff pressure (IQR)	*P* value for Δ from start position (25 cm H_2O)	N (%) >30 cmH_20
Anteflexion head (chin to chest)	29.3 (25.0–34.5)	0.115	3 (50.0)
Hypeiextension head	28.0 (26.0–30.0)	0.071	1 (16.7)
Left rotation head	28.5 (25.3–31.0)	0.092	1 (16.7)
Right rotation head	28.3(24.0–31.0)	0.336	1 (16.7)
Recumbent position, head of bed 10°	27.3 (25.0–29.0)	0.131	1 (16.7)
Recumbent position, head of bed 0°	28.0 (25.3–30.5)	0.075	1 (16.7)
Trendelenburg, head of bed -10°	29.0 (25.8–32.5)	0.042	2 (33.3)
Horizontal left lateral position 30°	30.0 (26.5–32.0)	0.034	4 (66.6)
Horizontal left lateral position 45°	30.2 (27.3–32.3)	0.042	4 (66.6)
Horizontal left lateral position 90°	31.8 (26.0–35.8)	0.058	4 (66.6)
Horizontal right lateral position 30°	29.8 (26.3–33.5)	0.046	2 (33.3)
Horizontal right lateral position 45°	31.8 (28.8–34.3)	0.028	4 (66.6)
Horizontal right lateral position 90°	29.7 (28.0–31.3)	0.042	3 (50.0)

In only 3 of 16 evaluated positions all 6 measurements were within the target range (left & right lateral flexion of head and recumbent position with HoB 45°; data excluded from table). In only one patient all measurements were within the target range. In one patient 3 out of 16 measurements were out of range (>30 cmH_20), in two patients 6 measurements, and in two other patients respectively 7 and 9 measurements. In total, 31/96 measurements (32.3%) exceeded the upper target range limit.

CONCLUSIONS. Despite the small number of patients included in this pilot study, significant alterations in ETT cuff pressure could be observed. Changes in patient positioning particularly resulted in increased cuff pressures. One-third of measurements exceeded the upper target limit of 30 cm H_2O and can be considered clinically relevant. As simple and frequently executed changes in patient positioning may result in potentially harmful cuff pressures, these observations call for strict monitoring practice.

0412

ACCURATE TRACHEAL TUBE CUFF PRESSURE MEASUREMENT IN INTENSIVE CARE PATIENTS

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INTRODUCTION. There is evidence to suggest that aspiration of subglottic contents past the endotracheal (ET) tube cuff can predispose to ventilator associated pneumonia (VAP) (1). Clinical observation prior to this audit suggested that cuff pressures were not being monitored regularly or accurately within our ICU. Few hand held cuff manometers were available for measurement.

OBJECTIVES. The aim was to audit current practice of ET cuff pressure measurement in order to instigate change and promote best practice.

METHODS. ET cuff pressures were measured within the first 24 h of insertion. Cuffs not maintained at optimum pressure would be corrected then re evaluated two or more days post insertion. The audit was repeated a second time once initial changes were actioned. On both occasions the data was collected over a 3 month period.

RESULTS. The initial audit demonstrated that 53% of patients had unacceptable cuff pressures within the first 24 h of ET tube insertion which were corrected by the data collectors. However 36% of cuff pressures from day two onwards were also unacceptable. The second audit indicates an approximate improvement in practice by 23% and 25% at both time points.

CONCLUSIONS. There is potential for long-term problems for the intubated patient with unacceptably high or low cuff pressures (tracheal damage and VAP respectively (2, 3). Initial changes included disseminating the results to staff; cuff manometers were supplied to each ICU bed space; local protocols for ET tube management were reviewed and updated. The final change made was to add cuff pressure monitoring as a competency in the intensive care nursing practice course. Although improvement in practice was demonstrated, further changes can still be made to prevent complications and improve patient care.

A further recommendation will be made to add a section for VAP prevention (as per Scottish intensive care society VAP prevention bundle guidelines (4) with a box prompting cuff pressure checks within the 24 h patient recording chart. It is believed that this will be a helpful reminder to staff and along with continuing multidisciplinary staff education we will see a further improvement with practice.

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Oral Sessions
Abstract Award Winning Session: 0413–0416

0413

WEANING FROM MECHANICAL VENTILATION GUIDED BY B-TYPE NATRIURETIC PEPTIDE: A MULTICENTER RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. The purpose of the weaning procedure is to reduce the duration of mechanical ventilation without incurring a substantial risk of failure. Several data have suggested that a global vascular overload could lead to prolongation of mechanical ventilation. B-type natriuretic peptides (BNP and NT-pro BNP) are hormones secreted by ventricular cardiomyocytes in response to increased wall stress that were found to be of interest in predicting weaning failure and diagnosing weaning failure from cardiac origin.

OBJECTIVES. To test if the incorporation of a BNP assay in a mechanical ventilation weaning protocol helps optimizing the weaning process and reduce the duration of ventilatory weaning period.

METHODS. In nine tertiary-care hospitals, we randomly assigned 306 mechanically ventilated patients presenting weaning criteria to management with standard physician-directed weaning (control group; n = 154) or weaning guided by BNP assay (intervention group; n = 156), with stratification on chronic obstructive pulmonary disease and left ventricle failure. In order to standardize the weaning process, patients were ventilated with an automated computer-driven pressure support weaning system in the two groups (Smart Care, Drager medical). A blood sample was collected from all patients every morning for BNP assay by the rapid immunofluorescence test (Triage BNP Test, Biosite). In the control group, the clinician was blinded for the assay results and weaning was carried out according to usual practices. Patients in the intervention group received diuretics according to a clinical practice algorithm based on plasma BNP levels with fluid intake restriction. The primary endpoint was the duration of weaning from mechanical ventilation. Registered at ClinicalTrials.gov: NCT00473148.

RESULTS. The study population included 26% of patients with COPD and 20% with left heart failure, with a mean age of 63 ± 15 years. SAPS II score at ICU admission was 46 ± 16 and SOFA score at randomization time was 4 ± 2. At day^{-1}, patients in the intervention group received more diuretics as compared to the control group, with a significantly lower fluid balance during weaning. Weaning duration (time to successful extubation) was reduced in the intervention group as compared to the control group from a median of 2.44–1.77 days (p = 0.03). Reintubation rate, intensive care length of stay and hospital length of stay did not differ between groups. As compared to the control group, patients in the intervention group exhibited fewer cases of ventilator-associated pneumonia, fewer need for assist-control ventilation because of respiratory worsening and fewer need for fluid loading because of hypotension during weaning. Detailed analyses of trial results including between strata comparisons are still ongoing and will be presented at the congress.

CONCLUSIONS. Incorporation of BNP assay in a weaning protocol is safe and reduces the duration of weaning.

0414

ULTRASOUND ASSESSMENT OF LUNG AERATION LOSS DURING A SUCCESSFUL WEANING TRIAL PREDICTS POSTEXTUBATION DISTRESS

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INTRODUCTION. Postextubation distress occurs up to 30% of patients within 48 h after a planned extubation in patients who have passed a successful spontaneous breathing trial. This event is associated with increased morbidity and mortality. Therefore, predicting postextubation distress in critically ill patients might be an important stake.

OBJECTIVES. The aim of this study is to assess whether lung derecruitment occurring during a spontaneous breathing trial, quantified by lung ultrasound, is predictive of postextubation distress.

METHODS. One hundred consecutive patients mechanically ventilated for more than 48 h in 2 ICU were included in an observational study. Lung ultrasound and B-type natriuretic peptide (BNP) dosage were performed before and at the end of a 60-min spontaneous breathing trial (SBT). Lung ultrasound score (LUS) was constructed according to the careful analysis of 12 regions of the chest wall. Four ultrasound aeration patterns were identified, normal aeration (N) defined as the presence of lung sliding; moderate loss of lung aeration (B1): multiple well-defined B lines; severe loss of lung aeration (B2): multiple coalescent B lines; and non aerated lung consolidation defined as a presence of a tissue pattern (C). For a given region of interest, points were allocated according to the ultrasound pattern observed: N = 0, B1 lines = 1, B2 lines = 2, C = 3. Two LUS, ranging between 0 and 36, were calculated as the sum of points of each regions, before and at the end of SBT.

RESULTS. 14 patients failed spontaneous breathing trial. Among 86 patients extubated, 57 were definitively weaned at day 2 (group 1) and 29 developed a postextubation distress (group 2) and required a resumption of artificial ventilation. Before SBT LUS was significantly higher in group-2 than in group-1 patients: 15 (13–17) versus 10 (6–13), respectively (p < 0.001). Loss of lung aeration during SBT occurred only in group-2 patients: LUS increased from 15 (13–17) to 19 (16–21) (p = 0.002). End-SBT LUS predicted postextubation distress with an area under ROC curve of 0.86, 95%CI (0.79–0.93). LUS > 14 had a sensitivity of 0.82 and a specificity of 0.79. BNP values were 459 (152–958) in group-2 versus 137 (65–315) in group-1, p = 0.002. Although significantly higher in group-2, BNP values were not clinically helpful to predict postextubation distress. AUC assessing the ability of end-SBT BNP to predict postextubation distress was low: 0.70, 95% CI (0.58–0.82). A BNP > 267, had a sensitivity of 0.71 and a specitficity of 0.68.

CONCLUSIONS. Lung ultrasound determination of aeration changes during a successful spontaneous breathing trial appears as a new tool to predict postextubation distress.

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0415

CHARACTERISTICS OF HOSPITAL-ACQUIRED BLOODSTREAM INFECTIONS IN INTENSIVE CARE UNITS: THE EUROBACT STUDY

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INTRODUCTION. Hospital acquired bloodstream infection (HA-BSI) is an important complication of critical illness, and the emergence of antimicrobial resistant organisms has increased the risk for treatment failure in recent years.

OBJECTIVES. To describe the contemporary epidemiology of HA-BSI in critically ill patients and assess the importance of antimicrobial resistance.

METHODS. A prospective, multi-centred cohort study was conducted in 162 ICUs in 24 countries worldwide.

RESULTS. 1,156 patients were included and were a median 62 (interquartile range; IQR; 49-74) years of age, 756 (65%) were male, and the mean (±standard deviation) SAPS II score was 50 ± 16. Admissions were medical in 672 (58%), elective surgical in 123 (11%), urgent surgical in 222 (19%), and were for trauma in 110 (10%) and for burns in 29 (3%). Infections were identified a median of 14 (IQR, 7-26) days after hospital admission and most (917/1156; 79%) were further classified as ICU-acquired (first cultured >48 h after ICU admission). Overall 526 (46%) HA-BSI were classified as primary of which 241 (21%) were intra-vascular catheter infection-associated. Of the 630 (54%) secondary bloodstream infections, the most common foci were respiratory tract (246; 21%) and intra-abdominal (128; 11%), and 145 patients (13%) had multiple foci identified. Poly-microbial infections occurred in 141 (12%) of cases and among mono-microbial infections (n = 1015), 592 (51%) were Gram-negative, 333 (29%) were Gram-positive, 77 (7%) were fungal, and 12 (1%) were anaerobes. The most common Gram-negative organisms isolated were *Acinetobacter baumanii* (148; 13%), *Pseudomonas aeruginosa* (141; 12%), and *Klebsiella pneumoniae* (137; 12%). Carbapenem resistance was documented in 105 (71%), 60 (43%), and 62 (45%) of isolates, respectively. The most common Gram-positive organisms were *Enterococcus* species (144; 12%; 17 isolates; 12% vancomycin resistant), coagulase negative staphylococci (141; 12%), and *Staphylococcus aureus* (119; 10%; 57 isolates 48%; methicillin-resistant). The distribution of organisms and resistance varied significantly by country. The median time from culture draw to receipt of first adequate antibiotic therapy was 13 (IQR, 0–48) h; 139 (12%) patients did not receive any adequate antibiotic therapy within 1 week of culture draw or before death. The overall 28-day case fatality rate was 413/1156 (36%) and failure to receive adequate antibiotic therapy was associated with an increased risk for death (71/139; 51% vs. 342/1017; 34%; p < 0.0001).

CONCLUSIONS. Gram-negative pathogens have re-emerged as the major cause of HA-BSI in critically ill patients and *and associated* with inadequate antibiotic therapy. These data justify increased preventive measures for HA-BSI and highlight the urgent need for new agents for treating antimicrobial resistant bacterial infections.

GRANT ACKNOWLEDGMENT. Funding, University Joseph Fourier/hospital Albert Michallon, 38000 Grenoble. ECCRN endorsed.

0416

VASOPRESSIN, EPINEPHRINE, AND CORTICOSTEROIDS FOR INHOSPITAL CARDIAC ARREST: RESULTS FROM A THREE-CENTER RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. The addition of vasopressin during cardiopulmonary resuscitation (CPR) and of steroids during and after CPR may increase the rates of return of spontaneous circulation (ROSC) and improve post-arrest survival (1).

OBJECTIVES. To further elucidate the potential effect of this combination treatment on survival with good neurological recovery, we conducted the present, three-center, randomized, controlled trial.

METHODS. Adult in-patients with refractory, inhospital cardiac arrest (i.e. requiring vasopressor treatment according to current CPR guidelines) were randomized to receive either 1) vasopressin (20 IU/CPR cycle for 5 cycles) plus epinephrine (1 mg/CPR cycle) plus methylprednisolone (single dose = 40 mg on the first CPR cycle) (study group); or 2) placebo plus epinephrine plus placebo (control group).

Following return of spontaneous circulation (ROSC), study group patients with postresuscitation shock also received stress dose hydrocortisone (300 mg/day for 3-7 days and then gradual taper), whereas controls received placebo, unless open-label corticosteroids were prescribed by their attending physicians. Primary endpoints were ROSC for at least 15 min, and survival to hospital discharge with good neurological recovery. Hospital discharge was defined as leaving the hospital alive to either home or a rehabilitation facility. Good neurological recovery was defined as a Glasgow-Pittsburgh Cerebral Performance Category (CPC) score of 1 or 2.

RESULTS. Data from 268 patients were analyzed. Patient clinical profiles were similar. Study group patients vs. controls had higher rates of ROSC (109/130, 83.2% vs. 91/138, 66.4% P = 0.002) and of hospital discharge with a CPC score of 1 or 2 (18/130, 13.7% vs. 7/138, 5.1% P = 0.020). Overall survival to hospital discharge was also more frequent in the study group vs. control (21/130, 16.0% vs. 10/138, 7.3% P = 0.035).

CONCLUSIONS. These results indicate that the use of vasopressin during CPR and of steroids during and after CPR improves long-term survival with good neurological recovery after refractory cardiac arrest.

REFERENCE. 1. Mentzelopoulos SD et al. Arch Intern Med. 2009;169:15–24.

GRANT ACKNOWLEDGMENT. Supported in part by the Thorax Foundation.

Pathophysiology & innovative therapies in ARDS: 0417–0421

0417

INTRACHEAL ADMINISTRATION OF SIRNA TARGETING FAS REDUCES ISCHEMIA–REPERFUSION INDUCED LUNG INJURY

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INTRODUCTION. Ischemia–reperfusion injury has been identified as the main cause of primary graft dysfunction after lung transplantation. Fas-mediated apoptosis is one of the most relevant mechanisms involved in the pathogenesis of ischemia-reperfusion injury. Exogenous administration of small interfering RNA (siRNA) is a new strategy of gene therapy able to specifically silence the expression of proteins through blocking the translation of mRNA.

OBJECTIVES. The aim of this study was to demonstrate in an ex vivo mouse model of lung ventilation and perfusion that a specific siRNA targeting Fas is able to reduce ischemia–reperfusion injury through the modulation of apoptosis.

METHODS. C57BL/6 male mice were randomized to intratracheally receive a specific sequence of siRNA targeting FAS (siRNA-FAS) or a scrambled siRNA 48 h before undergoing 15 h of cold ischemic time (4°C) and 2 h of ex vivo ventilation (peak inspiratory pressure = 7 cmH2O, PEEP = 2 cmH2O, RR = 100 b/min, FiO2 = 100%) and reperfusion (4% bovine serum albumin RPMI medium with 10% fresh blood at 1 ml/min flow rate) in a predisposed humidified chamber at 37°C.

At the end of experiment, lung elastance, assessed through tidal volume, total protein and MIP-2 concentration in the bronchoalveolar lavage (BAL) fluid, and the % of cell apoptosis on lung section (TUNEL) were measured. A separate set of lungs were analysed by Western Blot before undergoing cold ischemia to assess the expression of FAS protein. One-way analysis of variance with Student's t-test for comparison between groups was performed.

RESULTS. The intratracheal administration of siRNA-FAS reduced the expression of FAS in the lung by 44% (siRNA-FAS 0.90 ± 0.11 vs scrambled siRNA 1.61 ± 0.18 AU).

After the ischemia and reperfusion period, lung elastance, BAL total protein and MIP-2 concentration, and apoptosis were significantly reduced in the siRNA-FAS group as compared to control.

Data are mean ± SE. * = P < 0.05

	siRNA-FAS n.6	siRNA scrambled n.6
Lung elastance (cmH_2O/ml)	14.05 ± 0.53*	15.58 ± 0.2
BAL proteins (ug/ml)	482.90 ± 24.9*	716.06 ± 84.73
BAL MIP-2 (pg/ml)	2366.66 ± 292.71*	4740.10 ± 839.88
TUNEL (% apoptotic cells)	4.53 ± 0.7*	13.43 ± 3.2

CONCLUSIONS. The intratracheal administration of siRNA targeting FAS reduces lung apoptosis and improves alveolar membrane permeability during ischemia reperfusion injury.

GRANT ACKNOWLEDGMENT. Funded by PRIN 2007.

0418

CHARACTERIZATION OF A PULMONARY DOUBLE HIT MODEL IN MICE: UNILATERAL ACID ASPIRATION AND PROLONGED MECHANICAL VENTILATION

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INTRODUCTION. Mechanical ventilation is an essential therapeutic strategy for patients affected by ALI, but it can injure the lungs, as a consequence of the high regional tidal volumes applied to the aerated tissue.

OBJECTIVES. The aim of this work is to characterize a two-hit model that allows to study in the same animal the effect of mechanical ventilation in a lung previously injured by acid aspiration and in the controlateral one.

METHODS. Mice were anesthetized and hydrochloric acid 0,1 M (1,5 ml/kg) was administered selectively in the right lung. Then the animals were randomized in one of three experimental groups: 1) mechanical ventilation, tidal volume 25 ml/kg (TV25); 2) mechanical ventilation, tidal volume 15 ml/kg (TV15); 3) spontaneous breathing (SB). The sacrifice was performed 7 h after the acid instillation. We obtained: arterial blood for the gas exchange assessment, pressure volume curve of the respiratory system and bronchoalveolar lavage (BAL) to assess total and differential cellular count and protein dosage, separately in the right and left lung.

RESULTS. Oxygenation was impaired, although no differences between groups were found (arterial partial pressure of oxygen 210 ± 18 mmHg in TV25; 222 ± 42 mmHg in TV15; 265 ± 47 mmHg in SB). Respiratory system static compliance was significantly reduced in group TV25 (0.029 ± 0.001 ml/cmH_2O) compared with TV15 (0.035 ± 0.001 ml/cmH_2O, $p < 0.005$). The total number of cells counted in BAL of both lungs was significantly higher in group VT25 than in other groups, as well as the number of polymorphonuclear cells (Table 1). The protein content in BAL fluid of left lung was significantly higher in group VT25 than in other groups (543 ± 76 μg/ml in TV25 versus 123 ± 25 μg/ml in TV15 and 110 ± 45 μg/ml in SB, $p < 0.01$).

Total and differential cell count in BAL

	Total cells in BAL ($*10^3$) Right lung	Total cells in BAL ($*10^3$) Left lung	Polymorphonuclear cells in BAL ($*10^3$) Right lung	Polymorphonuclear cells in BAL ($*10^3$) Left lung
TV25	322 ± 80*	154 ± 38*	130 ± 33*	38 ± 13*
TV15	99 ± 16	39 ± 10	33 ± 9	3 ± 0.9
SB	111 ± 23	41 ± 9	51 ± 12	4 ± 1

*$p < 0.03$ versus MV15 and SB. Data are expressed as mean ± S.E.M.

CONCLUSIONS. We characterized a model of prolonged mechanical ventilation worsening pulmonary function and causing an inflammatory response also in the lung not directly affected by acid aspiration (left lung).

0419

LUNG STRAIN AND ALVEOLAR PROINFLAMMATORY RESPONSE IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Excessive lung tissue deformation may promote an alveolar inflammatory response through a mechanotransduction process. Tidal volumes or inspiratory pressures are not accurate surrogate markers of such deformation, and the calculation of strain (the ratio between tidal volume and the rest volume of the respiratory system) has been proposed.

OBJECTIVES. To study the influence of respiratory mechanics, including strain, on the lung biological response to mechanical ventilation, measured using markers of matrix remodelling and inflammation in the bronchoalveolar lavage fluid (BALF) from patients with and without acute lung injury (ALI).

METHODS. Twenty-two ventilatied patients were studied (16 meeting ALI criteria, and the 6 controls with normal lungs). Demographic and clinical data, arterial blood gases and respiratory mechanics were recorded. End-expiratory lung volume (EELV) was measured by oxygen washin/washout, and strain computed as the ratio between tidal volume and EELV. Afterwards, a bronchoalveolar lavage was performed. Type III procollagen and matrix metalloproteinases -2 and -9 were measured in the BALF as markers of extracellular matrix remodeling, and interleukins (IL) -6, -8, -10, -17A, IFNγ and VEGF as markers of inflammation. Patients with acute lung injury were divided in two subgroups according to the median strain. All the parameters were compared among controls, ALI-low strain and ALI-high strain groups using an ANOVA.

RESULTS. Patients meeting ALI criteria exhibited higher airway pressures, lower compliance and EELV and higher strain than controls. Median strain was 0.27. There were no significant differences in gas exchange, airway pressures or respiratory system compliance between ALI patients with low and high strain. However, patients in the ALI-high strain group showed significantly higher levels of IL-6 and IL-8 in BALF than the other two groups (see Figure).

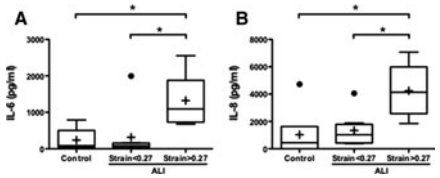

Fig.

Both IL-6 and IL-8 showed a linear correlation (r = 0.70 and r = 0.61 respectively, $p < 0.05$ in both cases) with strain. There were no differences in any of the biochemical measurements between the ALI-normal strain and control groups. Additionally, there were no differences in collagen or metalloproteinases among groups.

CONCLUSIONS. Patients with ALI and high strain show an increased pro-inflammatory response in the alveolar space. Therefore, measurement of strain could help to identify this population.

GRANT ACKNOWLEDGMENT. General Electric Heathcare.

0420

INHIBITION OF PULMONARY INFLAMMATION BY DEXAMETHASONE DOES NOT PREVENT VENTILATOR-INDUCED LUNG INJURY

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INTRODUCTION. Although lifesaving, mechanical ventilation itself may induce damage to pulmonary tissue (ventilator-induced lung injury, VILI). At present, it is hypothesized that ventilator-induced lung inflammation precedes lung injury. Activated granulocytes are recognized to induce oxidative stress and protease activity in the alveolar compartment, causing disruption of epithelial-endothelial barriers and pulmonary dysfunction.

OBJECTIVES. To evaluate whether the anti-inflammatory action of dexamethasone protects against important hallmarks of VILI, i.e. alveolar-capillary permeability, pulmonary edema and impaired gas exchange.

METHODS. Healthy male C57Bl6 mice were anesthetized, tracheotomized and mechanically ventilated for 5 h with either an inspiratory pressure of 10 cmH_2O (resulting in 'low' tidal volumes (V_T) ~7.5 ml/kg; LV_T) or 18 cmH_2O (resulting in 'high' V_T ~ 15 ml/kg; HV_T). Dexamethasone was intravenously administered at initiation of ventilation. Non-ventilated mice served as control animals. One subset of mice was used to determine inflammatory mediator expression and granulocyte infiltration in total lung homogenates. Another subset was used to determine markers of lung injury like alveolar protein levels and pulmonary wet-to-dry ratios. PaO_2/FiO_2 ratios were analyzed as a measure of gas exchange.

RESULTS. Both LV_T and HV_T-ventilation increased inflammatory mediator expression (KC, MIP-2, MCP-1, IL-1β, IL-6, E-selectin) which was associated with marked granulocyte infiltration into pulmonary tissue ($p < 0.05$). Vascular endothelial growth factor (VEGF) expression was only enhanced in HV_T-ventilated mice ($p < 0.05$). Mechanical ventilation increased alveolar protein levels and pulmonary wet-to-dry ratios in both ventilation groups ($p < 0.05$) and reduced PaO_2/FiO_2 ratios in the HV_T-ventilation group ($p < 0.001$). Even though treatment with dexamethasone completely abolished the inflammatory response and VEGF expression in pulmonary tissue ($p < 0.05$) it did not prevent vascular leakage and impaired oxygenation caused by mechanical ventilation. Moreover, dexamethasone even aggravated ventilator-induced effects on vascular leakage in HV_T-ventilated mice ($p < 0.05$).

CONCLUSIONS. Dexamethasone completely abolishes pulmonary inflammation and VEGF expression induced by either LV_T or HV_T-ventilation. Nonetheless, dexamethasone treatment does not protect ventilated mice against vascular leakage and impaired gas exchange.

GRANT ACKNOWLEDGMENT. This study was financially supported by the Catharijne Foundation of the University Medical Center Utrecht, Utrecht, the Netherlands.

0421

MESENCHYMAL STEM CELLS AND MESENCHYMAL STEM CELL CONDITIONED MEDIUM ACCELERATE ALVEOLAR EPITHELIAL WOUND HEALING IN AN IN VITRO WOUND SCRATCH MODEL

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INTRODUCTION. Recent work in pre-clinical experimental studies indicates that bone-marrow derived mesenchymal stem cells (MSCs) may be effective for the treatment of Acute Lung Injury (ALI). In studies in mice, intra-tracheal and systemic administration of MSCs reduced pulmonary oedema and pro-inflammatory cytokines, and improved survival in *E. coli* induced ALI (1) and systemic sepsis (2). Our laboratory has recently shown the efficacy of MSCs and MSC conditioned medium in enhancing recovery after Ventilator Induced Lung Injury (VILI) in rodents (3).
OBJECTIVES. We wished to evaluate if the efficacy of MSCs in enhancing recovery after Ventilator Induced Lung Injury (VILI) may be based on their ability to enhace alveolar epithelial repair, and if this may be mediated by a paracrine factor secreted by the MSCs themselves.
METHODS. We seeded a human alveolar epithelial cell line (A549 s) on 24 well plates and grew them to confluence. We then scratched the base of the wells using a 1000 microliter pipette tip, and exposed the wounds to different serum free conditions: a) to medium only, b) to medium that had been conditioned by exposure to human MSCs over a 24 h period, c) to medium that had been conditioned by exposure to human fibroblasts over a 24 h period, and d) to MSCs themselves in a co-culture experiment. After a 48 h period we fixed the wounds and stained the cells with haematoxylin and eosin. We used edge finding software to quantify wound healing.
RESULTS. MSCs and their conditioned medium were twice as effective in healing alveolar epithelial wounds in comparison to controls (Fig. 1).

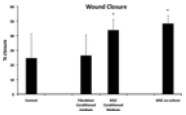

Fig. 1

CONCLUSIONS. Our model confirms that the ability of MSCs to enhance recovery after VILI may in part be due to their abiltiy to enhance alveolar epithelial wound repair, and that this mechansim may result wholly or in part from the secretion of a paracrine mediator. Further analysis of our work, including measurement and inhibition of candidate mediators, will provide mechanistic insight into the utility of MSCs to enhance repair in the lung.
REFERENCES. 1. Gupta, J Immunol., 2007. 2. Jianguo Xu Am J Physiol Lung Cell Mol Physiol. 2007. 3. G Curley et al., ESICM Barcelona 2010.
GRANT ACKNOWLEDGMENT. GC is a Clinican Scientist Fellow funded by Molecular Medicine Ireland and The Higher Education Authority of Ireland under the Framework 7 Programme.

Treating VAP & H1N1 influenza: 0422–0426

0422

VALUE OF RESPIRATORY TRACT SURVEILLANCE CULTURES TO PREDICT MICROBIAL ETIOLOGY IN VENTILATOR-ASSOCIATED PNEUMONIA: A DIAGNOSTIC TEST ACCURACY META-ANALYSIS

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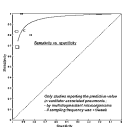
INTRODUCTION. In ventilator-associated pneumonia (VAP), appropriate empiric antimicrobial therapy is crucial to optimize the odds of survival. The use of routine respiratory tract surveillance cultures has been proposed to steer empiric antimicrobial therapy in mechanically ventilated patients.
OBJECTIVES. To assess the value of routine respiratory tract surveillance cultures (S.C.) in the prediction of VAP etiology.
METHODS. Systematic review (2000–2011) and diagnostic test accuracy meta-analysis (DTAM) to analyse sensitivity (SENS), specificity (SPEC), positive predictive value (PPV) and negative predictive value (NPV) of respiratory tract SC (= index test) to predict the microbiological etiology in VAP (diagnostic culture = reference test).
RESULTS. In total, 15 studies reported complete data needed for DTAM (4 only for specific microorganisms), and 7 were incomplete (e.g. only PPV reported). Clinical heterogeneity in reporting was high, due to differences in diagnostic techniques, inclusion criteria, sampling frequency, and method of calculation (e.g. difference in denominator), etc. Reported variables ranged between 0.07 and 1.00 (SENS), 0.23–0.96 (SPEC); 0.13–0.92 (PPV) and 0.46–1.00 (NPV).

Diagnostic accuracy meta-analysis

Summary value (95% confidence interval)	Sensitivity	Specificity	Positive predictive value	Negative predictive value
All microorganisms (N = 11 studies)	0.53 (0.47–0.58)	0.65 (0.60–0.69)	0.45 (0.40–0.51)	0.71 (0.67–0.75)
Only MDR microorganisms (N = 4 studies)	0.76 (0.68–0.83)	0.91 (0.87–0.94)	0.79 (0.72–0.85)	0.89 (0.86–0.92)
Sampling frequency ≤ 1 × week (N = 5 studies)	0.36 (0.19–0.56)	0.69 (0.53–0.82)	0.42 (0.25–0.61)	0.63 (0.49–0.75)
Sampling frequency 2x/week (N = 4 studies)	0.85 (0.55–0.98)	0.78 (0.63–0.89)	0.52 (0.32–0.72)	0.95 (0.82–0.99)
Sampling frequency 3x/week (N = 6 studies)	0.66 (0.50-0.80)	0.75 (0.63–0.84)	0.62 (0.47–0.74)	0.78 (0.67–0.86)

The highest PPV and NPV were found in studies that focused on the prediction of MDR etiology and/or studies with a sampling frequency of at least twice weekly (cf. Fig., Table).



SROC curve

CONCLUSIONS. Despite high clinical heterogeneity, SC proved to be useful in the prediction of microbiological etiology in VAP, on the condition that emphasis is given to the prediction of MDR pathogens and SC are sampled at least twice weekly.

0423

PANDEMIC 2009 INFLUENZA A (H1N1) AND AN/H1N1 2010–11 SEASONAL OUTBREAK: MORTALITY AND RISK FACTORS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. During the 2009 influenza pandemic, several reports were published, nevertheless, comparison on the risk factors present in critically ill patients during 2010–11 seasonal outbreak are still lacking.
OBJECTIVE. We compared clinical presentation, complications as well as the outcome in patients with 2009 influenza A (H1N1) virus infection and An/H1N1 post-pandemic seasonal influenza.
METHODS. Prospective, observational, multi-center study conducted in 148 Spanish intensive care units (ICU).
RESULTS. Nine hundred and ninety-seven patients admitted to an intensive care unit (ICU) with confirmed An/H1N1 infection were analyzed. Six hundred and forty-eight patients affected by 2009 influenza A(H1N1) virus infection and 349 patients affected by post-pandemic seasonal influenza were analyzed. Patients during this second outbreak were older (44.7 ± 14.6 vs. 49.9 ± 14.2, $P < 0.05$), had more chronic comorbidities (COPD, Chronic renal failure, haematological and neuromuscular disease) and presented a higher APACHE II score (13.9 ± 7.2 vs. 16.3 ± 7.7, $P < 0.05$) and SOFA score (5.6 ± 3.6 vs. 6.2 ± 4.1, $P < 0.05$) on ICU admission. Mortality was significantly higher during the second outbreak. (21.8 vs. 30.1% p 0.004). Multivariate analysis confirmed that independent risk factors associated with worse outcome during the 2009 influenza A (H1N1) virus infection was the presence of mechanical ventilation (OR 15.1 95% CI 5.6–40.9), AKIN III (OR 5.7 95% CI 2.5-10.4), and APACHE II score (OR 1.1 95% CI 1.0–1.1) and during the second outbreak mechanical ventilation (OR 4.3 95% CI 1.6–11.6), AKIN III (OR 5.3 95% CI 2.6–10.7), and APACHE II score (OR 1.1 95% CI 1.0–1.1) haematological disease (OR 2.7 95% CI 1.1–6.7) and HIV (OR 13.7 95% CI 2.4–77.1).
CONCLUSION. Haematological disease and HIV infection was dominant in the post-pandemic seasonal influenza outbreak. This subgroup of patients should be considered for future prevention strategies.

0424

MONITORING PROCALCITONIN (PCT) LEVELS IN VENTILATOR-ASSOCIATED PNEUMONIA(VAP) AND SURVIVAL, SEPTIC SHOCK DEVELOPMENT AND ACCURACY OF EMPIRIC THERAPY

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INTRODUCTION. VAP is among the most common nosocomial infections in ICU and elevates the mortality rate. There is a constant need for a prognostic biomarker in VAP and PCT was one candidate. Some reports proved its utility in the prediction of survival (1), but recently opposite results were published (2). Also, the relationship between PCT and the appropriateness of empiric therapy have been described. Therefore, we wanted to verify these observations.
OBJECTIVES. To evaluate the significance of PCT measurements in order to predict the survival, development of septic shock and accuracy of empiric antimicrobial therapy in patients with VAP.
METHODS. A prospective study on 34 general ICU patients who developed VAP after 48 h of mechanical ventilation and fulfilled all clinical diagnostic criteria and Clinical Pulmonary Infection Score. BAL was performed on all patients and quantitative cultures were obtained. All patients underwent empiric antibiotic treatment until microbiological data were available. PCT was measured on day 1, 2, 3, 5, 6, 7 of the diagnosis of VAP by chemiluminescence assay. Additionally, the following clinical data were recorded: WBC, APACHE II score, development of septic shock (SS) and VAP survival. The accuracy of the empiric therapy was evaluated on the basis of the clinical outcome. Statistical analyses were done using Statistica9.1 software and comparisons between groups were performed applying the Mann–Whitney *U* test.
RESULTS. Among the 34 VAP patients included in the study, 21% were nonsurvivors and 53% developed SS. All the nonsurvivors developed SS in the course of VAP. Nonsurvivors had significantly elevated PCT concentration on day 3 ($p < 0.05$) and WBC on day 1 ($p < 0.05$). The sensitivity and specificity in the prediction of an unfavorable outcome were 100 and 63% for PCT concentration higher than 0.61 ng/ml, respectively. VAP patients who developed septic shock had significantly higher PCT concentrations on days: 1 ($p = 0.005$),2 ($p = 0.01$),3 ($p = 0.01$),5 ($p = 0.01$) and 6 ($p = 0.04$). PCT concentration on day 1 higher than 1 ng/ml predicted a development of shock with a sensitivity of 72% and a specificity of 76%. Shock patients also had a significantly higher White Blood Count ($p < 0.05$) and APACHE II score ($p < 0.05$) in comparison with those who did not develop septic shock. There were no significant predictors of empiric treatment accuracy among analyzed data.
CONCLUSIONS. Our study revealed that in terms of mortality PCT levels differ significantly only on the third day of VAP. However, PCT levels are significantly elevated in patients who develop septic shock. Unfortunately, they are not informative about the accuracy of the empiric antimicrobial regimens.
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0425

FIRST INFLUENZA SEASON AFTER THE 2009 PANDEMIC INFLUENZA: CHARACTERISTICS OF ICU ADMISSIONS IN ADULTS AND CHILDREN IN VALL D'HEBRON HOSPITAL

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BACKGROUND. Influenza A (H1N1)2009 has become an emerging cause of ICU admissions, since its first appearance in 2009.

OBJECTIVES. To assess potential differences in epidemiology and management of patients admitted by influenza infection in the ICU during the first post-pandemic influenza period.

METHODS. Observational prospective study comparing September 2009-January 2010 with September 2010-January 2011 period in a single tertiary teaching hospital. Variables captured: demographics, co-morbidities, physiological parameters, outcomes and management. Analysis was performed by SPSS v. 13.0; p significance was set at 0.5. Data are expressed as frequencies or median (Interquartile range/IQR).

RESULTS. Data from 53 patients, 38 adults [age, 41.5 years (IQR 32.8–51.3)] and 15 children [age, 2 years (IQR 0.5–9)] are presented. Vaccination rate was 0% and 4.3% during the first and second period respectively. Differences postpandemic were: 100% of episodes developed after December compared to 16.7% in 2009 season. Younger children were affected [age 0.8 years (IQR 0.3–4.8) versus 7 years (IQR 1.25–11.5), p 0.05] and influenza B caused 8.7% of ICU admissions. Influenza A (H1N1)2009 and respiratory syncytial virus epidemics occurred simultaneously (42.8% of children) and bacterial coinfections doubled (from 10 to 21.7%); the prevalence of coinfections (viral or bacterial) increased from 10 to 39.1% (Odds Ratio 5.8, 95%CI 1.3–24.8). Severe acute respiratory infections (SARI) without chest X-ray opacities reflecting exacerbation of asthma or COPD, bronchitis or bronchiolitis increased (from 6.9% to 39.1%,$p < 0.05$) and pneumonia decreased (from 83.3 to 56.5%, $p < 0.05$). During the second period in adult patients, influenza A(H1N1)2009 expressed more severely [(mean $\pm$ SD) SOFA 5.25 ± 2.7 vs 4.7 ± 3.9 p 0.13; APACHE II 16.8 ± 10.2 vs 13.8 ± 11].

CONCLUSIONS. Primary viral pneumonia predominated among ICU admissions. Post-pandemic ICU Influenza developed later, with some cases of influenza B, more frequent bacterial and viral coinfections and more SARI cases with normal chest X-ray. Increasing vaccination rates among risk group individuals is warranted to prevent ICU admission and death.

0426

INDUCED HYPOTHERMIA INCREASES ATP AVAILABILITY AND TURN-OVER IN A RAT MODEL OF PNEUMOCOCCAL PNEUMOSEPSIS

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INTRODUCTION. Mitochondrial dysfunction is intrinsic to sepsis. Sepsis may result in direct mitochondrial damage, with decreased oxidative phosphorylation and ATP availability, leading to apoptotic cell death. Alternatively, decreased mitochondrial activity may be a functional response to excessive inflammation, protecting cells during energetic failure. Induced hypothermia may reduce ATP requirements during sepsis.

OBJECTIVE. To determine the effect of induced hypothermia (32°C) on mitochondrial respiration and ATP requirements in a model of pneumosepsis.

METHODS. Sprague-Dawley rats (350-400 g) were inoculated intratracheally with $\sim 8 \times 106$ colony forming units of *Streptococcus pneumoniae*, controls received saline. Mechanical ventilation was started with or without induced hypothermia (32°C). After 4 h, rats were sacrificed and mitochondria from liver and calf muscle were isolated. Oxygen consumption was measured using a respiratory system. ATP was measured by bicinchoninic acid assay.

RESULTS. Rats developed severe pneumonia with bacterial dissemination and lung and kidney injury. Liver mitochondrial oxygen consumption, as measured by state 3 respiration, was markedly decreased compared to controls, whereas state 4 respiration, a marker of uncoupling of mitochondria and respiration control index (RCI), the indicator of efficacy of mitochondrial function, remained stable. Low oxygen consumption in the liver was accompanied by a decrease in ATP levels and ATP/ADP ratio. Induced hypothermia restored the fall in oxygen consumption and ATP levels in the liver, while ATP/ADP ratio remained low.
By contrast, pneumosepsis decreased oxygen consumption in calf muscles, but increased ATP levels and ATP/ADP ratio compared to control animals. This was not due to uncoupling, as pneumonia did not affect RCI. Induced hypothermia resulted in a further increase in muscle ATP levels, whereas ATP/ADP ratio showed a decrease in rats with pneumonia, but not in healthy controls, suggesting increased ATP availability, in excess of ATP conversion to ADP.

CONCLUSIONS. Induced hypothermia does not reduce ATP demand during pneumosepsis but restores ATP availability and increases ATP turn-over in the skeletal muscle. The theory that mitochondrial dysfunction may be an adaptive response to sepsis is not supported by our findings. These data rather suggest that hypothermia may protect against sepsis-related mitochondrial damage.

Management of trauma: 0427–0431

0427

DOES HEMOPERITONEUM SIZE REALLY GUIDE THERAPEUTIC DECISION IN HYPOTENSIVE BLUNT TRAUMA PATIENTS WITH PELVIC RING FRACTURE?

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INTRODUCTION. Pelvic ring fracture (PRF) create significant hemorrhage and are often associated with abdominal injuries in blunt trauma patients. Thus, in unstable patients with PRF the bleeding origin can be peritoneal and/or pelvic origin. The presence of a hemoperitoneum seen by FAST should evoked a peritoneal source but with many false positives.[1]

OBJECTIVES. The purpose of this study was to determine if the hemoperitoneum size by semi-quantitative analysis allows to locate the bleeding source in hypotensive blunt trauma patients with PRF.

METHODS. The chart of patients with PRF admitted at our Level I trauma center from January 2005 to December 2009 were evaluated. We collected the main demographic, computed tomodensitometric (CT), angiographic and surgical data for these patients, their management and their outcome. Hypotensive patients were defined by a systolic blood pressure <90 mm Hg upon admission. Patients were classified in 3 groups based on our hemoperitoneum size (minimal or none, moderate and large) in using Federle score[2] on CT scan or during laparotomy. Pelvic fracture categories were defined by Tile-OTA pelvic fracture classification. An active hemorrhage was defined by an immediate procedure requirement during the initial management to control an active bleeding, be it with laparotomy or pelvic angiography. The active hemorrhage were especially studied between the 3 groups and the predictive value to laparotomy requirement were calculated according to hemoperitoneum size.

RESULTS. Of 185 patients, 116 had no hemoperitoneum, 43 had a moderate and 26 had a large one. One-hundred and two patients (55%) were hypotensive upon admission and 79 (43%) had an unstable PRF pattern. Total, 16% of patients had a peritoneal active hemorrhage requiring laparotomy and 11% had a pelvic arterial hemorrhage requiring angiography. Patients with hemoperitoneum (moderate or large) required significantly more laparotomy (39 vs. 2%) and more pelvic embolization (22 vs. 4%) than those without hemoperitoneum.The predictive value for laparotomy requirement of a moderate or larger hemoperitoneum (qualitative analysis) was at 39%, this rate was at 45% in hypotensive patients and 40% in those requiring pelvic embolisation. The corresponding values with large hemoperitoneum (semi-quantitative analysis) were at 62, 70, 67%. The PRF pattern did not affect significantly these values predicting laparotomy requirement.

CONCLUSIONS. 45% of hypotensive patients with PRF and hemoperitoneum associated had a peritoneal active hemorrhage. This rate was to 70% in those with large hemoperitoneum. The semi-quantitative analysis of hemoperitoneum predicts with a better value a peritoneal hemorrhage whatever the hemodynamic status or the PRF pattern. Nevertheless the clinician should know that one-third of hypotensive patients with large hemoperitoneum are false-positives and do not need laparotomy.

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0428

ENDOTOXEMIA FOLLOWING POLYTRAUMA CORRELATES WITH THE PRESENCE OF SHOCK AT ADMISSION AND WITH THE SUBSEQUENT DEVELOPMENT OF ORGAN FAILURE

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INTRODUCTION. Multiple trauma is associated with activation of the innate immune system, even in the absence of any infectious pathogens. The potential role of bacterial endotoxin (LPS) translocating from the gut has been controversial. We undertook a serial evaluation of circulating LPS levels in a cohort of polytrauma patients.

OBJECTIVES. To determine the prevalence and time course of endotoxemia in trauma patients, and to evaluate the correlation of endotoxemia with injury severity and organ dysfunction.

METHODS. Prospective observational cohort study of patients sustaining severe multiple trauma (ISS > 16). LPS levels were measured on days 0, 1, 3, and 5 using the Endotoxin Activity (EA)[1] Assay® on a scale from 0 to 1.0 activity units. EA levels are stratified as low (<0.40), intermediate ($\geq$0.40–0.59), or high ($\geq$0.60). Multiple organ failure was assessed by daily calculation of MOD scores, excluding the neurological aspect, given the frequent association of neurotrauma.

RESULTS. We recruited 29 patients, the majority (25/29) of whom had sustained blunt trauma. Their mean ISS was 41 ± 15, their age was 42 ± 21 years and most (72%) were males. We analyzed only those having a minimum of three EA levels collected (N = 24). Their median ICU Length of stay was 9 days (2-23) and their duration of mechanical ventilation was 9 days (1-22). Four patients died (17%) at 10 ± 2 days post admission. The mean initial (Day 0) EA level was 0.25 ± 0.12, significantly lower ($p < 0.001$) than that on Day 3 (0.41 ± 0.09) or Day 5 (0.41 ± 0.12). Four (17%) patients recorded high EA levels, while in 17 (71%) patients, the maximal levels were intermediate. Both maximal EA (0.65 ± 0.08 vs 0.46 ± 0.02, p = 0.008), and average EA levels across Day 0 to Day 5 ($0.48 \pm$ vs $0.33 \pm$, p = 0.006) were higher in non-survivors than in survivors. The presence of shock at admission correlated with EA level ($r^2 = 0.21$, p = 0.06), and predicted higher average EA (0.40 ± 0.03 vs 0.30 ± 0.02, p = 0.02) and maximal EA ($0.52 \pm$ vs 0.43, p = 0.045) levels. The admission base deficit as a measure of hypoperfusion correlated with maximal EA levels ($r^2 = 0.18$, p = 0.04). Moreover, the average EA level was significantly correlated with the average MODS burden[2] across Day 1 to Day 10 ($r^2 = 0.19$, p = 0.04) or across Day 5 to Day 10 ($r^2 = 0.18$, p = 0.04). Patients sustaining an EA level $\geq$ 0.4 on at least two occasions (12/24) also had higher subsequent (beyond Day 5) maximal MOD scores (3.58 ± 1.73 vs 2.25 ± 1.29, p = 0.04).

CONCLUSION. Endotoxemia—presumably of gut origin—is common during the first few days following severe multiple trauma. Its development is predicted by early post-injury hypoperfusion, and both its magnitude and persistence are associated with the subsequent development of organ failure.

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Acknowledgment: *Spectral Diagnostics Inc.(*Toronto, Canada*) provided the supplies for the* Assay®.

0429

CONCORDANCE BETWEEN OBSERVED AND THEORETICAL TRIAGE ACCORDING TO THE FRENCH AND AMERICAN TRIAGE CRITERIA FOR MAJOR TRAUMA PATIENTS

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INTRODUCTION. Prehospital triage of trauma patients is an essential element of trauma management. In France prehospital triage is based on a national algorithm (Vittel) developed in 2002 (1).

OBJECTIVES. The objective of this study was to determine the concordance between the observed triage and the theoretical triage according to the French (Vittel) and American (ACSCOT) (2) criteria of major trauma patients admitted to a trauma referral center in northern Île de France.

METHODS. For this retrospective observational analysis, demographic and clinical data of patients admitted in 2010 in a 500 beds trauma center were reviewed from a local prospective trauma registry. EMS physicians performed the triage on the field. Triage was considered to be adequate when patients admitted to the trauma center had an ISS $\geq$ 16, overtriage was defined as referral of a patient with an ISS $<$ 16. The observed trige was then compared to a theoretical triage according to Vittel or ACSCOT criteria if they would have been applied. Simple concordance and Kappa coefficients were calculated.

RESULTS. 285 patients were admitted for major trauma in 2010. The observed rate of overtriage was 39.6% (n = 113), 38% with Vittel and 28% with ACSCOT strictly applied. The concordance between observed and theoretical triage was 91% according to Vittel and 69% according to ACSCOT. With triage according to Vittel 62% (n = 165) of patients with at least one Vittel criterion had an ISS $\geq$ 16 versus 72% for ACSCOT. 26 patients (9%) had been triaged to the trauma center although they had no Vittel criterion and among these 34% had an ISS $\geq$ 16. For ACSCOT criteria this rate was 31% (n = 88) and 33% among these had an ISS $\geq$ 16. PPV for Vittel to predict an ISS $\geq$ 16 was 95%, for ACSCOT it was 76%. Concordance between the two algorithms was 81% with a Kappa of 0,44 (CI 0,26-0,58).
Observed and theoretical triage according to ISS

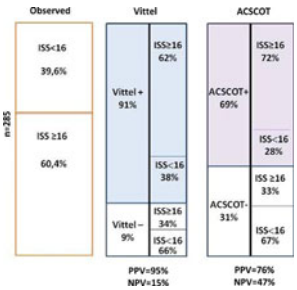

Fig. Observed and theoretical triage according to ISS

CONCLUSION. In this French cohort, the observed triage is more concordant with Vittel (91%) than ACSCOT triage criteria (69%). The rates of observed and theoretical overtriage were in accordance with current recommendations. Application of the ACSCOT algorithm resulted in a lower overtriage rate. The observed discordances especially in patients with no Vittel criteria might be explained by other determinants of triage, notably the judgment of the EMS physician.

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0430

ETOMIDATE ALTERS OUTCOMES OF TRAUMA PATIENTS

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INTRODUCTION. Trauma related corticosteroid insufficiency was suggested to increase both pneumonia rate and duration of mechanical ventilation (1). Etomidate is controversial due to inhibition of adrenal corticosteroid synthesis but is frequently used in trauma patients.

OBJECTIVES. To assess the impact of etomidate on (i) corticosteroid function, (ii) on systemic inflammation, and (iii) on morbidity of trauma patients.

METHODS. Ancillary study of the HYPOLYTE study (Hydrocortisone Therapy for Patients With Multiple Trauma) a multi-center, randomised, double blind, placebo controlled trial (1). Use of etomidate was collected. A cosyntropin test was performed in the first 36 h following trauma. Interleukine (IL)-6 was assessed on inclusion in the study. Endpoints were adrenal response to cosyntropin, blood IL-6 concentration and hospital acquired pneumonia (HAP) and mortality rates on day-28.

RESULTS. Among the 149 included patients, 95 (64%) has received a single bolus of etomidate and 54 (36%) did not receive any bolus of etomidate. Seventy-nine (83.1%) patients with etomidate and 34 (62.9%) patients without etomidate had corticosteroid insufficiency (P $<$ 0.01). Etomidate did not alter basal cortisolemia (P = 0.726) but decreased responsiveness to cosyntropin (8.7 $\pm$ 7.1 microg/dl with etomidate and 130 $\pm$ 93 microg/dl without etomidate, P $<$ 0.01). Plasma IL-6 concentration was 246 ng/ml (131-637) for patients with etomidate and 147 ng/ml (97-393) for patients without etomidate (P = 0.03). Forty-nine of 95 (52%) patients with etomidate and 16 of 54 (30%) patients without etomidate developed HAP by day 28 (P $<$ 0.01). On multivariate analysis, factors associated with HAP were: severe head trauma (Odd Ratio, OR : 3.05, Confidence Interval CI95% [1.50; 6.21], P $<$ 0.01), hydrocortisone (OR : 0.51, CI95% [0.25; 1.02], P = 0.05) and etomidate use (OR : 2.48, CI95% [1.19; 5.18], P = 0.02). Four of 95 (4.2%) patients with etomidate and 4 of 54 (7.4%) patients without etomidate died in ICU (P = 0.783). Hydrocortisone infusion decreased HAP rate of patients receiving etomidate (40% in the hydrocortisone group versus 62% for the placebo group, P = 0.03).

CONCLUSIONS. A single bolus of etomidate increased the incidence of corticosteroid insufficiency, systemic inflammation and HAP rates after severe trauma. Hydrocortisone would be used in case of etomidate infusion in trauma patients.

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GRANT ACKNOWLEDGMENT. PHRC inter-region ouest 2006.

0431

DECOMPRESSIVE CRANIECTOMY FOR SEVERE TRAUMATIC BRAIN INJURY: FOR WHICH PATIENTS?

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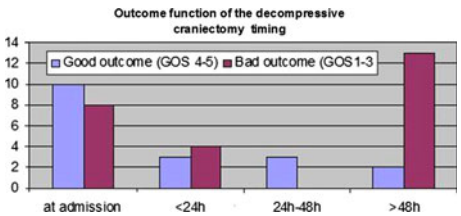
INTRODUCTION. Decompressive craniectomy (DC) for severe traumatic brain injury (TBI) remains a subject of debate. Despite benefits from retrospective studies, a recent randomized controlled trial found that DC might worsen the neurological outcome 6 months after severe diffuse TBI [1].

OBJECTIVES. We retrospectively analyzed clinical data of a cohort of TBI patients undergoing craniectomy to identify early factors possibly associated with neurologic outcome.

METHODS. We included all adult patients with post traumatic DC performed in our level I trauma center between 2004 and 2009. Traumatic carotid and vertebral dissections were excluded to prevent confounding factors with stroke. The Glasgow outcome scale (GOS) was evaluated at one year after the trauma using a French translation of the Wilson et al. standardised questionnaire [2]. Among data were collected the initial Glasgow coma score (GCS), the occurrence of anisocoria or bilateral dilated pupils, the pupil response to osmotherapy before DC. The brain lesions on CT scan before craniectomy were rated according to their type and the Rotterdam score [3]. Results are expressed as median (extremes values). Mann–Whitney and Chi-2 tests were used for intergroup analysis

RESULTS. Forty-three TBI patients with DC were included [36 M, age 30 (15–66), injury severity score 30 (16–56), Rotterdam score 5 (3–6)]. DC was indicated for refractory raised intracranial pressure associated with extra-axial hematoma (subdural or/and epidural; n = 28 patients), diffuse brain oedema (n = 7 patients) or multiple intracerebral contusions (n = 6 patients). Of the population, 25 patients had a bad outcome (GOS 1-3) 1 year after the injury, including 15 deaths in the intensive care unit. Early factors associated with bad outcome were bilateral dilated pupil even responsive to osmotherapy, unilateral dilated pupil unresponsive to osmotherapy, basal cisterns not visible on CT scan, initial GCS score of 3. A lower initial GCS was found in the bad outcome group [bad vs good outcome: 10 (4–15) vs. 7 (3–14); p $<$ 0.05)]. A higher ICP before and after DC was observed in the bad outcome group [bad vs. good outcome: pre DC: 26 (18–45) vs. 35 (14–65); post DC: 14 (8–25) vs. 22 (8–56)]. Decompressive craniectomy realized within 48 h after injury had a better neurologic outcome (p $<$ 0.05).



Outcome function of the decompressive craniectomy

CONCLUSIONS. In this cohort, a good outcome 1 year after severe TBI was found in 18 patients (43%). The initial presence of severe brain damage on clinical and CT scan findings is markedly associated with poor outcome as does late DC (>48 h) for refractory raised intracranial pressure. Efforts should be done to better delineate the indications for DC because this treatment is still one of therapeutic options to prevent post-traumatic cerebral ischemia after severe TBI.

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Microcirculatory aspects of shock: 0432–0436

0432

MICROVASCULAR REACTIVITY MEASURED BY NEAR INFRARED SPECTROSCOPY IN BRAIN DEAD DONORS

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INTRODUCTION. A characteristic feature of brain stem cardiovascular regulatory failure during brain death (BD) is vasoplegia. While the hemodynamic management of BD is based on restoring systemic hemodynamic variables (1), data on microcirculatory response are scarce.

OBJECTIVES. To evaluate tissular perfusion by measuring microvascular O_2 saturation (StO_2) and microvascular reactivity using a vascular occlusion test (VOT).

METHODS. Prospective, observational pilot study evaluating standard care. After diagnosis of BD, pts were referred to our institution for possible organ donation and BD was subsequently confirmed (angiography). Thenar StO_2 and total hemoglobin index (THI, units) were measured using a near infrared spectroscopy probe (NIRS, Hutchinson®) together with demographic and hemodynamic data. VOT was performed as follows : an adult-size pressure cuff was kept inflated for 3 min to 50 mmHg above systolic blood pressure (BP) and occlusion and reperfusion slopes (Δoccl and Δreperf in %/s) of StO_2 were calculated. Data were expressed as median (minimum; maximum), and compared to healthy volunteers (HV) as a control group (C), non parametric tests.

RESULTS. Over a 11-month period, 23 (12 M/11F) pts, age 57 (25;81) yrs, were consecutively included. Clinical BD had occured for 20 (12;100) h when StO_2 was measured. Mean BP was 86 (51–120) mmHg with 0.24 μg/kg/min (0; 0.92) of norepinephrine, while Hb was 10.9 (7.3; 14.8) g/dL and lactate 1.9 (0.4; 4.9) mmol/L. Central temperature (T) was 35.7 (33.3; 38.2) °C with a near disappearance of the central-to-cutaneous gradient at 1.2 (0; 3.2) °C. Baseline StO_2 was 88 (67; 93)%. 29 HV (11H/18F), age 31 (22; 56) years, had a mean BP of 89 (77;103) mmHg and a baseline StO_2 of 81 (67;87)% (BD vs C, p $<$ 0,01, Mann–Whitney). 43 VOT-BD et 29 VOT-C were analyzed and compared. If Δoccl were similar between groups (BD at −0.18 (−0.11; 0.31) and C at −0.18 (−0.13; 0.28)), Δreperf was decreased to 2.98 (0.38; 5.83), compared to controls at 4.06 (1.67; 6.95) %/s (p $<$ 0.001, Mann–Whitney), suggesting an altered microcirculatory reactivity.

CONCLUSIONS. Compared to control, StO_2 was higher in BD pts suggesting either a modification of O_2 muscular metabolism or the opening of arterio-venous shunts. The reperfusion slope was altered, similarly to septic shock, where it is a marker of severity (2). Further studies are needed to evaluate the role of this microvascular alteration on the subsequent graft function.

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0433

MICROCIRCULATORY ALTERATIONS IN HEMORRHAGIC SHOCK

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INTRODUCTION. Microcirculatory alterations have been described in septic shock patients (1). In hemorrhagic shock, while animal studies have described the microvascular behavior, no human study has been published.

OBJECTIVES. The goal of the present study was to describe the sublingual microcirculation (Sidestream Dark Field Imaging (SDF) Microscan, Microvision Medical, Amsterdam) during the initial phase of traumatic hemorrhagic shock after achieving bleeding control (surgical and/or endovascular embolization) (Day 0) and during the next 3 days (Days 1, 2 and 3). Sublingual microcirculation in trauma hemorrhagic shock patients was compared to sublingual microcirculation in trauma patients without hemorrhagic shock.

METHODS. The study is a single centre observational study conducted in a surgical ICU (CHU Bicêtre) and approved by our by our institutional ethics committee (Comité Consultatif de Protection des Personnes dans la Recherche biomédicale de Bicêtre). This study included 16 ventilated patients with a traumatic hemorrhagic shock. The systemic hemodynamic parameters (mean arterial pressure (MAP) and cardiac index (IC)) and microcirculatory parameters ((Microvascular Flow Index (MFI), proportion of perfused small vessels (PPV)) were obtained during four days (from Day 0 to Day 3). Measurements at Day 0 were compared to those of a group of 7 ventilated and sedated trauma patients without hemorrhagic shock.

RESULTS. Regarding systemic hemodynamic, there is no significant difference in MAP and CI between the patients with a traumatic hemorrhagic shock and patients without hemorrhagic shock at Day 0. However microcirculation (PPV and MFI) was significantly lower in patients with hemorrhagic shock compared to control group at Day 0 (MFI 1.35 (1.15–1.80) vs. 3.00 (2.95–3.00) and PPV 27% (17–55) vs. 98% (95–98)). At Day 0, significant correlations were found between IC and MFI ($r^2 = 0.61$, $p = 0.0004$), IC and PPV ($r^2 = 0.62$, $p = 0.0003$), MAP and MFI ($r^2 = 0.40$, $p = 0.0081$) and MAP and PPV ($r^2 = 0.62$, $p = 0.0088$). Sublingual microcirculation were impaired during at least 72 h despite restoration of macrovascular circulation. Moreover a significant correlation was found between sublingual microcirculation alterations at Day 0 and the SOFA score at Day 3.

CONCLUSIONS. Sublingual microcirculation is impaired in the acute phase of traumatic hemorrhagic shock despite restoration of macrocirculation and normalization of lactate concentration. If within the first 24 h systemic hemodynamic may play a role in microvascular alterations, other mechanisms appear to be involved in the sustainability of microvascular alterations. Development of organ dysfunction could be related to the importance of microvascular alterations.

REFERENCE. Crit Care Med. 2004 32:1825–31.

GRANT ACKNOWLEDGMENT. Jacques Duranteau.

0434

ACUTE HYPERCAPNIA IMPROVES MICROCIRCULATORY OXYGENATION IN SEPTIC RATS AND REDUCES HEPATIC NEUTROPHIL ACTIVITY

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OBJECTIVES. Acute hypercapnia induces macrohaemodynamic improvement comparable to catecholamine infusion, enhances global oxygen delivery[1] and increases microcirculatory oxygenation[2]. The aim of this study was to investigate the protective effects of acute hypercapnia on splanchnic mucosal microcirculatory oxygenation and hepatic neutrophil activity in a polymicrobial septic animal model.

METHODS. The data derive from 40 experiments (male Wistar rats, 350 ± 20 g) studied with approval of the local animal care and use committee. 24 h prior to the experiments a laparotomy and colon ascendens stent peritonitis (CASP) surgery was performed[3], inducing a polymicrobial sepsis with constant fecal leakage into the peritoneal cavity. 24 h after induction of sepsis the animals were anaesthetized with pentobarbital, received ongoing fluid replacement and muscle relaxation. Pressure-controlled ventilation for 120 min maintained a target pCO_2 of either 35–40 mmHg in the normocapnic group or induced a moderate hypercapnia (pCO_2 65–75 mmHg) by exogenous CO_2 application, with otherwise unaltered ventilator settings. Systemic macrohaemodynamic variables, ventilation pressures and microcirculatory oxygenation of the colonic wall (μHbO_2) were recorded continuously (tissue reflectance spectrophotometry), arterial blood was analyzed intermittently and hepatic myeloperoxidase (MPO) activity was measured at the end of the experiments. Data are presented as means ± SEM. μHbO_2: ANOVA, post-hoc Fisher's, MPO: Kruskal–Wallis ANOVA, Dunn's method, $p < 0.05$

RESULTS. Splanchnic microcirculatory oxygenation (μHbO_2) significantly deteriorated under normocapnia (from 61 ± 4 to 52 ± 5%, $p = 0.003$), despite macrocirculatory stability. This negative effect was fully reversed with hypercapnic ventilation (from 68 ± 3 to 71 ± 3%), maintaining the μHbO_2 at a similar level to that of the non-septic sham groups (normocapnia (65 ± 4 to 66 ± 4%), hypercapnia (66 ± 6 to 70 ± 5%)). Hepatic MPO activity in the septic groups increased more than twofold with normocapnic ventilation (from 2.6 ± 0.8 to 6.3 ± 3.5 U/g $p < 0.001$) but remained unchanged with hypercapnic ventilation (from 2.7 ± 1.4 to 4.1 ± 0.8 U/g). Hypercapnic ventilation in non-septic animals had no effect on hepatic MPO activity (from 2.6 ± 0.8 to 2.7 ± 1.4 U/g). Mean arterial pressure and heart rate were stable over time within all four groups.

CONCLUSIONS. In septic animals moderate acute hypercapnia counteracts the deterioration of splanchnic mucosal oxygenation and reduces hepatic neutrophil activity. The protective effect of acute hypercapnia might thus help to improve splanchnic mucosal barrier function and to reduce bacterial translocation and multiorgan failure.

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GRANT ACKNOWLEDGMENT. Supported by the Forschungskommission University Dusseldorf.

0435

THE VALUE OF LACTATE MEASUREMENTS IN DETECTING BOWEL ISCHEMIA

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INTRODUCTION. Acute bowel ischemia is a catastrophic event that often mandates prompt invasive intervention. However, recognizing and diagnosing bowel ischemia is difficult. Elevated circulating lactate levels have long been associated with bowel ischemia. However lactate levels in patients with proven bowel ischemia have not been systematically studied. The routine and frequent measurement of reliable point-of-care lactate levels at the emergency department and the ICU has been implemented in our hospital.

OBJECTIVES. We investigated the incidence of elevated lactate levels prior to surgery in patients with proven ischemia of the small bowel or colon.

METHODS. This single center retrospective study was performed in a tertiary university hospital with 45 ICU beds. Over a four-year period from 2007 through 2010 we collected all lactate measurements performed in patients of 15 years or older who underwent a laparotomy where bowel ischemia was found. Repeated surgery for bowel ischemia was excluded from the study. Only lactate levels collected within 24 h before surgery were analyzed. Lactate levels were divided into normal (<2 mmol/L), elevated (2–5 mmol/L) and strongly elevated (>5 mmol/L).

RESULTS. From a dataset of more than 4,000 abdominal operations, 78 patients with a mean ± SD age of 66 ± 13 years (64% male) were identified with bowel ischemia. Directly prior to surgery these patients were cared for on the emergency department (26%), the intensive care unit (56%) or the ward (18%). A resection of (part of) the small bowel, large bowel or both were performed in 35%, 53 and 5% of the patients, respectively. In 2 patients acute arterial revascularization was performed and in 11 patients (14%) surgery was deemed futile because of a dismal prognosis. Hospital mortality and 1-year mortality were 58 and 64%, respectively. In the 24 h directly before surgery 4.5 lactate measurements per patient were done. The last measurement was performed at 4.8 h ± 4.1 h before surgery. Maximal lactate was <2, 2–5 and >5 mmol/L in 33, 38 and 28% of the patients, respectively. Mean ± SD lactate was 3.5 ± 3.4 mmol/L in hospital survivors compared to 4.8 ± 3.5 mmol/L in non-survivors ($p = 0.11$).

CONCLUSIONS. As repeatedly reported in the literature, bowel ischemia carries a high mortality as reflected by these patients with ischemia proven during surgery. Although most patients demonstrated elevated lactate levels, a considerable minority did not.
Even with frequent lactate monitoring, low lactate levels should not be used to exclude bowel ischemia.

0436

OXYGEN DELIVERY IS NOT CREATED EQUAL: CARDIORESPIRATORY AND STRESS RESPONSES IN DIFFERENT SHOCK STATES

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INTRODUCTION. Although the pathologic responses following a drop in each constituent part of the oxygen delivery equation are likely to be diverse, oxygen delivery is usually considered a whole entity.

OBJECTIVES. To address the hypothesis that all oxygen delivery is not created equal; that is, a fall in oxygen delivery following a decrease in each component would have different effects at the end-organ level and would cause varied haemodynamic and stress responses.

METHODS. Under isoflurane anaesthesia, male Wistar rats underwent left common carotid and right jugular venous cannulation for blood sampling/BP monitoring and fluid administration, respectively. Ultrasonic flow probes measured blood flow in the descending aorta as an index of cardiac output. Tissue PO_2 (tPO_2) was determined using Oxylite probes (Oxford Optronix, UK) placed in thigh muscle. Animals were subjected to circulatory, anaemic and hypoxic hypoxia (achieved by haemorrhage, isovolaemic haemodilution and breathing 12.5% O_2, respectively), to produce a targeted 50% fall in global oxygen delivery. Sham-operated animals acted as controls until experiment end (60 min). Measurements were made of haemodynamics, tissue oxygen tension, blood gas analysis and circulating stress hormone levels.

RESULTS. Following a 50% drop in each component, diverse global and regional cardiorespiratory patterns were observed. Haemorrhage caused an expected perturbation to macrohemodynamics that also generated the greatest stress response in terms of hormone levels. By contrast, haemodilution had the most significant effect on blood pressure while hypoxaemia had far less of an impact on global haemodynamics but caused the greatest drop in regional oxygenation, coupled with hyperlactataemia.

TABLE 1

Time (mins)	Group	MAP (mmHg)	Global DO_2 (ml/min)	Muscle tPO_2 (kPa)	Norepinephrine (ng/ml)	Corticosterone (ng/ml)	Vasopressin (pg/ml)	Lactate (mmol/l)
0	SH	91 (6)	4.4 (0.5)	2.5 (0.4)	–	–	–	1.4 (0.2)
0	CH	91 (4)	4.5 (0.6)	2.7 (0.3)	–	–	–	1.6 (0.2)
0	AH	87 (3)	4.8 (0.6)	2.5 (0.4)	–	–	–	2.0 (0.2)
0	HH	102 (3)	4.5 (0.6)	3.1 (0.6)	–	–	–	1.9 (0.2)
60	SH	89 (3)	3.9 (0.4)	2.9 (0.3)	1,141 (450)	857 (236)	52 (34)	1.5 (0.2)
60	CH	77 (5)*	2.2 (0.2)*	2.0 (0.5)	2,637 (950)*	2,276 (1,250)	175 (152)	2.6 (0.3)
60	AH	68 (4)*	2.4 (0.1)*	1.9 (0.2)	1,872 (417)	818 (471)	25 (13)	2.8(0.7)
60	HH	97 (8)	2.8 (0.5)*	1.0 (0.4)*	2,227 (448)	460 (407)	42 (11)	2.7 (0.3)*

SH sham-operated control, *CH* circulatory hypoxia, *AH* anaemic hypoxia, *HH* hypoxic hypoxia. Data shown as mean (SEM) except hormone levels shown as median (SD). n = 6-10/group, *$p < 0.05$ comparing to sham. Statistics were performed using two-way ANOVA and Tukey's test or Kruskal–Wallis test followed by Dunn's test.

CONCLUSIONS. This study confirms that global oxygen delivery is not created equal with varying circulatory and stress hormone responses depending on the component affected. This disparity should be emphasized in classical teaching and re-evaluated in patient management.

GRANT ACKNOWLEDGMENT. Funded in part by ESICM.

Therapy of sepsis: Novel clinical approaches: 0437–0441

0437

EFFECTS OF IRON LOADING AND IRON CHELATION THERAPY ON INNATE IMMUNITY DURING HUMAN ENDOTOXEMIA

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INTRODUCTION. Iron is known to have pro-inflammatory effects, whereas iron chelation therapy exerts anti-inflammatory effects, at least in part mediated by oxidative stress. Therefore iron metabolism is a potential therapeutic target to modulate inflammation and immunity.

OBJECTIVES. The aim of the present study was to examine the effect of iron loading and iron chelation therapy on oxidative stress, innate immune response, and vascular reactivity during human endotoxemia.

METHODS. A randomized doubled blind placebo controlled trial was carried out in which thirty healthy male volunteers were randomized to receive the iron chelator deferasirox (30 mg/kg, orally, t = −2 h), iron sucrose (1.25 mg/kg, intravenously, t = −1 h), or placebo in advance of the intravenous administration of 2 ng/kg lipopolyssacharide (t = 0). Thiobarbituric acid reactive substances (TBARS) were measured in plasma as indicators of oxidative stress. Inflammation was monitored by measuring body temperature, plasma levels of various cytokines (TNF-alfa, IL-6, IL-10, IL-1ra, ICAM and VCAM) leucocyte count and differentiation. Vascular dysfunction was measured by the change in forearm blood flow in response to the intra brachial infusion of acethylcholine, nitroglycerine and norepinephrine before and 4 h after endotoxemia by venous occlusion plethysmography. Results are expressed as mean ± SEM.

RESULTS. Iron administration led to a rise in TBARS at t = 0 h (from 230 ± 56 to 998 ± 85 nmol MDA/l). Endotoxemia itself showed a non significant trend in rising TBARS(-from 241 ± 51 to 281 ± 49 nmol MDA/l, p = 0.56) at t = 3 h in the placebo group. Endotoxin administration led to a significant increase in body temperature (from 36.5 ± 0.4 to 38.5 ± 0.5°C) and leucocytes (from 5.7 ± 0.3 to 12.5 ± 0.61 at t = 8 h) in all three groups with no differences between the groups. Plasma levels of TNF-alfa peaked at t = 1.5 h with no significant differences between groups (Venofer 552 ± 66 pg/ml, deferasirox 579 ± 87 pg/ml, and placebo 608 ± 96 pg/ml). IL-6 showed a trend towards a higher peak (1,627 ± 228 pg/ml) in the iron sucrose treated group at t = 2 h compared to the deferasirox group (1,187 ± 184 pg/ml) and the placebo group (1,044 ± 142 pg/ml) (p = 0.052 compared to placebo), Also the anti-inflammatory IL-10 and IL-1ra and the markers of endothelial activation ICAM and VCAM were not statistically different. Also, the hemodynamic changes elicited by endotoxin were not influenced. The vascular response of forearm vessels to acethylcholine, nitroglycerine and epinephrine was reduced after endotoxemia, with no difference between the treatment groups.

CONCLUSIONS. Iron sucrose induces oxidative stress. Iron chelator deferasirox does not reduce LPS induced oxidative stress. Iron sucrose and deferasirox treatment do not alter the innate immune response to endotoxin, as well as the vascular dysfunction associated with endotoxemia.

GRANT ACKNOWLEDGMENT. LvE is a recipient of a grant of ZonMW.

0438

EFFICACY AND TOLERANCE OF HYPERONCOTIC ALBUMIN ADMINISTRATION IN SEPTIC SHOCK PATIENTS: THE EARSS STUDY

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INTRODUCTION. Albumin administration during hypovolemia and particularly in septic shock patients remains controversial. Despite its numerous potentially beneficial properties, albumin is considered as a costly blood product with a potential risk of renal and pulmonary toxicity.

OBJECTIVES. The EARSS study investigates if early administration of hyperoncotic albumin reduces septic shock mortality and analyses the safety of this infusion in this high-risk population.

METHODS. Prospective open randomized multicenter study in 29 French centres. After informed consent, any patient with septic shock could be included within 6 h after catecholamine introduction. Patients with overweight, previous severe heart failure, neutropenia, cirrhosis and primary peritonitis and severe burns were excluded. Patients were randomized to receive either 100 ml of 20% albumin (LFB) (Albumin group) or 100 ml 0.9% NaCl (Control group) every 8 h for 3 days. The primary endpoint was all-cause mortality at D28. Secondary objectives were the evolution of the SOFA score, length of stay in ICU and in hospital and the number of days without assistance. The safety of albumin administration was evaluated on kidney failure and acute pulmonary oedema incidence.

RESULTS. Between July 2006 and March 2010, 798 patients were included. At inclusion, patient characteristics were comparable between the 2 groups; age: 66 years [IQR: 55, 76], M/F %: 67/33, medical/surgical admission %: 75/25; SAPS2 = 51 [IQR: 40, 65], SOFA D1 = 10 [8, 12], lactate = 2.2 mg/dL [IQR: 1.4, 3.8]. Infection origin was mainly pulmonary (45%) and a bacteriological documentation was present in 73% of cases. At baseline, hypoalbuminemia was almost constant and severe (17.96 [IQR: 14.1, 21.6] g/L). The ICU management was similar between the 2 groups and assessed the severity of the population (RRT: 23%). There was no difference in fluid loading between the 2 groups within 12 h before inclusion but also in the following days.

The mortality rate was not significantly different between the 2 groups: 24.1 vs 26.3% for the Albumin and the control group respectively. The number of days without catecholamine was significantly higher in the Albumin group. However resolution of other organ dysfunction, duration in ICU or hospital LOS were not significantly different between the groups. Similarly, renal and pulmonary tolerance was comparable in the 2 groups.

CONCLUSION. Septic shock is frequently associated with severe hypoalbuminemia that has been partially corrected by the administration of hyperoncotic albumin. Renal and pulmonary tolerance and safety was good, but albumin did not change significantly the mortality rate of septic shock.

0439

EFFECT OF STATIN THERAPY IN EARLY SEPSIS: EFFECT ON ENDOTHELIAL FUNCTION AND PROGNOSTIC IMPLICATION

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BACKGROUND. Sepsis is generally viewed as a disease aggravated by the inappropriate immune response encountered in the affected individual. HMG-COA reductase inhibitors are potentially powerful inhibitors of the inflammatory process by a lipid independent mechanism as they are not related to lowering LDL cholesterol.

OBJECTIVE. To determine efficacy and safety of the new regimen of Atorvastatin as an adjunctive line of treatment in early sepsis as well as its effect on endothelial function and in modifying the inflammatory markers

METHODS. A total of 50 patients with early sepsis were alternatively randomized to statin group (25 patients) and received (Atorvastatin 80 mg/day for 4 consecutive days, plus conventional sepsis treatment) or control group (25 patients) and received only conventional sepsis treatment. They followed by: Inflammatory markers(CRP and PCT), Nitric oxide metabolites (reflecting endothelial function), severity of illness as indicated by SOFA score monitoring and need for organ supportive measures, length of ICU stay and 28 day mortality, and ALT, AST, and CPK to assure the safety of statins in early sepsis.

RESULTS. In relation to the control group, patients subjected to the short term high intensity Atorvastatin therapy showed: (1) significantly reduced the mean level of CRP (mg/l) and PCT (ng/ml) at day 4 (33.3 ± 22.9 vs. 51.9 ± 24.1, P = 0.007 and 0.44 ± 0.11 vs. 0.6 ± 0.15, P = 0.001 respectively)., (2) nonsignificantly reduced the mean level of Nox metabolites [(mu) M/L] at day 4 (56.4 ± 10.3 vs. 61.5 ± 8.5, P = 0.063)., (3) nonsignificantly reduced the total cholesterol level (mg/dl) at day 4 (145.3 ± 32.3 vs. 161.9 ± 46.2, P = 0.1), (4) significantly reduced the development of severe sepsis as indicated by reduction of Mean and Highest SOFA score; (3.6 ± 1.6 vs. 4.9 ± 2.5, P = 0.038 and 5.4 ± 2.7 vs 7.6 ± 4.7, P = 0.043 respectively), (5) significantly reduced the need for vasopressor (20 vs. 68%, P = 0.001) and the need for mechanical ventilation (32 vs. 60%, P = 0.044)., (6) nonsignificantly reduced the length of ICU stay (days) (12 ± 7.1 vs. 13.9 ± 4.2, P = 0.25); and 28 day mortality (40 vs. 56%, P = 0.26).

Also, the short term high intensity atorvastatin therapy are safe to be used in early sepsis regarding their effect on liver enzymes(mg/dl) (22.48 ± 9.7 at admission vs 28.36 ± 9.7, P = 0.11 for ALT and 22.68 ± 9.2 at admission vs 29.76 ± 10.8, P = 0.1 for AST) and muscle enzyme (mg/dl) (107.2 ± 61.2 at admission vs 107.5 ± 48.8, P = 0.9 for CPK).

CONCLUSION. The use of a short term high intensity Atorvastatin therapy in patient with early sepsis seems to be safe and associated with promising effects on inflammatory cascade, and endothelial function reflected clinically by its effect on clinical course and mortality from sepsis.

0440

ATAZANAVIR-INDUCED (UNCONJUGATED) HYPERBILIRUBINEMIA DOES NOT MODULATE PRO-INFLAMMATORY MARKERS, BUT ATTENUATES IL-10 AFTER LIPOPOLYSACCHARIDE CHALLENGE IN HUMANS

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INTRODUCTION. Oxidative stress is considered important in the pathogenesis of sepsis-induced organ dysfunction. Therefore, the eradication of free radicals is a potential treatment strategy. Bilirubin is a powerful endogenous anti-oxidant and has demonstrated to protect against inflammation-induced mortality in animal experiments. While bilirubin for human infusion is not available, atazanavir, a drug registered for HIV patients, is known to induce hyperbilirubinemia by inhibition of the enzyme UGT1A1.

OBJECTIVES. To determine the effects of atazanavir-induced (unconjugated) hyperbilirubinemia on anti-oxidant capacity, induction of the innate immune system, endothelial activation and clinical parameters during experimental endotoxemia in humans.

METHODS. In a double-blind placebo-controlled study, 20 healthy male volunteers received 2 ng/kg of *E.coli* lipopolysaccharide (LPS). Prior to the LPS infusion, subjects received atazanavir 300 mg twice daily for 4 days (n = 10) or placebo in identical capsules (n = 10). Blood was sampled to determine bilirubin, FRAP (a marker for total anti-oxidant capacity), cytokine and adhesion molecule concentrations. Blood pressure, heart rate and body temperature were recorded. Data are presented as mean ± SEM.

RESULTS. Treatment with atazanavir for 4 days increased total bilirubin concentration to 53 ± 4 compared to 7 ± 1 mmol/l in subjects treated with placebo with a further increase to 82 ± 6 vs 15 ± 2 mmol/l after LPS infusion (between groups $p < 0.01$). Conjugated bilirubin remained at or below the detection limit. FRAP was significantly increased in hyperbilirubinemic subjects (1.10 ± 0.04 vs 0.80 ± 0.04 mmol/l, $p < 0.01$). Moreover, in hyperbilirubinemic subjects, FRAP levels were significantly correlated to bilirubin concentration ($r^2 = 0.56$, p = 0.02). In all subjects, LPS infusion induced the production of pro-inflammatory cytokines but no differences were observed between groups (TNF-α: 585 ± 71 in hyperbilirubinemia vs 655 ± 117 pg/ml after placebo, p = 0.6; IL-6: 1035 ± 77 vs. 941 ± 96 pg/ml, p = 0.4; IL-8: 638 ± 49 vs. 613 ± 93 pg/ml, p = 0.6 and MCP-1: 5998 ± 725 vs. 6619 ± 736 pg/ml, p = 0.4). In contrast, concentrations of the anti-inflammatory cytokine IL-10 were reduced by hyperbilirubinemia (249 ± 40 vs. 424 ± 98 pg/ml, p = 0.03). Concentrations of adhesion molecules VCAM and E- and P-selectin were all increased during endotoxemia, but no differences were observed between groups. Also, significant LPS-induced changes in heart rate, blood pressure and body temperature were not modulated by hyperbilirubinemia.

CONCLUSIONS. The present study is the first to investigate the effects of the potent endogenous anti-oxidant bilirubin during human acute inflammation. Hyperbilirubinemia increased anti-oxidant capacity, did not alter the response of pro-inflammatory cytokines, but attenuated the rise of the anti-inflammatory cytokine IL-10.

GRANT ACKNOWLEDGMENT. M. D. is a recipient of a ZonMW AGIKO stipendium.

0441

THE INFLUENCE ON MORTALITY OF THE SYMBIOTIC PREPARATION "SIMBIOTIC DRINK"©

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OBJECTIVES. To assess the influence on mortality of a symbiotic preparation (Simbiotic Drink©) in patients with multi-organ failure.

MATERIALS AND METHODS. Randomised, double-blind, controlled trial in which a symbiotic (Simbiotic Drink©), administered via enteral feeding during the first 12 h of admission to ICU, is assessed. All patients with failure of at least 2 organs according to SOFA (Sepsis-related Organ Failure Assessment) criteria were included. Underage, pregnant women, and acute pancreatitis patients were excluded. The symbiotic was administered in the first 12 h on diagnosis of multi-organ failure.

RESULTS. 92 patients included; 48 in the symbiotic group and 44 in the control group. There were no significant differences in the patients' fundamental characteristics (medical history, age, reason for admission, severity scores). Comparing the symbiotic group with the control group there were found to be no significant differences in length of main hospital stay (27.7 ± 26.6 vs. 30.1 ± 26.1 days), nor in the length of ICU stay (14.4 ± 16.1 vs. 13.3 ± 14.8 days). The group of patients intubated in the progression of their condition was similar (74.5 vs. 75%) and there were no differences in vasoactive drug dose, time on mechanical ventilation, duration of hemofiltration, nor any other ICU parameter. In the symbiotic group 57.4% did not die, 34% died in ICU and 8.5% died on main hospital wards. In the control group, 56.8% did not die, 31.8% died in ICU and 11.5% died on main hospital wards; no differences were found.

CONCLUSIONS. The symbiotic preparation "Simbiotic Drink©", administered early on in multiple-organ failure, affects neither mortality nor the length of stay of patients in ICU.

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GRANT ACKNOWLEDGMENT. This study has been possible thanks to a FISCAM (Fundación para la Investigación Sanitaria en Castilla La mancha) grant (PI-2007/13) of the Regional Health Service of Castilla La Mancha (Spain).

0443

EFFECT OF CARDIAC OUTPUT TARGETED FLUID RESUSCITATION ON MICROVASCULAR PERFUSION IN DIFFERENT TISSUES IN EXPERIMENTAL SEPTIC AND OBSTRUCTIVE SHOCK

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INTRODUCTION. In critically ill patients impaired tissue perfusion has been associated with worse outcome. Nevertheless, hemodynamic resuscitation is aimed at systemic hemodynamic parameters because the relation between systemic hemodynamics and tissue perfusion is not clear. Thus the question remains whether tissue perfusion abnormalities are caused by local microvascular pathology or by suboptimal systemic resuscitation.

OBJECTIVES. To compare the effect of cardiac output (CO) targeted fluid resuscitation on microvascular perfusion in different tissues in experimental septic and obstructive shock.

METHODS. We randomly assigned pigs to 2 groups: the septic shock group (n = 8), in which sepsis was induced with LPS infusion or the obstructive shock group (n = 6), in which tamponade was induced by infusion of fluid in the pericardium. Complete hemodynamic measurements were obtained during shock state (I), resuscitation to baseline (II) and after optimal CO resuscitation (III), which was reached with repeated fluid challenges until $\leq$10% CO increase. In muscle, intestinal and sublingual vascular beds we monitored microvascular perfusion using a Sidestream Dark-Field (SDF) imager and regional tissue oxygenation with Near Infrared Spectroscopy (NIRS).

RESULTS. In both groups CO decreased significantly during shock (I), and reached baseline levels after initial resuscitation (stage II). However, following subsequent fluid resuscitation CO increased significantly in the septic [+ 67% vs. II] but not in the obstructive model [+13% vs. II] ($P < 0.05$). Additionally, microvascular flow variables (flow and density) reached baseline levels in after initial resuscitation (II) in the obstructive group, while in the septic group only CO targeted fluid resuscitation (stage III) increased microvascular flow, even above baseline. Correspondingly, microcirculatory blood flow increased significantly in intestine (II vs. III): (MFI, 2.1 [1.8; 2.7]–3.8 [3.6; 3.9]), muscle: (MFI, 2.2 [0.6; 3.0]–4.0 [3.0; 4.0]; PVD, 16.8 [3.8; 21.0] - 23.3 [20.4; 24.8], PPV, 56.1 [25.5; 88.4]–99.7 [76.4; 99.9]) and the sublingual area: (MFI, 2.1[1.8; 2.4]–3.5 [3.1; 3.9]; PVD, 15.9 [11.8; 20.0]–19.5 [17.7; 24.0] PPV, 75.3 [62.2; 89.8]–99.8 [94.9; 100.0]) ($p \leq 0.01$) in the septic group. There was no difference in NIRS between the different stages and groups of shock. Furthermore, all SDF parameters changed proportionally in all three vascular beds during the study period, with no significative differences.

CONCLUSIONS. In order to resuscitate microvascular perfusion, the therapeutic targets are dependent on the cause of shock. Clearly, correction of CO to normal levels is adequate in obstructive but not in septic shock. However, supranormal CO levels are required to improve microvascular perfusion as well. Optimal fluid resuscitation leads to hyperdynamic systemic and microvascular perfusion in septic but not in obstructive shock.

Poster Sessions
Basic science to evaluate new therapies in sepsis: 0442–0454

0442

MRNA-BASED APPROACH TO MONITOR RECOMBINANT GAMMA-INTERFERON RESTORATION OF LPS-INDUCED ENDOTOXIN TOLERANCE

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INTRODUCTION. It is now well accepted that sepsis is associated with the development of a pronounced immunosuppressive state, characterized by severe immune alterations (e.g. reduced proliferative capacity, endotoxin tolerance phenotype, apoptosis) participating in increased mortality and susceptibility to nosocomial infections. Efforts are currently aimed at restoring a functional immune response in septic patients. Successful therapy depends on the identification of appropriate immunostimulatory drugs and on the development of suitable biomarkers that could be used to stratify patients and to follow response to treatment.

OBJECTIVES. In this study, we evaluated the ex vivo effect of rIFN-γ in restoring monocyte functionality (endotoxin-induced TNF-α production) in a two-hit model of endotoxin tolerance (ET) with peripheral blood mononuclear cells from healthy volunteers and in whole blood of septic shock patients.

METHODS. We used quantitative-reverse transcription polymerase-chain reaction to monitor the expression of seven genes known to participate in ET (*TNF-α*, *IL-10*, *HLA-DRA*, *CIITA*, *IRAK-M*, *ABIN-3* and *LY64*).

RESULTS. Expression analysis of those genes confirmed the presence of an immunosuppression state and the restoration of immune functions by rIFN-γ. We show for the first time that rIFN-γ is able to bypass, at the mRNA level, the effect of *IRAK-M*, a negative regulator of the LPS signalling pathway.

CONCLUSIONS. *TNF-α*, *IL-10*, *HLA-DRA*, *CIITA*, *IRAK-M*, *ABIN-3* and *LY64* mRNA expressions appear as promising candidates for the evaluation of rIFN-γ efficacy. This translational research study demonstrates the potential of a mRNA-based approach to successfully monitor drug efficacy.

REFERENCE. 1. Biswas et al. Trends in Immunol 2009.

GRANT ACKNOWLEDGMENT. This project is part of Advanced Diagnostics for New Therapeutic Approaches, a program dedicated to personalized medicine, coordinated by Mérieux Alliance and supported by the French public agency, OSEO. GM, FV and AL are supported by the Hospices Civils de Lyon. GM is also supported by French ministry of health (PHRC interregional 2008) and DGOS-INSERM (Recherche clinique translationnelle 2009).

0444

TNF-α AND LPS INDUCED CELLULAR ADHESION MOLECULE EXPRESSION IS RESISTANT TO VITAMIN D IN VITRO

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INTRODUCTION. Endothelial dysfunction contributes to the pathophysiology of sepsis. This includes an up-regulation of cellular adhesion molecules (CAMs) including Vascular Cell Adhesion Molecule-1 (VCAM-1), and Intercellular Adhesion Molecule-1 (ICAM-1), stimulating transmigration of leukocytes from the circulation into extravascular tissue where they contribute to inflammation and tissue damage. Vitamin D has immunomodulatory effects. It inhibits LPS induced NF-$\kappa\beta$ activation and cytokine/chemokine release.

TNF-α and LPS activates NF-$\kappa\beta$ through different receptors (TNF-R and TLR-4 respectively) leading to increased CAM expression.

HYOPOTHESIS. Vitamin D has anti-inflammatory effects, measured as an alteration of LPS but not

TNF-α induced CAM expression in endothelial cells.

OBJECTIVES. To investigate if Vitamin D down-regulates LPS and TNF-α induced CAM expression in vitro using Human Umbilical Vein Endothelial Cells (HUVECs).

METHODS. HUVECs were obtained from a collagenase-digested human umbilical vein and cultured on gelatine-coated plates until they were confluent. The cells were cultured without or with TNF-α/LPS, TNF-α/LPS + vitamin D, TNF-α/LPS + media preincubated with vitamin D, or Vitamin D/media preincubated with Vitamin D alone, for 6 or 24 h (n = 8 for each condition). VCAM-1 and ICAM-1 expression was determined using ELISA. LDH levels were analysed in cell media as a marker of cell death.

NO levels was analysed using Griss reagents as a marker of endothelial cells stress.

Statistical analysis was done using Kruskal–Wallis one-way analysis of variance on ranks, post hoc analysis was done using Dunn's correction.

RESULTS. TNF-α and LPS significantly increased ICAM-1 and VCAM-1 expression compared to control after 6 and 24 h. Co-incubation with vitamin D or pre-incubation of the cell media with vitamin D did not modify this up-regulation. Incubation with vitamin D alone or pre-incubation of the cell media with vitamin D alone did not affect ICAM-1 and VCAM-1 expression compared to control.

LDH or NO production did not reach detectable levels in any group.

CONCLUSIONS. In this in vitro model incubation with TNF-α and LPS increased VCAM-1 and ICAM-1 expression on HUVECs. This increase was resistant to Vitamin D All together, the role of Vitamin D as an anti-inflammatory hormone was not confirmed in the present study.

0445

EFFECTS OF A SYNTHETIC PEG-YLATED TIE-2 AGONIST PEPTIDE ON ENDOTOXEMIC LUNG INJURY AND MORTALITY

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INTRODUCTION. A synthetic 7-mer, HHHRHSF, was recently identified by screening a phage display library for binding to the Tie-2 receptor. A polyethylene-oxide clustered version of this peptide, termed vasculotide (VT), was reported to activate Tie-2 and promote angiogenesis in a mouse model of diabetic ulcer.

OBJECTIVES. We hypothesized that VT administration would defend endothelial barrier function against sepsis-associated mediators of permeability, prevent lung vascular leakage arising in endotoxemia, and improve mortality in endotoxemic mice.

METHODS. Immunocytochemistry was used to visualize endotoxin (lipopolysaccharides, LPS O111:B4)-induced morphological changes (±VT) in human microvascular endothelial cells (HMVECs). FITC-labeled albumin, as well as transendothelial electrical resistance served as functional assays to quantify permeability in vitro.

In vivo LPS-induced organ (lung, kidney, spleen) permeability (±VT) was quantified via Evans-Blue Permeability assay. Tie2 and downstream signaling (immunohistochemistry,/-precipitation, and/- blotting) was investigated in lung tissue from endotoxemic mice. A panel of lung inflammatory mediators was examined by qPCR (ICAM-1. VCAM-1, PAI-1, IL-6, TNFalpha). Myocardial function was assessed by transthoracic echocardiography using a Vevo2100 system. Survival was recorded in endotoxemic wildtype C57Bl6/J and Tie2 heterozygous (Tie2±) mice (w or w/o VT) .

RESULTS. In confluent HMVECs, VT prevented endotoxin-induced gap formation, loss of monolayer resistance, and translocation of labeled albumin. In eight-week old male mice given a ~ 70% lethal dose of endotoxin (15 mg/kg IP), VT prevented lung vascular leakage and reversed the attenuation of lung vascular VE-cadherin induced by endotoxemia. These protective effects of VT were associated with activation of Tie-2 and its downstream mediator, Akt. Echocardiographic studies showed a trend toward improved myocardial performance associated with VT. Finally, we evaluated survival in this mouse model. Pre-Treatment with VT improved survival by 41.4% (n = 15/group, p = 0.02) and post-LPS administration of VT improved survival by 33.3% (n = 15/group, p = 0.051). VT-mediated protection from LPS lethality was lost in Tie-2 heterozygous mice, in agreement with VT's proposed receptor specificity.

CONCLUSIONS. We conclude that this synthetic Tie-2 agonist, completely unrelated to endogenous Tie-2 ligands, is sufficient to activate the receptor and its downstream pathways in vivo and that the Tie-2 receptor may be an important target for therapeutic evaluation in conditions of pathological vascular leakage.

GRANT ACKNOWLEDGMENT. SD (DA 1209/1-1), SMP (R01HL093234, R01HL093234-01S1, and K08DK06916).

0446

APOLIPOPROTEIN AI MIMETIC PEPTIDE ATTENUATES LUNG INFLAMMATION AND IMPROVES SURVIVAL DURING SEPSIS BY SUPPRESSING CELL ADHESION MOLECULES EXPRESSION

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INTRODUCTION. Neutrophil activation and adhesion to endothelium followed by transendothelial migration of polymorphonuclear leukocytes has been known as a major pathway for the development of microvascular and tissue injuries during sepsis.

OBJECTIVES. The aim of this study was to investigate whether apolipoprotein AI mimetic peptide 4F attenuates lung inflammation and mortality during sepsis and to determine whether the beneficial effects of 4F are associated with suppression of cell adhesion molecules expression.

METHODS. Experiments were performed on male Sprague–Dawley rats (body weight, 300–350 g). To induce endotoxemia in rats, lipopolysaccharide (LPS, Escherichia coli, O26: B6) at a dosage of 10 mg/kg was injected into a tail vein and 10 min later, vehicle or 4F (10 mg/kg) was intraperitoneally administered, respectively. We observed the survival of the subjects for 72 h. At 6 h post-LPS, we euthanized animals and measured serum lipid profiles. Then, we also measured intercellular adhesion molecule 1 (ICAM-1) and E-selectin expressions, myeloperoxidase (MPO) activity, tumor necrosis factor-α (TNF-α) and interleukin-6 (IL-6) gene expressions, and histologic damages in lung tissues.

RESULTS. 4F improved survival in endotoxemic rats. 4F increased total cholesterol and high density lipoprotein (HDL) cholesterol levels in serum, suppressed ICAM-1 and E-selectin expressions, MPO activity, and proinflammatory cytokine gene expressions in lung tissues, and reduced histologic lung damages.

CONCLUSIONS. Apolipoprotein AI mimetic peptide 4F increased serum HDL cholesterol level, attenuated lung inflammation, and improved survival during sepsis in rats. These therapeutic benefits of 4F were associated with the suppression of cell adhesion molecules expression.

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GRANT ACKNOWLEDGMENT. This work was supported by the grant of the Korea Healthcare technology R&D Project, Ministry for Health, Welfare & Family Affairs, Republic of Korea (grant number: A090504).

0447

IN VITRO VASCULAR REACTIVITY TO PHENYLEPHRINE AFTER A SINGLE IN VIVO ADMINISTRATION OF FLUDROCORTISONE AND HYDROCORTISONE, ALONE OR IN COMBINATION, IN AN ENDOTOXIN-INDUCED SEPTIC SHOCK MODEL

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INTRODUCTION. A survival benefit has been demonstrated in catecholamine-dependent septic shock patients who received a 7-day treatment with low doses of hydrocortisone (HC) and fludrocortisone (FC). If, for HC, this effect partly results from improved vascular response to catecholamines, for FC, it remains to be elucidated.

OBJECTIVES. The aim our study was to investigate the effects of a single in vivo administration of FC, HC or their combination on in vitro vascular reactivity to phenylephrine (PE) in an endotoxin-induced septic shock model.

METHODS. 48 male Wistar rats were prospectively randomized in 8 groups of 6 rats who received: a) lipopolysaccharide (LPS) (T0) then NaCl 0.9% or FC (5 μg/kg) or HC (4 mg/kg) or a combination of FC (5 μg/kg) and HC (4 mg/kg) (T1H) or b) NaCl 0.9% (T0) then NaCl 0.9% or FC or HC or a combination of HC and FC at the same doses (T1H). Treatments were administered intravenously. Systolic arterial pressure (SAP) was recorded at T50', T1H10', and T2H. Animals were sacrificed at T3H and the response of thoracic aorta and mesenteric artery rings to PE was measured ex vivo in isolated organ baths. Cumulative concentration–response curves to PE were established for each ring and the maximum contractile response (E_{max}) and concentration of PE inducing 50% of E_{max} (EC_{50}) were determined by modeling with WinNonLin software from each curve. Statistical analyses were performed using three-way ANOVAs.

RESULTS. Compared to NaCl, LPS induced a rapid and sustained fall in SAP ($p < 0.0001$ at T50', T1H10, and T2H). However there was no significant effect of FC or HC, and no significant interaction between LPS, FC and HC. Compared to NaCl, LPS induced a significant reduction of E_{max} to PE in aorta and mesenteric artery rings ($p < 0.0001$ for both). However there was no significant effect of FC or HC, and no significant interaction between LPS, FC and HC. Moreover, there was no significant effect of LPS, FC and HC and no significant interaction between LPS, FC and HC for EC_{50}.

CONCLUSIONS. LPS administration induced early and prolonged hypotension in vivo and vascular hypo-responsiveness to PE in vitro. Single administrations of FC or HC, either alone or in combination, modify neither arterial pressure nor vascular reactivity to PE. This lack of effect could result from the doses of FC and HC administered and/or from our experimental protocol.

0448

CONTINUOUS INFUSION OF SYNTHETIC ANTI-LIPOPOLYSACCHARIDE PEPTIDE DECREASES CYTOKINE RELEASE AND INCREASES ACTIVITY IN MURINE SEPSIS

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INTRODUCTION. Anti-lipopolysaccharide peptides are naturally existing peptides as part of innate immunity. They are elevated in patients with severe sepsis and bind lipopolysaccharid (LPS), thus decreasing cytokines and improving survival (1).

OBJECTIVES. To compare i.v. application of newly developed synthetic anti-lipopolysaccharide peptides (SALPs) to clarify effects on cytokine release and activity in a murine sepsis model.

METHODS. We induced sepsis by cecal ligation and puncture (CLP) in male NMRI mice (n = 65; weight 38 ± 3 g). Animals were randomized for control (control, sepsis + vehicle infusion), polymyxin B (polymyxin, sepsis + 1.2 μg/h polymyxin B), peptide 19.2-5 (pep2-5, sepsis + 2 μg/h peptide 19.2-5), peptide 19-4 (pep4, sepsis + 2 μg/h peptide 19-4), peptide 19-8 (pep8, sepsis + 2 μg/h peptide 19-8) or sham group (sham operation, vehicle infusion). Insertion of a self-made central venous catheter was completed 48 h before CLP. Activity was rated by a predefined score between 1 (healthy) and 5 (agony) by a blinded investigator 24 h after CLP. Blood samples were processed by cytometer bead array (CBA, BD Biosciences, Heidelberg, Germany) to determine levels of interleukin (IL)-6, IL-10, and monocyte chemoattractant protein-1 (MCP-1). After verifying normal distribution (skewness < 1.5) differences between groups were evaluated by 1-way analysis of variance (ANOVA) with *post hoc* Dunnett test. All data are expressed as mean ± SD.

RESULTS. After 24 h of sepsis activity was significantly higher in sham- (1.1 ± 0.3 points; $p < 0.001$), polymyxin- (3.2 ± 0.5; $p < 0.001$), and pep2-5 group (2.5 ± 0.7; $p < 0.001$) but not in pep4- (4.0 ± 0.8; p = 0.648) and pep8-group (4.1 ± 0.7; p = 0.769) compared to control group (4.4 ± 0.8).IL-6 was significantly lower in sham-, polymyxin- and pep2-5 group, but not in pep4- and pep8-group compared to control. IL-10 was significantly lower in sham and pep2-5-group compared to control group. Lower levels of MCP-1 were measured in sham-, polymyxin- and pep2-5-treated mice (Figure 1).

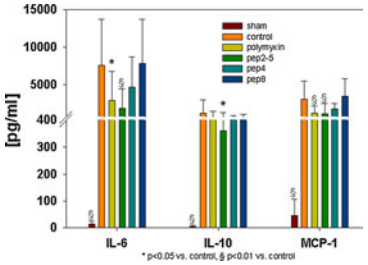

Fig. 1

CONCLUSIONS. The anti-inflammatory effect depends on the structure of the synthetic anti-lipopolysaccharide peptides (SALP). Continuous intravenous application of the SALP 19.2-5 decreases cytokine release in murine sepsis and increases post-CLP activity whereas other tested SALPs exerted no beneficial effects.

REFERENCE. 1. Gutsmann et al. Antimicrob Agents Chemother. 2010; 54(9):3817–24.

GRANT ACKNOWLEDGMENT. BMBF 01GU0826.

0449

INHALED NITRIC OXIDE AND CORTICOSTEROIDS IN ENDOTOXEMIA, EFFECTS ON ANIMAL ORGAN FAILURE SCORE

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INTRODUCTION. It has been reported that the combination of inhaled nitric oxide (iNO 30 ppm) and intravenous (IV) corticosteroids modifies endotoxin-induced organ damage in a piglet endotoxin (LPS) model. Apart from reducing lung vascular constriction, iNO also may have clinically interesting extrapulmonary effects. Among them we note possible synergistic anti-inflammatory action together with IV corticosteroid.

OBJECTIVES. We explored such synergistic effects of 30 ppm iNO and IV 75 mg hydrocortisone every 8th hour, in a 30 h model focused on clinically significant variables, summarized to an 'animal organ failure score'.

METHODS. Piglets (n = 34) were randomized into 5 groups: 1) Controls (conventional care only), 2) LPS alone (LPS infusion and conventional care), 3) LPS + iNO, 4) LPS + IV steroid, 5) LPS + iNO + IV steroid. A sepsis-like condition was established by continuous IV infusion of LPS (*E. Coli* endotoxin). Animals were sedated and mechanically ventilated in a pressure controlled mode. Fluid and vasopressor support were administered as needed. More intense supportive therapy added points to the animal organ failure score.

RESULTS. We observed no deaths in the LPS + iNO + IV steroid-treated animals during the study period, unlike one or two animals in each of the other LPS-infused groups. Furthermore the LPS + iNO + IV steroid group required less inotropic support and were generally more stable than those in the other LPS groups. The animal organ failure score suggested partial protection of organ functions (circulatory, respiratory, renal) in the LPS group treated with iNO + IV steroid ($p < 0.05$).

CONCLUSIONS. We found that combined early therapy with iNO 30 ppm and IV corticosteroids is associated with partial protection of organ functions after 30 h of LPS infusion.

REFERENCE. 1. Da et al.: Nitric oxide up-regulates the glucocorticoid receptor and blunts the inflammatory reaction in porcine endotoxin sepsis. Crit Care Med 2007; 35:26–32

GRANT ACKNOWLEDGMENT. Stockholm City Council, Per Sjöberg Foundation, CF Research & Consulting AB. Conflict of interest: author CF (iNO).

0450

INCREASING MEAN ARTERIAL BLOOD PRESSURE IN SEPSIS: EFFECTS ON RENAL FUNCTION, FLUID BALANCE AND VASOPRESSOR LOAD

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INTRODUCTION. The optimal goal for mean arterial blood pressure (MAP) during the initial resuscitation of severe sepsis and septic shock is unclear[1].

OBJECTIVES. To evaluate the effect of two different targets of MAP on inflammation, pattern of organ dysfunction, and the amount of fluids and vasoactive drugs administered during the first 48 h of resuscitation in a long-term model of fecal peritonitis.

METHODS. In 24 anesthetized pigs [41.0 ± 3.1 kg (mean ± SD)] fecal peritonitis was induced by instillation of 2 g/kg autologous feces. After 12 h of untreated peritonitis, animals were randomly assigned (n = 8 per group) to a septic control group (Septic-CG) without resuscitation until death or one of two groups in which resuscitation was performed for 48 h, targeting MAP between 50-60 mmHg (Low-MAP) or between 75-85 mmHg (High-MAP). During the resuscitation period, animals received Ringer's Lactate and glucose 50% (total 3 mL/kg/h), and additional boluses of Ringer's Lactate and 6% hydroxyethyl starch (130/0.4), and norepinephrine and dobutamine when necessary to reach the assigned MAP, mixed venous oxygen saturation ≥50%, urine output ≥0.5 mL/kg/h and arterial lactate level <2.0 mmol/L.

RESULTS. One animal each in the Low-MAP and High-MAP groups and all septic controls died during the resuscitation period (survival time 21.4 ± 6.0 h). All animals in High-MAP and three in Low-MAP received norepinephrine (P = 0.02), and High-MAP animals also received more additional fluids [2.0 (1.6–2.8) vs. 0.7 (0.5–2.0) ml/kg/h [median(IQR)], respectively; P = 0.06). Cardiac index, carotid and femoral artery blood flow index, urinary output, arterial lactate, base excess, platelets, total bilirubin, TNFalpha and IL-6 did not differ between High-MAP and Low-MAP groups. However, at the end of the study, Low-MAP animals exhibited higher plasma creatinine levels than High-MAP animals (2.2 ± 2.2 vs. 0.8 ± 0.2 mg/dl, respectively; P = 0.02).

CONCLUSIONS. Higher target of MAP during the initial phase of resuscitation in this model decreased the incidence of renal dysfunction without an impact on indices of other organs' functions or inflammatory response. Whether the consequent increased fluid balance and vasopressor load are of relevance for recovery after initial resuscitation needs to be studied.

REFERENCE. 1. Takala J. Should we target blood pressure in sepsis? Crit Care Med. 2010.

TABLE 1

Variables	Group	Baseline	EOP	RP 24 h	RP 48 h	P value* (t-g interaction)
MAP	Septic-CG	78 ± 9	68 ± 22			
(mmHg)	Low-MAP	65 ± 9	81 ± 16	67 ± 12	59 ± 8	0.02[a]
	High-MAP	63 ± 7	76 ± 11	81 ± 7	82 ± 3	<0.01[b]
Cardiac index	Septic-CG	115 ± 27	70 ± 21			
(ml/kg/min)	Low-MAP	105 ± 13	88 ± 22	143 ± 31	149 ± 19	0.17[a]
	High-MAP	112 ± 23	77 ± 16	165 ± 78	150 ± 31	0.33[b]
Arterial lactate	Septic-CG	0.7 ± 0.1	1.9 ± 1.2			
(mmol/L)	Low-MAP	1.3 ± 0.6	1.0 ± 0.4	1.1 ± 0.4	0.9 ± 0.2	<0.01[a]
	High-MAP	0.9 ± 0.3	1.0 ± 0.2	1.2 ± 0.5	1.1 ± 0.3	0.09[b]

* *RM-ANOVA*, [a]BL and EOP (3 groups), [b]All time points (2 groups)

GRANT ACKNOWLEDGMENT. Swiss National Science Foundation: 32003B_127619.

0451

THE EFFECT OF HYPOTHERMIA DEFENDS ON THE SEVERITY OF SEPSIS

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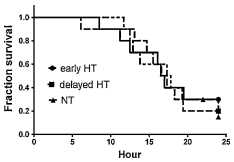
INTRODUCTION. Despite significant progress in understanding the pathophysiology of sepsis and new therapeutic approaches, severe sepsis is still a major cause of death. Controversial data were reported on the effects of therapeutic hypothermia (HT) during sepsis depending on the species and models studied as well as whether HT spontaneously developed or was deliberately induced.

OBJECTIVES. This study investigated the beneficial effects of HT according to the severity of sepsis.

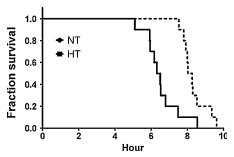
METHODS. We developed moderate and severe septic shock model using different model of cecal ligation and perforation. The survival rates of moderate and severe septic shock model were 50% in 24 h and 100% in 12 h, respectively. The 4-h therapeutic HT and 2-h rewarming were applied to both models. We compared survival rates, systemic cytokines, and tissue malondialdehyde (MDA) level in normothermia (NT) and therapeutic HT group.

RESULTS. Therapeutic HT had no beneficial effects on survival in moderate septic shock model Survival effect.



Survival effect of HT induction time on moderates

In severe septic shock model, however, the survival rate was higher in the HT group compared to NT group Survival effect.



Survival effect of HT and NT on severe sepsis. P <

IL-6 level were significantly lower in the HT group (HT: 521.0 ± 451.2, NT: 1.071.6 ± 452.9, $p < 0.05$). No differences were found in the IL-10 levels between both groups (HT: 647.3 ± 211.7, NT: 583.5 ± 161.2, p = 0.50). The IL-6/IL-10 ratio was significantly lower in the HT group than NT group (HT: 0.67 ± 0.51, NT: 1.51 ± 0.35, $p < 0.005$). Tissue MDA levels in lung and liver were significantly lower in HT group than NT group.

CONCLUSIONS. Therapeutic HT had a survival beneficial effect only on severe septic shock model. It might be associated with modulation of the inflammatory response and anti-oxidant effects.

0452

EFFECT OF OZONE PRECONDITIONING ON LIVER, KIDNEY AND LUNG HISTOPATHOLOGY AND SOD, THIOLS AND MDA LEVELS IN EXPERIMENTAL SEPSIS

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INTRODUCTION. It has been demonstrated that ozone therapy may prepare the host to face pathophysiological conditions mediated by reactive oxygen species (ROS) by increasing endogenous antioxidant systems. ROS causes endothelial dysfunction which plays a key role in the pathogenesis of sepsis.

OBJECTIVES. Ozone preconditioning by giving low doses of ozone before sepsis may have beneficial effects in lethal polymicrobial sepsis in rats protecting vital organs from the damage produced by ROS. We designed a study to observe the effect of ozone preconditioning on organ histopathology and superoxide dismutase (SOD), thiols and malondialdehyde (MDA) levels in experimental sepsis.

METHODS. The study was performed after obtaining consent of the Local Ethical Committee. Rats (n = 25) were divided into 4 groups.

Group1 (sham, n = 4): Air (80 ml/kg) was administered intraperitoneally (i.p) once daily for 5 days.

Group 2 (control, n = 7): Ozone (80 ml/kg and 50 μg/ml) was administered i.p once daily for 5 days.

Group 3 (air/sepsis, n = 7): Air (80 ml/kg) was administered i.p once daily for 5 days.

Group 4 (ozone/sepsis, n = 7): Ozone (80 ml/kg and 50 μg/ml) was administered i.p once daily for 5 days.

In groups 1 and 2, laparotomy was performed without cecal ligation and perforation (CLP) at 6th day. In groups 3 and 4, laparotomy and CLP was performed to create sepsis at 6th day. Rats in all 4 groups were sacrificed at 7th day after taking liver, kidney and lung biopsy and blood from heart.

RESULTS. In control group superoxide dismutase (SOD) and thiols increased significantly and malondialdehyde (MDA) decreased when compared to sham group. In ozone/sepsis group SOD and thiols increased and MDA decreased significantly when compared to air/sepsis group ($p < 0.05$). Histopathologically, liver sinusoids were larger in air/sepsis group than ozone/sepsis group indicating liver injury. Alveolar membrane injury were more pronounced in air/sepsis group than ozone/sepsis group. Increases in Bowman space were significant when compared to ozone/sepsis group indicating renal injury.

CONCLUSIONS. We demonstrated a decrease in lipid peroxidation and an increase in endogenous antioxidant capacity by ozone preconditioning in septic rats. Furthermore, liver, lung and renal histopathology were less affected from oxidant stress of sepsis in ozone pretreated rats.

REFERENCE. 1. Effects of ozone oxidative preconditioning on TNF-alpha release and antioxidant-prooxidant intracellular balance in mice during endotoxic shock. Mediators Inflamm. 2005;2005(1):16–22.

0453

LIPID- AND PROTEIN-ENRICHED ENTERAL NUTRITION LIMITS INFLAMMATION IN A HUMAN ENDOTOXEMIA MODEL

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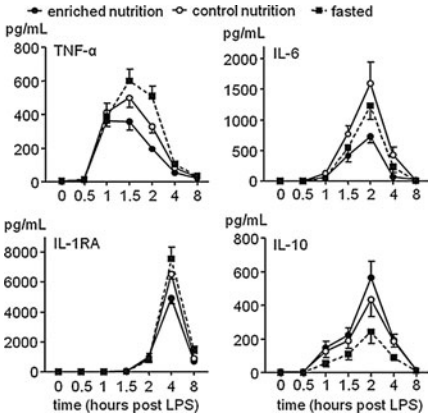
INTRODUCTION. A dysregulated inflammatory response is an important cause of morbidity and mortality in critically ill patients. Enteral administration of lipid-enriched nutrition was previously shown to attenuate inflammation and organ damage via a cholecystokinin-mediated vagovagal reflex in animal studies.

OBJECTIVES. The current proof-of-principle study investigates the immunomodulatory potential of enteral lipid- and protein-enriched nutrition during experimental human endotoxemia.

METHODS. After an overnight fast, 18 healthy male subjects received an intravenous bolus of *Escherichia coli* lipopolysaccharide (LPS; 2 ng/kg). Subjects in the fasted group (n = 6) were deprived of food throughout the study, while subjects in the intervention groups were fed either enriched (n = 6) or isocaloric control nutrition (n = 6) via nasojejunal tube, starting 1 h prior to LPS administration until 6 h afterwards.

RESULTS. LPS administration resulted in a marked inflammatory response. Continuous postpyloric administration of nutrition increased plasma cholecystokinin levels. Enriched nutrition attenuated circulating levels of the pro-inflammatory cytokines TNF-α and IL-6 and the IL-1 receptor antagonist compared with control nutrition (all: $p < 0.01$) and fasted subjects (all: $p < 0.05$). Additionally, enriched nutrition augmented the anti-inflammatory response, reflected by increased IL-10 release compared with fasted subjects ($p < 0.0001$).



Plasma cytokines in the three experimental groups

CONCLUSIONS. The current study establishes the anti-inflammatory potential of enriched nutrition in humans. The immediate anti-inflammatory effect of enriched nutrition suggests that the beneficial effects are mediated via a cholecystokinin-dependent vagovagal reflex. Enteral administration of enriched nutrition is a promising intervention to modulate the immune response in the early course of systemic inflammation.

GRANT ACKNOWLEDGMENT. This work was financially supported by DANONE Research Centre for Specialised Nutrition, Wageningen, the Netherlands and by AGIKO-stipendium 920-03-522 (to TL) from the Netherlands Organization for Health Research and Development. The funding sources had no involvement in study design and analysis or interpretation of data.

0454

EFFECT OF CAFFEIC ACID PHENETHYL ESTER ON LIPOPOLYSACCHARIDE-INDUCED MURINE MACROPHAGE ACTIVATION

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AIMS. Caffeic acid phenethyl ester (CAPE) is an active component of propolis and known to have anti-inflammatory property. This study was performed to evaluate the effects of CAPE on lipopolysaccharide (LPS)-induced murine macrophage activation.

METHODS. Raw 264.7 cells were incubated with varying concentrations of CAPE with or without LPS. The production of TNF-a, IL-1, and MIP-2 and activation of extracellular signal regulated kinases (ERK) 1/2, c-Jun amino terminal kinases (JNK) and p38 were measured.

RESULTS. CAPE inhibited the production of TNF-a, IL-1 and MIP-2 and attenuated phosphorylation levels of ERK 1/2 and p38, but not JNK in RAW264.7 cells stimulated with LPS.

CONCLUSIONS. CAPE can attenuate LPS-induced macrophage responses and we suggest that such effects could play an important role in modulating macrophage-mediated inflammatory responses in vivo.

CAP & other pneumonias: 0455–0467

0455

POSTOPERATIVE PNEUMONIA FOLLOWING CARDIAC SURGERY

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INTRODUCTION. Perioperative care, indications and general demography of cardiac surgery (CS) patients (pts) are changing. Previous studies confined their analysis to pts with ventilator associated pneumonia (VAP). Nevertheless, VAP is not the only presentation of postoperative pneumonia (POP) following CS.

OBJECTIVES. The aim of our study was to analyze the risk-factors of all types of early-onset (Eo)-POP including VAP and non-VAP following CS.

METHODS. This retrospective study, using a prospective collected database, included all patients undergoing CS with cardiopulmonary by-pass (CPB) between December 2005 and December 2010. Diagnostic of Eo-POP (<7 days) was based on clinical, laboratory and microbiological criteria obtained by fiberoptic bronchoscopy (broncho-alveolar lavage $\geq 10^4$ cfu/ml and protected specimen brush $\geq 10^3$ cfu/ml). Pre and intra-operative variables associated with the development of Eo-POP were assessed by comparison of the characteristics of pts without Eo-POP. Logistic regression analysis was used to assess parameters predictive of Eo-POP.

RESULTS. Over the studied period, Eo-POP occurred in 167 of the 5,114 pts (3.3%) with a delay of 4 [3–6] days. Risk factors associated with Eo-POP after multivariate analysis were age >65 years old (aOR: 1.6; 95% CI: 1.1–2.3; P = 0.02), left ventricular ejection fraction <60% (aOR: 1.9; 95% CI: 1.4–2.6; P = 0.0001), chronic obstructive pulmonary disease (COPD) (aOR: 3; 95% CI: 2.1–4.3; P < 0.0001), redo surgery (aOR: 1.9; 95% CI: 1.2–3.1; P = 0.007), length of CPB time >60 min (aOR: 1.9; 95% CI: 1.4–2.7; P = 0.0002), serum creatinin clearance <60 ml/min (aOR: 1.5; 95% CI: 1.1–2.2; P = 0.002) and intraoperative number of packed red blood cell transfused >2 (aOR: 1.7; 95% CI: 1.2–2.4; P = 0.002). We also found that Eo-POP was linked with significantly longer duration of mechanical ventilation ($P < 0.0001$), prolonged ICU stay ($P < 0.0001$) and higher mortality rate (41 vs. 4.6% ,$P < 0.0001$). The most frequent isolated microorganisms were *Enterobacteriaceae* (40%), *P. aeruginosa* (18%) and *Haemophilus spp.* (17%). *S. aureus* represented only 5% of all isolated microorganisms (one strain was resistant to methicillin).

CONCLUSIONS. Assessing risk factors of Eo-POP could lead to a preventive policy to decrease the incidence of Eo-POP (systematic pre and postoperative chest physiotherapy in all pts with COPD and age > 65 years old, more restrictive thresholds for transfusion...). Moreover Gram negative bacilli and more specifically *P. aeruginosa* should be taken into account for empiric broad-spectrum antibiotic treatment in case of Eo-POP following CS.

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0456

DIAGNOSIS OF COMMUNITY-ACQUIRED PNEUMONIA IN PATIENTS WITH INVASIVE MECHANICAL VENTILATION AT THE INTENSIVE CARE UNITS (ICU) OF LATIN AMERICA

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INTRODUCTION. Limited information is available regarding the epidemiology and diagnostic methods in patients with Severe Community Acquired Pneumonia (SCAP) in Latin American Intensive Care Units (ICUs).

OBJECTIVES. Our aim was to characterize the epidemiology and diagnosis of SCAP in Latin American ICUs.

METHODS. A multicenter prospective observational study was done in 17 Intensive Care Units (ICUs) from 4 Latin American countries (Argentina, Colombia, Peru, and Ecuador). We included consecutive ICU patients whom required >48 h of invasive mechanical ventilation and developed a clinical diagnosis of SCAP. We performed descriptive statistics using Stata/SE 10.0.

RESULTS. 77 were diagnosed with CAP, with a 9.6% of incidence. The mean age was 56.1 ± 15.6 years old and 50.7% were men.The average SAPSIII was 60.3 ± 17.5 when admitted. The day before the suspected diagnosis it was 55.52 ± 17.2; and the day of the diagnosis itself the SAPSIII was 64.28 ± 19.2. Septic shock occurred in 41.5% and severe sepsis in 24.7%. Mean CAP-PIRO was 3.82 (±1.58) and CURB-65 2.57 (±1.30). The respiratory diagnostic methods used in SCAP patients in the ICU were: sputum sample (16 patients [20.7%]; obtained prior to intubation), endotracheal aspirate (27 patients [35%]; 19.5%qualitative and 15.6% quantitative) and bronchoscopy (8 patients [10.4%]). Blood cultures were obtained in 61 patients (79.2%), but were positive in only 11.5% of the patients. The most frequent isolated pathogen was *Streptococcus pneumoniae* 57.1%. The ICU mortality was 48% and the hospital mortality was 10% for SCAP patients.

CONCLUSIONS. Non-invasive methods are the preferred methodology in Latin American ICUs to assess patients with SCAP in the ICU. Further analysis will determine the impact on health care utilization and patient outcomes.

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0457

VALIDATION OF TREATMENT FAILURE CRITERIA OF NOSOCOMIAL PNEUMONIA IN ICU

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INTRODUCTION. Nosocomial pneumonia (NP) is the most important infection acquired in ICU. Although several studies have attempted to establish the course of NP in ICU, there is no clear and validated definition to evaluate treatment failure (TF) [1–4].

OBJECTIVES. To validate a previously established definition of TF [5].

METHODS. We prospectively collected data of NP in ICU, evaluated the rate of TF at 72 h after beginning antibiotic treatment and compared the groups with or without TF. TF was defined as the presence of any of the following: failure to improve the PaO_2/FiO_2 ratio or need for intubation because of pneumonia, persistence of fever or hypothermia plus purulent respiratory secretions, worsening of the pulmonary infiltrate by >50%, or occurrence of septic shock or multiple organ dysfunction not present on day 1.

RESULTS. We evaluated 297 cases; 178 with ventilator-associated pneumonia (VAP) and 119 with non-VAP. 165 patients (55%) fulfilled TF criteria. There was no difference between groups in demographics, severity scores (APACHE-II), or inflammatory response assessed by CRP. Treatment failure was related with increased mortality in the ICU (45 vs. 18%, $p < 0.001$) and the hospital (52 vs. 25%, $p < 0.001$), longer ICU stay (22 ± 22 vs. 16 ± 21 days, $p = 0.035$), but with similar hospital stay. Clinical Pulmonary Infection Score (CPIS) was 6.7 in both groups at day 1 ($p = 0.69$) lowering to 5.5 (SD $\pm$ 1.8) in survivors and 6.2 (SD $\pm$ 1.7) in non-survivors ($p = 0.01$ for differences between groups). Failure to improve the PaO_2/FiO_2 was the only individual component of TF definition associated with the evaluated clinical outcomes.

CONCLUSIONS. The definition of TF appears to correlate well with relevant clinical outcomes, mainly due to the respiratory parameters.

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0458

CRITICAL CARE OF HIV INFECTED PATIENTS EXPERIENCING PNEUMOCISTIS JIROVECII PNEUMONIA

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INTRODUCTION. Despite a decline in its incidence severe Pneumocystis jirovecii pneumonia (PJP), continues to be a common cause of ICU admission where mortality remains high.

OBJECTIVES. A study was undertaken to examine the ICU outcome for patients with PJP and to identify prognostic factors.

METHODS. Consecutive HIV infected adults admitted to the ICU at Luigi Sacco Hospital from February 1986 until December 2010 were identified, together with the confirmed cases of PJP. On all the patients the following data were retrospectively collected i. demographics and laboratory data the admission (i.e. PaO_2, CD4, serum LDH; ii. presence of co-morbidity and evidence of co-pathogens in BAL fluid; iii. treatment for PCP; iv. 1st 24 h APACHE II score3, ICU and hospital length of stay, mechanical ventilation (MV), pneumothorax outcome.

RESULTS. Out of a total number of 508 (8.8% of all admissions) HIV-infected patients admitted to our ICU over the study period, 197 (38.8%) experienced a microbiological confirmed PJP. A Cox's proportional hazard model assessed previous PJP history (HR: 1.9, 95% CI 1.2–4.3, $p = 0.027$), need of MV (HR: 2.6, 95% CI 1.9–3.3, $p = 0.036$) and ARDS (HR: 3.9, 95% CI 1.5–4.8, $p = 0.022$) as predictors of death. Highly Active Antiretroviral Therapy was not found affecting significantly patient mortality. Highly Active Anti Retroviral Therapy

CONCLUSIONS. Observed improved outcomes from severe PJP for patients admitted to the ICU occurred in the absence of intervention with HAART. It probably reflects general improvements in ICU management of respiratory failure and ARDS rather than improvements in the management of PJP.

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0459

FLUID BALANCE IN SEVERE COMMUNITY ACQUIRED PNEUMONIA IN INTENSIVE CARE

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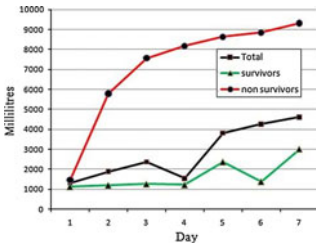
INTRODUCTION. Conservative fluid management in acute lung injury patients has shown to reduce the duration of mechanical ventilation and duration of intensive care stay [1].

OBJECTIVES. To investigate the fluid balance in patients admitted to the intensive care with severe community acquired pneumonia.

METHODS. This was a retrospective audit of all patients admitted to a district general hospital intensive care unit with community acquired pneumonia (CAP) in a 1 year period from October 2009 to October 2010. Patients were excluded if they developed pneumonia after 48 h of admission to the hospital. Data collected included patient demographics, duration of intensive care, duration of mechanical ventilator support, APACHE II score on admission, cumulative fluid balance (CFB) and mortality. Results were analysed using Mann–Whitney *U* test and p value <0.05 was considered statistically significant.

RESULTS. 38 patients with a mean age of 57 years were admitted with severe pneumonia during the time period studied. The mean APACHE II score was 16.5. Thirty day mortality of these patients was 36.7%. The median length of stay in the intensive care was 3.8 days and the median duration of mechanical ventilatory support was 2.5 days. The median 7 day CFB was 4,614 ml. Among the patients who died, the median 7 day cumulative balance was 9,319.5 ml and in patients who survived it was 2,997 ml ($P = 0.03$). There was statistically significant difference in fluid balance between survivors and non survivors by the second day ($p = 0.008$).



Median cumulative fluid balance in first 7 days

CONCLUSIONS. The mean 7 day cumulative fluid balance was higher than the FACTT conservative fluid therapy group. Positive fluid balance in the first 3 days contributed significantly to the 7 day cumulative fluid balance. Patients who died had significantly higher cumulative balance than those who survived [1, 2]. This data supports the hypothesis that a positive fluid balance in patients with community acquired pneumonia is associated with higher mortality. If haemodynamics allow, clinicians should avoid liberal fluid therapy in the early stages of admission.

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0460

PNEUMONIA IN POSTOPERATIVE INTENSIVE CARE UNIT. HOW BIG IS THE PROBLEM?

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INTRODUCTION. Addition of pneumonia/ventilator-associated pneumonia (VAP) raises risk of mortality, prolongs stay in intensive care unit (ICU) and increases cost of treatment. Javier et al. 2009 reported that VAP is common in patients undergoing major heart surgery that require mechanical ventilation more than 48 h.

OBJECTIVES. Our purpose was to evaluate rate, etiology, course and cost of pneumonia patients in our postoperative ICU and to determine the incidence of VAP.

METHODS. Descriptive study in 9-bed postoperative ICU during 2010. We collected data from all patients with pneumonia, regardless of etiology.

RESULTS. During 2010 1,052 patients were admitted to ICU, most patients were post cardiac surgery (60%) or post neurosurgery/neurotrauma patients (20%). Average APACHE II score was 14, length of stay (LOS) 2.2 days, mortality rate 2.3%.

Data of 24 patients with pneumonia was collected, mean age 56.6 years, 15 (62.5%) were male. Average APACHE II score (1 day of treatment) 22.5. 8 patients had pneumonia before admission, 4 patients had aspiration pneumonia and 11 patients got VAP. 9 patients were post neurosurgery/neurotrauma, 5 post cardiac surgery, 8 after large general or vascular surgery. 19 patients (79.2%) were ventilated over 48 h, invasive ventilation time was 12.1 days with mean minimal pO_2/FiO_2 103.5.

14 needed tracheostomy. Most commonly isolated cultures from trachea were *Staphylococcus aureus* (16.7%) and 12.5% of patients had either *Pseudomonas aeruginosae*, *Enterobacter cloaceae*, *Escerichia coli* or *Klebsiella pneumoniae* in endotracheal aspirate. In 37.5% cases multiple microorganisms were isolated and 8 patients (33.3%) had no microbes in their cultures. Average max CRP and PCT in the ICU were 229.8 mg/l and 5.2 ng/ml. Mean LOS in ICU was 14.1 days with mortality rate 29.1%, mean hospital LOS was 30.8 days with mortality rate 37.5%. Mean all hospital cost of a pneumonia case was 18,027 euros.

57.9% of patients with pneumonia, who were ventilated over 48 h had VAP. Mean APACHE II score 25.7, CRP 254.2 mg/l, PCT 4.42 ng/l, pO_2/FiO_2 110, median invasive ventilation time 16.5 days, mean ventilation time before pneumonia diagnosis was 6.2 days, 9 patients were tracheostomized. Acute kidney failure appeared in 5 patients with VAP, 2 of them needed kidney replacement therapy. 91% recieved vasoactive therapy, blood transfusion was made in 9 cases. Mean LOS in ICU 19.5 days, hospital LOS 26.1 days, mortality rate in ICU 45.5%. Mean all hospital cost was 19,791.8 euros.

CONCLUSIONS. Incidence of pneumonia in our ICU is not high (2.3%), incidence of VAP is 1.1%.

The cost of cases complicated with pneumonia is high.

Because of these facts it is important to avoid pneumonia by using international evidence-based guidelines and recommendations.

REFERENCE. Hortal J et al. Incidence and risk factors for ventilator-associated pneumonia after major heart surgery. Intensive Care Med. 2009;35:1518–1525.

0461

PREDICTIVE VALUE OF C-REACTIVE PROTEIN (CRP) IN SEVERE COMMUNITY-ACQUIRED PNEUMONIA (SCAP) PATIENTS REQUIRING INTENSIVE CARE UNIT (ICU) ADMISSION

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INTRODUCTION. Among SCAP patients, mortality is usually high, especially in those requiring invasive mechanical ventilation (IMV) or vasopressor support (VS).

OBJECTIVES. We investigated CRP on admission and 8th day values association with mortality and adverse outcomes in SCAP patients requiring ICU admission.

METHODS. 30 ICU patients with SCAP CURB-65 class 3, 4 were enrolled to the study. Control group included 16 comparable healthy volunteers. X-ray examination, CRP levels measurement were performed within the first 24 after admission and at 8th day. The main endpoints were in-hospital outcomes (in-hospital mortality (IHM), length of in-hospital stay, duration of ICU stay), necessity of IMV and VS.

RESULTS. CRP on admission and 8th day values correlated with CURB-65 score ($r = 0.8$; $p = 0.00004$ and $r = 0.76$; $p = 0.0001$ respectively). Their levels at 1st and 8th days were statistically different in CURB-65 class 3 and 4 patients ($p = 0.0007$ and $p = 0.0013$ respectively). CRP were higher in non-survivors then those in survivors [median] [311 vs. 241 mg/ml, $p = 0.006$ respectively] at 1st and 8th days [249.3 vs. 89.3 mg/ml, $p = 0.01$ respectively] and revealed statistically significant correlation with IHM ($r = 0.64$; $p = 0.003$ and $r = 0.6$; $p = 0.006$ respectively).Longer duration of ICU stay was associated with higher CRP values on admission ($r = 0.43$; $p = 0.04$). CRP at 1st day correlated with necessity of VS ($r = 0.79$; $p = 0.00004$) and revealed higher concentrations in patients requiring VS compared with those with stable haemodynamics [311.3 vs. 232.8 mg/ml, $p = 0.0007$ respectively].Enhanced CRP levels on ICU admission were associated with necessity of IMV($r = 0.63$; $p = 0.003$), their values appeared to be higher in patients requiring IMV [311.3 vs. 244.3 mg/ml respectively, $p = 0.006$]. Adverse X-ray dynamics was associated with increased CRP levels at 1st day ($r = 0.55$; $p = 0.045$).

CONCLUSIONS. Increased CRP values in SCAP patients requiring ICU admission are associated with disease severity, adversed X-ray dynamics and could be used for identifying patients with high mortality risk, prediction of duration of ICU stay, necessity of VS and IMV.

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GRANT ACKNOWLEDGMENT. We disclose any relationship with manufacturers or providers of any commercial products or survices relevant to this research.

0462

PROGNOSTIC FACTORS OF SEVERE PNEUMONIA PNEUMOCOCCAL

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INTRODUCTION. Despite therapeutic advances, severe pneumococcal pneumonia remains a serious disease with high mortality.

OBJECTIVE. To determine factors associated with mortality in patients with severe pneumococcal pneumonia.

METHODS. Retrospective study of patients from two centers during 1996–2009. All patients had a *Streptococcus pneumoniae* bacteriemia. We analysed clinical and laboratory data.

RESULTS. We included 70 patients who were admitted to the critical care department. The average age was 55 years(SD 16.28), 64% were men. The value of APACHE II was 19.8 (SD 9.75), SOFA: 7.6 (SD 3.9) y PSI: 113.43 (SD 32). The susceptibility antibiotic was: penicillin 80%, cefotaxime 97%, erythromycin 81% and 98% levofloxacin. The hospitality mortality was 25%. The multivariate logistic regression showed that the non-susceptible to macrolide (Odds Ratio = 28.34, 95% Confidence Interval = 1.61–498.91, $p = 0.02$) and APACHE II (Odds Ratio = , 95% Confidence Interval = ,$p = 0.002$), SOFA (Odds Ratio = 0.60, 95% Confidence Interval = 0.43–0.84, $p = 0.003$), PSI (Odds Ratio = 0.93, 95% Confidence Interval = 0.90–0.97, $p = 0.002$) were associated with mortality of these patients.

CONCLUSIONS. Resistance to macrolide and high score in the APACHE II, SOFA, PSI were associated with increased risk of mortality in patients with severe pneumococcal pneumonia.

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0463

COMMUNITY ACQUIRED PNEUMONIA (CAP) IN OCTOGENARIANS ADMITTED TO A CRITICAL CARE UNIT AT A DISTRICT GENERAL HOSPITAL (DGH): DILEMMA OF AN INTENSIVIST

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INTRODUCTION. We did a retrospective study of all octogenarians admitted to a CCU at a district general hospital (DGH) with CAP from 1995 to 2010. As Intensivists face an increasing tide of geriatric patients, decisions to admit to CCU and resource allocation is becoming increasingly difficult [5]. Early admission to CCU, age and functional status of the patient were believed to be associated with hospital mortality [3].

OBJECTIVES. To determine the risk factors for mortality in octogenarians admitted to CCU with CAP in a DGH.

METHODS. A retrospective analysis of all octogenarians admitted to CCU from 1995 to 2010. The data collected included their sex, age, source of admission to CCU, length of stay (LOS) prior to admission to CCU, LOS on the CCU, post CCU LOS and total hospital LOS, APACHE II score, APACHE II probability, cardiovascular morbidities etc. and organ failures. SPSS 16 was used to stratify mortality and performance characteristics (sensitivity, specificity, positive predictive value, negative predictive value and AUC-ROC).

RESULTS. There were 48 admissions out of which 10(20.8%) were females and 38(79.2%) males. The average ages of male and female patients were 82.4 ± 2.32 and 83.29 ± 3.18 years respectively. The average age of non-survivors was 82.86 ± 2.82 years. The APACHE score and APACHE probability of this cohort were 19.54 ± 4.3 and 47.34 ± 18.88 respectively. The patients referred from accident and emergency unit (A + E) had 88.9% sensitivities and 1.27 positive likelihood ratio values (PLRV) for CCU mortality respectively. Those patients admitted from the wards had 77.8% CCU mortality sensitivity and 1.46 PLRV respectively.Of these admissions, a total of 30(62.5%) patients survived the CCU admission. However, only 21(43.75%) were discharged home. One third of hospital deaths in Octogenarians were after their discharge from CCU. Those with coexisting CVS morbidity ($p = 0.0001$) and organ failure ($p = 0.001$) has significant mortality after their discharge from CCU. The inpatients survival of the CCU was 96.3% sensitivity and 1.02 PLRV at 1.5 days. Thus, at day 7 and 14, patient CCU survival sensitivity were 33.3, 11.1% and PLRV 1.0 and 0.65 respectively.

CONCLUSIONS. There was significant correlation to survival of patients to LOS on the CCU (p value = 0.004) similar to Restrepo et al's study. Survival declined by a third every 7 days of their CCU stay. CCU LOS (p value = 0.004), post-CCU LOS (p value: 0.001), and total hospital LOS (p value: 0.001) were significant factors contributing to hospital mortality with CAP in Octogenarians. Those referred from A + E had higher overall mortality which could be related to their higher APACHEII scores and co-morbidities contrary to Renaud et al's [1] study which included less severe CAP. CVS morbidity ($p = 0.0001$) and organ failure ($p = 0.001$) were risk factors for mortality after their CCU survival.

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MANAGEMENT OF ASPIRATION PNEUMONIA IN AN INTENSIVE CARE SETTING

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INTRODUCTION. Aspiration pneumonia accounts for about 10% of patients admitted to hospital with pneumonia and is usually diagnosed as pneumonia in the presence of risk factors for aspiration.[1, 2] Current guidelines for the treatment of aspiration pneumonia in NHS Greater Glasgow and Clyde are Amoxicillin and Metronidazole [3]

OBJECTIVES. The aim of the study is to identify which bacteria are grown from sputum cultures and tracheal aspirates from patients admitted to ICU with a diagnosis of aspiration pneumonia and to subsequently guide antibiotic therapy.

METHODS. This is a retrospective study looking at the sputum cultures of all patients admitted to the Intensive Care Unit (ICU) at the Southern General Hospital with a diagnosis of aspiration pneumonia between the years 1995 and 2010.

RESULTS. 111 patients were included in the study with a median hospital stay of 1 day prior to admission to ICU. The most frequently isolated bacteria were a mixture of Gram negative and Gram positive microbes; no anaerobic pathogens were grown. Addition of gentamicin to current treatment guidelines would improve antibiotic cover from 29 to 59% patients.

CONCLUSIONS. This study suggests that the addition of gentamicin should be considered in all patients requiring admission to ICU with a suspected diagnosis of aspiration pneumonia and raises the possibility that anaerobic cover is not necessary in its treatment.

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0465

HYDROCORTISONE DECREASED POST HEMORRHAGE SUSCEPTIBILITY TO PNEUMONIA

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INTRODUCTION. Immunoparalysis (IS)-induced pneumonia (PN) is the leading cause of morbidity after hemorrhagic shock (HS). Hydrocortisone decreased the rate of pneumonia in multiple trauma patients.

OBJECTIVES. Evaluation of hydrocortisone (i) in decreasing lung lesions and (ii) in restoring dendritic cells functions in a murine model of post-traumatic methicilline susceptible *Staphylococcus aureus* (MSSA) pneumonia.

METHODS. A published murine model of hemorrhagic shock with a subsequent MSSA pneumonia was used [1]. Four groups were studied: Sham, Pneumonia (P group), Hemorrhage followed by pneumonia (HP group), Hemorrhage followed by first hydrocortisone then pneumonia (HP-HSHC group) We assessed: mortality, lung and spleen bacterial (log CFU/g of organ), lung neutrophil infiltration (Myeloperoxydase Activity), lung endothelial lesions (albumin-FITC permeability), lung cytokine concentration (TNF alpha parenchyma), mRNA levels (RT-PCR) of Tumor Necrosis Factor (TNF) alpha, Interferon (IFN) gamma in sorted dendritic cells (DC).

RESULTS. In this model, hemorrhage increased mortality rate of pneumonia (25% in group P vs. 45% in group HP, $P < 0.05$) and hydrocortisone decreased mortality (26%, $P < 0.01$ vs. group HP).

Results

	Sham	Pneumonia	Hemorrhage-pneumonia	Hemorrhage-hydrocortisone-pneumonia
Lung bacterial load	0.7 (0.5–1.0)#	6.2 (5.7–7.5)	6.4 (5.8–6.6)#	6.3 (5.7–7.5)
Spleen bacterial load	0.7 (0.5-1.0)#	1.8 (1.1–2.3)	2.8 (2.2–3.2)#	2.9 (2.3–3.3)#
Myeloperoxydase activity	1 (1–2)#	15 (12–19)	24 (20–27)#	28 (24–31)#,*
Endothelial permeability	5 (4–7)#	9 (6–12)	17 (12–20)#	12 (8–15)#,*
TNFalpha lung concentrations	15 (15–30)#	180 (163–198)	208 (173–224)	175 (159–193)
mRNA in DCs TNFalpha IFNgamma	1 (0.8–1.1)# 1 (0.9–1.1)#	2.4 (1.9–2.7) 12 (6.1–14.3)	2.5 (1.9–2.8) 7.8 (2.4–11.1)#	2.4 (2–2.7) 12.5 (7.1–14.8)*

CONCLUSIONS. Post traumatic immunosuppresion increased mortality, bacterial dissemination, inflammatory lung lesions during MSSA-pneumonia and decreased IFN gamma transcription in DC.

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LEGENDS. #$P < 0.05$ verus P group; * $P < 0.05$ versus HP group.

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RISK FACTORS FOR THE EARLY COLONIZATION WITH RESISTANT GRAM NEGATIVE BACTERIA OF ICU PATIENTS

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INTRODUCTION. Colonization is considered to be the first step in the pathogenesis of nosocomial infections.

OBJECTIVES. The purpose of the present study was to evaluate the colonization and resistance dynamics of gram-negative bacteria (GNB) in bronchial tree, oropharyngeal and gastric microfloras and to identify risk factors and mechanisms for Resistant-GNB acquisition.

METHODS. Inclusion criteria: Intubation and mechanical ventilation on admission to ICU or within the last 12 h before ICU admission or within the first 48 h after ICU admission. Cultures were sent upon ICU admission and at regular intervals thereafter during the first week of ICU stay. Possible other risk factors were recorded daily.

RESULTS. One hundred and twenty six patients were assessed for eligibility. On the 7th day post ICU admission, R-GNB colonization in bronchial tree was 69%, in oropharyngeal secretions 79% and in gastric secretions 59%.

Significant differences between patients with and without bronchial RGNB on day 7 were found for the following variables: bronchial colonization with RGNB on admission (27 vs. 0.0%, $p < 0.008$) and aminoglycosides administration (44 vs. 17%, $p < 0.05$). We also found significant associations in bronchial secretions for the presence of *Klebsiella pneumoniae* and prior use of tigecycline (54 vs. 21%, $p < 0.003$) as well as of aminoglycosides (68 vs. 25%, $p < 0.001$). Both antibiotics were significant independent variables in a multivariate logistic regression model (tigecycline: OR = 3.8, $p < 0.024$, aminoglycosides: OR = 5.6, $p < 0.006$).

Regarding oropharyngeal colonization with RGNB on the 7th day a significant association was found only between resistant *Acinetobacter baumannii* and the prior use of b-lactames (78 vs. 59%, $p < 0.05$).

Chronic renal failure (16 vs. 0%, $p < 0.03$) and gastric colonization with RGNB on admission (25 vs. 3.8%, $p < 0.03$), were significantly different between patients with and without gastric colonization with RGNB on the 7th day. A significant association was found between resistant *Klebsiella pneumoniae* and the prior use of cephalosporines (30 vs. 7%, $p < 0.03$) and linezolid (33 vs. 11%, $p < 0.05$).

CONCLUSIONS. High percentage of multiple site colonization with RGNB was found on day 7 pst ICU admission. In our study, mechanisms that may lead to colonization of ICU patients with resistant strains include the prior use of broad spectrum antibiotic agents.

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EVALUATION OF NEW FEVER IN ICU; OUR PRACTICE

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INTRODUCTION. Fever is a common problem in ICU patients. Those patients frequently have multiple infectious and non-infectious causes of fever necessitating a systematic and comprehensive diagnostic approach. Blood cultures are one of the most widely used microbiological screening tools in ICU patients.

OBJECTIVES. Marik [1] recommended taking blood cultures for all febrile patients. His argument was that bacteraemia and candidaemia have been documented in up to 10% of ICU patients and are an important cause of morbidity and mortality in the ICU. However, the American College of Critical Care Medicine and the Infectious Diseases Society of America [2] have recommended that blood cultures should be obtained in patients with a new fever only when clinical evaluation does not strongly suggest a non-infectious cause. We aimed to audit the rate of taking blood and other body fluids cultures in our 16 bedded ICU and reflect that on the available clinical evidence and guidance.

METHODS. A group of 25 sequential patients admitted to ICU in August 2010 were investigated daily for a single episode of significant fever whilst their stay in ICU using the data from the patients' electronics system. All blood cultures were retrieved using the hospital intranet blood results database and were matched with data from the ICU patients' electronic system.

RESULTS. Blood cultures were taken in 88% of patients on the same day of the first episode of fever and generally were taken in 52% of all fever days. For patients whom stayed on ICU for more than 21 days and had continuous or intermittent fever, blood cultures taking rate during the first week was higher than the second week and significantly higher than third week. Blood cultures were only positive in 4%.

CONCLUSIONS. Our results clearly shows that the routine practice of taking blood cultures in all patients with new onset fever remains controversial. In our practice it is clear that cultures are taken consistently in the first episode of fever however, this will become inconsistent with continuous or further episodes of fever and even more sporadic in patient with continuous fever for more than 2 weeks even when none was isolated. Regarding the cultures positivity rate, blood cultures were much lower than the published figures. Although this could be simply occurred by chance, it is possible that many aspects of blood culture taking techniques are responsible for the large number of negative results. Recommendation: (1) We need clear guidance regarding the frequency of taking blood culture in patient with new onset fever. (2) Auditing the technique of blood culture.

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Fungal & other difficult infections: 0468–0478

0468

DIFFICULT VENTILATORY SUPPORT WEANING IN PATIENTS WITH SEVERE NICOTINE ADDICTION DEPRIVATION: CASE REPORT

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INTRODUCTION. According to data from the Spanish Critical Care Society, between 20 and 30% of ICU admissions in our country are due to nicotine addiction related diseases, of which an exacerbation of a chronic respiratory failure is the leader cause. It is well known that nicotine addiction is a relevant health problem all over the world, with significantly lower incidence in the last decades in the developed countries. Nicotine has a great addiction power in consumers, and its sudden withdrawal produces a deprivation syndrome, with irritability, anxiety, psychomotor stress and delirium, making sedation withdrawal and ventilator weaning more difficult. From our point of view, this situation is often undervalued in critically ill patients, as we do not think in nicotine addiction as the cause and therefore, in only a few cases do we prescribe nicotine administration in order to control deprivation symptoms.

METHODS. We present a case of severe nicotine addiction that made weaning impossible until nicotine administration was started in order to control the deprivation syndrome.

RESULTS. 66 years of male, with a history of right lung scar from old tuberculosis, chronic phyquiatric schizoid-like disturb with a good pharmacologic control, ex-alcoholic, and smoker of 100 cigarettes a day during the last 20 years, with clinical evidence of untreated chronic bronchitis. On ICU admission an acute respiratory failure as a consequence of a community acquired pneumonia (CURB 65: 3 points) was diagnosed. Orotracheal intubation and ventilatory support were immediately required, and in the following days a clinically favorable evolution let us reduce ventilatory support. While initiating sedation withdrawal, a deprivation syndrome with severe psychomotor agitation and anxiety was evident, and therefore weaning from ventilator was delayed and sedation was reintroduced. In spite of the administration of adequate doses of neuroleptics and benzodiazepines, a tracheotomy procedure was carried out as a preventive measure for a complex weaning. A subsequent family interview confirmed the patient's severe smoking habit. We initiated sustitutive topic therapy with 21 mg/day of nicotine and empiric increases in dose were done based on clinical response, reaching 63 mg/day on the 4th day in ICU. Since then, deprivation clinical synthoms became under control, which let us begin ventilatory weaning and complete ventilator withdrawal on day 14 of ICU admission.

CONCLUSIONS. Nicotine deprivation is a well known clinical entity with many bibliographic references. In ICU patients with sedation and ventilatory support, deprivation syndrome emerges as soon as withdrawal of sedation begins, and in our experience, this situation is often undervalued in critically ill patients, generating a delay in nicotine prescription, and contributing to a difficult weaning, therefore extending ICU stay and increasing morbility.

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WEEKLY HIGH DOSE LIPOSOMAL AMPHOTERICIN B (L-AMB) IN SEPTIC SHOCK PATIENTS WITH MULTIPLE CANDIDA COLONIZATION: AMBIDEX STUDY

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INTRODUCTION. In patients with unresolved ICU-acquired sepsis, antifungal therapy has been proposed in case of high risk of candidemia or in presence of surrogate markers of infection such as multiple Candida colonization.

OBJECTIVES. To demonstrate feasibility and safety of weekly high dose (10/mg/kg) L-AMB for 2 weeks.

METHODS. Non immunocompromized patients, receiving mechanical ventilation were eligible if they presented ICU-acquired severe sepsis requiring newly administered antibacterial agents. Candida colonization in at least two sites was mandatory for inclusion. Proxies provided informed consent (NCT00697944). Exclusion criteria were need for antifungal therapy, candidemia and renal failure with creatinine >220 mmol/L. Patients were followed until hospital discharge with particular monitoring of renal function, kaliemia, organ dysfunction, candidemia and mortality.

RESULTS. 21 patients (11 men, 10 women, 5 surgical patients, 66 years old [57.5; 75.5], SOFA 7 (3–6), SAPS2 55 (39–68)). Reasons for ICU admission were sepsis (75%), acute respiratory failure (75%), shock (45%), coma (30%), and acute renal failure (30%). At inclusion, 8 patients had severe sepsis and 13 (65%) had septic shock. Candida colonization was retrieved in 3 sites (2–4). 85% of patients received a drug potentially leading renal toxicity. In one patient, LAMB was immediately discontinued because of respiratory distress and anaphylactic shock. Among the 20 remaining patients, 4 received one dose and 16 two doses of LAMB. Blood creatinine and urea remained stable throughout the study period. No patient required dialysis and no patients presented with severe hypokaliemia. One patient presented with candidemia that was actually present at inclusion. ICU and hospital lengths of stay were 13 (8–26) and 21 (10–27) days respectively. Hospital mortality was 23.8% (5 deaths).
L-AMB patients were compared to 69 control patients. Matching criteria were the centre, case-mix (medical/surgical), SAPS2 score ±5, presence of Candida colonization, absence of antifungal therapy, and length of ICU stay ≥ time to inclusion in the present study. Among our 5 outcome variables, control patients presented with the same proportion of potassium level <3 mmol/L, and had 6 (9%) ICU acquired candidemia. Renal function was better in LAMB patients compared to controls throughout the study period. Mortality was 29% in control patients and 23% in L-AMB patients. Adjusted survival (on SAPS2 and SOFA scores) was not different in L-AMB patients compared to controls (OR 0.43 (0.10–1.83), P = 0.250. There was a trend for increased candidemia-free survival (OR 0.42 (0.14–1.31), P = 0.13).

CONCLUSION. Weekly administration of high dose L-AMB is safe and feasible in patients with ICU acquired sepsis and multiple Candida colonization. Comparison of L-AMB with other antifungal agents used as pre-empitive antifungal therapy is warranted.

The study was Granted by GILEAD France.

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CANDIDA PERITONITIS: ANALYSIS OF 81 EPISODES

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OBJECTIVES. To describe the epidemiology and prognosis of Candida peritonitis in non-neutropenic critically ill adult patients with complicated abdominal surgery.

METHODS. In a prospective, observational and multicenter study, the following cohorts were included: 1,699 patients admitted to 73 ICUs in 1998/1999 (EPCAN database), 1,107 patients admitted to 36 ICUs in 2006/2007 (CAVA I project), and 254 ICU patients admitted in 2009/2010 (CAVA II project). Length of ICU stay for at least 7 days was an inclusion criterion. Patients with complicated abdominal surgery were selected for the present analysis. Candida peritonitis was defined as isolation of *Candida* spp. in a peritoneal sample obtained by laparotomy or percutaneous puncture in patients with associated clinical findings. Variables independently associated with Candida peritonitis were analyzed in a logistic regression model and the discriminating capacity of the predictive variable selected was assessed with the area under the ROC curve.

RESULTS. There were 81 episodes of Candida peritonitis among 1,120 patients undergoing abdominal surgery (incidence 72.32 episodes/1,000 patients). Risk factors for Candida peritonitis were multifocal colonization by *Candida* spp. (OR = 4.74, 95% CI 2.21–10.17), severe sepsis or septic shock (OR = 3.54, 95% CI 1.77–7.07), extrarenal depuration procedures (OR = 2.31, 95% CI 1.19–4.52), and days of ICU stay (OR = 1.03, 95% CI 1.01–1.04). Preemptive antifungal treatment was a protective factor (OR = 0.13, 95% CI 0.05–0.34) and showed a high discriminating capacity (AUC = 0.842, P < 0.001). Crude mortality in patients with and without Candida peritonitis was 39.5 and 25.4% (P = 0.006).

CONCLUSIONS. Multifocal colonization, degree of sepsis, extrarenal depuration procedures, and length of ICU stay allow identifying patients with complicated abdominal surgery at risk for Candida peritonitis. Candida peritonitis is associated with a high mortality. Preemptive fungal therapy prevents intraabdominal *Candida* spp. invasion during the postoperative period in ICU patients after complicated abdominal surgery.

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GRANT ACKNOWLEDGMENT. Suported by Astellas S.A., Spain.

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USEFULNESS OF THE 1,3-BETA-D-GLUCAN AND *CANDIDA ALBICANS* GERM TUBE-SECIFIC ANTIBODIES FOR EARLY DIAGNOSIS OF INVASIVE CANDIDIASIS IN NON-NEUTROPENIC CRITICALLY ILL ADULT PATIENTS

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INTRODUCTION. Candida colonization is a well known significant risk factor for invasive candidiasis.

OBJECTIVES. To assess the usefulness of serum levels of 1-3-beta-D-glucan and the *C. albicans* germ tube-specific antibodies (CAGTA) to diagnose invasive candidiasis and to discriminate between *Candida* species colonization and invasive candidiasis (IC).

METHODS. Non-neutropenic critically ill adult patients with complicated abdominal clinical conditions admitted to 20 Spanish ICUs were studied in a longitudinal, prospective, observational study. For all patients twice a week clinical status was registered and surveillance cultures for *Candida* species and serum samples were collected. Measurement of serum levels of 1-3-beta-D-glucan (Fungitell® assay) and CAGTA (Vircell® Kit) were performed. Patients were classified into three groups, neither colonized nor infected, *Candida* species colonization and IC. Biomarkers maximum values at or before the episode of IC or across all observations were used in the analysis. For the patients with fungal colonization, a model for the prediction of the IC was obtained using the procedure of the classification and regression trees (CART). The model includes biomarkers and the patient's clinical status. The discrimination power of the prediction rule was assessed by mean of the area under the ROC curve (AUC).

RESULTS. 176 patients were investigated. There were 31 (17.6%) patients with IC, 84 (47.7%) colonized, and 61 (34.6%) neither colonized/nor infected. 1-3-beta-D-glucan and CAGTA values were significantly higher in patients with IC compared to the other study groups (p = 0.003 and p < 0.001, respectively). According to CART; the probability of IC was 59.3% for the terminal node of 1-3-beta-D-glucan with levels >259 pg/mL and 30.8% when 1-3-beta-D-glucan is <259 pg/mL and CAGTA are positive. On the other hand, the probabilities of not having an IC were 93.7% when 1-3-beta-D-glucan levels were <259 pg/mL and CAGTA levels were negative. Using a cutoff of 30% for the probability of IC, the resulting prediction rule showed a 90.3% sensitivity, 54.2% specificity, 42.4% positive predictive value and 93.7% negative predictive value with an AUC of 0.78 (95% CI 0.7–0.8).

CONCLUSIONS. Serum levels of 1-3-beta-D-glucan >259 pg/mL when associated with positive CAGTA assay accurately discriminates Candida colonization from IC.

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GRANT ACKNOWLEDGMENT. Suported by Astellas S.A., Spain.

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INFECTIVE ENDOCARDITIS SURGERY: COMPARISON OF 5 SCORES

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INTRODUCTION. Decision making regarding surgical intervention in infective endocarditis (IE) is complex despite International guidelines and clinical judgment. Prediction models are useful in decision making and quality assurance. A new score (infective endocarditis score : IES) was elaborated by the STS (Society of Thoracic Surgeons) [1].

OBJECTIVES. The aim was to assess the performance of European System for Cardiac Operative Risk Evaluation (EuroSCORE), Logistic System 97 (LS97), Ontario Province Risk (OPR) and IES scores in IE.

METHODS. We conducted a retrospective study from 2000 to 2010. We included patients operated for IE The additive and logistic EuroSCORE, logistic System 97 [2], OPR [3] and IES were calculated. Primary outcome was in-hospital mortality. Comparisons between survivors and nonsurvivors were determined by Mann–Whitney test. The discriminating ability of the scores associated with mortality was tested with receiver operating characteristic (ROC) curves. Median (interquartile range) were used to describe the continuous variables.

RESULTS. We included 40 patients with 41 episodes of IE. Mortality rate was 19%. Logistic System 97 and IES in the survivors were significantly lower than in non-survivors, [6.2 (2.8–14) versus 27.8 (17.2–48.1), $p = 0.01$] and [25 (16–33) versus 35 (26–51), $p = 0.02$], respectively. Additive and logistic EuroSCORE and OPR were unable to predict mortality (p > 0.05). Data obtained from ROC curves are presented in Table 1.

TABLE 1 OPTIMAL CUT-OFF VALUES FOR LS97 AND IES

	AUC	Optimal cut-off	Sensitivity (%)	Specificity (%)	p
LS97	0.87	16	86	79	0.005
IES	0.76	24	100	48.5	0.022

CONCLUSIONS. Among the investigated scores, the logistic system 97 and IES yielded a predictive value in our patient population.

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0473

RISK FACTORS FOR INVASIVE CANDIDAL INFECTIONS IN PATIENTS WITH SEVERE ACUTE PANCREATITIS

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INTRODUCTION. Severe acute pancreatitis (SAP) is a risk factor for infection with *Candida spp* [1]. Critically ill patients who develop invasive candiasis (IC) have a high mortality. The benefit of prophylactic anti-fungal drugs for patients colonised with *Candida* who are at high risk for subsequent IC is unclear [2]. Risk factors for IC have been identified but their accuracy in patients with SAP has not been assessed [1, 3, 4]. We performed an observational study on patients admitted to the intensive care unit (ICU) with SAP to identify the proportion of patients who develop IC and to identify any defining characteristics of this patient group.
METHODS. We carried out a retrospective chart review of all patients admitted to the ICU of a tertiary pancreatitis referral centre with a diagnosis of SAP between July 2003 and April 2010. Patients were considered to have IC if they had a positive blood or abdominal tissue culture for *Candida spp*. We considered patients with a positive abdominal fluid culture to be infected only if they received antifungal drugs after positive culture. Patients with positive respiratory secretions, urine or line tip culture or wound swab culture alone were considered to be colonised. Univariate analysis was used to assess differences in characteristics of patients with and without IC.
RESULTS. SAP was diagnosed in 163 patients (64% male), The commonest aetiologies were gallstones (44%) and alcohol (30%). Overall hospital mortality was 35%. 31 patients (19%) developed IC and hospital mortality was significantly higher in these patients (68 vs. 27.3%, $p < 0.0001$). Factors significantly associated with the development of IC on univariate analysis were severe sepsis on admission to ICU and the use of antibiotics on days 1–3 of ICU admission ($p < 0.05$). Using a modified clinical prediction tool in this cohort of patients [1], we found that this tool had a sensitivity of 49% and specificity of 69% in correctly identifying those patients who had an IC. Positive and negative predictive value was 27 and 75% respectively.
DISCUSSION. The incidence of IC in patients with SAP is 19% and their hospital mortality is significantly higher those without IC. Previous studies identified previous antibiotic use, central venous catheter, total parenteral nutrition, renal replacement therapy, surgery, steroids and immunosuppression as risk factors [1, 3, 4]. In our cohort of patients with SAP, IC was associated only with the prior use of antibiotics. Further studies stratifying the risk of IC in patients with SAP are needed.
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0474

ANALYSIS OF MICROBIOLOGICAL ISOLATES IN UCI SETTINGS

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INTRODUCTION. ICU patients are especially susceptible to infection due to immunologic depression from severe disease and, need for invasive devices for monitorization and support among other [1]. The prognosis worsens when multidrug resistant organisms are cause of infection.
OBJECTIVES. To describe epidemiologic settings related to infection in a general ICU.
METHODS. Retrospective analysis of all the patients admitted in ICU with microbiological isolates, from January 2008 through December 2010. The database records from the Microbiology Service of our hospital were used. We analyzed: the frequency of isolates and biologic products; demographic data of the patients included (age, sex); comorbidities; total SOFA score at admission; ventilation days; length of stay (LOS); mortality. We also analyzed antibiotic resistance of the ESKAPE bacteria.
RESULTS. We obtained 483 isolations from 218 patients. The most isolated organisms were *C. albicans* 71(14.7%), *Staph. aureus* 62 (12.8%), *E. Coli* 49 (10%), *P. aeruginosa* 35 (7.2%), *Staph. Coagulase* negative 31 (6.4%), *H. influenza* 25 (5.1%), *Strep. pneumoniae* 24 (4.9%), *Stenotrophomonas maltophilia* 22 (4.5%), *Kleb. pneumoniae* 16 (3.3%), *Staph. epidermidis* 13 (2.6%), *E. faecalis* 11 (2.2%), *E. Cloacae* 10 (2%), *Proteus mirabilis* 8 (1.6%), other (<1%). Isolates were mostly obtained from tracheobronchial aspirates 231 (47.8%), Blood 86 (17.8%), Urine 84 (17.3%), Central Venous Catheter tip 23 (4.7%), Peritoneal fluid 20 (4%), Pus 19 (3.9%).

TABLE 1 PATIENT RELATED DATA

Age (X ± SD)	60.7 ± 15.5
Sex M (%)	67.4
SOFA admission (X ± SD)	6.8 ± 4.2
Comorbidities (X ± SD)	2.7 ± 1.6
Ventilation days (X ± SD)	7.6 ± 8.4
LOS (X ± SD)	9.46 ± 9.43
Mortality (%)	18.8

TABLE 2 ANTIBIOTIC RESISTANCE 2008–2010

		2008 (n) R %	2009 (n) R %	2010 (n) R %
E. cloacae	3rd G. Ceph.	(1) 0	(3) 50	(6) 34.7
	Levofloxacin*	–	(3) 100	(6) 100
Staph.aureus	Oxacilin	(19) 18.8	(10) 66.7	(33) 83.4
K. pneumoniae	ESBL	(4) 0	(8) 36.3	(4) 33.3
A. baumannii	Carbapenem	(1) 100	(1) 100	(1) 100
P. aeruginosa	Levofloxacin*	–	(7) 74.6	(9) 55.6
	Imipenem	(19) 26.7	(7) 37.5	(9) 28
E. Coli	ESBL	(13) 8.3	(18) 100	(18) 100

CONCLUSIONS. Infection among ICU patients remains a major issue. Knowing the local microbiological flora, and its susceptibility pattern, is crucial for implementing an adequate antibiotic policy, aiming to stop the emergence of multidrug resistant microorganisms.
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0475

CORRELATION OF LIPID LEVELS IN CRITICALLY ILL PATIENTS WITH PARAMETERS OF DISEASE SEVERITY, LABORATORY PARAMETERS AND PRELIMINARY TAKING CERTAIN DRUGS

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INTRODUCTION. Hypocholesterolemia occurs in critically ill, often in patients with sepsis. Some medications may affect the level of lipids in the critically ill.
OBJECTIVES. To see how the values of blood lipids—total cholesterol (TC), LDL, HDL, and triglycerides (TG) in critically ill patients correlate with disease severity measured by APACHE II score, GCS, survival and what is the relation with certain laboratory parameters (CRP, hemoglobin, platelets, prothrombin time (PT), glucose, total proteins (TP), albumins). The purpose was also to determine whether prior taking drugs (statins, ACE inhibitors (ACEI), AT II receptor blockers (ARB), beta blockers (BB), calcium antagonists (CB), insulin and oral hypoglycaemic agents (POHG) effect on lipid levels and has the impact of the APACHE II score, GCS and survival.
METHODS. A retrospective analysis of 159 patients who were hospitalized in the medical intensive care unit.
RESULTS. The study included 96 male and 63 female subjects. Respondents were average 66.3 years (66.3 ± 15.0), age range 22–88 years. The average level of TG was significantly higher in APACHE II ≥25, and the levels of total cholesterol (TC), LDL, HDL levels were significantly higher in patients with GCS >7, as well as in a group of survivors. Higher values of hemoglobin, PT, TP, albumin and glucose were found in patients with higher HDL, LDL and TC values. It was found that the level of CRP has a negative correlation with the levels of HDL.*T* tests show that the differences are statistically significant for the TC, LDL and HDL—in those with sepsis levels were below average compared to those that are sepsis free. There was no difference in lipid levels in those who have only infection without sepsis.sepsis and wectio not infection. There was no significant difference in APACHE II score, GCS and survival—between those with and without statin therapy, nor in taking the ACEI/ARB, BB, CB, insulin and POHG (53.8% patients were taking one or more these drugs, others were without).
If we are comparing preliminary drug taking (statins, ACEI/ARB, BB, CB, insulin and POHG) with the lipid level—significantly higher levels of total cholesterol and LDL were found in patients who were previously treated with CB, while in the other groups it was not statistically significant. In patients with sepsis (41 patient)—women had significantly better survival (63.2%) than men (40%). In critically ill patients without sepsis survival rate within men and women was similar.
CONCLUSIONS. TC, HDL, LDL were significantly higher in the group of survivors. The average level of TG was significantly higher in APACHE II ≥25, and the levels of TC, LDL, HDL levels were significantly higher in patients with GCS >7. Significantly higher levels of TC and LDL were found in patients who were previously treated with CB, while in the other groups it was not statistically significant.

0476

INFECTIONS IN PATIENTS WITH TRAUMATIC BRAIN AND SPINAL CORD INJURY: INCIDENCE, RISK FACTORS AND OUTCOME

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INTRODUCTION. Infections occur frequently in traumatized patients and are associated with an increased morbidity and mortality, hospital length of stay, and costs. This group of patients is more prone to infections due to disruption of the host's tissue integrity and loss of many immune effectors mechanisms.
OBJECTIVES. The aim of this study was to determine the incidence of infections, as well as determining associated risk factors and ICU-mortality among patients with traumatic brain and spinal cord injuries admitted to an intensive care unit.
METHODS. Retrospective study of all consecutive critically ill patients with traumatic brain and spinal cord injury admitted to a tertiary polyvalent 12-bed ICU between January 2007 and December 2009 were included. Infections were diagnosed according to CDC criteria. Demographic data, comorbidities, severity scores, Glasgow coma score, length of stay, concomitant injury, invasive procedures, number of days of mechanical ventilation, microbiologic data (pathogens, antibiotic regime and resistance profiles) were recorded. Logistic regression analysis was performed to determine the risk factors for infection and for ICU mortality.
RESULTS. A total of 42 patients were included. Blunt thoracic trauma (67%) was the most commonly associated injury, followed by blunt abdominal trauma (33%). The mean age was 44 ± 20 years old. The mean APACHE II score was 19.1 ± 7.8. 60% of the patients developed an infection. Infection was associated with prolonged ICU length of stay (21 vs. 5 days, $p < 0.01$), prolonged length of hospital stay (66 vs. 29 days, $p < 0.01$) and with increased duration of mechanical ventilation (11 vs. 3 days, $p < 0.01$). The infection group had a lower mortality rate (12 vs. 36%, $p < 0.001$). A total of 56 infections were diagnosed. 44% of the patients had 1 infection during their ICU stay, 20% had 2 infections and 40% had 3 or more. The majority of these infections (67%) occurred during the first 4 days of ICU admission. The main source of infection was pulmonary (86%). The most common pathogens found were methicillin sensitive *Staphylococcus aureus* (50%), *Haemophilus Influenzae* (42%), *Klebsiella pneumonia* (8%). The main risk factors for pneumonia were endotracheal intubation ($p < 0.01$) and surgery ($p < 0.01$) before admission to the ICU and blunt thoracic trauma (0.001). The most common infection sites 5 days after admission were respiratory (45%), catheter-related infections (20%) and wound infections (16%). The most prevalent microorganisms were methicillin-resistant *Staphylococcus aureus* (20%), coagulase-negative *Staphylococci* (18%), *Pseudomonas aeruginosa* (18%) and *Acinetobacter baumanni* (16%).
CONCLUSIONS. The rate of infections in patients with traumatic brain and spinal cord injury is high especially when associated with concomitant blunt thoracic trauma. Pneumonia was the predominant infection. In our study infections in traumatized patients were not associated with a higher mortality.

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PROFILE OF CANDIDEMIAS IN THE INTENSIVE CARE UNIT OF A UNIVERSITY HOSPITAL

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INTRODUCTION. Invasive candidiasis and candidemia are often encountered in the nosocomial setting, particularly in the Intensive Care Unit (ICU) causing considerable morbidity and mortality. Candidemia is ranked fourth as the cause of bloodstream infection in USA and seventh in Europe and it occurs more frequently in the ICU than in hospital wards. The increasing incidence of non-albicans *Candida* species is also important.

OBJECTIVES. The aim of the present study was to record the epidemiology, risk factors, mortality, kind of candida isolated, and strains susceptibility to antifungal drugs.

METHODS. This is a clinical and microbiological retrospective study of all fungemia episodes which were registered in one medical—surgical ICUs in a 7 year period (1/1/2004 and 31/12/2010). The records of the research laboratories of the 4th department of Internal Medicine and of the microbiology department of Attikon university hospital were used in order to identify patients. Medical records were then retrieved. Only the first fungemia episode was evaluated. Special forms were completed for each patient including demographic information, concomitant conditions. Apache II and Sofa severity scores the day of ICU admission, the risk factors within the preceding 10 days, data of colonization and candidemia related information.

RESULTS. Attikon hospital is a 640-bed teaching tertiary care hospital with a 25-bed polyvalent ICU. During the study period a total of 1,615 pts were hospitalized. Total number of patients with fungemia was 68 (78 fungemia episodes). Mean patients' age was 62.4 years (range 18–89). Median ICU length of stay was 40 days (range 1–240). Medical cause of admission was present in 28 cases. Identification in 65 species revealed : *C. albicans* (24), *C.parapsilosis* (22), C. T*ropicalis* (3), C.spp(3), *C.glabrata* (6), and *Non - albicans* (5), C.*kruzei* (2). Sensitivity tests were performed for 38 isolates. Twenty eight isolates were sensitive to fluconazole. Six fungemias were "imported" (patients were hospitalized for less than <72 h). Median time elapsed between ICU admission and candidemia was 19 days (3–85). Mean Apache II score was 19 (range 12–37) on the day of admission and overall mortality was 60%. Caspofungin was the most commonly introduced treatment.

CONCLUSIONS. Compared to other blood infections fungemias are not common among our patients but they are often lethal. A high Apache II score at admission, multiple site colonization in combination with abdominal surgery should raise a high suspicion index and a prophylactic therapy should start. Non *Albicans* species are on the rise. Fluconazole sensitivity is not negligible and could be used as empiric or prophylactic treatment.

0478

DESCENDING NECROTIZING MEDIASTINITIS: AN AGGRESSIVE APPROACH SUCCESSFUL IN FOURTEEN CASES

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INTRODUCTION. Descending necrotizing mediastinitis (DNM) is a particularly virulent form of mediastinal infection and a rare but potentially life-threatening complication of deep neck necrotizing fasciitis (NF), caused by the rapid downward spread of an oropharyngeal or cervical infection along the fascial planes into the mediastinum facilitated by gravity, breathing and negative intrathoracic pressure [1]. Due to the high mortality rate, a rapid diagnosis and adequate management are very important [2].

OBJECTIVES. The aim of this study was to evaluate the results of our fast and aggressive treatment strategy for DNM, consisting of immediate surgical intervention combined with wide spectrum antibiotic therapy.

METHODS. We conducted a retrospective review of the medical records of fourteen patients with DNM treated at our institution during the period between January 2006 and September 2010. Data on patient demographics and comorbidities were collected, as well as information on clinical presentation, treatment, bacteriological studies, complications and duration of hospital stay. CT scans and surgical reports were analysed for each patient and the mortality rate determined.

RESULTS. Patient (10 male, 4 female) mean age was 45 years. Sources of infection were dental abscess (n = 8), peritonsillar abscess (n = 4) and sinusitis (n = 2). Diagnoses were confirmed by computed tomography and all patients underwent immediate emergency surgical treatment including cervical drainage, thoracotomy (via a cervical approach) with radical debridment of the mediastinum, excision of necrotic tissue and decortication. Thoracotomy was associated with the cervical approach in all cases. Ten patients underwent tracheotomy. Broad-spectrum antibiotics consisting of piperacillin-tazobactam plus daptomycin were administered empirically. The mean intensive care unit stay was 19.6 days and the mortality rate was 0%.

CONCLUSIONS. DNM are severe infections because of their unlimited extensive character, affecting several anatomic zones without respect for anatomical barriers, provoking necrosis of muscles and fascias and inducing systemic toxicity [1, 3]. We think our treatment strategy for severe DNM was efficacious because it was "fast and hard": early detection, immediate resuscitation, aggressive surgical treatment and wide spectrum empiric antimicrobial therapy defined according to local epidemiology.

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GRANT ACKNOWLEDGMENT. The Authors declare that they have no competing interests.

Sepsis, inflammation & infection: 0479–0491

0479

SEPSIS: WHERE IS THE DELAY? A MULTI-CENTRE OBSERVATIONAL STUDY

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INTRODUCTION. Recent evidence suggests that when sepsis develops, the longer the delay in antibiotic administration, the higher the mortality. The *Surviving Sepsis Campaign* stipulates that antibiotics should be administered within 1 h of onset of severe sepsis and septic shock. Healthcare providers often struggle to achieve this goal. Yet it remains unclear in which clinical area the delays in therapy are most marked. A greater understanding of the location and components of the delay in recognition and treatment of sepsis may guide service development and improve clinical outcome.

OBJECTIVES. • To determine the time to recognition and treatment of sepsis across various clinical locations.
• If delay was present, to determine at which stage of the clinical process it was most severe.
• To determine if there was commonality in delay between the two institutions.

METHODS. A retrospective analysis of patients presenting with sepsis to critical care services in two busy UK teaching hospitals between May 2010 and March 2011. Initial patient deterioration was defined as an Early Warning Score (EWS) >3. The time from this deterioration to the medical team's recognition of sepsis was recorded. The time from this recognition until prescription and administration of antibiotics was also noted.

RESULTS. 132 of patients were included in the study. Overall mortality was 11%. Only 14% of patients received antibiotics within 1 h of clinical deterioration. Administration was most rapid in emergency departments and the longest delay in therapy was on surgical wards. The greatest delay was in the recognition of sepsis. There was strong commonality between the two institutions.

Results

	All clinical areas	Emergency Department	Medical wards	Surgical wards	High dependency Area	Other wards
Number of patients	132	37	28	40	7	20
Mortality	14 (11%)	4 (11%)	5 (18%)	1 (3%)	1 (14%)	3 (15%)
Median time from EWS>3 to abx therapy	3 h 15 mins	2 h 15 mins	3 h 15 mins	5 h 45 mins	2 h 30 mins	2 h 30 mins
Median time from EWS >3 to recognition	1 h 30 mins	0 h 30 mins	1 h 38 mins	3 h 00 mins	1 h 00 mins	1 h 15 mins
Median time from recognition to prescription of abx	0 h 30 mins	0 h 15 mins	1 h 00 mins	1 h 00 mins	0 h 45 mins	0 h 38 mins
Median time from prescription of abx to administration	0 h 15 mins	0 h 15 mins	0 h 30 mins	0 h 15 mins	0 h 30 mins	0 h 23 mins

CONCLUSIONS. Recognition and treatment of sepsis is frequently delayed. Further targeting of illness recognition with education, electronic early warning systems and 24 h critical care outreach involvement may reduce time to antibiotic administration. In both the study centres, the delay was longest on surgical wards. Further study is required to understand why the delay is most marked in this clinical area.

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0480

ACUTE CARDIOPULMONARY, MICROCIRCULATORY AND INFLAMMATORY EFFECTS OF STORED HOMOLOGOUS RED BLOOD CELLS TRANSFUSION DURING EXPERIMENTAL HYPOVOLEMIA

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INTRODUCTION. Red blood cell (RBC) transfusion has been associated to deleterious inflammatory and respiratory effects in clinical trials. However, the mechanisms related to immunomodulation and respiratory dysfunction after transfusion are not completely understood, possibly due to methodological biases in the clinical studies and presence of comorbidities such as sepsis or trauma. Thus, a controlled animal model of RBC transfusion could be a more appropriate approach to minimize these issues.

OBJECTIVE. To evaluate the effect of homologous stored RBC infusion on hemodynamics, microcirculation, respiratory function and pulmonary and systemic inflammation on hypovolemic swine.

METHODS. Sixteen anesthetized and instrumented male swine (60–70 kg) were submitted to controlled hemorrhage (25% of volemia). Two units of non-filtered RBC from each animal were collected, processed and stored for 14 days. After hypovolemia, eight animals received Lactated Ringer's solution (three times the removed blood volume) and other eight animals received the 2 units of stored homologous RBC and Lactated Ringer's solution (to complete blood volume removed); Hemodynamic and respiratory parameters were monitored immediately before, immediately after fluid resuscitation and every 60 min up to 6 h after transfusion. Microcirculation was assessed with a laserdoppler flowmetry probe at terminal ileum. Evaluation of the inflammatory response was performed with measurement of plasmatic and pulmonary cytokines' concentrations by ELISA (IL-6, IL-1, IL-10, TNF-alpha), nitrate concentrations (NO analyzer) and real-time PCR for cytokines (IL-10, TNF-alpha, IL-21, IL-1) and NOS_2 in the lungs.

RESULTS. RBC transfusion was associated with a significant increase in mixed oxygen venous saturation and oxygen delivery as compared to control group. No other significant hemodynamic effects were observed. Microcirculatory evaluation did not differ significantly between the groups, as well as the evaluation of pulmonary mechanics and gas exchange. In addition, nitrate and cytokines concentration in the plasma and lungs were not significantly different between groups. However, RT-PCR for inflammatory cytokines demonstrated a non-significant increase in mRNA for TNF-alpha and a twofold increase in mRNA for NOS_2 in the lungs of transfused animals ($p < 0.05$). In addition, a 0.5-fold decrease in mRNA for IL-21 in the transfused pigs was also obtained ($p < 0.05$).

CONCLUSION. Stored homologous RBC transfusion during hypovolemia does not induce respiratory dysfunction up to 6 h after transfusion. However, RBC transfusion is associated with a significant increase in mRNA for NOS2 and a reduction in mRNA for IL-21, suggesting that stored RBC transfusion may be associated with pulmonary inflammatory response.

GRANT ACKNOWLEDGMENT. Research and Education Institute, Hospital Sirio-Libanes.

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THE EFFECT OF AN EDUCATIONAL CAMPAIGN ON TIME TAKEN TO ADMINISTRATION OF ANTIBIOTICS IN SEPSIS

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INTRODUCTION. The surviving sepsis campaign advocates administration of broad spectrum antibiotics within 1 h of presentation of severe sepsis [1]. Kumar et al. [2] demonstrated the effects of delayed antibiotic initiation following persistent hypotension in septic shock, namely an increase of 7.6% mortality per hour delay in starting therapy. An audit was undertaken at Royal Surrey County Hospital over a three-month period in 2009 to assess time taken to administer antibiotics in patients with sepsis. This was re-audited November 2010–February 2011 following an educational campaign highlighting increased mortality when antibiotic administration is delayed. The original audit in 2009 set a standard of initiating new antibiotics within 6 h of onset of sepsis; this was achieved in 76.7% of cases.

OBJECTIVE. To further reduce delay in initiating antibiotics.

METHODS. The initial audit studied 50 patients with sepsis referred to the Critical Care Outreach Team. Information was gained from medical records to establish time of onset of sepsis and time taken to either initiate antibiotic therapy or give the first dose of an alternative antibiotic if the existing regimen was considered ineffective.The definition of sepsis used for inclusion required two or more criteria of the systemic inflammatory response syndrome (HR $>$ 90, RR $>$ 20, WCC $<$ 4 or $>12 \times 10^9$/L, temperature $<$36 or $>$38°C). The re-audit used the same criteria with 80 patients. The educational campaign consisted of a presentation to doctors and a poster displayed on each ward highlighting the importance of early antibiotic administration. Data were analysed using chi-squared analysis with Yates' correction.

RESULTS. In 2009, 76.7% of patients received antibiotics within 6 h. Following the campaign in 2010 this increased to 82.9% ($p = 0.58$). Two hours post-onset of sepsis, 41.9% of the 2009 group received antibiotics. In 2010/11 54.5% of patients received antibiotics within that time frame ($p = 0.43$). The reason for delay in antibiotic administration was recorded; the most common cause was nursing delay (29.6%).

DISCUSSION. Re-audit showed an improvement of 12.6% in giving antibiotics within 2 h of presentation with sepsis. However, this is not statistically significant. This may show an educational campaign consisting of a presentation to doctors and poster display is insufficient to change practice. In particular, nurses were not specifically targeted during the period of education; this may reflect why nursing delay was the main identifiable cause of delay in antibiotic administration. This is an area to focus future work.

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0482

NEUTROPHIL CD64 IS USEFUL IN THE DIAGNOSIS OF SEPSIS IN CRITICALLY ILL ADULT PATIENTS

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INTRODUCTION. Sepsis is the leading cause of death in ICU patients. Its early identification is essential to deliver rapid appropriate treatment. Expression of CD64, the high affinity immunoglobulin Fc g receptor I, on neutrophils has been proposed as a possible biomarker of systemic infection and sepsis.

OBJECTIVES. To evaluate the accuracy of neutrophil CD64 to diagnose sepsis in adult critically ill patients.

METHODS. Prospective observational study of all consecutive adult patients admitted to a 31-bed medico-surgical department of intensive care for more than 4 h over a 3.5 month period. Diagnosis of sepsis was based on the 2001 sepsis definitions [1]. Along with neutrophil CD64, neutrophil CD16 and monocyte HLA-DR expression were also measured by flow cytometry (Beckman Coulter FC500). Attending physicians were not aware of these data.

RESULTS. Of a total of 722 patients admitted during the observation period, 454 patients had flow cytometry measurements within 24 h after admission, of whom 98 had sepsis. Septic and non-septic patients had a median age (IQR) of 59.5 (52–72) and 57.5 (43.5–70.5) years, APACHE II scores of 18 (13–25) and 10 (7–15) and median SOFA scores of 7 (4–10)and 3 (1–5), respectively.

The units of antigen expression are Mean Fluorescence Intensity (MFI) and results (median and interquartile range) are presented in Table 1.

TABLE 1

Biomarker	Sepsis N = 98	No sepsis N = 356	p value	AUC	95%CI of AUC
Neutrophil CD64	356 (284–433)	131 (0–184)	<0.001	0.94	0.92–0.97
Neutrophil CD16	662 (594–720)	726 (697–749)	<0.001	0.74	0.68–0.80
Monocyte HLA-DR	351 (270–433)	438 (374–492)	<0.001	0.69	0.62–0.76
CRP, mg/dl	17.0 (5.6–26.0)	0.4 (0.1–1.6)	<0.001	0.92	0.89–0.95
WBC, 10^3/ml	10.6 (6.3–17.1)	10.5 (7.7–14.4)	NS	0.49	0.42–0.57

At a cutoff of 230 MFI, neutrophil CD64 had sensitivity of 90% (95% CI: 82–95), specificity 87% (83–90), positive predictive value 66% (57–73), negative predictive value 97% (94–98), likelihood ratio for positive test 6.95, likelihood ratio for negative test 0.12 and odds ratio 59 for diagnosis of sepsis.

CONCLUSIONS. Septic patients at ICU admission have significantly increased expression of neutrophil CD64 and decreased expression of neutrophil CD16 and monocyte HLA-DR compared to patients without sepsis. Neutrophil CD64 differentiates septic from non-septic critically ill patients with high levels of diagnostic accuracy.

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0483

CHANGES OF MONOCYTE HUMAN LEUKOCYTE ANTIGEN-DR EXPRESSION AS A RELIABLE PREDICTOR OF MORTALITY IN SEVERE SEPSIS

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INTRODUCTION. Many studies have shown that the monocyte human leukocyte antigen-DR (mHLA-DR) expression might be a good predictor for mortality in severe septic patients. However, other studies contrarily found mHLA-DR was not a useful prognostic marker in severe sepsis.

OBJECTIVES. The objective of this study was to estimate the prognostic value of the changes of mHLA-DR to predict mortality of severe sepsis.

METHODS. In this prospective observational study, mHLA-DR was measured by flow cytometry in peripheral blood from 79 adult patients with severe sepsis. mHLA-DR levels were determined on day 0, 3, 7. after admission to the SICU with a diagnosis of severe sepsis.$\triangle$mHLA-DR_3 and $\triangle$mHLA-DR_7 were defined as the changes in mHLA-DR value on day 3 and day 7 compared to that on day 0. Data were compared for 28 day survivors and non-survivors. Receiver operating characteristic (ROC) curves were plotted to measure the performance and discriminating threshold of $\triangle$mHLA-DR_3, $\triangle$mHLA-DR_7, HLA-DR_0, HLA-DR_3 and, HLA-DR_7 in predicting mortality of severe sepsis.

RESULTS. ROC curve analysis showed that $\triangle$mHLA-DR_3 and $\triangle$mHLA-DR_7 were reliable indicators of mortality in severe sepsis. A $\triangle$mHLA-DR_3 value of 4.8% allowed discrimination between survivors and non-survivors with a sensitivity of 89.0% and a specificity of 93.7%, similarly, $\triangle$mHLA-DR_7 value of 9% allowed discrimination between survivors and non-survivors with a sensitivity of 85.7% and a specificity of 90.0%. Patients with $\triangle$mHLA-DR_3 $\leq$4.8% had higher mortality than those with $\triangle$mHLA-DR_3 $>$4.8% (71.4 vs. 2.0%); Patients with $\triangle$mHLA-DR_7 $\leq$9% had higher mortality than those with $\triangle$mHLA-DR_7 $>$9% (52.9 vs. 2.0%).The mHLA-DR was significantly lower among non-survivors than that among survivors on day 3 and day 7 (p value were 0.016, $<$0.001, respectively). There was an increasing trend of mHLA-DR in the survivor group ($p < 0.001$), which was not found in non-survivor group ($F = 0.026$, $p = 0.975$).

CONCLUSIONS. The changes of mHLA-DR over time may be a reliable predictor for mortality of patients with severe sepsis.

0484

NEUTROPHIL CD64 EXPRESSION: RELEVANCE IN CRITICALLY ILL PATIENTS WITH SUSPECTED BACTERIAL INFECTION

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INTRODUCTION. Early diagnosis and antibiotic treatment improve the prognosis of severe bacterial infection. Quantifiable CD64 expression on the surface of neutrophils (PN) has recently been proposed as an early marker of bacterial infection.

OBJECTIVES. The goal of this study was to determine whether the CD64 index allows differentiation of bacterial sepsis from other inflammatory states in a critical care setting.

METHODS. We undertook a monocentric observational study between September 2009 and March 2010. All patients admitted to medical intensive care unit (ICU) with a clinical suspicion of infection and at least two criteria for systemic inflammatory response syndrome (SIRS) were eligible for inclusion. Upon admission, hematological exams were conducted by flow cytometry, allowing quantification of CD64 expression (Leuco64^{TM} kit, Trillium diagnostics LLC, USA). Patients were classified as having SIRS, sepsis, severe sepsis, or septic shock/severe sepsis. ROC curve analysis was performed to evaluate the utility of the CD64 index in the diagnosis of bacterial infection. Patients with undocumented infections were excluded.

RESULTS. Our study included 293 patients with a SAPS II score of 45 (31–59). Bacterial infection was found in 148 patients (59 sepsis, 34 severe sepsis, and 55 septic shock), and SIRS or non-bacterial infection was documented in 145 patients (127 SIRS, 8 sepsis, 6 severe sepsis, and 4 septic shock). A CD64 index greater than 2.2 predicted bacterial infection with a sensitivity and specificity of 63% (55–71%) and 89% (83–94%), respectively. The area under the ROC curve was 0.8 (0.75–0.84). Positive and negative likelihood ratios were 5.7 (5.0–6.5) and 0.4 (0.3–0.7), respectively.

CONCLUSIONS. The CD64 index is specific for bacterial infection among ICU patients. Due to its weak sensitivity, the CD64 index may not be practically recommended, but it may be useful in combination with a more sensitive biological marker.

0485

COMPUTED TOMOGRAPHY CHARACTERISTICS FOR SEVERE ACUTE CALCULOUS CHOLANGITIS IN ICU PATIENTS: COMPARISON OF SEPTIC AND NON-SEPTIC PATIENT GROUPS

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INTRODUCTION. Acute calculous cholangitis (ACC) has a variety of clinical conditions ranging from local biliary infection to septic shock. Computed tomography (CT) scan is a common modality for the prompt diagnosis and treatment of ACC in intensive care unit (ICU). However, CT imaging characteristics of severe ACC are not familiar to physicians, and the disease severity is commonly decided by laboratory tests.

OBJECTIVES. We undertook this study to evaluate CT findings strongly relate to severe ACC by comparing septic and non-septic patients.

METHODS. Between January 2008 and December 2010, patients admitted ICU and finally diagnosed as ACC were included. Exclusion criteria were having any obstructive biliary tumors and other origin of fever. Patients were divided into two groups: a sepsis group and a non-sepsis group. The two groups were compared in order to investigate different CT findings including common bile duct (CBD) diameter, existence of CBD stone, size and number of CBD stone, intrahepatic duct (IHD) dilatation and pancreatic duct dilatation. We also examined previous history of biliary disease, signs and symptoms between each group. A p value <0.05 was considered to be statistically significant.

RESULTS. A total of 288 cases of acute cholangitis were reviewed during this period and 172 cases were identified as ACC. The number of septic and non-septic patients group was 79 and 93, respectively. In the septic patients group, 51% of the patients were male ($n = 40$); mean age was 68.70 ± 11.99 year (non-septic group was 64.78 ± 16.56); 31% of the patients have a previous history of biliary disease (non-septic group was 27%). Of the CT findings, the presence of intrahepatic duct dilatation ($p = 0.047$), pancreatic duct dilatation ($p = 0.025$) were more frequently found in the septic patient group with ACC. Septic patients showed fever ($p = 0.010$) and chill ($p = 0.049$).

CONCLUSIONS. Septic patient group with ACC patients have more clinically important findings on CT, such as the presence of intrahepatic duct dilatation and pancreatic duct dilatation. These results are consistent with data, suggesting that high intrabiliary pressure may related with the occurrence of biliary sepsis. Physicians may use these findings for managing ICU patients with ACC.

0486

COMPARISON BETWEEN MEDICAL AND SURGICAL PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

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OBJECTIVE. To analyse and compare the main characteristics of patients (pts) with severe sepsis (SS) and septic shock (SO) betwen surgical (SU) and medical (ME) pts included in our computerized protocol for the management of multidisciplinary sepsis. (CPMIS).

METHODS. In 2006, we began a CPMIS for patients with SS and SO that included all areas of our Hospital. In 2007 we developed a rapid intervention team and in 2008 we created the Multidisciplinary Sepsis Unit (MSU). In this study we include the first 1,500 pts between Jan 2006 until April 2009. Data are expressed as n (%) if they are categorical, and as average (DE) or median (intercuartilic range) if they are quantitative ones depending on wether they meet normality criteria or not. Statistical Tests used are Chi Square and Mann–Whitney.

RESULTS. We included 525 (35%) SU pts and 975 (65%) ME. There were no differences among sex, age and co-morbidities, except for solid cancer that was significantly higher in SU group (19.2 vs. 39.8%, 0.03). No differences were found between the criteria of SIRS and type of organic dysfunction, except for respiratory failure, that was more frequent in the ME group (<0.01) and for renal failure that was more frequent in SU (0.04). There were no differences in the CPR, procalcitonine or lactate mean measures, APACHE II or SOFA at the time of inclusion between these groups. Both groups initiated antibiotics in 3 h (86 and 87%, p: 0.1). The was no difference on ICU length of stay (ME 8.3 ($\pm$4.5); SU 11.5 ($\pm$5.1) p 0.75) or crude mortality (ME 243 (25.3%); SU 149 (28.5%) p 0.32) between both groups. Main differences between the two groups are described in Table I

Main differences between medical and surgical pts

Variable	MED (975 pts)	SU (525 pts)	p
SO	370 (38%)	284 (54%)	<0.01
Community acquired sepsis	710 (73%)	294 (56%)	0.001
Nosocomial sepsis	166 (16%)	184 (34%)	0.03
Polimicrobial aetiology	172 (17.7%)	233 (44.4%)	0.001
Inadequate antibiotic therapy (IAT)	87 (8.9%)	87(16.7%)	0.007
De-escalate	270 (27.7%)	86 (16.5%)	0.04
Mechanical ventilation	365 (37.5%)	288 (55%)	<0.01
Continuous Haemofiltration	76 (7.8%)	75 (14.3%)	0.02
Hospital LOS (days)	14,3 ($\pm$5.6)	21.8($\pm$8.8)	0.001

In multivariate analysis, neither ME nor SU pts had a higher crude mortality rate (OR 0.678, CI 95% 0.54–2.45; OR 0.86, 0.66–1.99, respectively), but SU pts had higher hospital LOS (OR 3.21; 2.10–10.89).

CONCLUSIONS. Although SU pts required more support therapies, higher rate of SO, IAT and hospital LOS, this does not translate into higher crude mortality.

0487

PROGNOSTIC FACTORS IN SEPTIC SHOCK: ROLE OF MODERATE TO SEVERE MYOCADIAL DYSFUNCTION

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INTRODUCCION. Early myocardial dysfunction in septic shock patients is well documented.

OBJECTIVE. To determine the role of myocardial dysfunction in patients with septic shock.

METHODS. Retrospective study conducted in an intensive care unit during the period 2001–2009, of patients with septic shock. Cardiac dysfunction was studied during the first 48 h of admission by echocardiography. The ejection fraction less than 40% identified a moderate to severe cardiac dysfunction. All patients had positive blood cultures.

RESULTS. We included 37 patients. The mean age was 54 years, 62% were men. The value of APACHE II was 24. All patients required norepinephrine at doses higher than 0.5 μg/kg/min. Gram negative organisms were isolated from blood of 70% of patients. Twenty-four percent of patients had moderate-severe cardiac dysfunction. The mortality of patients with cardiac dysfunction was 55%, while that of patients without cardiac dysfunction was 42%. In the statistical analysis, age of patients with cardiac dysfunction was significantly lower ($p < 0.05$) compared without cardiac dysfunction (43 vs. 57 years old).

CONCLUSIONS. Moderate or severe left heart dysfunction that occurs early in some patients with septic shock is not a prognostic factor in these patients and is more common in younger patients.

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0488

C-REACTIVE PROTEIN IN CRITICALLY ILL CANCER PATIENTS WITH SEPSIS: INFLUENCE OF NEUTROPENIA

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INTRODUCTION. Several biomarkers have been studied in febrile neutropenia with conflicting results. Besides there is a controversy concerning the effect of immunosuppression on infection induced acute phase reaction, namely C-reactive protein (CRP) concentration.

OBJECTIVES. Our aim was to assess CRP concentration in septic critically ill cancer patients comparing those with and without neutropenia.

METHODS. A secondary analysis of a matched case–control study conducted at an oncologic medical–surgical intensive care unit (ICU) was performed, segregating patients with severe sepsis/septic shock. The impact of neutropenia on CRP concentrations at admission and during the first week of ICU stay was assessed.

RESULTS. A total of 154 critically ill septic cancer patients, 86 with neutropenia and 68 without, were included in the present study. At ICU admission, CRP concentration of neutropenic patients was significantly higher than in non-neutropenic patients, 25.9 ± 11.2 vs. 19.7 ± 11.4 mg/dL ($p = 0.009$). Among neutropenic patients, CRP concentrations at ICU admission were not influenced by the severity of neutropenia ($<100/mm^3$ vs. $\geq 100/mm^3$ neutrophils), 25.1 ± 11.6 vs. 26.9 ± 10.9 mg/dL ($p = 0.527$). Time dependent analysis of CRP from day 1 to day 7 of antibiotic therapy showed an almost parallel decrease in both groups ($p = 0.335$), though CRP of neutropenic patients was, on average, always higher in comparison to that of non-neutropenic patients.

CONCLUSIONS. In septic critically ill cancer patients CRP concentrations are more elevated in those with neutropenia. However, CRP course seem to be independent of the presence or absence of neutropenia.

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0489

IS THE SYSTEMIC INFLAMATORY RESPONSE IN PULMONARY SEPSIS DIFFERENT FROM ABDOMINAL SEPSIS?

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INTRODUCTION. The incidence of septic shock is increasing, being the commonest sources of infection the lung (25%) and abdomen (25%), with mortality ranging from 30 to 70% [1]. The diagnosis of sepsis and evaluation of its severity is complicated by the highly variable and non-specific nature of the signs and symptoms. Biomarkers can have an important place in this process; however, their exact role in these patients remains undefined [1].

OBJECTIVE. To evaluate differences in the pattern of biomarkers in patients with abdominal and pulmonary septic shock.

METHODS. We analysed retrospectively medical records of patients with septic shock admitted to a general ICU from January 2008 to October 2009. Physiologic scores, site of infection, lactate, reactive protein C (RPC), protein C (PC), platelets, fibrinogen and D-dimers were collected on admission. We used Student's *t* test and Mann–Whitney test to compare the biomarkers between the group of patients with pulmonary and abdominal septic shock. $p < 0.05$ was considered significant. Logistic regression analysis was performed between the biomarkers and mortality in both groups of patients with pulmonary vs abdominal septic shock.

RESULTS. From a total of 92 septic patients, we enrolled 40 with septic shock. The mean age was 61.8 ± 14.7, 22 (55%) were males. The length of stay was 12.8 ± 13.0 days.

Comparison abdominal versus pulmonary septic shock

	Septic shock		
	Abdominal n (24)	Pulmonary n (16)	p
Mortality	15(62.5%)	10 (62.5%)	–
SAPS II	57.2 ± 22.1	49.0 ± 17.4	0.217
SOFA	10.2 ± 3.6	10.9 ± 2.5	0.493
LOS	6 (1.0–19.7)	11.5 (5.0–17.2)	0.206
Lactate	4.9 (3.4–6.7)	2.7 (2.2–4.2)	0.083
RPC	147.7 ± 93.4	291.9 ± 123.1	0 000
PC	28.8 ± 15.5	44.4 ± 17.1	0.009
Platelets	143.5 ± 100.3	141.1 ± 70.4	0.935
Fibrinogen	328.4 ± 189.4	680.4 ± 230.2	<0.0001
D-dimers	2,644 (719–5,493)	2,471.5 (1,664–3,027)	0.989

Biomarkers and mortality: logistic regression

	Abdominal septic shock			Pulmonary septic shock		
	OR	95% CI	AUC	OR	95% CI	AUC
Lactate	1.462	0.925–2.312	**0.802**	1.380	0.781–2.441	0.625
RPC	0.997	0.987–1.007	0.589	0.993	0.983–1.002	**0.733**
PC	1.050	0.984–1.121	**0.740**	0.940	0.868–1.018	**0.771**
Platelets	0.991	0.980–1.101	**0.719**	1.303	0.988–1.019	0.550
Fibrinogen	1.000	0.995–1.004	0.563	1.000	0.995–1.005	0.460
D-dimers	1.000	1.000–1.000	0.659	1.000	0.949–1.000	0.383

CONCLUSIONS. We have found significative differences, with high discriminative power in the biomarkers: lactate and platelet in abdominal septic shock and RPC in pulmonary septic shock. PC was equally discriminative for mortality in both groups.

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0490

SEPSIS AND MULTIPLE ORGAN DYSFUNCTIONS IN CHILDREN IN OUR P. I. C.U

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INTRODUCTION. Multiple organ dysfunction (M.O.D.) may occur during a septic disease and usually deteriorates the prognosis. The final outcome depends on many factors, such as the age and the immunocompetence of the affective children, the responsible organism and the underlying disease if any.

OBJECTIVES. The aim of the study was to determine the relative frequency of M.O.D. in our P.I.C.U., define the clinical and laboratory features of affective children and evaluate their outcome.

METHODS. A retrospective study received from medical records of patients admitted in our P.I.C.U. with the diagnosis of sepsis and M.O.D. during the last decade (from 1/8/2000–1/8/2010).

RESULTS. During the study period, 36 children suffered from sepsis and M.O.D admitted in our P.I.C.U, five of them had also a chronic disease. Boys were 61% and girls 39%. The responsible pathogen was isolated (72%) and the most common was *Neisseria meningitis* (33%). Mortality was 38%. Five children (not these with the chronic disease) died during the first 8 h after the admission and for the rest, the mean hospital stay was about 14 days. The most frequent affective systems were cardiovascular (92%), hematologic (92%) respiratory (72%), renal (47%), CNS (42%), while liver (22%) and gastrointestinal system (17%) were less involved. The survival depended on the number of affected systems. When two systems were involved the survival was 100%, three systems (86%), four (42%) and five or more (38%). The existance of chronic disease deteriorated the outcome, as all children with sepsis and chonic disease died. Compairing children who died with those who survived, there was significal difference in the involvement of respiratory system (92 vs. 59%) and CNS (50 vs. 36%). There was difference but less significant in the involvement of cardiovascular system (100 vs. 86%), hematological (92 vs. 86%), renal (50 vs. 45%) and liver (29 vs. 18%).

CONCLUSIONS. Sepsis with M.O.D. is frequent in children admitted to our pediatric intensive care unit and is associated with high mortality rate. The most common dysfunctions were from cardiovascular and hematologic system but the involvement of respiratory system and CNS deteriorated survival and final outcome.

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PAEDIATRIC INTENSIVE CARE UNIT INFECTIONS IN UNIVERSITY HOSPITAL IN CRETE ISLAND, GREECE

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INTRODUCTION. Infection is a common complication in Intensive Care Units and is related to a mortality of about 11% globally.

OBJECTIVES. Description of the epidemiology in our department at a time period of 6.5 years (8/9/2004–23/2/2011).

METHODS. Material Positive cultures derived from Central Blood Catheters, Endotracheal Tubes, Urinary Catheters, Cerebrospinal, Peritoneal, Vaginal and Gastric Fluid as well as Ear, Pharyngeal, Stool and other tissue specimen were recorded and analysed.Data analysis was conducted according to the infected organ system and the distribution of responsible microorganism.

RESULTS. In our department, infections from three organ systems seem to prevail; respiratory, circulatory, urinary. Eighty one per cent of positive cultures came from endotracheal tube (68.75%), Blood and Central Catheter (14.4 and 7.8% respectively) and Urinary Catheter (9.76%). Microbe isolation from other sites (Cerebrospinal,Peritoneal, Vaginal and Gastric fluids as well as Stool, Pharyngeal, Ear and other tissue specimen comprised the rest 19% of infections.In patients with microbe isolation from Endotracheal Tube *Pseudomonas aeruginosa* was cultured in 49%, *Staphylococcus aureus* in 7% and other microbes (*Staphylococci, Enterobacteriaccae, Streptococci, Haemophilus* sp) in 44%.In case of blood cultures *Staphylococcus epidermidis* and *Haemolyticus* were the commonest (48%) while *Klebsiella Pneumoniae, Pseudomonas Aeruginosa, Acinetobacter Baumanii* participated with 6.75% each of them respectively. Similar results appeared from isolated microbes from central catheters with *Staphylococcus Epidermidis* and *Haemolyticus* 42.5%, *Pseudomonas* 10%, *Klebsiella* 5%.At last urinary cultures revealed *Pseudomonas aeruginosa* 36% and *Escherichia coli*, *Klebsiella*, Proteus at 44%.

CONCLUSIONS. The commonest microbes in our department are: 1 *Pseudomonas aeruginosa* (39%) 2 *Staphylococcus aureus*(5%) 3 *Klebsiella Pneumoniae*(4.65%)
And the majority of positive cultures come from blood, urine and tracheal secretions.

Renal replacement therapy: 0492–0503

0492

HAEMODIAFILTRATION WITH LOW-CONCENTRATED CITRATE IS A SAVE AND APPROPRIATE METHOD OF PERFORMING CRRT IN ICU PATIENTS

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INTRODUCTION. Acute kidney injury (AKI) is a common disease in ICU patients. It has a high morbidity and mortality. Thus early intervention with continuous renal replacement therapy (CRRT) and a good circuit patency to achieve the best dosage seem to be very important.

OBJECTIVES. Citrate as anticoagulation seems to be favourable, but there are reports of lethal complications with high-concentrated citrate. Therefore we developed a protocol with low-concentrated citrate (0.3%). The aim of this study is to find out whether haemodiafiltration (CVVHDF) with low-concentrated citrate anticoagulation in predilution mode is a save and appropriate way of performing CRRT on the ICU.

METHODS. 21 consecutive patients were treated for AKI with CVVHDF (Gambro Prismaflex) using low-concentrated citrate anticoagulation (Prismocitrate 10/2) as predilution with 3.0 mmol/l citrate (about 2,700 ml/h). Other settings were a bloodflow of 180, 1,000 ml/h dialysate (Prism 0 cal), 400 ml/h substitution (Prismasol 2). Bloodsamples were taken at the start of CRRT and every 4 h until CRRT was stopped. Primary outcomes were filter patency, systemic and postfilter ionised calcium.

RESULTS. 114 filters were used with a median lifetime of 52.7 h. 61 filters (53%) reached the maximum lifetime (780 1total volume, about 56 h). The mean systemic ionised calcium (range 1.14–1.33 mmol/l, 95% CI) and mean postfilter ionised calcium (range 0.34–0.4 mmol/l, 95% CI) were stable. No filterclotting or adverse effects of citrate, such as intoxication, could be observed.

CONCLUSIONS. CVVHDF with low-concentrated citrate with 3.0 mmol/l is save concerning stability of ionised calcium in ICU patients with AKI. The circuit patency is excellent and the method of anticoagulation is appropriate.

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CITRATE ANTICOAGULATED CONTINUOUS HAEMODIAFILTRATION: FOCUS ON IONISED MAGNESIUM

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INTRODUCTION. Citrate anticoagulation influences the levels of divalent cations. The changes of ionised calcium are used to guide to dose of citrate however, much less is known about parallel changes of magnesium.

OBJECTIVES. The authors compared handling of magnesium and calcium in 4% citrate anticoagulated continuous haemodiafiltration.

METHODS. The levels of Mg_{tot} and Mg^{2+}, Ca_{tot} and Ca^{2+} were taken in critically ill patients treated with CVVHDF, Baxter Aquarius, polysulfone filters Aquamax 1.9 m^2. All were anticoagulated with 4% citrate (GML Czech Republic, n = 32) and all were administered calcium free dialysis/filtration solution with 0.75 mmol/l magnesium (Citralysate, GML, Czech Republic). Citrate was titrated in increments to maintain the postfilter Ca^{2+} less than 0.4 mmol/l. Samples for biochemical analysis were taken from central venous catheter, ports pre and post filter and from dialysate/filtrate 24 h after commencing with CRRT (T0) and 60 min later (T1). Citrate levels were measured with capillary zone electroforesis.
The settings were kept constant between T0 and T1.

RESULTS. Mean blood flow was 114 ± 18 ml/min, dialysis flow 1545.5 ± 261 ml/h, haemofiltration 376 ± 349 ml/h, ultrafiltration (net fluid loss) was titrated according to the haemodynamic needs. The mean dose of 4% citrate prefilter was 175.1 ± 27.4 ml/h. Median loss of total magnesium was −0.60 (−1.08 to −0.35) mmol/h. Median loss of total Ca was −3.32 mmol/h (−2.79 to −3.72 mmol/h). Neither loss of Mg_{tot} or Ca_{tot} nor loss of Mg^{2+} or Ca^{2+} were related to the absolute dose of citrate pre-filter or dose of citrate in relation to blood flow ($p > 0.05$). The change of plasma calcium index on filter (d-Ca_{tot}/Ca^{2+}) was directly related to the change of magnesium index in plasma (d-Mg_{tot}/Mg^{2+}, $r = 0.46$, $p < 0.01$).

CONCLUSIONS. The change of plasma magnesium index under 4% citrate anticoagulated CVVHDF is weakly related to the change of calcium index. Regardless of the level of Mg in the dialysis/substition fluid citrate anticoagulated continuous haemodiafiltration requires an extra 2–3 g of magnesium sulfate to be given as infusion supplement.

0494

INCIDENCE OF SEVERE ASYMPTOMATIC HYPOTENSION IN INITIALLY HAEMODYNAMICALLY STABLE PATIENTS UNDERGOING HAEMODIALYSIS

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INTRODUCTION. Emerging evidence suggests that intradialytic hypotension is associated with an increased risk of mortality [1]. Symptomatic hypotension still continues to be the most common complication of haemodialysis (HD), occurring in up to 50% of HD sessions [2]. However, the exact incidence of asymptomatic hypotension is not well known, as in current practice this involves invasive intra-arterial BP monitoring, which is not justified for use in haemodynamically stable patients to avoid complications.

OBJECTIVES. We utilised a noninvasive continuous beat-by-beat haemodynamic monitor (Finometer) to assess the incidence of hypotensive episodes in initially haemodynamically stable patients undergoing HD. We also identified the corresponding changes in other haemodynamic variables.

METHODS. 45 patients were continuously monitored by the Finometer throughout a single HD session each, which lasted between 3.5 and 4.5 h. The mean (SD) age was 62.8 (18.4), 27 male and 18 female.
Asymptomatic hypotensive episodes were defined as SBP <90 mmHg for more than 10 min, and symptomatic episodes as SBP <90 mmHg regardless of the duration.

RESULTS. Asymptomatic hypotensive episodes were significantly more prevalent than symptomatic episodes amongst our patients, with an incidence of 20 and 6.7% respectively ($p = 0.0143$*). The mean (SD) duration of asymptomatic hypotensive episodes was 47 (51) min. Intravenous fluids were administered to all patients who had symptomatic hypotension. However, under the current intermittent blood pressure (BP) measurement protocols, asymptomatic episodes passed unnoticed and consequently received no intervention. On further analysing the asymptomatic hypotensive episodes, we found that there were no corresponding significant changes in the heart rate (HR), stroke volume (SV), cardiac output (CO) and total peripheral resistance (TPR); indicating failure of the normal cardiovascular compensatory mechanisms to HD induced hypovolaemia in renal failure patients.

CONCLUSIONS. Severe asymptomatic hypotensive episodes, which usually pass unnoticed under the currently used intermittent BP measurement protocols, are more prevalent than symptomatic episodes amongst renal failure patients. They can be explained by failure of the normal cardiovascular response to HD induced hypovolaemia, possibly due to alterations in autonomic activation. Further studies are needed to evaluate whether extra information about haemodynamic changes, as assessed by the Finometer, have an impact on clinical management of haemodynamics during HD.

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0495

ELECTROLYTE DISTURBANCES (DIALYTRAUMA) OF CONTINUOUS RENAL REPLACEMENT THERAPY: A SIX YEARS RETROSPECTIVE STUDY

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INTRODUCTION. Continuous renal replacement therapy(CRRT) is currently the most widely used technique for extra-renal filtration in critically ill patients [1]. This continuous therapy, if not appropriately monitored, can be associated with several electrolyte and acid–base disturbances [2]. Changes in sodium, potassium, calcium, magnesium and phosphorus all have been observed under certain CRRT modalities [3].

OBJECTIVES. To determine the pattern and the incidence of electrolyte and acid–base disturbances in patients with septic shock requiring CRRT.

METHODS. A retrospective analysis was performed in the data of patients with septic shock undergoing CRRT. From 1,626 patients admitted between 2005 and 2010, 213(13%) were treated with CRRT. We excluded patients with <24 h therapy. Serum sodium, potassium, chloride, calcium, magnesium, phosphate, pH, bicarbonate, base excess, lactate, albumin, glucose and hematocrit were assessed before the start of each treatment and daily for 3 days. We used Gambro® replacement fluids (Hemosol®, Primasol4®, Primocitrate® 10/2 and Prim0 cal®). Categorical variables were expressed as absolute (n) and relative (%) frequency and continuous variables as mean ± standard deviation (SD). Differences between groups were assessed using ANOVA. $p < 0.05$ was considered significant.

RESULTS. 105 patients were enrolled, mean age 64.1 ± 13.1 years, 63(60%) males, mean SOFA on admission 11.3 ± 3.7, mean SAPS II 53.9 ± 15.8 pts. Hospital and ICU mortality were 61.9 and 50.5% respectively. Before treatment, we observed a high incidence of abnormal phosphorus (hyperphosphatemia in 53(50.4%) and hypophosphatemia in 13(12.3%) patients), hypocalcemia in 74(70.4%) patients, Hyperkalemia in 15(14.2%) patients and hypermagnesemia in 14(13.3%) patients. In the first 72 h of CRRT, the levels of chloride, potassium, phosphorus and platelets fell significantly, and the levels of total calcium, base excess and bicarbonate increased significantly. There was no correlation between and mortality and any of the electrolyte disturbances.

Evolution during the first 72 h CRRT

	Initial N = 105	24 h N = 105	48 h N = 102	72 h N = 80	p
Sodium (mEq/L) mean ± SD	140.6 ± 6.3	140.7 ± 4.8	139.8 ± 4.9	139.4 ± 4.8	0.199
Chloride (mEq/L) mean ± SD	108.0 ± 8.0	105.6 ± 5.5	103.9 ± 3.5	103.9 ± 3.5	**<0.0001**
Potassium (mEq/L) mean ± SD	4.4 ± 0.9	3.8 ± 0.6	3.9 ± 0.8	3.8 ± 0.8	**0.01**
Phosphorus (mg/dL) mean ± SD	5.6 ± 2.4	3.4 ± 1.5	2.4 ± 1.1	1.9 ± 0.9	**<0.0001**
Magnesium (mg/dL) mean ± SD	2.3 ± 0.6	2.1 ± 0.3	2.2 ± 0.3	2.2 ± 0.3	**<0.0001**
Total calcium (mEq/L) mean ± SD	3.6 ± 0.4	4.0 ± 0.4	4.4 ± 0.4	4.4 ± 0.3	**0.055**
pH mean ± SD	7.2 ± 0.1	7.3 ± 0.6	7.3 ± 0.1	7.4 ± 0.0	0.205
Bicarbonate (mmol/L) mean ± SD	19.1 ± 6.4	24.3 ± 4.8	25.4 ± 5.3	26.3 ± 4.7	**0.019**
BE(mmol/L) mean ± SD	−7.3 ± 7.9	−0.8 ± 8.8	0.5 ± 6.1	1.6 ± 5.0	**0.005**
Lactate(mmol/L) mean ± SD	4.5 ± 4.1	5.1 ± 4.5	4.5 ± 4.9	3.5 ± 3.1	0.107
Platelets (×10^A3/μL) mean ± SD	145.7 ± 105.8	114.1 ± 98.0	94.6 ± 83.4	79.4 ± 63.8	**0.004**
Glucose (mg/dL) mean ± SD	162.8 ± 80.8	135.0 ± 62.2	152.3 ± 66.8	162.5 ± 63.2	**0.016**
Hematocrit (%)mean ± SD	31.1 ± 5.4	30.6 ± 4.7	29.7 ± 4.7	29.0 ± 4.0	0.139

CONCLUSIONS. During CRRT, electrolyte disturbances (dialytrauma) are frequent, usually corrected with replacement solutions. The main disturbance found was in phosphorus and potassium. We didn't observe a significant decrease in lactate as referred in the literature.

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0496

EFFECT OF SITE OF HAEMOFILTER CATHETER ON THE DURATION OF HAEMOFILTER CIRCUIT

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INTRODUCTION. Premature clotting is a major problem in the daily practice of Continuous Renal Replacement Therapy (CRRT). Early clotting is related to bio-incompatibility of the CRRT circuit material, modality used, haematocrit, thrombocytosis, ineffective anticoagulation. Well-functioning vascular access is essential for the provision of adequate CRRT. However, few data exist to describe the effect of catheter site location on CRRT performance in the adult population.

OBJECTIVE. We conducted a retrospective analysis of patients who had undergone CRRT in our Adult general Intensive Care unit (ICU) to determine if the site of Vascath placement had any role in the duration of Haemofilter circuit duration.

METHODS. Demographic (age, sex) and clinical (Platlet count, INR, APTT, anticoagulant used and the rate of infusion of anticoagulant) data that are known to influence the duration of CRRT circuit was compared. The number of bags (5 l) of replacement fluid used on each circuit and the number of bags prescribed were noted. Cycles which were terminated because of high Pin pressure or documented clogging of the circuit were included in the study. All patients had the similar make intravenous catheter device (14French, Polyurathane catheter, Logitech™) and the same CRRT machine and circuit.

RESULTS. One hundred and twenty one patients had undergone CRRT in the unit in the last 2 years. Two hundred and forty six CRRT circuits were used in total. The cycles were then divided in six groups based on side and position of Haemofilter venous catheter i.e. Right Internal Jugular vein (RIJV), Left Internal Jugular vein (LIJV), Right Femoral Vein (RFV), Left femoral Vein (LFV), Right Subclavian Vein (RSCV), Left Subclavian Vein (LSCV). The demographic and clinical characteristics of the groups were compared by Kruskal–Wallis' test (non parametric version of 1-way ANOVA) with Dunn's Multiple Comparison post-test (comparing all sets of groups). All the groups were similar in their demographic and clinical characteristics. Ratio of number of bags completed to the number of bags prescribed was calculated in each cycle and the groups were again compared by Kruskal–Wallis' test (non parametric version of 1-way ANOVA) with Dunn's Multiple Comparison post-test (comparing all sets of groups). There was no significant difference in the ratio of number of bags used to the number of bags prescribed between the six groups compared.

CONCLUSIONS. Even though it is generally considered that Haemofilter circuit duration is longer in case of RIJV venous catheter [1] there is no good quality evidence in adult patients to support the theory. In our study, there was no significant difference in the duration of the Haemofilter circuit according to the site of catheter placement.

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0497

MID-HIGH FLUX HEMODIALYSIS (HD) IS EQUAL TO CONTINUOUS VENOUS VENOUS HEMODIAFILTRATION (CVVHDF) IN THE TREATMENT OF SEVERE LACTIC ACIDOSIS

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INTRODUCTION. The ideal mode to treat the severe lactic acidosis (LA) is still a matter of great debate. It is not clear which mode of dialysis is preferable: daily hemodialysis or hemodiafiltration.

METHODS. We reviewed retrospectively the charts of 9 pts treated during January 2008 to December 2010. Clearance studies on lactate dialysis were performed on 5 pts (a total of 13 clearances studies) who were treated with Continuous Venous–Venous Hemodiafiltration (CVVHDF) and 4 pts who were treated with high flux hemodialysis filter with daily hemodialysis (a total of 26 clearances studies). LA was caused by Metformin in 6 pts and by hematological tumors lysis in 3 pts.In order to compare between the two modalities we used the data from the charts and calculated the Mass Removal Rate (MRR) of LA in the two modalities. Comparing pre and post treatments LA serum is inadequate because the rate of LA production during treatment is variable. MRR is actually the total amount in mg of LA that was removed while passing through the dialyzer in both modalities. MRR formula [1] $= K_B$ X 240(min in 4 h HD) Where K_B = whole blood-dialyzer clearance/min [1] $= [(Q_{Bi} \times C_{Bi})-(Q_{Bo} \times C_{Bo})]/ C_{Bi} + Q_f(C_{Bo}/ C_{Bi})$ where Q_{Bi} = blood flow (BF) rate in the dialyzer, C_{Bi} = serum LA concentration before the hemodialysis filter, Q_{Bo} = BF rate in the dialyzer outlet, C_{Bo} = serum LA concentration in the filter outlet, Q_f = is net ultrafiltration rate.Q_{Bi} and Q_{Bo} were calculated according to the formula of BF prescribed in the hemo-dialysis machine: 250 ml/min multiply by(1-HCT) pre and post filter respectively. $Q_{Bi} = 250 \times (1\text{-}Hct_{Inlet})$, $Q_{Bo} = 250 \times (1\text{-}Hct_{Outlet})$ We calculated the mean change of Ht post and pre HD filter in 40 HD pts and extrapolated it into our formula. The MRR in CVVHDF was calculated according to the formula $K_B = C_{Dialisate} \times D_{Flow}$ where $C_{Dialisate}$ = the LA concentration in the CVVHD dialysate, D_{Flow} = Dialysate flow in 24 h. In order to compare standard modes of dialysis in severe lactic acidosis where the pts are usually in hemodynamic shock or hypovolemic, we compared mild BF and minimum ultrafiltration in both modalities: HD prescription: BF 250 ml/min, net ultrafiltration total of 1 1 in 4hCVVHD prescription was: BF 150 ml/min, Fluid replacement 1,300 ml/h, dialysate flow 1,300 ml/h, fluid removal rate 40 ml/h.

RESULTS. Average(AV) $Q_{Bi} = 164.50$, AV $C_{Bi} = 63$, AV $Q_{BO} = 142$, AV $C_{Bo} = 172$, AV $Q_f = 4.1$ MMR = 30,448.63 mg for 4 h hihgh flux HD, MRR = 45,672.95 mg for 6 h high flux HD CVVHD: $C_{Dialisate} = 63$ mg/dl, $D_{Flow} = 1{,}300$ ml/h MRR = 31,200 mg/24 h

CONCLUSIONS. The Mass removal rate of LA in severe lactic acidosis is equal in 4 h mid-high flux HD and in CVVHDF of 24 h duration.The Mass removal rate of LA in MID-HD of 6 h duration will be grater than CVVHD but taking into consideration that the patients are hemodynamically unstable, 6 h MID-High flux HD will be difficult to perform

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0498

EXTRACORPOREAL DEPURATION THERAPY (EDT) IN A POLIVALENT INTENSIVE CARE UNIT (ICU). ONE YEAR RESULTS

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INTRODUCTION. EDT is a real therapeutic option in ICUs since more than 30 years ago. These therapies are useful for several problems in the critical care pathology, but Acute Kidney Failure (AKI) in the context of multiorgan disfunction is where it has its most important role.

OBJECTIVES. To review utilization and epidemiology of AKI and EDT in a polivalent ICU.

METHODS. A retrospective analysis of all patients admitted during 2009 in the ICU of the Hospital Universitario Virgen de la Victoria Málaga. We studied patients diagnosed of AKI according RIFLE criteria, with special interest in those treated with EDT. Gathered variables included: age, gender, length of ICU stay, APACHE II score, pathology group, RIFLE classification, EDT indication, EDT technique used, renal function recovery and vital status at ICU discharge.

RESULTS. Hospital Universitario Virgen de la Victoria had an average of 580 functional beds during the study period. Its ICU has 18 beds, there were 1,468 admissions in that period. Between them, 273 patients (18.59%) had AKI according to RIFLE criteria, with a mean age was 63.3 years; 67.4% were men, mean length of ICU stay was 7.3 days with a median of 5 days; mean APACHE II score was 20, main diagnosis at admission was medical in 90.5% of patients, urgent surgery in 5.9% and scheduled surgery in 3.7%. Mortality rate in this subgroup of patients was 31% (global ICU mortality rate in the study period: 14.3%, 211 patients). EDT was used in 25.3% of AKI (69 patients), with a mean age 57.1 years, 63.8% of them were men, had a mean length of stay in ICU of 12.3 days (median 8), and a mean APACHE-II score of 23.32. Indication for EDT was oliguric AKI in 81.2% of cases, and non-oliguric AKI in 18.8%. EDT techniques most frequently used were convective ones (63.3%).
Intra-ICU mortality rate in the subgroup of AKI patients treated with EDT was 47.8%, and among survivors (52.2%), 55.6% had a normal kidney function at ICU discharge.

CONCLUSIONS. AKI incidence in a polivalent ICU with medical admissions mainly was 18.59%, which is much higher than what has been reported in previous epidemiological studies, reflecting the impact of a new operative AKI definition using RIFLE criteria. ICU patients that develop AKI, do so in the context of multiorgan disfunction, with high severity, mortality and length of stay. AKI patients treated with EDT were younger with even higher severity scores, mortality rate and length of stay.

0499

HIGH VOLUME HEMOFILTRATION AND VERY HIGH VOLUMEN HEMOFILTRATION IMPROVES HEMODYNAMICS AND RESPIRATORY VARIABLES AND PROBABLY INCREASE SURVIVING IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Mortality rates in septic shock remain unacceptably high despite advances in our standing of the Syndrome (40–60%). HVHF and VHVHF can removes Levels of CytoKines and potentially improves Clinical Outcome.We Appplied in all patients The Guidelines of SSGC ("HORIZONTAL RESUSCITATION").

OBJECTIVES. We are going to explore if HVHF and VHVHF can improve clinical evolution in Septic Shock patients, 28 day survival, hospitality survival and quality of life 90 day (Barthel's index). We compare our results with predict mortality by Apache II.

METHODS. Our prospective, randomized and observational study including 60 patients hospitalized with septic shock; treated with HVHF and Pulse of VHVHF between 2008 and 2010 in the Medical UCI of a Teaching Hospital in Malaga. We propose two Groups: one of them with HVHF (35 Ml/kg/h) and another with VHVHF(55 Ml/kg/h). In the second group is possible to administer Pulse VHVHF of 60–140 Ml/Kg/h. We inserted a Catheter of Swan Ganz in Most of the patients and measured Hemodynamics (CO, RVS, Partm, PECP, SvO_2), Respiratory variables (PaO_2/FiO_2) and levels of procalcitonin. Using the schedule described, commercial bicarbonate-buffered replacement fluid was used in pre and post-dilution. We use Heparin like anticoagulant and the second option is Flolan.

RESULTS. We treated 60 patients, mean age (57.63 years),weight (75.66 kg), Mean Acute Phisiology and Chronic Health Evaluation II Score (26.63), Lactato (4.64 mmol/l), PaO_2/FiO_2(166.88), Norepinefrine dose (1.37 mcg/kg/m), Creatinine level at the entrance (2.66 mg/dl), urine in the first 24 h (1,232.80 ml/24 h), SvO_2 (60.96), mean arterial pressure (63.76) and mean PCT levels 38.08. The arm with VHVHF(55 Ml/kg/h) to present longer duration of mechanical ventilation (mean days 10.21), Uci's length (20.33 days), longer duration of TCDE (6.45 days), higher score Apache II (27.27), poor values of SvO_2 (59.76), more damage of kidney function (mean Creatinine 2.73 mg/dl), higher doses of Norepinefrine (1.47 mcg/kg/min); nevertheless beginning time of Hemofiltration was faster (14.93 vs. 22.11 h). The Observed 28 day survival was 90.9% (VHVHF group) versus 66.7% (HVHF group) versus 56% predicted mortality by APACHE II. The Observed Hospitality survival was 84.8% in VHVHF group versus 63% in HVHF Group. In the group of surviver patients 90 day, 75.6% of them, presented barthel's index superior to 90.

CONCLUSIONS. Early initiation of Therapy an adequate dose may improve hemodynamic response and 28 day survival, Hospitality survival like that quality of life 90 day .

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0500

THE IMPACT OF CONTINUOUS RENAL REPLACEMENT THERAPY ON HEMOSTATIC PROFILE IN CARDIAC SURGERY. TROMBOEBALSTOGRAPHY STUDY

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OBJECTIVES. We sought to evaluate changes in systemic coagulation system during continuous renal replacement therapy (CRRT) related to its duration and usage of different anticoagulation methods after cardiac surgery.

METHODS. Between February 2010 and February 2010, a total of 12 patients indicated for veno-venous continuous hemodiafiltration CRRT for post-cardiotomic renal failure were enrolled and prospectively follow-up. For systemic coagulation monitoring thromboelastography (TEG ® Haemoscope 5000, kaolin activated) was used, with the heparinase and functional fibrinogen setting and correlated with standard tests (PT, aPTT, Quick time, INR). Blood samples were taken just prior setting of CRRT, 3 h after initiation therapy, and every 12 (TEG®—heparinase) to 24 h (TEG—functional fibrinogen®) of ongoing therapy.

RESULTS. There were no hemostatic changes in TEG and standard test parameters within first 24 h of therapy. However, significant increase in pro-coagulation activity (Rs 10.95 vs. 7.46, $p < 0.01$, K 2.6 vs. 1. 82, $p < 0.05$, CI −3.58 vs. 0. 07, $p < 0.01$) and fibrinolysis (LY 60 4.05 vs. × 8. 15, $p < 0.05$) was displayed on TEG as well as on standard tests (INR, 1.39 vs. 1. 24, $p < 0.05$, Quick time, 83.66 vs. 71. 66 s, $p < 0.05$) compared 1st and 2nd day ongoing therapy and persisted in even the termination of CRRT. No difference between standard heparin (2 patients) and regional citrate (10 patients) used for anticoagulation was found. The median of therapy duration reached 61.08 ± 12.69 h

RESULTS. Significant activation of systemic hemocoagulation with delayed fibrinolysis was found during CRRT, particularly after 24 h ongoing therapy and persisted in even the termination of CRRT.

0501

REFLECTION OF CURRENT HAEMOFILTRATION PRACTICE IN NORWICH ICU

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INTRODUCTION. Acute Kidney Injury (AKI) in ICU is a common problem with increased morbidity and mortality. The mortality rates could be as high as 50 to 70% with severe AKI [1].
OBJECTIVES. We intend to find out the magnitude of the problem in our 20 bedded Intensive care unit and aim to look at different variables which are associated with poor outcome.
METHODS. This retrospective observational study involved collecting data of patients who underwent haemofiltration over a period of 2 years (2008–2010) from our local ICU database (Metavision).We applied APACHE II scores to all patients and looked at the mortality rates in both surgical and medical admissions on our unit. Age, duration of stay in ICU, duration of haemofiltration and other organ supports were also recorded to observe the correlation of these variables with outcome measures.
RESULTS. Total number of patients who needed CVVH in 2 year period was 96 of which 52 patients were surgical and 44 were medical.42% of Surgical and 34% of Medical admissions died.The overall mortality was 38.5%. See attached picture which illustrates association with mortality variables.

	Survivors (n=59)	Non-Survivors (n=37)
Median Age (yrs)	62.9	69
Males	38	24
Females	21	13
Median APACHE II scores	32	36
Estimated mortality (%)	75	85
Median Time (admission to CVVH) in days	1	1
Median Urea(admission) mmol/l	18.1	14.7
Median Creatinine (admission) µmo/l	250	203
Median Urea (@ start of CVVH) mmol/l	23.5	21
Median Creatinine (@ start of CVVH) µmo/l	32.7	272
Median fluid balance (mls)@start of CVVH	1215	1571
Average length of stay (days)	15.9	10
Exchange rates(ml/kg/hr)	36	36
Cardio-vascular + Respiratory Support (%)	59.3	97.2

Norwich CVVH

CONCLUSIONS. Analysis of our CVVH results showed the overall mortality rate in our unit is 38.5% which is well below the average mortality rate of 50–70% published in current literature [1, 2].This could be due strict protocol with regards to early commencement of CVVH and fluid balance.APACHE-2 score does not seem to predict the mortality of patients needing CVVH [3].We also found renal patients who needed both respiratory and cardiovascular support had worse prognosis.To generalise this finding we need further studies to confirm.
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0502

EARLY CONTINUOUS HAEMODIAFILTRATION (CVVHDF) IN SEPTIC PATIENTS. SIX YEARS EXPERIENCE

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INTRODUCTION. In critically ill patients dysfunction of many organs develops during first 24 h of recognised septic shock. However renal dysfunction, which is represented by high creatinine, water and sodium retention, is often observed after 48 or more hours, in spite of the facts in literature saying that early kidney injury (AKI) can exist without the change in creatinine level.
OBJECTIVES. Those facts forced us to implement early CVVHDF in septic shock during 24 h after admission.
METHODS. Between 2004 and 2010 early CVVHDF was introduced in 46 patients with septic shock without clinical and biochemical signs of renal failure: mean level of creatinine was 1.08 mg/dl, mean daily urine output was 2,370 ml, mean age was 58, mean Apache score was 23 points. Standard ultrafiltration rate was 35 ml/kg/h. The second group of patients consisted of 48 people, here CVVHDF was introduced after recognition of clinical and biochemical signs of renal failure: mean creatinine level was 1.8 mg/dl, mean daily urine output was 430 ml, mean age was 58 years, mean Apache score was 23 points. Results of treatment in both groups were compared in Table below. *T* student test and Chi-square were used, and $p < 0.05$ was recognised as statistically significant.
RESULTS. The results are presented in Table below.

Results of the study

	CVVHDF <24 h	CVVHDF >48 h	p
Number of patients	46	48	ns
Age in years	58	58	ns
Apache score	23	23	ns
Creatinine [mg/dl]	1.08	1.8	$p = 0.08$
Daily urine output [ml/24 h]	2,370	430	$p = 0.07$
Ultrafiltration [ml/kg/h]	35	35	ns
Mortality	16/46 [34.7%]	19/48 [39.5%]	$p = 0.06$

CONCLUSIONS. Lower mortality was observed in group <24 h but it was not statistically significant
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ACKNOWLEDGMENT. Team of ICU.

0503

CLINICAL EVALUATION OF EMIC2 DIALYSIS FILTER IN PATIENTS RECEIVING RENAL REPLACEMENT THERAPY

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INTRODUCTION. Ultraflux EMiC2 dialysis filter was developed to increase clearance of middle size molecules as for example myoglobuline during renal replacement therapy (RRT). The filter has a molecular weight cut off value of about 40,000 D and a low loss of larger molecules as albumine or coagulations factors. The aim of this study was to evaluate the filter in clinical practice.
METHODS. Six EMiC2 filters were tested in 3 patients with rhabdomyolysis receiving RRT (CVVHD) with citrate as local anticoagulation. During the therapy albumin concentration was followed in the dialysate. Further, plasma concentration of albumin, coagulations factors and myoglobuline were measured daily.
RESULTS. The live time of the filters were 9–79 h (mean 39.5 h). Plasma myoglobine and filter live time are shown in Table 1.

TABLE 1

Filter	Patient	Diagnosis	Filter live time	P-myoglobine before	P-myogolbin after	% decrease
1	A	Fall trauma	75.7	16,000	8,000	50
2	A	Fall trauma	79.1	8,000	1,400	83
3	B	Intoxication	52.9	12,000	3,300	73
4	C	Road accident	9	640,000	370,000	42
5	C	Road accident	8.3	370,000	120,000	68
6	C	Road accident	12	120,000	70,000	42

Albumine concentration in the dialysate was low and the patients did not need substitution. The patients were also stable in there coagulations parameters during the therapy. Patient C bleed heavily and received blood and plasma which might have affected the decreases in plasma myoglobine concentrations.
CONCLUSIONS. EMiC2 filter is effective for increasing middle weight size molecule clearance as myoglobine in patients receiving RRT with low loss of larger size molecules. A larger study I s planned to evaluate the efficiency of this filter.

General perioperative care: Microcirculation, biomarkers & monitoring: 0504–0517

0504

EVALUATION OF RISK FACTORS ASSOCIATED WITH THE DEVELOPMENT OF NON OCCLUSIVE MESENTERIC ISCHEMIA AFTER CARDIAC SURGERY

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INTRODUCTION. Non-occlusive mesenteric ischemia (NOMI) is an infrequent but serious squealae after cardiac surgery with a mortality ranging from 47 to 90%. Unfortunately, patients after cardiac surgery are mostly ventilated postoperatively, consequently initial symptoms are not reported and the physical examination is equivocal due to masked, late appearing or missing clinical signs.
OBJECTIVES. Aim of this prospective observational study was to elucidate preoperative, intraoperative and postoperative risk factors associated with the development of NOMI after cardiac surgery.
METHODS. After approval of the local ethic committee, from 02/2010 to 01/2011 all patients data were collected with a computerized data bank in addition to the medical record chart. First comparison was made between patients with confirmed NOMI and all other patients enrolled in the study. After identification of preoperative risk factors, we defined a "NOMI risk group" with statistically equal values of preoperative risk factors. Pooled variance *t* test, c^2-test of independence and Fisher's exact test were used to assess differences between means and groups for statistical significance.
RESULTS. A total of 848 patients were enrolled in the study, whereof 69 patients (8%) developed moderate to severe NOMI after cardiac surgery. A total of 93 possible risk factors have been elucidated.
Statistically significant different demographic factors included higher age ($p < 0.001$), bigger body size ($p < 0.05$), elevated Euro Score ($p < 0.001$), reduced ejection fraction ($p < 0.05$), preexisting chronic pulmonary disease ($p < 0.05$), preexisting pulmonary hypertension ($p < 0.001$), preexisting renal insufficiency ($p < 0.001$), preexisting atrial fibrillation (<0.05), preexisting stroke ($p < 0.05$) and preexisting coronary heart disease ($p < 0.05$).
Statistically significant preoperative biomarker risk factors included elevated proBNP ($p < 0.001$), elevated cystatin C ($p < 0.001$), elevated urea ($p < 0.001$), lowered albumin ($p < 0.001$), elevated gamma glutamyl transpeptidase (<0.05) and lowered cholinesterase ($p < 0.001$).
Statistically significant intraoperative risk factors included prolonged operation time ($p < 0.001$), prolonged cardiopulmonary bypass time ($p < 0.001$), prolonged aortic cross clamp time ($p < 0.05$) and the need for intraoperative IABP support ($p < 0.001$).
Statistically significant postoperative risk factors included new onset of atrial fibrillation ($p < 0.001$) and elevated blood loss ($p < 0.001$).
Interestingly, the NOMI risk group again showed statistically prolonged operations times ($p < 0.001$), a higher need for IABP support ($p < 0.001$) and an elevated postoperative blood loss ($p < 0.001$).
CONCLUSIONS. A high index of suspicion for NOMI after cardiac surgery in patients with the above mentioned risk factors may decrease the diagnostic delay and maybe lead to an decreased mortality rate due to earlier intervention.

0505

COMPLICATIONS OF CENTRAL VENOUS CATHETER INSERTION

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INTRODUCTION. The technique for central venous catheter (CVC) insertion at our institution has changed in recent years with the introduction of ultrasound. While it is generally accepted to be safe and effective, we wished to determine the incidence of procedural related complications in a prospective observational study.

OBJECTIVES. To identify the incidence of complications related to CVC insertion and the impact of ultrasound use, operator experience and levels of supervision.

METHODS. 500 CVC insertions were prospectively audited in a single tertiary level institution. Data was collected consecutively in the anaesthetic department and the intensive care unit from March until November 2010. Data collected included the use of ultrasound, operator experience (<25, 25–50, or >50 previous insertions), level of supervision, site of insertion, and procedural complications. These were listed as none, minor (unable to pass guide-wire, multiple attempts, second site, second operator, local haematoma, arterial puncture), major (arterial dilatation, pneumothorax, haemothorax, other), or failed attempt.

RESULTS. There were no major complications recorded during the audit period. The overall rate of complications was low, <8.5%. Ultrasound was used in the majority of insertions, 430 (86%), real-time in 382 (77%) with no ultrasound in 70 (14%). Arterial puncture occurred in 13 cases (2.1%). This occurred significantly more frequently when ultrasound was not used (7.2 vs. 2.1% with ultrasound; $p = 0.03$) and at the subclavian site (8 vs. 1.6% for non-subclavian approaches; $p = 0.004$). Arterial punctures were significantly reduced with consultant supervision (0.6 vs. 3.7%, $p = 0.02$), as were overall complications (none 88.9%, minor <5%, arterial puncture 1.3%, failed insertion 1.3%; $p = 0.0003$). Arterial puncture was more frequent with less experienced operators (5.2% if <25 vs. 2.1% if >50 previous procedures) but this was not statistically significant ($p = 0.1$). Insertion failed in 11 (2.2%) cases; 2 (18%) of the failed attempts were consultant supervised ($p = 0.28$).

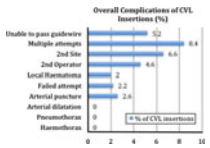

Fig. 1

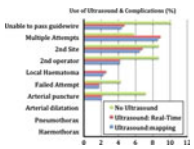

Fig. 2

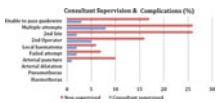

Fig. 3

CONCLUSIONS. The overall rate of complications was unexpectedly low and major complications rare. Ultrasound use is common at our institution and it reduced the incidence of arterial puncture. Consultant supervision reduced overall complications including arterial puncture. Even inexperienced operators are able to perform CVC insertion with a low incidence of complications when ultrasound is used and the subclavian vein is avoided.

0506

DOES EARLY PERIOPERATIVE GOAL DIRECTED THERAPY USING FUNCTIONAL AND VOLUMETRIC HEMODYNAMIC PARAMETERS IMPROVE THERAPY IN CARDIAC SURGERY? A PROSPECTIVE, RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. There is growing evidence that an early and algorithm guided hemodynamic therapy primarily increasing cardiac output by preload optimization improves outcome in high risk surgical patients. Preload optimization was so far guided either by the filling pressures CVP or PAOP, cardiac output (CO), or functional parameters based on heart lung interactions, i.e. stroke volume variations (SVV). In particular the latter one, having shown to be useful intraoperatively under controlled mechanical ventilation, but becomes invalid in patients under assisted mechanical ventilation or during spontaneous breathing. Volumetric parameters of cardiac preload, such as global end-diastolic volume index (GEDI) differ significantly inter-individually in critically ill patients, but have been proven to be highly accurate to allow tracking changes in cardiac preload in both, mechanically ventilated patients, and during spontaneous breathing.

OBJECTIVES. We implemented a hemodynamic treatment algorithm based on measurements of CO, SVV, and a patient-individual GEDI for optimizing therapy during and after elective cardiac surgery. We compared a study group (SG) guided by this algorithm with a control group (CG) guided by an algorithm based on CVP and mean arterial blood pressure (MAP).

METHODS. After approval of the ethic committee and written informed consent one-hundred patients scheduled for elective coronary artery bypass (CAB) surgery or CAB surgery in combination with aortic valve replacement (AVR) were randomized either to the SG ($n = 50$), or to the CG ($n = 50$). Algorithm driven hemodynamic therapy started immediately after induction of anesthesia and was commenced until discharge from the intensive care unit (ICU).

RESULTS. 92 Patients could finally be analyzed. There was no difference in perioperative mortality. All over complications were less in the SG (42 vs. 63). Time to reach ICU discharge criteria (SG: 15 ± 6 h vs. CG: 24 ± 29 ($p < 0.001$), length of stay on the ICU (SG: 42 ± 19 h vs. CG: 61 ± 58 ($p < 0.05$), and time to reach criteria for hospital discharge (SG: 5d ± 3 vs. CG: 6 ± 3 ($p < 0.001$) were significantly shorter in the SG. The cumulative use of catecholamines and vasopressors was significantly less in the SG (1,196 ± 1,002 µg) compared to the CG (2,523 ± 2,205 µg; $p < 0.001$). Areas under the curve for postoperative (36 h) creatinine kinase, AST, ALT, and gGT all were smaller in the study group, however without reaching statistical significance. There were no differences in pulmonary or renal function within the study period.

CONCLUSIONS. Goal-directed hemodynamic therapy based on an algorithm using measurements of CO, SVV and a patient-individual GEDI minimizes organ damage and reduces length of ICU stay after elective cardiac surgery. If long-term outcome can be improved by these treatment strategies needs to be clarified in the future.

GRANT ACKNOWLEDGMENT. This study was supported by an unrestricted Grant from Pulsion Medical Systems AG.

0507

PERI-OPERATIVE MICROVASCULAR FLOW AND CARDIO-PULMONARY EXERCISE TESTING IN HIGH RISK SURGICAL PATIENTS

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INTRODUCTION. Poor microvascular flow and low anaerobic threshold (AT) or peak oxygen uptake (VO_2) on a cardiopulmonary exercise test (CPET) before major abdominal surgery have been associated with poor outcomes [1, 2]

OBJECTIVE. To evaluate whether peri-operative microvascular flow in patients referred for CPET was deranged in those who went on to develop post-operative complications compared with those who did not.

METHODS. After approval by the local research ethics committee, observational data were collected prior to, within 4 h of, and 1 day after major elective abdominal or vascular surgery. Patients received routine clinical care. Clinicians were made aware of CPET data and could use it to inform care. Data included sublingual microvascular flow index (MFI) and functional capillary density (FCD) in small (<20 µm) and large (>20 µm) vessels (sidestream darkfield imaging or SDF), AT and VO_2. Data are presented as median (IQR).

RESULTS. 100 patients were recruited (72 males; age 69 years [62–78]). 83 patients proceeded to surgery (P-POSSUM 52 [32–73]). 40 (48%) developed complications and 3 (4%) died by day 28. After surgery small vessel MFI and FCD decreased in the group that developed complications (Table 1). By day 1 values had returned to baseline. There was no difference in MFI or FCD between the two groups. There was a difference between the groups for both AT and VO_2 but this was small (Table 2). No correlation was found between CPET data and any index of sublingual microvascular flow.

TABLE 1

	Microvascular changes before and after major surgery	
	Complications	No complications
Pre-operative MFI	2.9 (2.5–3.0)	2.8 (2.5–2.9)
Post-operative MFI	2.5 (2.3–2.9)*	2.6 (2.0–2.9)
Day 1 MFI	2.7 (2.3–3.0)	2.5 (2.3–2.9)
Pre-operative FCD	7.6 (6.3–8.3)	7.19 (3.7–8.3)
Post-operative FCD	5.6 (3.5–8.0)*	4.5 (1.7–7.0)
Day 1 FCD	7.8 (4.2–9.5)	5.8 (2.5–6.9)

*$p < 0.05$ Wilcoxon matched-pairs test compared to pre-operative value. FCD units = mm^{-1}

TABLE 2

	Cardio-pulmonary exercise test values according to outcome	
	Complications	No Complications
AT ml/min/kg	11.4 (9.6–13.8)	13.4 (11.3–15.0)**
VO_2 ml/min/kg	14.8 (12.6–17.3)	16.4 (13.6–19.5)*

*$p < 0.05$, **$p < 0.01$ Mann–Whitney test

CONCLUSIONS. There was a decrease in MFI and FCD following surgery in those patients who went on to develop complications. No difference was found in values obtained before surgery between this group and the group that did not develop complications.

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0508

EVALUATION OF ENDOTHELIN-1 SERUM LEVELS IN PATIENTS WITH NON-OCCLUSIVE MESENTERIC ISCHEMIA AFTER CARDIAC SURGERY

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INTRODUCTION. Non-occlusive mesenteric ischemia (NOMI) is a rare but serious complication after cardiac surgery associated with a mortality ranging from 47 to 90%. Unfortunately, the underlying mechanisms leading to this fatal intestinal ischemia are not fully understood.

OBJECTIVES. Aim of this prospective observational study was to elucidate the role of endothelin-1 (ET-1) serum levels in patients with moderate to severe NOMI after cardiac surgery.

METHODS. After approval of the local ethic committee, from 02/2010 to 01/2011 ET-1 plasma levels were determined in patients undergoing cardiac surgery preoperatively and 24 h thereafter. Plasma ET-1 levels were determined by means of Enzyme Linked Immunosorbent Assay (Assay Designs, Inc. Immunoassay Kit, Cat.No.: 900-017). All mesenteric angiographies had been accomplished within the first 24 h after surgery in case of clinical suspicion of NOMI. Angiographic images were assessed by two experienced radiologist on consensus basis with respect to vessel morphology, spill-over of contrast medium into the aorta, contrast enhancement and distension of the intestine, as well as the time of portal vein filling. All patients with NOMI were matched via propensity scores and compared with patients without NOMI.

RESULTS. During the observation period 848 patients were included in our study, whereof 46 patients (5%) developed moderate to severe NOMI after cardiac surgery. Whereas preoperative ET-1 plasma levels did not differ significantly between both groups, all patients with confirmed NOMI showed significantly higher ET-1 plasma levels after 24 h than the matched control group (14.5 + 0.8 vs. 11.9 + 0.5 pg/ml [$p < 0.05$]). Preoperatively as well as 24 h after surgery plasma levels of ET-1 were significantly higher in patients who died ($n = 11$ [24%]), compared to survivors ($n = 35$ [76%]) and the matched control group, respectively (13.7 ± 0.5 vs. 10.9 ± 0.8 pg/ml [$p < 0.05$] versus 11.0 ± 0.5 [$p < 0.05$] and 15.7 ± 0.7 versus 13.8 ± 1.1 pg/ml [$p < 0.05$] versus 11.9 ± 0.5 pg/ml [$p < 0.05$]). Additionally, the difference between survivors and the control group was also statistically significant after 24 h (13.8 ± 1.1 vs. 11.9 ± 0.5 pg/ml, [$p < 0.05$]).

CONCLUSIONS. NOMI is associated with elevated serum ET-1 levels preoperatively as well as 24 h after confirmation. Additionally, high serum levels of ET-1 are associated with increased mortality.

0509

OPTIMISING STROKE VOLUME AND OXYGEN DELIVERY IN ELECTIVE OPEN LOWER-LIMB ARTERIAL SURGERY—A RANDOMISED CONTROLLED PILOT TRIAL

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INTRODUCTION. Individualised goal-directed therapy (IGDT) has been suggested to improve outcome in patients undergoing high risk surgery [1]. Post-operative complications after elective lower-limb arterial surgery (ELAS) due to critical ischemia are common [2]. However, the effect and feasibility of IGDT in this group of patients is not clear [3].

OBJECTIVES. The aim of this study was to investigate the effect of IGDT on flow-related haemodynamic parameters and fluid-administration in ELAS.

METHODS. Forty ELAS patients were randomised to IGDT or conventional therapy. Stroke volume index (SVI) was optimised by administering aliquots of 250 ml colloid intraoperatively and for the first 6 h postoperatively. Additionally, during the first 6 h postoperatively, a level of oxygen delivery index (DO_2I) $\geq$600 ml min^{-1} m^{-2} was targeted by infusion of Dobutamine, if needed. Hemodynamic data were collected at predefined time points, including baseline (t0), intra- (t1–t3), and postoperatively (p1–p6). Volume replacements and fluid balance were recorded for the intraoperative, postoperative, and total intervention period. Perspiration and third-space losses were not estimated.

RESULTS. SVI and DO_2I levels were significantly higher throughout the intervention period in the IGDT group (45 vs. 41 and 492 vs. 419 ml min^{-1} m^{-2}, respectively, $p < 0.001$) and explicitly in the postoperative period (46 vs. 41 and 527 vs. 431 ml min^{-1} m^{-2}, respectively, $p < 0.001$). MAP, HR and hourly urine output did not differ between the groups. There were no differences in *intraoperative* volume replacements or fluid balance between the groups. In the *postoperative* phase, the IGDT group received significantly more fluids (2,375 vs. 1,450 ml, $p = 0.001$), especially colloids (500 vs. 0 ml, $p < 0.001$). The *postoperative* fluid balance was significantly higher in the IGDT group (1,491 vs 682 ml, $p < 0.001$). The *overall* fluid balance (from baseline to P6) tended to be more positive in the IGDT group (2,573 vs. 2,017 ml, $p = 0.06$).

CONCLUSIONS. These results demonstrate that perioperative individualised goal-directed therapy in elective lower-limb arterial surgery increases flow-related haemodynamic parameters and results in administration of more fluids. The effect on outcome is currently being analysed in this study material.

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0510

CARDIAC OUTPUT MEASUREMENT USING TRANSCARDIOPULMONARY THERMODILUTION AND ARTERIAL PULSE CONTOUR ANALYSIS IN SEVERE AORTIC STENOSIS AND INSUFFICIENCY: EVALUTION IN PATIENTS UNDERGOING TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI)

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INTRODUCTION. Accuracy of stroke volume (SV) measurement with transcardiopulmonary thermodilution (TCPTD) and arterial pulse contour analysis (PC) has been amply examined in different clinical settings. Unfortunately these methods are not validated in severe aortic stenosis (AS) and insufficiency (AI) and reliability in patients undergoing transcatheter aortic valve implantation (TAVI) is unknown.

OBJECTIVES. In this prospective single-center study we evaluated SV measurement using TCPTD (SV_{TD}, PiCCOplus™ system, Pulsion Medical Systems, Munich, Germany), calibrated PC ($SV_{PC\ cal}$, PiCCO plus) and uncalibrated PC ($SV_{PC\ uncal}$, FlowTrac™/Vigileo™ system, Edwards Lifesciences, Version 1.07, Irvine, CA) with transoesophageal echocardiography (SV_{TEE}, Philips/HP Sonos 5500™, Agilent, Andover, USA), serving here as clinical gold standard, in patients with severe AS and AI during TAVI.

METHODS. After approval of the ethic committee and written informed consent simultaneous measurement of SV_{TEE}, SV_{TD}, $SV_{PC\ cal}$ (via A. brachialis) and $SV_{PC\ uncal}$ (via A. radialis) was performed at predefined measurement points (M1: pre-interventional with severe AS, M2: after aortic valvuloplasty with a high degree of AI and M3: after TAVI with normal postinterventional aortic valve function) in 18 patients.

RESULTS. The bias and the lower and upper limits of agreement (LOA) for SV_{TD} was satisfying at all measurement points (M1: bias −5.03%, LOA −28.24 to +18.17%, M2: bias 2.75%, −23.80 to +29.30%, M3: bias 2.11%, LOA −13.07 to +17.30%) compared with SV_{TEE}. Furthermore the bias and LOA for $SV_{PC\ cal}$ was adequate, according to recently defined criteria [1], in patients with normal aortic valve function (M3: bias 2,06%, LOA −15.34 to +19.47%) and severe AS (M1: bias −4.21%, LOA −28.67 to +20.25%), and poor in patients with relevant AI (M2: bias 4.59%, LOA −56.60 to +65.77%). The LOA for $SV_{PC\ uncal}$ was out of the tolerable range at all measurement points (M1: bias −11.24%, LOA −64.41 to +41.92%, M2: bias −10.71%, LOA −72.47 to 51.06%, M3: bias 4.43%, LOA −41.94 to +50.80%).

CONCLUSIONS. The acceptance of SV measurement must be judged against the accuracy of the reference method (1) (SV_{TEE}), especially in the context of rapid, extensive periprocedural hemodynamic disturbances during TAVI, which are predominantly present in M2. Measurements of SV derived by TCPTD were accurate during all investigated hemodynamic situations (AS, AI, after TAVI), as were measurements by calibrated PC in AS and after TAVI. In contrast, PC (both, calibrated and uncalibrated) was not accurate in severe AI. Further, measurements of SV by uncalibrated PC were not accurate as well during AS and after TAVI.

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GRANT ACKNOWLEDGMENT. This study was solely financed by institutional sources.

0511

RESPONSE TIME OF CONTINUES CARDIAC OUTPUT TREND MONITORING TO A FUNCTIONAL HEMODYNAMIC ARREST INDUCED BY RAPID VENTRICULAR PACING DURING TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI)

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INTRODUCTION. An important characteristic of a hemodynamic monitoring device is a reliable detection of clinical significant events, ability of discrimination from hemodynamic baseline variations and a short latency period. The performance of continuous cardiac output (CCO) monitors based on arterial pulse contour analysis (PC) during profound hemodynamic changes and critical cardiocirculatory events has rarely been reported yet.

OBJECTIVES. In this prospective single-center study we evaluated the response of a calibrated ($CO_{PC\ cal}$, PiCCOplus™ system, Pulsion Medical Systems, Munich, Germany) and an uncalibrated ($CO_{PC\ uncal}$, FlowTrac™/Vigileo™ system, Edwards Lifesciences, Version 1.07, Irvine, CA) monitoring system based on PC to a functional hemodynamic arrest induced by a ventricular rapid pacing (RP) maneuver (HR 180–220/min) during transcatheter aortic valve implantation (TAVI).

METHODS. After approval of the ethic committee and written informed consent 18 patients undergoing TAVI were enrolled. In all patients measurements of $CO_{PC\ cal}$ (via A. brachialis) and $CO_{PC\ uncal}$ (via A. radialis) were performed. During the TAVI procedure RP was conducted to enable valvuloplasty and valve implantation. 37 RP-episodes longer than 10 s in 13 patients were included. A minor event was defined as a 15% decrease and a major event as a 25% decrease of the baseline CCO registered with the $CO_{PC\ cal}$, and the $CO_{PC\ uncal}$ monitoring system. For quantitative analysis we registered the response time defined as the delay from initiation of RP to detection of a minor and major event. We limited the detection period to a maximum of 60 s.

RESULTS. A functional hemodynamic arrest induced by RP lasting 17.4 ± 6.8 s (mean ± SD) was registered with the $CO_{PC\ cal}$ monitoring system as minor event in 100% and as major event in 91.9% with a latency period for minor events of 9.9 ± 4.8 s and for major events of 12.8 ± 7.0 s. In contrast $CO_{PC\ uncal}$ registered only 59.5% of functional hemodynamic arrests as minor and 40.5% as major events with a mean latency period of 31.3 ± 14.8 s for minor and 35.6 ± 13.7 s for major events.

CONCLUSIONS. Early recognition of hemodynamic changes directs adequate therapeutic responses. The detection rate for critical cardiocirculatory events induced by RP was inadequately low and with a longer delay using $CO_{PC\ uncal}$ in its present form. In contrast the detection rate was decisively higher and the response time much shorter using $CO_{PC\ cal}$.

GRANT ACKNOWLEDGMENT. This study was financed solely by institutional sources.

0512

SERUM CONCENTRATIONS OF PROCALCITONIN AFTER CARDIAC SURGERY: A MARKER OF FAST TRACK FAILURE?

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INTRODUCTION. Procalcitonin (PCT) is a poypeptide of 116 amino acids that is an early and highly specific marker of bacterial infection that causes a systemic inflammatory response syndrome (SIRS). Cardiac surgery also causes a SIRS due to several stimuli such as exposure of blood to foreign surfaces without the presents of a bacterial infection. Because of this systemic response conventional clinical investigations may be misleading in the early detection of postoperative complications.

OBJECTIVES. The purpose of the study was to elucidate serum concentrations of procalcitonin 24 h postoperatively in order to identify patients who are at risk for fast track failure after cardiac surgery.

METHODS. After approval of the local ethic committee, from 02/2010 to 01/2011 serum PCT levels were determined in patients undergoing cardiac surgery preoperatively and 24 h thereafter. We compared serum PCT levels in patients with a length of stay (LOS) in the intensive care unit (ICU) of less than 24 h ("fats track group") and patients with a LOS of more than 24 h ("fast track failure group"). Pooled variance *t* test, c^2 test of independence and Fisher's exact test were used to assess differences between means and groups for statistical significance.

RESULTS. A total of 846 patients were enrolled in the study, whereof 621 patients (73%) were discharged to the intermediate care unit on postoperative day one. 225 patients (27%) needed prolonged ICU support due to postoperative complications. Serum PCT levels of patients who were not discharged on day one postoperatively were significantly higher than in the fast track group (5.81 ± 0.8 vs. 2.4 ± 0.3 ng/ml [$p < 0.001$]. Complications that lead to this prolonged ICU stay included pneumonia, sepsis, postoperative confusion syndrome and acute renal failure.

CONCLUSIONS. These results provide evidence that PCT might serve as an early marker for fast track failure due to inflammatory complications in patients undergoing cardiac surgery.

0513

RISK FACTORS FOR PERIOPERATIVE MYOCARDIAL INFARCTION (PMI) AFTER OFF-PUMP CORONARY ARTERY BYPASS GRAFT SURGERY (OPCAB)

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OBJECTIVES. Determination of preoperative and surgical risk factors involved in PMI after OPCAB.
METHODS. The longitudinal study enrolled a cohort of patients admitted in our ICU, undergone OPCAB during 4 years (2005–2008). Variables recorded: preoperative [demographics; comorbility; recent myocardial infarction (MI); high blood pressure (HBP); pulmonary hypertension; need of emergent surgery; Euroscore, NYHA functional classification, left ventricular ejection fraction (LVEF)]; previous surgery]; perioperative: [cardiogenic shock; intraaortic balloon pump counterpulsation (IABP) pre or intraoperative] and surgical factors [sort of graft (internal mammary artery/saphenous vein); incomplete revascularization and endarterectomy (EDA)].PMI was defined according to the ACC/AHA criteria [1].Continuous variables were compared by *t* Student or Mann–Whitney test whereas binary qualitative variables were analysed by Chi-square. Multivariable study was estimated from logistic regression model. Alfa error <0.05. Odds Ratio (OR) was reported with 95% confidence interval (CI 95%).
RESULTS. We enrolled a total of 862 patients. 78.5% males, 21.5% females; mean age 67 (SD 10); Diabetes 44.5%; Previous surgery 2.4%; emergent surgery 10.9%; reduced LVEF 25.2%; NYHA III–IV 38.1%; Euroscore >5 34.4%; recent MI 37%, IABP 11%; cardiogenic shock 0.7%; EDA 5.6%; mammary graft 99%; saphenous graft 58%; incomplete revascularization 49.4%. 111 patients underwent PMI (12.9%). Global mortality rate was 5% (46/862), 20.7% due to PMI (23/111 $p = 0.001$; OR 12.01 CI 95% 6.11–23.59). Univariated analysis showed a significant association between PMI and the followed variables: No diabetes, OR 1,662 (CI 95% 1,090–2,535) $p = 0.017$; previous surgery, OR 3,004 (CI 95% 1,129–7,993) $p = 0.021$; Euroscore >5, OR 2,350 (CI 95% 1,570–3,516) p 0.001; cardiogenic shock, OR 6,888 (CI 95% 1,373–34,566) p 0.007; need of emergent surgery, OR 2,184 (CI 95% 1,281–3,724) $p = 0.03$; IABP, OR 3,831 (CI 95% 2,282–6,433) $p = 0.001$; saphenous graft, OR 1,526 (CI 95% 1,002–2,323) $p = 0.048$; EDA, OR 2,714 (CI 95% 1,388–5,307) $p = 0.002$. However at the multivariated analysis, only a significant correlation with PMI was found by: No diabetes, OR 1,638 (CI 95% 1,040–2,580) $p = 0.03$; age, OR 1,035 (CI 95% 1.01–1.05) $p = 0.003$; IABP, OR 3.89 (CI 95% 2.28–6.62) $p = 0.001$; non-use of mammary artery graft, OR 5.20 (CI 95% 1.09–24.65) $p = 0.038$; EDA, OR 2.64 (CI 95% 1.21–5.76) $p = 0.014$.
CONCLUSIONS. In our patients, the incidence of perioperative myocardial infarction after off-pump coronary artery bypass grafting surgery is 12.9% with an associated mortality rate 12 times higher than patients who did not submit, and risk factors associated were: age, not being diabetic, need of intra-aortic balloon pump counterpulsation preoperative or intraoperative, non-use of mammary artery graft and performing endarterectomy.
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0514

LACTATE AND BIOCHEMICAL MARKERS RELEASE AFTER ATRIAL FIBRILATION ABLATION CONCOMITANT WITH CARDIAC SURGERY VS CARDIAC SURGERY

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INTRODUCTION. Surgical ablation of atrial fibrillation (AF) using crioablation or bipolar radiofrequency (BRF) allows recovery of sinus rhythm in patients with AF who undergo open-heart surgery. Few data about the release of cardiac necrosis biomarkers after surgical ablation concomitant with cardiac surgery have been reported.
OBJECTIVES. We sought to evaluate the profile of biochemical markers of myocardial damage and lactate after surgical ablation and its correlation with postoperative complications and length of stay (LOS) compared to cardiac surgery alone.
METHODS. Observational prospective study. We studied patients who underwent AF ablation concomitant to cardiac surgery (group A) and patients without AF ablation (group B). Surgical AF ablation was performed with endo-epicardial Maze III pattern using crioablation or bipolar RF as sources of energy. The following data was collected and compared between groups: surgical procedure; serial biochemical markers:lactate, troponines and CPK-MB at 1, 6, 12 and 24 h postsurgery; ICU and hospital LOS and postoperative complications. Statistical analysis: data expressed as mean + standard deviation. *T* student test for paired data and χ^2 for qualitative data.
RESULTS. To abstract date 45 patients were enrolled: 30 in group A and 15 in group B. There were no differences in demographic data and surgical procedure performed. We detected statistically significant abnormally high concentrations of lactate, troponines and CPK and CPKmb in group A compared to group B not related to the presence of low cardiac output state or ischemic events. ICU-LOS and hospital LOS were statistically shorter in group A. We observed statistically significant higher rate of postoperative ventricular dysfunction in group B. We did not observe differences in other postoperative complications (*$p < 0.05$).
CONCLUSIONS. AF ablation concomitant with surgery is associated with elevation of lactate, troponines, CPK and CPKmb with no evidence of higher rate of hypoperfusion state or ischemic events maybe related to specific interaction energy-tissue. Nevertheless, surgical AF ablation correlates with shorter ICU-LOS and hospital LOS. Biochemical markers and lactate could not differentiate patients with hypoperfusion state or coronary ischemia in this subgroup of patients. Their prognostic value remains unclear.

Biochemical markers

Biochemical markers	Lactate (mmol/L) 1 h p.o	Lactate (mmol/L) 6 h p.o	Lactate (mmol/L) 12 h p.o	Lactate (mmol/L) 24 h p.o	Troponines (pg/ml) 1 h p.o	Troponines (pg/ml) 6 h p.o	Troponines (pg/ml) 12 h p.o	Troponines (pg/ml) 24 h p.o
Group A	3.1 ± 1.6*	3.7 ± 2.2*	4 ± 2.7*	2.9 ± 2.1*	28.8 ± 27.3*	39.6 ± 36.9*	32.9 ± 25*	21.2 ± 21.8
Group B	2.1 ± 0.6	2.4 ± 1.5	2.3 ± 1.8	1.8 ± 1.3	7.7 ± 11.3	15.3 ± 23.9	11.5 ± 10.1	5.4 ± 4.5

Postoperative variables

Postoperative variables	Group A	Group B
Hospital los (days)	9.2 ± 3.3	12 ± 13*
ICU-LOS (days)	4.4 ± 1.7*	4.9 ± 2.4*
Endotracheal intubation Time (h)	13.1 ± 15.5	13 ± 7.2

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0515

THE EFFECT OF LEVOSIMENDAN ON MORTALITY RATES IN HIGH RISK PATIENTS

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INTRODUCTION. Levosimendan is a calcium-sensitizing inotropic drug. It acts in two ways; firstly it sensitises Troponin C to calcium enhancing myocardial contractility without substantial changes in oxygen consumption. Secondly, it activates the adenosine triphosphate-sensitive potassium channel, producing vasodilatory effects decreasing preload and afterload. This has both anti-ischaemic and cardioprotective effects [1, 2]. Levosimendan's use improves mortality post-operatively in both cardiac surgical patients and those with left ventricular failure post-myocardial infarction [3, 4]
OBJECTIVES. To review the use of Levosimendan in University Hospitals Bristol following the introduction of local guidelines to establish whether there was any mortality benefit in our patient population.
METHODS. All patients who had received Levosimendan on the cardiac and general intensive care units between June 2009 and January 2011 were identified using our clinical information system. A total of 27 patients were identified; 21 cardiac surgical patients and 6 cardiology patients. We analysed mortality at 30 days and 6 months using the Chi-squared test to compare patient mortality rates to expected mortality rates based on APACHE II score (medical patients) or Logistic Euroscore (surgical patients).
RESULTS. 21 surgical patients had received Levosimendan. 18 patients underwent cardiopulmonary bypass (CPB); 5 received Levosimendan pre-CPB, 9 during CPB and 4 post-CPB. Of the 6 medical patients, 4 were post-primary percutaneous coronary intervention (2 post-myocardial infarction, 2 post-cardiac arrest), 1 patient had acute biventricular failure and 1 was awaiting heart transplantation. Left ventricular (LV) function was poor in 70.4%, moderate in 18.5% and good in 11.1% of patients. An intra-aortic balloon pump was required in 63% of patients. Fifty percent of patients showed an improvement in inotrope requirements at 24 h but no improvement was seen in LV function in 81% of patients with Levosimendan use. Complications included hypotension (18.5%), arrhythmias (30%) and cardiac arrest (7.4%).

Mortality rates for patients on Levosimendan

	Median age in years (range)	Euroscore (median (range))	APACHE II score (median (range))	Predicated mortality (%) (median (range))	30 day mortality (%) (median (range))	6 month mortality (%) (median (range))
Cardiology patients (n = 6)	60 (35–68)		22 (17–24)	61.1 (37.6–77.3)	50.0*	66.6*
Cardiac Surgery patient (n = 21)	66 (33–82)	12 (6–24)		26.34 (4.4–91.18)	28.6*	33.3*

* Not statistically significant to predicted mortality using Chi-squared test

CONCLUSIONS. Since the introduction of Levosimendan into our hospital we cannot show a mortality benefit for its use in both our surgical and medical patients but our sample size is small on patients with high predicted mortality.
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0516

POSTOPERATIVE C-REACTIVE PROTEIN AS PREDICTOR FOR MYOCARDIAL DAMAGE, MULTIPLE ORGAN DYSFUNCTION, AND ICU LENGTH OF STAY, AFTER PRIMARY CORONARY ARTERY BYPASS GRAFTING

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INTRODUCTION. C-reactive protein (CRP) is the most extensively studied inflammation biomarker in cardiovascular diseases. It's already known that the preoperative CRP is a predictor for cardiovascular events, long term mortality and the in hospital length of stay after coronary artery bypass grafting (CABG) surgery.
OBJECTIVES. The present study examined the correlation between postoperative CRP levels and markers of myocardial damage, multiple organ dysfunction, and the length of stay in ICU after primary CABG-only surgery
METHODS. Ninety four patients undergoing CABG between May 2009 and June 2010 were served as development set. The length of stay in ICU was taken into account as studied outcome. Samples: Peripheral blood samples (5 ml) without anticoagulant were taken 2 and 24 h after intervention, centrifuged at 3,000 rpm, 25°C, for 10 min. Isolated serum was immediately used for CRP and troponin 1 (cTnI) measurements. Assays: Serum CRP (mg/dl) was measured by laser nephelometry and cTnI (μg/l) by Enzyme Linked Immuno-Sorbent Assay (ELISA). Sequential Organ Failure Assessment (SOFA) score was estimated (1) 2 and (2) 24 h after surgery and calculated according to Vincent JL et al. (1996). Statistics: Data were analyzed with Graph Pad 5. Wilcoxon non parametric test and Spearman correlation coefficient between parameters were applied. P value <0.05 was considered as significant.
RESULTS. CRP levels 2 h post surgery (CRP1) showed a significant correlation with CRP and SOFA at 24 h after intervention, CRP2 and SOFA2, $P = 0.01$, Fig. 1 and $P = 0.01$, Fig. 3 respectively. cTnI and SOFA 2 h post surgery, cTnI1 and SOFA1, were significantly correlated with CRP1, $P = 0.02$, Fig. 2 and $P = 0.007$ Fig. 4 respectively.
The length of stay in ICU was significantly correlated with SOFA2 ($P = 0.005$) but not with CRP.

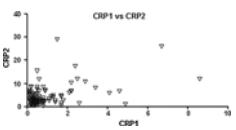

Fig. 1 CRP1 versus CRP2

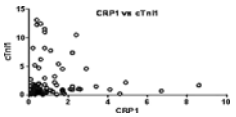

Fig. 2 CRP1 versus cTnI1

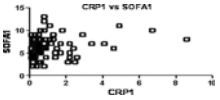

Fig. 4 CRP1 versus SOFA1

CONCLUSIONS. Early postoperative CRP concentrations could be assessed as markers to identify patients with severe myocardial damage and multiple organ dysfunction, undergoing CABG surgery. Previous reports have already confirmed the correlation between the postoperative increase of cTnI release and the postoperative morbidity and mortality. SOFA score could account for prediction factor of ICU stay.
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0517

ALBUMIN LEVEL IS AN INDEPENDENT PREDICTOR FACTOR OF COMPLICATIONS AFTER CARDIOVASCULAR SURGERY

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INTRODUCTION. Hospitalized patients are more vulnerable to suffer malnutrition and this is associated with an increased postoperative complications.

OBJECTIVES. To describe the nutritional status and assess its effect on morbi-mortality.

METHODS. Prospective observational cohort study of 124 consecutive patients between November of 2007 and February of 2008. Younger than 18, immunocompromised and emergency surgery patients were excluded for analysis. Relationships with complications were evaluated for the following variables: age, gender, lifestyle risk factors and pre-existing comorbidities (cardiac heart failure, diabetes, dyslipemia, hypertension, obesity (defined as CMI >30 kg/m^2), chronic kidney failure, NYHA classification), pharmacological treatments (betablockers, statins, digital, ACE, diuretics), Parsonnet score, type of surgery (valvular or coronary), time of ischemia, time of extracorporeal circulation. Nutritional status was defined in function of albumin, transferrin, limphocytes, CMI and prealbumin levels. Discrete variables were expressed as counts (%) and continuous variables as mean and standard deviation (SD). Differences in categorical variables were calculated using two-sided likehood ratio χ-square test or Fisher's exact test, and the Mann-Withney *U* test or Student t test for continuous variables, when appropriate. Data analysis was performade using SPPS for Window 15.0.0 (SPSS, Chicago, IL).

RESULTS. Out of 124 patients were included. 48.4% were women, the mean age was 65 $\pm$ 11 years. The frequency of comorbidities and pharmacological treatments were: hypertension 61%, chronic kidney failure 8%, diabetes 25%, dislipemia 40.5%, obesity 29%, betablockers 39.5%, statins 40.3%, ACE 46.8%, Parsonnet score 16.8 $\pm$ 9.7 points. The mean serum albumin was 3.6 $\pm$ 0.5 mg/dl. After logistic regression, albumin levels lower than 3.5 mg/dl resulted to be an independent predictor factor of hydrothorax (OR 4.44 95% CI 1.88–10.50, p 0.001), ARDS (OR 13.82, 95% CI 1.64–116.34, p 0.03), heart failure (OR 2.62 95% CI 1.15–5.99, p 0.02), cardiogenic shock (OR 4.05 95% CI 1.29–12.74, p 0.01), nosocomial pneumonia (OR 2.6 95% CI 1.10–6.14, p 0.02), SIRS (OR 2.38 95% CI 1.07–5.29, p 0.03)4, sepsis (OR 4.74 95% CI 2.08–10.77, p 0.000), septic shock (OR 10.47 95%CI 2.46–44.46, p 0.001), postoperative bleeding (OR 2.68 95%CI 1.26–5.68 p 0.01) and acute renal failure (OR 5.04 95% CI 1.76–14.41, p 0.003).

CONCLUSIONS. Serum albumin lower than 3.5 mg/dl is an independent predictor factor of complications in cardiovascular surgery. We should improve the nutritional status before surgery.

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0519

ACCURACY OF PREOPERATIVE BOOKING REQUESTS FOR CRITICAL CARE BEDS IN ELECTIVE SURGICAL PATIENTS

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INTRODUCTION. Valuable commodities have to be used in the most efficient manner possible. The availability of critical care beds is one such scarce resource.Traditionally many types of post surgical patients have level 3 beds booked postoperatively. We felt that a significant proportion did not require such high level care and that these requests were causing delays to surgery due to shortages of ITU beds.

OBJECTIVES. To determine the extent of care required by postoperative elective surgical patients and the accuracy of preoperative booking requests for HDU and ITU beds.

METHODS. We performed a retrospective audit of all elective surgical admissions to the critical care ward at the Bradford Teaching Hospitals NHS Foundation Trust between the first of January 2009 and the first of March 2010.

Maximal level of care data was gathered from the critical care minimum data set. The requested preoperative level of care was obtained from the ITU booking diary. The data sets were combined to highlight differences between the intended and the actual care provided. For all patients receiving level 3 care the patient notes were examined.

RESULTS. There were 264 elective surgical admissions. 40% (107) booked as ITU, 45% (118) HDU and 15% (39) did not indicate a preference. Of those requesting an ITU bed, 90% (95) required only HDU care during the first 24 h. 95% (247) of all elective admissions to the critical care unit required HDU care and only 4% (15) needed ITU support within the first 24 h. Ten cases required level 3 care after the first 24 h. Only five were booked as ICU cases.

CONCLUSIONS. Preoperative bed requests are not predictive of the need for post operative ITU care.

The majority of post operative patients require at most level 2 support. Over estimation of care can delay the start of surgery, reducing theatre efficiency and cause postponement due to a lack of beds.

Postoperative care in level 2 facilities is safe and effective [1] or can be achieved as part of an overnight intensive recovery program [2, 3]. This relieves pressure on ITU beds allowing them to be appropriately utilised.

We introduced the guide line: All elective surgical admissions should be booked as HDU patients, unless there is a compelling indication for post operative ventilation. This has reduced delays in obtaining critical care beds and has reduced the possibility of cancelation due to bed shortages.

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Patient, family, staff comfort & satisfaction: 0518–0525

0518

A PSYCHOLOGIST FOR NURSES AND NURSE-ASSISTANTS IN AN ICU: IMPACT ON THE BURNOUT AND THE ANXIETY OF THE CAREGIVERS

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INTRODUCTION. ICU caregivers are facing a demanding job with a high level of technology, a stressful environment and a high work load. They are at high risk of developing anxiety, depression and a burnout syndrome(BOS) [1]. These psychological distresses can impact on their welfare, performances and patients' care [2]. BOS favours absenteeism and job-leave from ICU, whereas the shortage of ICU caregivers already started.

OBJECTIVES. To evaluate the impact of the intervention of a psychologist on anxiety, depression and BOS of ICU nurses and nurse-assistants.

METHODS. Randomised, controlled, single blind study. Two psychologists lead problem-based weekly sessions in small groups of caregivers with a systemic approach during 9 months. Individual meetings with one of the psychologists were optional. Anxiety (HA)-depression (HD) and BOS were assessed by HADS and MBI respectively, before and after the intervention.

RESULTS. Out of 170 caregivers of a tertiary ICU of 36 beds, 99(58%) responded the questionnaires before and after. Nurses: 77/99(78); Nurse-assistants:22(22); Men:24(24); Age <40 years old:72(73); Occupational rate 100%:54(55); Intervention Group(**IG**):41(41); Control Group(**CG**):58(59).

IG: Scores mean(SEM):HA:before 7(17)/after 5(13); HD:0/2(5); MBI:−14.5(2.98)/−19.4(2.61) $p < 0.05$; Exhaustion:16.3(1.83)/13.4(1.54); Depersonalisation:6.49(.87)/4.7(.65) $p < 0.01$; Accomplishment:36.8(.98)/37.5(1.06). Proportions N(%) of severe anxiety (HA > 8):7(17)/5(13); severe depression(HD > 8):3(5)/2(4); Severe BOS(MBI >−9): 15(27)/14(25).

CG: Scores mean(SEM):HA: before 6.5(.43)/after 6.7(.45); HD:4.2(.45)/3.8(.41); MBI:−15.8(2.33)/−18.5(2.07); exhaustion:16.9(1.45)/15.1(1.35); depersonalisation:5.3(.77)/5.0(.58); Accomplishment:38.1(.87)/38.7(.78). Proportions N(%) of severe Anxiety:7(13)/11(19); severe depression:0/2(5); severe BOS:15(41)/9(22).

HADS and MBI scores tended to decrease for the whole cohort of caregivers. The scores did not differ significantly between the groups at any moment. The scores of BOS decreased significantly after the intervention, whereas not in the CG.

In parallel, the ICU activities during the 3 time periods of 3 months, Before, During, After were: mortality(%): 8.8, 8.3, 13.0 ($p = 0.009$); mean ICU admissions/month:272, 242, 173; mean SAPS:39, 37, 37; mean PRN:166, 167, 166, respectively.

CONCLUSIONS. Up to 32% of ICU nurses and nurse-assistants show high risk of BOS, and up to17/4% show signs of anxiety/depression. After the intervention by psychologists, the scores of BOS decreased significantly whereas it was unchanged in the control group. Also, the anxiety-depression scores tended to decrease more in the IG, although there was no statistical significance. The presence of psychologists might help to care for the caregivers. Further investigation is needed for testing their usefulness for physicians.

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GRANT ACKNOWLEDGMENT. Institutional funds.

0520

TELEPHONE-BASED COPING SKILLS TRAINING FOR ACUTE LUNG INJURY SURVIVORS & THEIR INFORMAL CAREGIVERS

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INTRODUCTION. Acute lung injury (ALI) mortality is decreasing over time, yet ALI survivors continue to demonstrate dramatic emotional and physical disability. Similarly, the majority of the friends and family members who provide informal caregiving to ALI patients also experience psychological distress. Unfortunately, there are few interventions aimed at improving this growing population's psychological distress. We previously showed that the ability to cope with ALI-associated dysfunction is deeply important to ALI survivors' well being [1]. However, most survivors report infrequent use of coping skills and low self-efficacy—patterns that are associated with increased psychological distress.

OBJECTIVES. To address this problem, we aimed to pilot test a novel caregiver-assisted, telephone-based ALI coping skills training (CST) intervention.

METHODS. We enrolled 20 ALI subjects (10 patient-caregiver dyads). A trained nurse interventionist provided CST in 12 weekly, 30 min sessions lasting $\sim$30 min. We measured depression and anxiety (HADS), PTSD symptoms (PTSS), self-efficacy, and coping frequency (COPE) pre- and post-intervention.

RESULTS. Three enrolled dyads did not begin the intervention: one patient died before hospital discharge, one was readmitted and withdrew consent, and one was lost to follow up. Importantly, all 14 subjects who began the CST protocol completed it. Subjects were diverse in age (range 40–72), race and ethnicity (7 whites, 6 African Americans, 1 Hispanic), as well as gender (57% female). Caregivers included spouses (70%), parents (15%), and siblings (15%). Subjects had reductions in HADS and PTSS scores that exceeded instruments' minimal clinically important differences as well as improvements expected over time based on past research. In addition, improvement in HADS scores was highly correlated with pre- to post-treatment improvements in both self-efficacy ($r = 0.79$) and frequency of adaptive coping ($r = 0.66$). PTSS improvements were also associated with improved self-efficacy ($r = 0.67$) and adaptive coping ($r = 0.51$). COPE domains with the greatest improvement were active, emotional support, and planning. Furthermore, subjects described CST in qualitative analyses as "life changing" and "incredibly rewarding...I use these techniques daily."

CONCLUSIONS. This pilot shows that CST can improve coping and self-efficacy, which in turn reduces psychological distress. Because these uncontrolled data represent only three centers' experience and could be confounded by case-mix and temporal trends, a multi-center RCT is needed to confirm and extend these results.

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GRANT ACKNOWLEDGMENT. NIH Grant K23 HL081048-03.

0521

THE CHANGE IN THE WORKING CLIMATE OF CRITICAL CARE AND ACUTE CARE NURSES BETWEEN 2003–2008

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INTRODUCTION. Nurses working in demanding areas such as emergency department, intensive care unit or acute medical and surgical settings are likely to spend a lot of time during their working day in intense interactions with people. The nature of these settings is often physically and psychologically demanding.

AIM. This study aims to assess several aspects of working climate of hospital nurses and to identify the most changing factors in a 5 year period of time.

METHODS. A self fill in questionnaire was administered to critical care and acute care nurses in two cross-sectional surveys in five Hungarian hospitals in 2003 and in 2008 ($n_{2003} = 425$; $n_{2008} = 104$). Critical care nurses were defined as working in emergency department and in intensive care units, while acute care nurses were involved from the different medical-surgical units, like: casualty, surgery, urology, internal medicine, cardiology, neurology. Further inclusion criteria were to work in the given department at least 2 years in a bedside direct patient care in nursing position. Beyond the sociodemographic questions the working atmosphere was measured with different items in a Likert-type scale (5 = very positive/friendly; 1 = not at all positive/unfriendly). SPSS 15.0 were used for statistical analysis; Pearson's chi-squared test, Mann–Whitney *U* test and Spearmans's rho were calculated. The significance was considered to be significant at 5%.

RESULTS. The education level of nurses raised in the examined period (academic degree from 9.8% up to 13.15%). Gender Collegial help was scored more higher among critical care nurses between 2003 and 2008 (3.82 vs. 4.14; $p = 0.03$), although acute care nurses find it almost same (3.89 vs. 3.97; $p = 0.45$). Both group evaluated the control over doing their work significantly more favourable (critical care nurses: 2.44 vs. 3.48 $p = 0.00$; acute care nurses: 2.59 vs. 3.37 $p = 0.00$). Taking altogether into consideration critical care nurses does not feel too much change in the working atmosphere (3.87 vs. 3.68 $p = 0.14$). However acute care nurses deem slightly worsening in their working climate (3.87 vs. 3.35 $p = 0.00$). In both group the work load due to the lack of appropriate and enough nursing tools increased significantly ($p < 0.01$) while the moral acknowledgement and financial appreciation ($p < 0.01$).

CONCLUSION. The quality of nursing care is sorely based on the optimal working climate including nursing tools and satisfaction with the work. During 5 year span the nurses' working climate in critical and acute care setting worsened in many aspects which needs urgent intervention.

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0522

PTSD AND DRUG USE AMONG AMBULANCE WORKERS

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INTRODUCTION. Wide range of literature deals with the enormous strain of ambulance workers what might lead to mental health problems. Drug usage can be a solution as coping mechanism.

OBJECTIVES. This study aims to assess the mental health status of ambulance workers; incidence rate, severity of post-traumatic stress disorder and its influencing factors and coping mechanisms.

METHODS. A representative sample of 121 participants was taken from 9 ambulance stations between September 2009 and January 2010 in Hungary. Inclusion criteria were working in direct patient care. The respondents were asked anonymously with a self-made questionnaire on a voluntary basis, which was an integral part of the John Briere, Marsha Runtz developed by the Trauma Symptom checklist-40, except for sexual dysfunction parts. It has included sociodemographic, drug and illegal drug use and other Addictions for coping with stress were also recorded. Issues relating to harmful behaviour questions. The data were processed in SPSS 13.0 software, in which Chi-square test, *T* test, and ANOVA was carried out.

RESULTS. In the sample 10 women and 111 men participated. Out of them 86 workers experienced some traumatic event in the last 2 years (71.1%). A lot of them were affected by accidents involving children ($p = 0.002$). The majority of ambulance workers shared their problems with their colleagues ($p = 0.003$) or with their families ($p = 0.002$). The respondents reached an average of 18 points on the standard PTSD intensity scale (maximum score 61 minimum score 0). More than half of them deem their mental health very important (76%). They would ask a professional help to overcome the accumulated stress ($p < 0.001$). 8 people of them (6.6%) use some substance to relief stress (tranquilizers, sleeping pills, alcohol). This correlates with higher score on the PTSD scale significantly ($p < 0.001$), and in a milder stage of PTSD respondents use significantly less substance ($p < 0.001$). In the study, 28 people (23.1%) admitted having consumed illegal drugs during their lifetime. Only one of them was a regular user.

CONCLUSIONS. Analysing the psychosocial strain among prehospital ambulance staff it has been proven that they are at risk of developing posttraumatic stress disorder. Ambulance workers sometimes cope with illegal drugs but not on a regular basis. Majority of them use legal substances like alcohol, sleeping pills and prefer to talk to other colleagues of friends. They are aware of the importance of their mental health and the need for professional help.

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0523

THE AMC LINEAR DISABILITY SCORE (ALDS) FOR EVALUATION OF PHYSICAL RESERVE ON ADMISSION TO THE ICU: CAN WE QUERY THE RELATIVES?

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INTRODUCTION. The Academic Medical Center linear disability score (ALDS) is a recently developed generic item bank which measures functional disability of patients with a broad range of diseases, as expressed by the ability to perform activities of daily living [1].

OBJECTIVES. We aimed to study, whether proxy scoring with the ALDS could be used to assess the patients' functional status on admission for cardiac care (CCU) or intensive care (ICU) patients and how the ALDS relates to the physical component score (PCS) using the Short-form-12 (SF-12).

METHODS. Prospective study involving direct interviews of patients and relatives during ICU and CCU stay in a 12-bed mixed ICU and a 10-bed CCU. Patients and proxies completed the ALDS and SF-12 in the first 72 h following ICU elective surgery (n = 14), ICU emergency admission (n = 56) and CCU emergency admissions (n = 70).

RESULTS. In all patients (n = 140) a significant intra-class correlation was found for the ALDS score (0.857) the PCS (0.798), and mental component score (MCS) (0.679) between patients and their proxy. Bland–altman analysis showed acceptable limits of agreement between patients and proxies for the ALDS-score. In both scheduled and emergency ICU admissions, a significant correlation was found between patient and their proxy for the ALDS score, although a lower correlation was found for the ICU scheduled admissions (0.755), compared with the ICU emergency admissions (0.889). In CCU patients a significant correlation between patients and proxies was found for the ALDS (0.855), PCS (0.807) and MCS (0.740).

CONCLUSIONS. Relatives in close contact with critically ill patients can adequately reflect the patient's level of disability on ICU and CCU admission when using the ALDS item bank. When comparing the physical disability score of the ALDS item bank with the physical component score (PCS) of the SF-12, the highest correlation between patients and their proxies was found using the ALDS item bank.

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0524

NOISE IN THE ICU IS NOT REDUCED IN A MODERN BUILDING: A BEFORE-AFTER ASSESSMENT

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INTRODUCTION. Intensive Care Units are environments with multiple noise sources. The 2009 French consensus conference "Living better in the ICU" [1] recommends to measure noise levels, modulate the intensity of alarms, and develop a policy to reduce noise. Our ICU moved from a construction renovated in 1993 to a new building in March 2011.

OBJECTIVES. To assess the impact of a modern construction on noise levels and determine factors that could be improved.

METHODS. Ten bed medical-surgical ICU. The rooms were around 15 m^2 in the 1993 ICU and 21 m^2 in the 2011 ICU. Unlike the 1993 ICU, the 2011 ICU has phonic isolation of the windows and doors and air conditionning. We assessed noise with a data logger 8,852 si sound level meter. We measured minimal and maximal values in dB (A) over 5 min, at different locations of the two ICUs before and after moving, in March 2011. In rooms, the microphone was put at the patient's head and oriented to mimic auditory perception. Measurements were performed with and without patient in the rooms, and with closed or open doors. We also measured noise peaks induced by human voices or machines.

RESULTS. In the absence of alarm or people speaking, the table shows that minimal noise values are very high in both ICUs, and constantly higher in the new ICU. This may be attributable to the presence of mechanical air conditioning.

Noise in the absence of alarm or people speaking

Room	Door	Value	Noise in dB(A)	
			1993 ICU	2011 ICU
With patient	Open	Min	46	54
		Max	57	57
	Closed	Min	43	54
		Max	51	55
Without patient	Open	Min	35	43
		Max	NA	50
	Closed	Min	35	41
		Max	NA	47

The peaks of noise induced by alarms or voices inside the rooms were between 69 and 85 dB (A) in each ICU. In the 2011 ICU, the noise induced by a medical visit outside a room is 51 dB (A) when the door is open and 43 dB (A) when the door is closed.

CONCLUSIONS. To build a modern ICU was not associated with a reduction in noise level. Noise is mainly due to air conditioning, alarms and voices from inside the room.

Noise reduction requires sensitizing the team to alarm management and voice volume, particularly inside the patient's room.

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0525

PATIENT SATISFACTION IN THE CRITICAL CARE UNIT: A QUALITATIVE PHENOMENOLOGICAL STUDY

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INTRODUCTION. Our understanding and advancement of patients experience and satisfaction with care forms a pivotal role in modern healthcare (Otani and Harris 2004). Experiences are best explored using qualitative interview techniques (Silverman 2009), such as phenomenological interviewing. Critical care unit environments are well-documented for their associations with delirium, and psychological morbidity (Griffiths et al. 2007; van Rompaey 2008).

OBJECTIVES. Alongside ascertaining experiences of critical care, this study also aimed to establish any issues around being in a temporary critical care unit environment.

METHODS. A hermeneutic phenomenological approach was taken. Phenomenology qualitatively explores a person's experience and their personal meanings from those experiences, considers the structure of a person's subjective experience and looks for patterns that are shared by particular instances or experiences (Polit and Beck 2009). A purposive sample of patients was interviewed to explore experiences and to gain their meanings of their stay in critical care in a temporary unit, during main critical care unit relocation and rebuild.

FINDINGS. Eight patients were recruited into the study from January 2009–August 2009. All participants recruited to the study were in-patients in the temporary unit and had a length of stay of at least 48 h. In-depth interviews were carried out in patients' homes around a month after discharge. Six main themes were established from the phenomenological study of satisfaction experiences and included: 1. *Experiences of critical care,* 2. *Coping with the present,* 3. *Critical care unit environment,* 4. *Relationships: staff and family,* 5. *Communication issues,* 6. *Impact of negative experiences.*

Patients' perceptions of their experiences of critical care were varied but included: feelings of fear, being disorientated and finding it hard to adjust to the alien environment. The temporary unit, while providing a challenge to patients in terms of orientation, light and space, had surprisingly few psychological implications, which contrasts with what might be expected for these patients.

CONCLUSION. Experiences in critical care had an impact on their levels of satisfaction, with bad experiences adversely affecting perceptions of satisfaction. However, staff facilitated a more pleasant experience through their demeanour and careful explanations. This ameliorated the psychological and environmental challenges of being a patient in a temporary critical care unit.

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ICU patient safety 1: 0526–0538

0526

EVALUATING (POTENTIAL) PREVENTABLE MORTALITY IN AN ADULT ICU

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INTRODUCTION. Critical care is still associated with high mortality. Following the publication of the report "to err is human" it has been recognized that delivering the right care at the right moment in a safe way might have a greater impact on outcome of patient care than new technology. As a consequence measuring outcome parameters has got a tremendous boost. Standardised Mortality Ratio (SMR) is the most used outcome parameter in the ICU. However this measure can only be used as a screening tool. It gives us no information about preventability. In our ICU we believed that despite a low SMR, there might be some preventable deaths from which we can learn. Therefore we tried to find a way to evaluate (potential) preventable mortality in our daily ICU practice.

METHODS. After an explanatory meeting in which the aims of the study were explained, the attending staff-intensivist was asked to evaluate preventability each time a patient died in our ICU. If death was considered (potential) preventable the intensivist was also asked to judge in which domain preventability was present. Our ICU is a 47-bed mixed adult ICU in a tertiary teaching hospital. The study started in October 2010. All ICU-deaths were included. Our ICU participates in the National ICU Evaluation (NICE) in the Netherlands. Included patients were evaluated for APACHE IV scores and chance of death. These data were compared with the preventability scores during the period October–December 2010.

RESULTS. In this period our ICU-mortality was 8.9% (71 patients). Mean expected mortality based on APACHE IV-score was 15% (confidence interval 0–57%). SMR was 0.73(range 0.44–1.16). The mean SMR of the participating ICU's based on the NICE-registry in the Netherlands was 0.75. Nine patients died with a chance of dying based on APACHE IV <0.20. From this group 8 deaths were considered not preventable and one death was considered potentially preventable. In the whole group of 71 deceased patients, death was considered (potentially) preventable in 12 patients.

CONCLUSIONS. An APACHE IV-based chance of dying <0.20 is not usefull as a screening tool for (potential) preventable mortality in the ICU. Therefore all deceased patients should be evaluated. Evaluating preventability in ICU-deaths adds more information to outcome measurement data and might be a way to get more tools which can be used to further improve our patient care.

0527

COULD WE REDUCE DELIRIUM OCCURRENCE IN THE CRITICALLY ILL: RESULTS OF AN INTERVENTIONAL STUDY

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INTRODUCTION. A wide variability in the approach towards Delirium in the critically ill results from the dearth of prospective randomised studies [1, 2].

OBJECTIVES. We performed this two-stage prospective observational study to assess Delirium occurrence and its predictors.

METHODS. Luigi Sacco is a tertiary referring University hospital in Milan, Italy with a 8 bed ICU. All the patients admitted to our ICU from February–December 2008 without pre-existing cognitive disorders, dementia, psychosis and severe strokes. The first step—February–June 2008—was the observational phase (I-ph), whereas the second one—July–December 2008—was interventional (II-ph). Patients in both phases were managed with standardised sedation protocol; twice per day, CAM-ICU was used for delirium assessment, whereas pain was measured using Numerical Rating Scale. Intervention was based on a re-orientation strategy of patients applied only during II-ph.

RESULTS. We admitted a total of respectively 170 (I-ph) and 144 (II-ph) patients with a median (IQR) age of respectively 70 (56–78) and 69.5 (56.5–78.5) years. The Delirium occurrence was significantly lower in (II-ph) 22 vs. 35.5% in (I-ph) ($p = 0.020$). A Cox's proportional hazard model found the applied reorientation strategy as the strongest protective predictors of Delirium: (HR 0.504, 95% C.I. 0.313–0.890, $p = 0.034$), whereas age (HR 1.034, 95% CI: 1.013–1.056, $p = 0.001$) and sedation with midazolam plus opiate (HR 2.145, 95% CI: 2.247–4.032, $p = 0.018$) were negative predictors.

CONCLUSIONS. A timely and appropriate re-orientation strategy seems to be correlated with significantly lower occurrence of Delirium.

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0528

INVESTIGATING THE FREQUENCY AND VOLUME OF BLOOD SAMPLING IN CRITICAL CARE PATIENTS IN AN ATTEMPT TO REDUCE IATROGENIC ANAEMIA

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INTRODUCTION. Anaemia is a common occurrence in critical ill patients due to a variety of causes. Frequent blood sampling for diagnostic testing can lead to Iatrogenic Anemia. The average blood loss is between 40 and 52 ml per 24 h.

OBJECTIVES. We aimed to observe the practice of blood sampling in Critical Care patients. To audit the frequency and indication of blood sampling in different categories of Critical care patients and assess if blood sampling is appropriate with the aim of reducing sampling related blood loss.

METHODS. We carried out a prospective audit over 3 weeks in an Intensive care unit. A data collection sheet was filled in on a daily basis for arterial blood gases and laboratory bloods. Using the variables 'Routine', 'Doctor's request', 'Weaning', 'Abnormal result earlier', 'Electrolyte, Hb. BM' or 'Following replacement', as a reason for the sample. Results were timed and tallied by the critical care staff. Organ support of each patient was documented and day of stay in ICU. All patients in the ICU were included, no exclusions.

RESULTS. The ratio of male to female was 3:9. 42 completed audit forms in 3 week period. All level 2 or 3 patients: 33 patients had Ventilatory support, 5 on continuous dialysis and 9 had neither. Average of 8 ABGs per patient per 24 h day were performed in ventilated patients and 5.6 in non-ventilated patients. More than 50% documented 'For weaning' and 18% for 'Routine'. A significant proportion of laboratory blood tests done carried out >1/day as a routine request (in descending order) CRP > Bone Profile > U&E > Amylase > LFT > FBP > coagulation screen. Greater than 70% of FBP were 'Routine', 74% coagulation screen were 'Routine' and 59% U + Es were 'Routine' with 27% U + Es performed after replacement. 61% of bone profile bloods were 'Routine' with 30% 'following replacement' and 85% LFTS routine. Approximately 49.8 ml of blood per patient per day was extracted for diagnostic blood tests. Taking into consideration the cost implication of these tests. Using the average number of samples per day gives an average of £56.32 per patient per day.

Number of blood samples

Blood test	Mean/day (total sample)	Range
ABG	6.8 (286)	4–12
U + E	2.5 (105)	1–4
Bone profile	2.5 (105)	1–4
FBP	1.7 (72)	1–3
CRP	1.7 (72)	1–3
LFT	1.6 (66)	1–3
Coag	1.5 (62)	1–3
Amylase	1.5 (64)	1–2

Blood loss per day per patient

Blood sample	Mean sample per day	Volume lost per sample	Total volume
ABG	6.8	3.6	24.5
FBP	1.7	4	6.8
Coag	1.5	4	6
U + E	5	5	12.5

CONCLUSIONS. Blood loss of 50 ml/day in sampling with average cost of £56. A significant proportion of blood tests were performed twice a day as routine and are repeated without request. We identified areas where changes could be made to reduce volume of blood lost, such as using paediatric blood collection tubes, potentially reducing by 37–47%. For ABG—use of clinical assessment for weaning using ETCO2 or SPO2, to remove the concept of routine ABG. We incorporated results and presented to critical care staff in order to develop practice guidelines. After publishing guidelines we will repeat audit to evaluate if education has reduced number and volume of blood tests and ultimately improved patient care.

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0529

EVIDENCE BASED TRANSFUSION PRACTICE IN ITU: HOW WELL DO WE DO?

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INTRODUCTION. Restrictive transfusion policies are safe in critically ill patients with liberal transfusion shown to increase mortality in certain groups. We investigated red cell transfusion practice in our intensive care unit.

OBJECTIVES. To determine if red cell transfusion is appropriate among intensive care patients and look for evidence of increased morbidity and mortality.

METHODS. Retrospective audit looking at red cell transfusions over a 12 month period. Demographic data, reason for admission, APACHE II score, length of stay, past medical history and outcome were determined. The number of units requested and transfused and the pre and post haemoglobins (Hb) were acquired.

RESULTS. 158 patients were admitted over 12 months of which 54 (34%) were transfused. Six patients were transfused for bleeding, ten had chronic ischaemic heart disease and one patient suffered an acute coronary syndrome.

121 transfusion events occurred with an average of 2 units prescribed per event giving a total of 208 units. 9 transfusion events had no related laboratory data and thus pre and post haemoglobin levels were unable to be determined. 5 patients were transfused out with ITU and admitted prior to completion and not included.

The median trigger Hb for transfusion was found to be 71 g/L (minimum 39 g/L; maximum 92 g/L). 13 transfusion events were triggered by Hb ≥80 g/L, however 3 of these events were in patients with evidence of bleeding. The post transfusion median Hb was 91 g/L (minimum 52 g/L; maximum 124 g/L). Both extremes were in bleeding patients.

The median APACHE II score was higher in the transfusion group (22 vs. 17). Mortality rates were higher in the transfusion group (40 vs. 15.6%). The median APACHE II score in those who died was slightly lower in the transfusion group (27 vs. 29).

The median length of stay in those transfused was 6 days (minimum 1 day; maximum 43 days). The median length of stay in those not transfused was 2 days (minimum 1 day; maximum 20 days). When correcting for APACHE II score the length of stay in ITU stay was longer in those receiving a transfusion and was generally proportional to the number of units prescribed.

CONCLUSIONS. Transfusion rates for this ITU were comparable to those published by others. Appropriate haemoglobin triggers for transfusion were used with the majority receiving blood at a Hb of 70–80 g/L. Single unit transfusion with reassessment may have helped to reduce blood product use by avoiding over transfusion. A correlation between length of stay and number of units prescribed was evident however a direct link with mortality was not reached.

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0530

AN AUDIT OF THE INCIDENCE OF ADVERSE EVENTS IN INTENSIVE CARE AND THEIR EFFECTS ON LENGTH OF STAY AND MORTALITY

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INTRODUCTION. An adverse event (AE) is defined as "an injury related to medical management, whether preventable or non-preventable" [1]. Data regarding incidence of AEs varies. In critical care, due to increased complexity of care, the risk of AEs is increased. An incidence of AEs of 15.4% is reported, with increased length of stay (LOS), and mortality [2, 3]. Castle Hill Hospital has 2 intensive care units (ICUs) which admit cardiothoracic and general patients.

OBJECTIVES. By auditing reasons for admission to the ICUs we hoped to characterise AEs, thereby identifying factors which may reduce mortality, LOS and cost.

METHODS. This audit analysed admissions to ICU over 2 months. AEs were divided into two groups; those leading directly to admission; and those occurring on the units. Data collection was from patients' notes on ICU and from ICU admission books. Primary outcomes were ICU LOS and death or discharge from ICU. A cost analysis based on LOS was performed. Our audit data was compared with ICNARC data for the same period, to ensure audit data collection was representative of casemix on the units.

RESULTS. Over 2 months, 158 patients were admitted to ICU; 130 surgical and 28 medical. 71 were emergency and 87 elective.

Of the 158 admissions, 40 patients experienced an AE; 25 of these prior to admission, with 16 occurring on ICU. 28 were surgical, 8 anaesthesia/critical care, and 5 medical.

Results

Groups	Mortality (%)	Mean LOS (patient days)	Aver. cost per patient (£)
AE	35	8.1	11340
No AE	10.1	3.9	5460
All patients	16.4	4.6	6440

Cost analysis was based on the number of bed days incurred by the adverse event (on average 4.2 days longer in the adverse event group) at a cost of £1400 per ICU bed per day, i.e. £5880 extra per patient; a total extra cost of £235,200 for the 2 months

CONCLUSIONS. In our audit an AE caused, on average, an increase of ICU LOS of 4.2 days and threefold increase in mortality. Most AEs were surgical.

These findings support available evidence that AEs increase LOS and mortality. Reducing AEs would improve outcomes, and reduce costs. The nature of the AEs suggest that improvements could be achieved by focusing on preventing AEs throughout the hospital. Increased awareness, planning, education and vigilance could impact on AEs.

Comparison with ICNARC suggests that our data is representative of the case mix on the units. Of note, ICNARC does not have a function to identify AEs.

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GRANT ACKNOWLEDGMENT. No grants were received during the audit process.

0531

MEAN RADIATION DOSE CAUSED BY RADIOLOGICAL STUDIES WITHIN AN INTENSIVE CARE POPULATION

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INTRODUCTION. Patients requiring critical care often undergo multiple radiological examinations. Previous studies have focused on specialised areas such as trauma intensive care but few have reviewed the mean radiation dose delivered to patients staying in a district hospital intensive care unit.

OBJECTIVES. To estimate the radiation dose delivered to such a population and compare it to the dose delivered on the in patient ward.

METHODS. Adult admissions to the ITU at Colchester Hospital between August and November 2009 were retrospectively reviewed. Data was collected on the number of CT scans and CXR performed whilst in the ITU and whilst on the in patient wards. The total and average dose used for each imaging modality was then calculated using average dosing information[1].

RESULTS. Adult admissions totalled n = 136. The average length of stay for all specialties was 6.43 days (range 1–38), for medicine 6.89 days and for surgical specialties 6.07 days. The mean radiation dose delivered to patients during their time on ITU was calculated and compared to their time on the ward, using a paired student t test. The mean radiation dose delivered for CT scans on ITU was 2.82 mSv/patient and on the ward 5.19mSV/patient ($p = 0.039$). For chest x-rays on ITU the mean radiation dose was 0.05 mSv/patient and 0.03 mSv/patient on the ward ($p = 0.0042$). The mean total radiation dose delivered from CT scans for medical patients was 1.8 mSv on ITU versus 2.34 mSv on the ward, ($p = 0.050$) and 3.6 mSv versus 7.38 mSv ($p = 0.037$) respectively for surgical specialties. The total dose of radiation in patients staying on ITU <7 days and for those >than 7 days was calculated and from that the average dose of radiation/person/day was derived. For all those staying less than 7 days the total dose of radiation on ITU was 100.14 mSv and on the ward was 427.64 mSv; this equated to 0.303 mSv/day on ITU and 0.317 mSv/day on the ward. For all those staying more than 7 days a total of 288.28 mSv was received on ITU and 320.46 mSv on the ward. This equated to 0.53 mSv/day on ITU and 0.47 mSv/day on the ward.

CONCLUSIONS. This demonstrates that although patients are exposed to a significantly higher radiation dose from chest radiographs on ITU the converse is true for CT scans. It appears that surgical patients receive a higher radiation dose from CT scans both on ITU and on the ward compared to medical patients. It is evident that the longer a patient stays in hospital the more likely they are to be exposed to a greater radiation dose, however when the radiation dose per person per day is calculated the difference between the dose of radiation on ITU and that on the ward appears similar. Statutory regulations require all concerned to reduce unnecessary exposure of patients to radiation and an ITU stay does not appear to confer excess risk of radiation exposure compared with a ward stay.

REFERENCE. http://www.hps.org/publications/dosesmedicalradiation.html.

0532

THE SLAVED PROCESS CHECK: A QUALITY IMPROVEMENT INITIATIVE TO IMPROVE RELIABILITY IN DELIVERY OF SMALL-SCALE EVIDENCE BASED TREATMENT GOALS IN ICU

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INTRODUCTION. Quality Improvement (QI) processes assess the impact of small changes to routine practice on a defined outcome. Reliability, an inverse measure of system failure, underpins the QI framework [1]. Healthcare organizations traditionally demonstrate poor reliability; improving reliability improves patient outcomes. QI focuses on improving reliability through a number of steps, initially via system standardization. Our intensive care unit (ICU) introduced the clinical microsystems (CMS) [2] approach to QI in 2010 with establishment of a multidisciplinary lead improvement group to drive QI initiatives. The SLAVED process check was developed by the group. The aim of the SLAVED check is to increase the reliability of routine small-scale evidence-based treatment goals undertaken on a daily basis. SLAVED is an acronym made up from the elements (S)edation, (Lines), (A)nalgesia, (V)entilation, (E)nteric protection and (D)VT prophylaxis. Medical staff set daily goals for each SLAVED element for each patient on our unit.

OBJECTIVES. To assess the compliance to the SLAVED process and identify reasons for failure to achieve goals.

METHODS. Data were collected each day for 1 week on all patients resident on our 17-bedded ICU. Documentation of goals for each SLAVED element was recorded. Attainment of goals was checked and reasons for failure were recorded.

RESULTS. 94 patient encounters were eligible for inclusion. 81 (86%) encounters had a SLAVED check documented. The most reliable elements of the process were (A)nalgesia and (D)VT prophylaxis with goals achieved in 80 (85%) encounters. The least reliable aspect was (E)nteric protection, with goals achieved in 75 (80%) encounters.

TABLE 1 INDIVIDUAL SLAVED PROCESS ELEMENTS

Process element	Outcome targets
Sedation	Daily sedation hold in all appropriate patients
Lines	Early removal of all indwelling arterial and venous catheters to prevent infection
Analgesia	Optimisation of analgesia to facilitate patient care
Ventilation	Low tidal volume strategy, weaning plans
Enteric protection	Proton pump inhibitors prescribed in patients at risk of GI ulcers proton pump inhibitors discontinued in patients who are fully fed (prevention of VAP)
DVT prophylaxis	Appropriate DVT prophylaxis

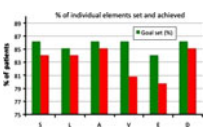

Fig. 1 % elements achieved

CONCLUSIONS. The SLAVED process check has resulted in a stable level of compliance in the delivery of evidence based small-scale interventions on our ICU. The process check provides a safety net to ensure that all elements are completed on all patients ("every patient, every day"), mitigating the aspect of human error that exists in all delivery of health care. The use of such a standardized checklist is typically associated with a reliability level of between 80 and 90%, or 1 or 2 failures out of 10. Additional strategies, based around "error-proofing" the system, are necessary to improve the reliability of the process to the next level (95% or 5 failures or fewer out of 100 opportunities) [1]. To attain a higher level of reliability we have introduced a reminder step in our ICU; clerical staff ensure that the SLAVED process check has been completed on the clinical computer system. If a SLAVED check has not been documented a reminder is sent to the responsible medical staff member.

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0533

ROUTINE BLOOD TESTS (RBTS) IN THE ICU: ARE THEY JUSTIFIED?

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INTRODUCTION. Routine blood tests (RBT[1]) usually taken 2–4 times per day are a widespread and established part of UK intensive care practice. During the early phases of critical illness such practice may be justified; however once the diagnosis is established and the patient is improving RBT may not be necessary. Internationally, cost-effective reductions in routine blood testing in the ICU have been demonstrated with no deterioration in patient outcomes [1, 2]. We investigated the indications, interventions and costs (including staff time) associated with RBT in a single large intensive care unit.

OBJECTIVES. 1. To determine if RBT were indicated. 2. To determine if a RBT lead to an intervention. 3. To calculate the costs of RBT (including staff time). 4. To produce an algorithm describing the process of obtaining RBT results.

METHODS. This audit was completed in a 24-bed general ICU at a university teaching hospital. 20 patients deemed by a consultant intensivist to be in the recovery phase of illness were followed up for 5 days or until discharge. The indication for the RBT was compared to a list of all possible indications. Any intervention occurring as a direct result of the RBT was recorded. An algorithm describing the process of routine blood testing was prepared by mapping each step in the process for 3 patients. The average time for a RBT was determined from this algorithm.

RESULTS. Data for 70/100 days of RBT; with 30 days were obtained with 30 RBT-days lost (28 discharges before 5 days and 2 deaths). A total of 503 RBT were performed, of which 209 (42%) were indicated and 294 (58%) not indicated.

Of 503 tests, 73 (15%) led to a direct intervention and 430 (85%) did not.

The total amount spent during this 70 patient-day period was € 1,094, of which € 495.55 was expended appropriately with an inappropriate expenditure of € 575.93. The loss incurred due to ICU RLTs per patient day is € 8.23.

The average staff time required to obtain one set of RBT per patient was 10 min and 56 s.

CONCLUSIONS. Over 50% of RLTs (at an average cost of € 8.23/test) were not indicated suggesting that an annual saving of € 72,128 could be made in a 24 bed ICU department. This is in keeping with findings of other studies where cost reduction savings of € 44,967 have been reported [3]. Moreover, many hours of staff time could also be saved by discarding the practice of routine blood tests in ICU. [1] Full blood count; CRP; coagulation screen; urea and electrolytes; serum phosphate and magnesium and liver function tests.

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0534

IMPLEMENTATION OF A MULTIDISCIPLINARY FRAMEWORK FOR PREVENTION OF CENTRAL VENOUS CATHETER BLOOD STREAM INFECTIONS IN A RURAL DISTRICT GENERAL ICU

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INTRODUCTION. Hereford County Hospital (HCH) is a small, district general hospital with critical care facilities to provide care for eight level 2 and 3 patients. Despite its small size and rural location HCH is committed to improving the standards of care it provides and therefore it is part of the 97% of acute trusts in England which are participating in Matching Michigan (MM); a quality improvement project based on a model developed in the United States which, over 18 months, saved approximately 1,500 patient lives [1]. The original model implemented in Michigan Intensive Care Units (ICUs) showed that by introducing data definitions in conjunction with changes in clinical practice, leadership and teamwork a reduction in Central Venous Catheter blood stream infections (CVC BSI) is possible [2].

OBJECTIVES. As a participant of this project HCH has devised and implemented a unique multidisciplinary framework for prevention of CVC BSI (Fig. 1). The aim of this framework is to ensure optimal clinical practice and therefore minimising CVC BSI on our ICU.

METHODS. The framework, which was introduced in May 2010 consists of 2 documents to be completed by ICU doctors and nurses, which ensures (1) clinical practice for CVC insertion meets the required standard and (2) the daily review of the CVC for signs of infection. The framework also provides guidance on managing a suspected CVC BSI and a root cause analysis tool, which is completed by the muti-disciplinary team if a CVC BSI is confirmed.

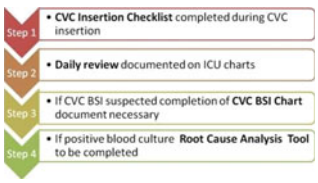

Fig. 1

RESULTS. Prior to implementation of the framework the incidence of CVC BSI at HCH was higher than the MM adult data set. Since its inception the trend in the initial data suggests a significant improvement in our clinical practice (Fig. 2).

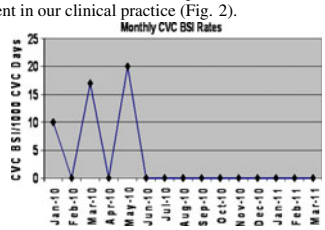

Fig. 2

CONCLUSIONS. We expect the adoption of this framework to achieve quality improvements which we hope will eliminate CVC BSI in our institution.

REFERENCES. 1. http://www.nrls.npsa.nhs.uk/matchingmichigan 2. http://www.patientsafetyfirst.nhs.

0535

EVALUATION OF ADVERSE INCIDENT REPORTING IN INTENSIVE CARE WITH LIMITED RESOURCES

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INTRODUCTION. Adverse incident, defined as unintended injuries or complications that are provoked by medical management rather than the patient's underlying disease.

OBJECTIVES. The aim of our study was to identify the incidence, outcome, and potential risk factors leading to critical incident during intensive care stay in a tertiary care teaching hospital and attempt to suggest preventive measures.

METHODS. A prospective study was conducted in an 8-bed surgical intensive care unit. Adverse events were retained for analysis included mortality in the unit, unplanned extubation, need for reintubation within 48 h after planned extubation, and need for readmission to the unit within 48 h after discharge. Pre-printed incident book was used to act as guide to establish the severity and causality. The severity was classified according to outcome into: Minor incident in which outcome was not affected without any residual disability. Major incident in which life threatening incident mandated invasive procedure whether there was a residual disability or not.

RESULTS. During study period from November 2010 to March 2011, 138 patients admitted to our ICU 77 adverse events involving 49 (35.5%) patients were analyzed. Fifty nine major adverse events occurred in 38 patients, and 11 patients had 18 minor adverse events (5 patients experienced both major and minor adverse events) during their ICU stays.

The adverse incident occurred more frequently in night shift between 9 pm to 8 am $P < 0.05$. Major adverse events occurred in more critically ill patients with prolonged duration of invasive respiratory support, whereas neither the age of the patients nor the duration of ICU influence the severity of ICU-related adverse events.

CONCLUSIONS. Our adverse incident analysis documented that human factor is the single most important factor in the majority of these incident. Development of standardized ICU protocols, policies and procedures is far more important than importing high tech equipments.

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0536

UNDERSTANDING SAFETY ISSUES IN ICU: AN INCIDENT REPORTING SYSTEM ANALYSIS

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INTRODUCTION. It has been estimated that average patient in the ICU has 1.7 errors in his or her care daily. To detect those errors and mitigate the risks the creation of an incident reporting system (IRS) is critical.

OBJECTIVES. To evaluate the characteristics of incidents reported after the implementation of a voluntary IRS in a surgical ICU in a 50-bed private hospital.

METHODS. From August 2010 to March 2011 we have retrospectively reviewed all incident reports related to ICU (from and directed to ICU). Our hospital adopts an IRS that is paper-based, relying on willingness to report and the identification of the reporter is not mandatory. The Institute of Healthcare Improvement (IHI) classification of incident severity (usual, acceptable, moderate, important and unacceptable) is used and all relevant events are deeply investigated through root cause analysis (RCA). When opportunities for improvement or preventative actions to be taken are identified a PDCA (Plan-Do-Check-Act) cycle is conducted. We have classified all the reports in the following groups: breach in a standardized operating procedure or clinical care protocols (group 1), drug administration-related (group 2), supplies and logistic (group 3), medical equipment (group 4), poor communication between multiprofessional team (group 5), poor interdepartmental communication (group 6) and others (group 7). We have also collected epidemiologic and clinical outcome data.

RESULTS. The ICU admitted 242 patients, mean age was 60 years, mean APACHE II score was 13, LOS was 5 days and overall hospital mortality was 12%. There were 539 incidents on the hospital and 81 (15%) were ICU related. According to the IHI criteria incidents were classified as usual 4.9% (n = 4), acceptable 64.2% (n = 52), moderate 28.4% (n = 23), important 2, 5% (n = 2) and unacceptable zero. We have considered that there was moderate or severe harm in 12% (n = 10) of reported ICU events. Group 1 was most frequently reported (54.3%), followed by group 2 (24.7%), group 7 (7.4%), group 3 (4.9%), group 6 (4.9%), group 4 (2.5%) and group 5 (1.2%). We have conducted 12 full PDCA cycles in the study period.

CONCLUSIONS. These preliminary data show that incidents are common in ICU and IRS is critical to risk and process improvement management in this environment.

0537

STUDIES USED AS TOOL TO REDUCE THE IATROGENIC: THE CASE OF TRANSFUSION

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OBJECTIVES. The main objectives of this study are: (1) Describe the characteristics of the use of packed red blood cells in the emergency department, and (2) Describe the adequacy of its use as recommended by national guidelines in order to rationalize use and reduce iatrogenic.
MATERIALS AND METHODS.
DESIGN. We conducted a study of prescription drug use, indication. The study was approved by the C.E.I.C. Hospital Universitario La Paz (HULP), Madrid.
Subjects: We included all transfused patients in the emergency department of HULP during the month of August 2010, collected from application flyers that are sent to Blood Bank.
Variables: For each patient were collected demographic variables (age and gender), comorbidity (personal history), laboratory findings (pre and post-transfusion), treatment variables (cause and type of transfusion) and proof of treatment variables (recorded in history).
Data analysis: For analysis of the appropriateness of prescribing have been used as a reference the "Guidelines on the transfusion of blood components and plasma derivatives" of the Spanish Society of Blood Transfusion. Was used for statistical analysis SPSS 17.0 software.
RESULTS. Have been made in the month studied a total of 89 packed red blood cell transfusions. The total number of units transfused was 243 units (mean = 2.7 units per transfusion, median = 2). The mean age of patients was 70.5 ± 19.0 years, and 60.7% were men. The most common diagnoses for these patients were anemia (37.2%) and gastrointestinal bleeding (12%). At 20.2% is not collected the diagnosis on clinical history. From the diagnosis, medical history and laboratory findings, has drawn up a list of the reasons for transfusion. 76.4% in those who have been able to gather the reason, the most common being analytical criteria (37 cases) and active bleeding without hemodynamic consequences (20 cases). Pretransfusion mean hemoglobin was 8.0 ± 1.7 g/dL and post-transfusion of 10.1 ± 1.7 g/dL. The average increase was 1.9 ± 1.9 g/dL, this value is statistically significant ($p < 0.05$). No analytical pretransfusion was 7.9% (7 cases) or analytical postrafusional at 15.8% (14 cases). In 24 cases (27%) were not sufficient data on clinical history and/or analytical results to be evaluated the appropriateness of prescribing. Of the remaining cases, 78.5% (51 cases) the prescription was not appropriate to the indication.
CONCLUSIONS. 1. Were found in poor quality information transfusions of packed red blood cells. 2. 78.5% of transfusions were inappropriate based on the recommendations, which far exceeds that published in other hospital services (78.5 vs. 35–45%). 3. It's necessary to confirm these results through a multicenter study and develop an explanatory model/predictive useful in planning educational activities to improve overall prescribing habits of red cell concentrates.

0538

ALLOGENEIC BLOOD TRANSFUSION IN EMERGENCY ROOM ARE WE DOING WELL?

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AIM. To describe the allogeneic blood usage according to the Transfusion National Guidelines, in the Emergency Room of a University Hospital.
MATERIALS AND METHODS. In-hospital drug utilization study of prescription-indication, observational and longitudinal during 1 month. All transfunded patients in the ER were included.
VARIABLES COLLECTED. Demographic (age and gender), comorbidities, laboratory findings (before and after transfusion), reason and blood product used, tolerability (adverse events) and follow up and informed consent (medical report, prescriptor identification, informed consent form correctly filled). To analyze the suitability of prescriptions we used the National Clinical Practice Guideline for Transfusion of Blood Products. For statistics analyse we used SPSS 17.0 software.
RESULTS. 107 transfusions have been done in 1 month to 91 patients. 83.2% was red cells transfusions, with a total of 243 units (mean 2.7, median 2). 60.7% were male and the mean age was 70.5-year old. From the 107 transfusions 28% could not be evaluated because no sufficient data were collected. We detail the suitability to the practice guidelines of the 77 cases analyzed in the next table: **RBC** Platelets plasma global. Fit 14 (21.5%) 4 (50%) 3 (75%) 21 (27.3%). Unfit 51 (78.5%) 4 (50%) 1 (25%) 56 (72.7%)
CONCLUSIONS. 72.7% of the transfusions made did not fit to the Spanish Blood Transfusion Society Clinical Practice Guideline, which is even higher (78.5%) when analyzing RBC transfusion only. That is extremely higher to the other services Publications (72.7 vs. 35–45%). It seems necessary to increase the sample and number of centres to analyze the variables associated to the transfusion prescription fails in order to develop a predictive and explicative model useful for educative programs in transfusion customs.

New mediators in the course of sepsis: 0539–0552

0539

HIGH MOLECULAR WEIGHT ADIPONECTIN INCREASES WITH IMPROVEMENT OF SEVERE SEPSIS

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INTRODUCTION. Adiponectin is an adipokine that promotes glucose utilisation, fatty acid oxidation and exhibits anti-inflammatory properties [1]. Pathologies characterised by insulin resistance, such as type 2 diabetes mellitus or the metabolic syndrome, are associated with low levels of adiponectin [2]. Patients with severe sepsis also develop insulin resistance and hyperglycaemia. In a previous study, we have shown that expression of adipose tissue adiponectin mRNA is reduced in a murine model of endotoxaemia [3]. High Molecular Weight (HMW) adiponectin, however, is thought to be more potent than its full length counterpart [2]. We therefore investigated the alterations in plasma total and HMW adiponectin in patients with severe sepsis.
METHODS. The study was approved by the Local Research and Ethics committee and written consent was obtained from each participant or their next of kin. 21 patients with severe sepsis were recruited. Blood samples were taken on days 1 and 2 and day of discharge and serum levels of total and HMW adiponectin were determined by ELISA. Mann–Whitney U test was used for statistical analysis.
RESULTS. Twenty-one patients were recruited, 10 male and 11 female. Mean (±SD) age was 62.24 (±14.06) years and APACHE score was 20.81 (±6.49). There was a significant increase in both total and HMW adiponectin between day 1 and day of discharge (3.84 vs. 6.59 μg/ml ($p < 0.01$) and 2.58 versus 4.85 μg/ml ($p < 0.01$) respectively). The ratio of HMW/total adiponectin also increased between admission and discharge (0.69 vs. 0.88, $p < 0.01$).
DISCUSSION. Our results demonstrate that adiponectin levels are lower in patients with severe sepsis on admission than on day of discharge. Low total and HMW adiponectin levels during sepsis may be relevant for the development of insulin resistance observed in sepsis. It may also play a role in the inflammatory process as adiponectin is known to have anti-inflammatory properties [1]. There was an increase in serum total and HMW adiponectin with resolution of sepsis. Hypoadiponectinaemia in sepsis has been observed in previous studies [4] but the increases in HMW adiponectin with clinical improvement has not been previously demonstrated. The present results further support a potential role of circulating adiponectin during acute infection.
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0540

IMMUNITY IN THE EVOLUTION OF PATIENTS WITH SEVERE SEPSIS

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INTRODUCTION. Activation and suppression of the immune response is crucial in septic patients, in these patients have been reported significant changes in lymphocyte subpopulations, particularly those involved in adaptive immunity.
OBJECTIVES. To study the changes of lymphocyte populations and cytokine levels during the evolution of septic patients admitted to the ICU and its relationship to mortality.
METHODS. Prospective observational study. We recruited patients admitted in the ICU, with a diagnosis of severe sepsis. We excluded patients under 18 and over 70 years of age, treated with steroids or other drugs that affect on the HPA axis, with a previous adrenal insufficiency, hematologic or autoimmune disease. We have determined the lymphocyte subpopulations and cytokine levels (TNF, IL2, IL4, IL6 and L10) at admission, at 48 h, after 5 days and before discharging.
RESULTS. After implementation of the protocol, 50 patients were enrolled, mean age 53 ± 13 years; mortality of 18%. The lymphocyte count mean at admission was 944.6 ± 624, with no difference between survival subgroups; 14 patients had less than 500 cells, their mortality was 28%, above of the 36 remaining patients in which it was 13.9%. The CD4 represent 36.85%, with a cells' number of 373 ± 324. The CD4/CD8 ratio showed no significant changes. The CD4 percentage increased significantly at 48 h after admission (36.85 ± 12/45 ± 12.5%, $p = 0.0001$). The CD19 increased significantly at 48 h and at admission NK represent 8.86 ± 7.9% of the lymphocytes, and decrease significantly at 48 h. Comparison of survival groups showed a significant difference in the percentage of CD4 in survivors at admission (39 ± 11/27 ± 12%, $p < 0.01$). TNF values were high throughout the evolution of patients from 543 ± 357 pg/ml at admission to the 352 ± 292 pg/ml at discharge. IL2 and IL4 were consistently high, with no significant differences during evolution. IL6 values at admission were of 453 ± 445 pg/ml and a significant dropping was observed at 48 h. The mortality of the groups studied after 48 h of admission, showed a significant difference in IL6 levels (179 ± 263/420 ± 426, $P = 0.048$). The values of IL 10 were high at admission, with averages of 336 ± 334 pg/m, decreasing gradually to 130 ± 196 pg/ml at discharge ($p = 0.001$). Studying the evolution of the values of IL10 in the survival groups, showed persistence of high levels of IL10 in the group of survivors with no significant differences among survivors as at admission (583 ± 351 pg/ml against 282 ± 308 pg/ml ($p = 0.0129$) as at 48 h (463 ± 404 pg/ml/155 ± 189 pg/ml, $p = 0.0021$).
CONCLUSIONS. Lymphopenia at the expense of CD4+ lymphocytes is associated with a poor prognosis. The persistence of the inflammatory process characterized by high levels of pro and anti-inflammatory cytokines is a sign of poor prognosis, especially when it is dominated by IL-10.

0541

PARAOXONASE-1 ACTIVITY IN SURGICAL PATIENTS WITH SEPSIS

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INTRODUCTION. Sepsis is associated with significant increase in production of oxidant species and decrease in endogenous antioxidant defenses. Paraoxonase-1 (PON-1) has a significant role in the organism's antioxidant system. It is thought to degrade oxidized phospholipids in lipoproteins and limit production of proinflammatory mediators.

OBJECTIVES. To investigate serum PON-1 activity in surgical patients with sepsis in relation to other parameters of oxidative stress.

METHODS. Study included 28 septic patients in surgical ICU (age 52.4 ± 21.9 years; 11 female, 17 male) and 28 age/sex-matched healthy controls. Blood samples were collected on admission to ICU and 48 h later. Serum PON-1 and superoxide-dismutase activity, total oxidative and antioxidative status, prooxidative-antioxidative balance, malondialdehide, -SH groups and C-reactive protein (CRP) concentrations were measured. Patients were managed independently by the ICU team. Hemodynamic and laboratory parameters were measured daily, until ICU discharge or death.

RESULTS. PON-1 activity was significantly lower in septic patients both on admission to ICU (106.0 U/l [39.2–216.0]) and 48 h later (74.5 U/l [34.7–192.5]) then in healthy controls (488.9 U/l [303.3–659.2]). PON-1 activity on admission to ICU correlated with APACHE II score ($\rho = -0.468$, $p < 0.05$) and total oxidative status ($\rho = 0.664$, $p < 0.01$), but did not correlate with other tested parameters of oxidative stress and CRP. Survivor group had significantly higher PON-1 activity then non survivor group, both on admission to ICU (161.0 U/l [61.7–433.2] vs. 38.5 U/l [30.0–71.2], $p < 0.05$) and 48 h later (131.0 U/l [56.2–295.2] vs. 45.0 U/l [21.2–70.0], $p < 0.05$). ROC curve analysis revealed that PON-1 activity on admission to ICU and 48 h later were good predictors of outcome of sepsis, need for renal replacement therapy, mechanical ventilation and inotropic support during entire course of disease.

CONCLUSIONS. PON-1 activity was significantly lower in septic patients then in healthy controls. PON-1 activity correlated with disease severity and could predict outcome of sepsis.

0542

INCREASED ACID SPHINGOMYELINASE SERUM ACTIVITY IN CRITICALLY ILL PATIENTS BEFORE ONSET OF SEPSIS

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INTRODUCTION. Sepsis is one of the major causes of mortality in the intensive care unit (ICU) setting. Acid sphingomyelinase (ASM) plays an important role during this host response to inflammatory stimuli. It is involved in lipid signalling pathways and regulates apoptosis by generation of ceramide. Administration of inhibitors of ASM to reduce ceramide-mediated cell death could become a novel approach in treatment of sepsis.

OBJECTIVES. Retrospective examination whether ASM serum activity is increased in critically ill patients before the occurrence of septic episodes, as identified by elevation of procalcitonin (PCT) plasma levels in comparison with established ICU scoring systems and markers of infection.

METHODS. In a total of 41 patients, blood samples were collected daily during their ICU stay and ASM serum activity was determined retrospectively when clinical signs of SIRS, sepsis or septic shock were evident. Routine laboratory tests including measurement of PCT were performed every 24 h. Vital signs, ventilator settings and drug dosages were recorded for daily evaluation of modified SOFA (excluding central nervous system), SAPS II and TISS scores. Onset of septic episode was defined as elevation of PCT >2 ng/ml or increase of >100% in comparison to the value of the preceding day. Data were examined 9 days before (period I) and 3 days after PCT elevation (period II). A total of 25 septic episodes in 23 patients could be identified. Eight patients undergoing visceral surgery for intestinal resection and no history of PCT levels of >2 pg/nl were used as a control group.

RESULTS. ASM serum activity was increased during period I (2691.51 ± 189.07 pMol/ml h, mean ± SD) and period II (3102.15 ± 205.67 pMol/ml h), compared with the first five post-operative days (1280.67 ± 120.47 pMol/ml h) or baseline values (754.42 ± 342.7 pMol/ml h) in the control group. PCT levels were 3.89 ± 2.23 ng/ml (period I) and 6.77 ± 0.46 ng/ml (period II), whereas lower PCT values were found in the control group (0.41 ± 0.19 ng/ml). Lactate concentrations were 2.21 ± 0.3 mMol/l (period I) and 3.01 ± 0.34 mMol/l (period II). Modified SOFA scores were 8.7 ± 1.2 (period I) and 8.4 ± 0.7 (period II). SAPS II scores were 39.3 ± 1.5 (period I) and 38.4 ± 2.4 (period II). TISS scores were 27.2 ± 4.2 (period I) and 22.1 ± 3.8 (period II). CRP levels were 194.16 ± 42.31 mg/l (period I) and 184.38 ± 31.52 mg/l (period II), and 114.3 ± 45.08 mg/l in the control group.

CONCLUSIONS. The data suggest that critically ill patients suffering from septic episodes as defined by elevation of plasma PCT levels exhibit markedly increased ASM serum activity up to 9 days before changes in PCT levels can be observed. ASM serum activity is increased in patients with clinical signs of systemic inflammation, as reflected by elevated mean SOFA, SAPS II and TISS scores, whereas it is not in patients with an uncomplicated history of visceral surgery.

0543

ANGIOPOIETIN-2 IS ELEVATED IN CRITICALLY ILL PATIENTS AND IS ASSOCIATED WITH SEVERITY AND MORTALITY

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INTRODUCTION. Angiopoietin-2 (Ang-2), an angiogenic peptide released by endothelial cell Weibel-Palade bodies, increases endothelial activity and vascular permeability. Ang-2 is known to be elevated in severe sepsis, but the precise mechanisms underlying this are not yet elucidated. Procalcitonin (PCT) level is increased in response to pro-inflammatory cytokines, and increasing interest in PCT has resulted in a large body of literature assessing the diagnostic utility of this biomarker in a variety of clinical settings, including cardiothoracic surgery and burns units, and in the study of pancreatitis and meningitis. However, PCT, which is a biomarker of infection in non-severely ill patients in the emergency room, loses its discriminative power and becomes generically indicative of severity in the intensive care unit. We set out to clarify the relationship between Ang-2 and PCT in critically ill patients.

OBJECTIVES. We studied 63 consecutive patients (40 men, 23 women, average age 61 years) admitted to the ICU.

METHODS. Patient severities were assessed according to their acute physiology and chronic health evaluation 2 (APACHE 2) scores and sequential organ failure assessment (SOFA) scores. PaO2/FIO2 ratios were calculated daily, and Ang-2 and PCT were measured immediately after ICU admission. Patients were allocated to 1 of the following 4 groups based on Ang-2 measurements: G-1: Ang-2 <5,000, G-2: 5,000 <Ang-2 <10,000, G-3: 10,000 <Ang-2 <15,000, G-4: 15,000 <Ang-2. Serum Ang-2 and PCT were measured by ELISA (enzyme-linked immunosorbent assay and ECLIA (electrochemiluminescence immunoassay), respectively.

RESULTS. The mean APACHE 2 and SOFA scores were 21.3 and 7.8, respectively. Plasma Ang-2 was found to be elevated in critically ill patients (median, 7,870 ng/ml), which correlated inversely with PaO2/FiO2 ratios ($r = -0.402$, $p < 0.03$) but positively with APACHE 2 scores ($r = 0.514$, $p < 0.003$) and SOFA scores ($r = 0.626$, $p < 0.0001$). The survival rate of each group was as follows: G-1: 20.0%, G-2: 25.0%, G-3: 20% and G-4: 45.5%.

CONCLUSIONS. Ang-2 is elevated in critically ill patients and may be associated with severity and mortality.

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0544

CD64 AS A DIAGNOSTIC TEST FOR SEPSIS IN CRITICALLY ILL ADULTS: OUR EXPERIENCE

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INTRODUCTION. Infections are a major health problem in intensive care unit (ICU), where they are associated with a very high mortality rate [1]. The rapid diagnosis and management of bacterial infection are heavily dependent upon clinical assessment. CD64 is an early marker of infection whose expression on neutrophil surface is upregulated in cases of bacterial infections [2], therefore it could be used for improving the diagnosis and management of septic patients.

OBJECTIVES. To evaluate the diagnostic performance of a quantitative flow cytometric assay for neutrophil CD64 expression, as a sepsis marker in ICU patients.

METHODS. Single center prospective study which evaluates neutrophil CD64 in 146 adult patients admitted to our polyvalent ICU. Blood samples were drawn from ICU patients, who were categorized in 4 groups: SIRS patients (n = 45), septic patients (n = 37), severe septic patients (n = 25), and septic shock patients (n = 39). The control group included 35 healthy adults. The CD64 assay was performed within 12–24 h after onset of suspicion of sepsis [3]. The laboratory findings were compared with a clinical score for the likelihood of infection/sepsis. We used the diagnostic kit Leuko 64; Trillium Diagnostics, Brewer, ME, USA. For statistical analysis we used MedCalc software.

RESULTS. Expression of CD64 was significantly enhanced in sepsis group versus healthy controls ($p < 0.001$) and severe sepsis group ($p = 0.0197$). Severe sepsis and septic shock were not statistically different from each other ($p = 0.7270$). For diagnosis of sepsis the highest sensitivity of 97% and specificity of 86% were found at a cut-off value of 1.50 versus healthy controls, predictive positive value 85.7%, negative predictive value 100%; when SIRS patients were used as control, the specificity decreased (the best cut-off >2.16; sensibility 70.2%; specificity 51.3%; positive predictive value 59%; negative predictive value 63%).

CONCLUSIONS. Neuthrophil CD64 expression is a sensitive marker for detecting sepsis in critically ill adults but as it is also raised in SIRS, it lacks specificity. It correlates strongly with severe sepsis, but there is not any significative difference between severe sepsis and septic shock. Finally it could be included in diagnostic guidelines for sepsis in ICU, combining it with other tests and always correlating it to adequate clinical evaluation. Further studies could also evaluate its prognostic value for survival.

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0545

PRESEPSIN(SCD14-ST): A NEW MARKER FOR DIAGNOSIS OF BACTERIAL INFECTION

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INTRODUCTION. CD14 is present in macrophage, monocyte, and granulocyte cells and their cell membranes, and it is said to be responsible for intracellular transduction of endotoxin signals. Its soluble fraction is present in blood and is thought to be produced in association with infections. It is called the soluble CD14-subtype (sCD14-ST), and in the text below it will be referred to by its generic name, presepsin. We have previously reported that presepsin is produced in association with infection and that it is specifically expressed in sepsis.

OBJECTIVES. In the present study we developed a new rapid diagnostic method by using a chemiluminescent enzyme immunoassay, and it made automated measurements in a shorter time possible.

METHODS. The subjects were 41 inpatients (25 males and 16 females), 62 ± 19 year old, who had been brought to the Critical Care and Emergency Center of Iwate Medical University, and who fulfilled at least two of the diagnostic criteria for SIRS on arrival. Blood specimens were collected a total of 6 times, i.e., on admission, and 12 and 24 h and 3, 5, and 7 days later, and the presepsin values were measured. The sepsis markers PCT, IL-6, and CRP were also measured for comparison.

RESULTS. The results of using this method to measure presepsin values in different pathological conditions were: normal, 294.2 ± 121.4 pg/ml; local infection, 721.0 ± 611.3 pg/ml; systemic inflammatory response syndrome (SIRS), 333.5 ± 130.6 pg/ml; sepsis, 817.9 ± 572.7 pg/ml; and severe sepsis 1992.9 ± 1509.2 pg/ml, and the presepsin values. Were significantly higher in patients with local infection, sepsis, and severe sepsis than in patients who did not have infection as a complication. In a comparative study with other diagnostic markers of sepsis based on ROC curves, the area under the curve (AUC) of presepsin was 0.845, and higher than the AUC of PCT (0.652), CRP (0.815), or IL-6 (0.672).

CONCLUSIONS. In the present study we were able to obtain results similar to those obtained with the conventional ELISA method, and it was possible to diagnose sepsis more rapidly and conveniently by using the immunoassay analyzer. We are currently using the analyzer in a multicenter clinical study, and are in the process of conducting.

A further clinical dynamics analysis in various pathological conditions. Based on the results of the present study it appears that presepsin will soon be widely used as a diagnostic marker of sepsis in clinical settings.

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0546

DEHYDROEPIANDROSTRONE (DHEA) AND DEHYDROEPIANDROSTRONE SULFATE (DHEAS) LEVELS DURING SEVERE SEPSIS IN PATIENTS WITHOUT PREVIOUS ADRENAL COMORBIDITY

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INTRODUCTION. DHEA and its sulphate have pro-inflammatory and immunomodulatory effects. In sepsis have been reported alterations in their metabolism and their plasma levels.

OBJECTIVES. The aim of this study is to determinate the levels of DHEA and DHEAS during the evolution of septic patients admitted in the ICU without previous adrenal comorbidity and the association between them in these patients.

METHODS. Prospective observational study. We recruited patients admitted in the ICU, with a diagnosis of severe sepsis. We excluded patients under 18 and over 70 years of age, treated with steroids or other drugs that affect on the HPA axis, with a previous adrenal insufficiency, hematologic or autoimmune disease. We determined the levels of DHEA, DHEAS, ACTH and cortisol at admission, at 48 h, after 5 days and at discharge. DHEA and DHEAS levels were expressed in absolute and percentage values up to maximum values for age and sex.

RESULTS. During a 13-months period, 50 patients were recruited, 32 males and 18 females, mean age 53 ± 13 years. Mortality was 18%. The average length of stay in ICU was 8.53 ± 15 days. PCT: 7.17 ± 4.7 ng/ml, CRP: 28 ± 13 mg/dl; Apache II: 19.46 ± 6.6 points, 38.5 points SAPS II, SOFA 7.76 ± 3.8. At admission DHEA values were 11.86 ± 6.23 ng/ml; at 48 h they decreased to 8.4 ± 5 ng/ml ($p < 0.001$); at the 5th day 4.23 ± 4.7 ng/ml ($p = 0.0126$), and remained similar at discharge (3.7 ± 2.3 ng/ml). The values expressed as a percentage virtually evolved similarly. At admission the DHEA values were 241 ± 169%; at 48 h 173 ± 134 ($p < 0.001$); 111 ± 91% after 5 days ($p < 0.001$), and 67 ± 37% before discharging ($p < 0.001$). DHEAS levels at admission were 234 ± 140 g/ml; at 48 h 140 ± 100 mg/ml ($p = 0.0001$); at the 5th day 106 ± 77 mg/ml ($p = 0.008$), and at discharging 101 ± 72 mg/ml (ns). The values expressed as a percentage evolved similarly. At admission DHEAS levels were 112.5 ± 136%; at 48 h 67 ± 94% ($p < 0.001$); 47 ± 55% after 5 days ($p < 0.001$), and 47 ± 55% before discharging. DHEA and DHEAS levels decreased during the evolution of the whole group and that of the survivors'. Not survivor patients got highest levels and they remained high during the evolution. No association was found between hormone levels and prognostic markers of severity. The study of the correlation of both values was performed by linear regression. It was significant with a good income coefficient of determination at admission ($r^2 = 0.9356$), worsening during the evolution and becoming regular in 5 days ($r^2 = 0.4185$).

CONCLUSIONS. Initial levels of DHEA in septic patients were high, although lower than it was expected for their level of stress, however they decreased during the evolution. The levels of DHEA/DHEAS were not related to the severity parameters. It was dissociation between levels of DHEA and DHEAS in patients with severe sepsis that increased during the course of sepsis.

0547

PROGNOSTIC VALUE OF LABORATORY PARAMETERS CLEARANCE IN SEPTIC PATIENTS ADMITTED IN ICU

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INTRODUCTION. Sepsis is a leading cause of morbidity and mortality in ICU. Prognostic value of several laboratory parameters has been described. An early diagnosis and treatment of severe sepsis has been shown to improve outcome.

AIM. The objectives of the study were to describe the clinical characteristics of septic shock patients admitted in ICU and to analyze the correlation between laboratory parameters clearance within the first 24 h of admission.

METHODS. Consecutive septic shock patients admitted in intensive care unit during the year 2010 were included. Age, sex, ICU length of stay, time of mechanical ventilation, Apache II score at admission and mortality were registered. Laboratory clearance of laboratory parameters obtained by the resulting difference between the value result in the first 24 h of ICU stay less the admission in ICU value result, it was applied to the following variables: lactic acid, creatinine blood levels, venous ph, bicarbonate, activated partial thromboplastin time (APTT), leukocytes, neutrophils and platelets count. Results were compared according mortality.

RESULTS. 60 septic shock patients were analyzed. Mean age was 66.2 ± 14.6 years, 21 female and 39 male, ICU length of stay 11.3 ± 10.9 days, the mean APACHE II score was 24.2 ± 7. According clinical outcome we difference two groups, survivors and deaths.

Results

	Survivors	Deaths
Lactic acid clearance	0.49 ± 1.48	−1.32 ± 3.53
APPT clearance	0.18 ± 7.97	−4.02 ± 19.71
Leukocytes count clearance	−67.24 ± 6,050.63	1,114.44 ± 7,346.01
Neutrophils count clearance	355.92 ± 4,939	1,092.69 ± 7,310
Creatinine blood levels clearance	0.02 ± 0.61	−0.02 ± 0.85

CONCLUSIONS. – Lactic acid, creatinine blood levels, APPT, leukocytes and neutrophils count clearance in 24 h of ICU admission were associated with a better outcome in septic shock patients. The improvement in 24 h of venous ph, bicarbonate levels, platelets and lymphocytes blood count were not associated with an increase in survival.

0548

IS MULTICOLOR FLOW CYTOMETRY DIAGNOSTIC AND PRONOSTIC AT THE ACUTE PHASE OF SEPSIS?

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INTRODUCTION. Multicolor flow cytometry (MFC) provides various informations on the activation state and the level of differentiation of leucocyte populations. As such, it could be valuable for the diagnosis of sepsis at its early phase, and even be predictive of outcome.

OBJECTIVES. Evaluation of diagnostic interest of MFC at the acute phase of sepsis.

METHODS. All patients admitted to our institution for a sepsis initiated since less than 24 h were eligible. Exclusion criteria were medical history of cancer, inflammatory disease or immunosuppressive therapy. A site of infection, microbiological documentation, SOFA score, initial CRP and procalcitonin (PCT) levels, and organ dysfunctions were recorded during 7 days. A total of 39 circulating blood leucocytes subsets was analized by MFC on a blood sample obtained on admission. During the same period, normal leucocytes subsets analysis using MFC were determined in a group of healthy volunteers. Patients were divided into three groups (sepsis, severe sepsis, septic shock), three groups according to the course of organ failures on day 2 (worsening, improvement, stability) and two groups according to outcome on day 7 (death related to sepsis, or alived patients).

RESULTS.

Population description (median [Q1; Q3])

	Sepsis N = 49	Severe Sepsis N = 44	Septic shock N = 14
Leucocytes (G/L)	15 [11.4; 18.4]	12.9 [9.38; 19.9]	9.5 [5.25; 19.98]
PCT (ng/ml)	1 [0; 5]	16 [2; 39]	58 [13; 96]
CRP (mg/l)	216 [85; 318]	226 [74; 414]	271 [88; 310]
SOFA	1 [0; 2]	3 [2; 8]	9 [7; 11]
Mortality (%)	0	9	35

During 11 months, 111 septic patients and 47 controls were studied. Infections were principally community-acquired (89%) and more frequently intra-abdominal-, lung-, or urinary-related (28, 26 and 20% respectively). 61% of infections were microbiologically documented. All studied leucocytes subsets were statistically different between septic patients and controls, regardless of the severity of sepsis. Immature granulocytes (CD10−, CD16−) were markedly increased in septic patients with multiorgan failure ($p < 0.001$), in the presence of the worsening of SOFA score on day 2 ($p < 0.001$), and in deceaded patients ($p = 0.002$). Monocytes CD16+ and neutrophils CD64+ appeared unrelated to the severity of sepsis. Unfavorable outcome is associated with reduced count of lymphocytes (CD4, CD8, NK, T regulators and T cytotoxic serves: $p < 0.05$).

CONCLUSIONS. Multicolor Flow Cytometry appears promising for helping the diagnosis of sepsis on ICU admission. Certain leucocytes subsets (immature granulocytes) appear to be related to the severity of sepsis.

GRANT ACKNOWLEDGMENT. Support from INSERM.

0549

IMMATURE BLOOD NEUTROPHILS ARE INDICATORS OF INFECTION AND MORTALITY IN ICU PATIENTS

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INTRODUCTION. The identification of >10% immature neutrophils (band cells) in the peripheral blood is one of the criteria of the systemic inflammatory response syndrome (SIRS) [1]. However, the appearance of these cells in the circulation, referred to as 'a shift to the left', is also a feature of bacterial infection. We were interested to clarify whether immature neutrophils are particularly associated with SIRS induced by infection (sepsis) rather than by non-infectious stimuli.

OBJECTIVES. The aims of the study were to determine if the presence of >10% circulating immature neutrophils discriminated patients with sepsis from those with non-infectious SIRS and whether their presence had any diagnostic or prognostic significance.

METHODS. Blood samples from 135 patients recently admitted to the ICU and from 20 healthy staff were examined for their presence of immature neutrophils by an experienced haematologist who was not provided with any patient details. Neutrophils in the final stages of development, myelocyte → metamyelocyte → band cell → mature segmented cell, were identified by their characteristic morphologies. Later, the patients were retrospectively categorised by an ICU consultant, who was blinded to the laboratory findings, into three groups: 62 patients with sepsis, 55 with non-infectious SIRS (NIS) and 18 patients who had neither SIRS nor sepsis (NSNS).

RESULTS. Of the patients with sepsis 68% had >10% circulating immature neutrophils in comparison with 49% patients with NIS ($p < 0.005$). The incidence of these cells in NSNS and healthy subjects was 33 and 0% respectively. Most of the immature neutrophils were band cells but myelocytes and metamyelocytes were often present. The overall percentage of immature neutrophils was far higher in the sepsis group (mean 28 ± 3: $p < 0.05$) than in the NIS (16 ± 2) and NSNS patients (10 ± 2). The percentage of total immature neutrophils was related directly to the patients' age and CRP concentration and indirectly to the platelet numbers. There was no relationship with the total WBC count.

We noted that over a 28 day period patients who died within 2 days of blood sampling had more myelocytes and metamyelocytes in their circulation (mean $20 \pm 6\%$;$p < 0.01$) than patients who died later ($6 \pm 2\%$). Neither the levels of band cells nor the WBC counts were associated with mortality.

CONCLUSIONS. Circulating immature neutrophils, especially with myelocytes and metamyelocyte included in their assessment, are a particular feature of sepsis. The monitoring of blood myelocytes and metamyelocytes may have considerable prognostic significance in patients with sepsis.

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GRANT ACKNOWLEDGMENT. The work was supported be the Guy's and St.Thomas' Charitable Foundation.

0550

LYMPHOCYTES TO WCC RATIO AS A PREDICTOR OF INFECTION IN SURGICAL PATIENTS ADMITTED TO INTENSIVE CARE UNIT

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INTRODUCTION. Differential white blood cell (WBC) count and C-reactive protein (CRP) are routinely performed blood tests on intensive care unit (ICU) patients. Patients with acute bacteraemia typically present with elevated CRP, elevated total WBC count, neutrophilia, eosinopaenia and lymphopaenia. Patients admitted post-operatively to ICU also have elevated levels of CRP and WBC count due to the inflammatory response to surgery. We prospectively studied a cohort of surgical ICU patients to see if CRP and differential WBC counts are associated with infection on admission to ICU.

OBJECTIVES. To compare the usefulness of CRP, routine differential WBC count tests and derived ratios in predicting the presence of infection in surgical patients admitted to ICU.

METHODS. An observational, prospective cohort study of all consecutive surgical patients was carried out in a 17-bedded mixed ICU, in a 1500 bedded university teaching hospital, between September and December 2010. On ICU admission, routine blood tests performed included: total WBC count, automated neutrophil count, lymphocyte count and CRP levels. On admission, patients with a proven infection were identified using a positive blood, urine, sputum or tissue cultures. Data on demographics, routine blood results, presence of infection were collected and the receiver operating characteristics (ROC) curve and the area under the curve (AUC) were calculated for differential WBC count, CRP and derived ratios.

RESULTS. A total of 216 patients were studied, (86 females, 132 males), mean age of 58.5 years ± SD 19.5. There were 97 emergency admissions. In total 42 out of 216 (19.5%) patients with a proven infection on admission. CRP and Lymphocyte/WCC ratio showed the best AUC in the ROC analysis (>0.6, $p < 0.01$). Neutrophil/WCC ratio had an area of 0.598 with a $p < 0.05$. Table 1 summaries the results:

TABLE 1

	Area	SE	P value
CRP	0.671	0.048	0.001
Lymph/WCC Ratio	0.635	0.05	0.006
Neutrophil/WCC	0.598	0.053	0.049

CONCLUSIONS. The stress of surgery makes it difficult to interpret commonly used markers of infection in the context of surgical inflammation. CRP and lymphocyte to total WBC count ratio demonstrate equal, discriminatory value in differentiating those patients with infection from those without. Further investigation into the usefulness of lymphocyte to total WBC count ratio is warranted, not least as this information is already generated but currently ignored.

0551

CLINICAL AND BIOCHEMICAL PARAMETERS TO PREDICT OUTCOME IN SEPSIS AT ICU ADMISSION

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INTRODUCTION. The sepsis is the most common cause of death in the hospitalized patients in Intensive Care Unit (ICU). The prevalence of severe sepsis and septic shock in our ICU was 12.4%.

OBJECTIVES. The goal of our study is to assess the mortality risk factor profitability of different proteins, biomarkers and nutritional parameters, with severity scores in severe sepsis or septic shock patients. We provide analytical and clinical parameters that allow us to develop a statistical predictive model in a severe septic episode.

METHODS. A retrospective chart review was performed in 113 patients during 6 months from January to May 2009. The diagnosis and biomarkers were set in the first 24 h. The quantitative variables measured were: procalcitonin (PCT) and C-reactive protein (CRP), α1-acid glycoprotein (AAG), serum amyloid A (SAA), lymphocytes, albumin, cholesterol (Chol), total proteins (TP) and prealbumin. The qualitative variables measured were: sequential organ failure assessment (SOFA), acute physiology and chronic health enquiry (APACHEII), stages of sepsis and infectious focus. The CRP and prealbumin were determined by immunonephelometry (Dimension Vista, Siemens); Chol, TP and albumin were measured by polybiochromatic endpoint (Dimension Vista, Siemens); PCT was analyzed by immunoassay (Vidas, Brahms) and finally SAA and AAG were measured by immunonephelometry (BN-ProSpec, Siemens).The statistical model used has been the logistic regression and probit model with the statistics package (STATISTICA7.1 ®)

RESULTS. The mean age was 60.5 ± 16 years, 67% were men, APACHE II was 23.78 ± 6.52 and SOFA 9.96 ± 3.13; the length of stay in ICU was 9.5 ± 10.1 days, septic shock was present in 87.6% and rate mortality was 26.5% ($n = 30$). The principal predictive variable was SOFA scale. The CRP and total Chol, improve significant logistic regression model ($p = 0.0016$) than just SOFA score. Significant Predictive variables were SOFA, CRP and Chol ($p = 0.000012$), Wald's Chi-square test.

Predictive Model and Severe Septic Episode

	SOFA (%)	SOFA, CRP and cholesterol (%)
Sensitivity	91.5	93.9
Specificity	30.0	41.4
Positive predictive value (PPV)	15.6	19.4
Negative predictive value (NPV)	96.14	98.1

CONCLUSIONS. The inclusion of CRP and Cholesterol to SOFA score improve Sensitivity and NPV in severe sepsis and septic shock.

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0552

A NOVEL TECHNIQUE TO INVESTIGATE ERYTHROCYTE MEMBRANE ABNORMALITIES IN SEPTIC PATIENTS

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INTRODUCTION. A number of rheological disturbances are observed in sepsis including abnormal red cell deformability and these may contribute to microcirculatory dysfunction [1]. Traditional techniques used to investigate these rely on bulk filtration methods and analysis of whole blood leaving the effect at the cellular level largely unknown.

OBJECTIVES. To use a novel biophysical technique to investigate erythrocyte elasticity in septic patients.

METHODS. Patients diagnosed with sepsis, severe sepsis or septic shock were identified and recruited within 48 h of admission to our Intensive Care Unit (ICU). Daily blood samples were taken for up to 5 days or until patient discharge or death. The thermal fluctuation spectra of ten individual erythrocytes from each sample were recorded using fast phase-contrast video microscopy [2]. The analysis of the membrane mean square fluctuations provided a measure of the erythrocyte stiffness and allowed the evaluation of the membrane elastic constants. The obtained results were compared against control samples from normal volunteers. Clinical, physiological variables and sequential organ failure assessment (SOFA) scores were collected for all patients.

RESULTS. We report initial data from the pilot stage of our on-going research. Table 1 shows mean relative erythrocyte fluctuation (a dimensionless number) on each day of admission with the calculated SOFA scores for 6 septic patients.

[Mean relative fluctuation, (SD) and SOFA scores]

Patient	Day 1	Day 2	Day 3	Day 4	Day 5
Sepsis 1	5.1 (±0.4), 12	4.7 (±0.3), 9	4.6 (±0.4), 7	5.4 (±0.5), 5	5.5 (±0.5), 3
Sepsis 2	5.7 (±0.4),14	4.6 (±0.6), 20			
Sepsis 3	5.1 (±0.3), 12	4.8 (±0.3), 14	5.4 (±0.4), 7		
Sepsis 4	5.4 (±0.4), 7	5.4 (±0.4), 5			
Sepsis 5	4.5 (±0.2), 11	4.5 (±0.4), 2	4.8 (±0.7), 1		
Sepsis 6	5.0 (±0.4), 17	5.4 (±0.2), 20	5.2 (±0.4), 21		

CONCLUSIONS. Thermal fluctuation analysis allows the characterisation of individual erythrocyte membrane properties. This novel technique may offer new insights into the microcirculatory changes that are observed in patients with sepsis.

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GRANT ACKNOWLEDGMENT. This work is funded through a Royal Society University Fellowship held by S. A. Jewell.

Outcome in sepsis: 0553–0566

0553

HEPATOADRENAL SYNDROME: UNDERDIAGNOSED ENTITY

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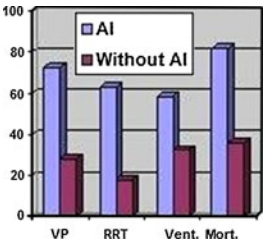
INTRODUCTION. Adrenal insufficiency (AI) in critical illness have been reported to be associated with increased morbidity and mortality. Occult adrenal insufficiency in chronic liver disease patients in underdiagnosed and underreported.

OBJECTIVES. We hypothesized that adrenal insufficiency is present in critically ill chronic liver disease (CLD) patients and is associated with increased in-hospital mortality [1].

METHODS. We observed the incidence of adrenal insufficiency in 56 CLD patients admitted to an adult gastrointestinal intensive care unit (ICU) between January 2011 to March 2011. Out of these patients, 21 patients were excluded as they received steroids in last 3 months. Remaining 35 patients (9 females and 26 males) had random cortisol and serum high density lipoprotein (HDL) level testing at admission to the ICU. Threshold random cortisol value of less than 15ug/dl was kept to diagnose adrenal insufficiency. The need for vasopressor use, renal replacement therapy (RRT), ventilatory support and in hospital mortality was observed.

RESULTS. Out of 35 patients, 20 (57.14%) had adrenal insufficiency by the threshold values. Out of these 20 patients only 11 (55.0%) had low HDL levels. Patients with adrenal insufficiency had higher vasopressor (VP) requirement (72.6 vs. 28.3%), more need for RRT (63 vs. 18%), more ventilator days (58.1 vs. 32.6%) and higher in-hospital mortality (82 vs. 36%).



Variables with and without AI

CONCLUSIONS. Adrenal insufficiency is commonly missed in critically ill CLD patients and is associated with increased incidence of multiorgan failure and increased in-hospital mortality. Low HDL values does not show a strong co-relation with AI.

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0554

SEPTIC SHOCK IN A COHORT OF MORE THAN 1000 PATIENTS FROM THE NORTH-EAST OF FRANCE: EPISS GROUP

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INTRODUCTION. Incidence of septic shock in France ranges from 8 to 10% among patients (pts) admitted to intensive care. Mortality at 28 days is 55–60% [1]. To date, no nationwide cohort of septic shock exists in France that could allow regular evaluation of the epidemiology of septic shock and the impact of new management modalities on mortality, particularly since the publication of the Surviving Sepsis Campaign international guidelines [2].

OBJECTIVES. To investigate epidemiology, treatment and mortality of pts with septic shock in a multicentre registry.

METHODS. Prospective, multicentre, observational cohort study supported by the Collège Interrégional des Réanimateurs du Nord-Est (CIRNE) including 14 intensive care units in 10 university or non-academic hospitals. Inclusion criteria were: pts aged >18 years presenting with documented/suspected infection requiring initiation of vasopressor amines despite adequate vascular filling, with at least 1 of the following hypoperfusion criteria: metabolic acidosis (base excess $\geq$5 mEq/L or alkaline reserve <18 mEq/L or lactate $\geq$2.5 mmol/L); oliguria/renal insufficiency (<0.5 ml/kg/h for 3 h or elevation >50% of baseline creatinine); or hepatic dysfunction (AST or ALT >500 IU/L or bilirubin >20 mg/L(34 µmol/L)). Patients with previous septic shock during their hospital stay were excluded. Quality control was performed by the Dijon Clinical Investigation Center (INSERM).

RESULTS. Mean inclusion was 80 pts/month for all centres. We analysed the first 1,018 patients up to 05/04/2011. Mean age was 68 $\pm$ 13 years, 64% men. Indication for admission was medical in 84%. Mean SAPSII score was 60 $\pm$ 21, mean SOFA score at time of shock was 11 $\pm$ 3. Sepsis was mainly of pulmonary (48%), digestive (17%), or urinary origin (10%), with 25% other causes. Sepsis was mainly community-acquired (64%) and was documented in 72%, of which 47% were Gram negative bacilli, 37% Gram positive cocci and 16% others. Replacement techniques used were: invasive mechanical ventilation (84%), continuous dialysis (34%) and intermittent dialysis (20%). Activated protein C was used (3%) and hydrocortisone hemisuccinate in 238 (64%). Mortality was 43% in intensive care and 53% in-hospital.

CONCLUSIONS. Given the high mortality in pts with septic shock, a large cohort of septic shock pts is of particular interest, especially when it is not taken from a clinical trial population with highly selected pts. We are able to evaluate in "real life" conditions the epidemiology and treatment of septic shock, and identify short-, medium- and long-term prognostic factors. Our findings raise hope of improved knowledge of epidemiology and management of septic shock in intensive care pts, and should have a beneficial effect on prognosis.

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0555

PREEXISTING ALTERATION OF RENAL FUNCTION INFLUENCES THE OUTCOME OF SEPTIC SHOCK PATIENTS

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OBJECTIVES. The aim of this study was to evaluate the influence of the preexisting glomerular filtration rate (GFR) on outcomes of critically ill patients treated for septic shock.

METHODS. We included all patients treated for septic shock in 2008 and 2009 in the medical intensive care unit, CHU Amiens. We classified patients into 4 groups according to their GFR preexisting to the septic shock.

Group 1: normal renal function (GFR $\geq$60 ml/min/1.73 m^2).

Group 2: Chronic renal failure (CRF) not on dialysis (CRF ND) (GFR <60 ml/min/1.73 m^2 but ND).

Group 3: CRF on hemodialysis (CRF HD) (GFR <5).

Group 4: CRF (ND and HD) (GFR <60 ml/min/1.73 m^2 corresponding to group 2 + 3). The primary outcome was 1-year mortality. Secondary outcomes were 28-days mortality, duration (days) without mechanical ventilation (MV) (J1–J28) and duration (days) without vasoactive drugs (VD) (J1–J28).

RESULTS. One hundred forty patients were included in this study with a mean age of 66 $\pm$ 14-year old and a mean SAPSII of 65 $\pm$ 37. Eighty-five patients belonged to group 1, 38 in group 2 and 17 in group 3. Patients in group 1 were younger and presented a less frequent history of hypertension and diabetes than the other groups. The mortality at 1 year was significantly higher in group 4 (85.4%) versus group 1 (64.7%; $p = 0.004$). Similarly, 28-days mortality was significantly higher in group 4 (73%) versus group 1 (53%; $p = 0.01$). The number of days without MV was not significantly different between the four groups. The number of days without VD was significantly different between group 1 (5.9 $\pm$ 7.6 free days) versus group 2 (2.9 $\pm$ 4.5; $p = 0.02$), versus group 3 (1.6 $\pm$ 2.5; $p = 0.02$) and versus group 4 (2.5 $\pm$ 4; $p = 0.003$). Renal support was more frequently require in group 3 (76%) than in group 1 (46%; $p = 0.04$) but there were no significant differences between the other groups (group 2, 50%; group 4, 58%). In multivariate analysis, GFR is a risk factor of 1-year mortality independent of age, hypertension, diabetes, modified SAPS 2 (excluding age, diuresis and uremia) or the number of days without MV (J1-J28). However, faced with the number of days without VD (J1–J28), the GFR is no longer an independent risk factor of mortality at 1 year.

CONCLUSIONS. Experiencing septic shock, the pre-existing GFR is a risk factor for 1-year mortality independent of age, hypertension, diabetes, modified SAPS 2, or the number of days without MV (J1–J28). The mechanism involved in this excess mortality remains uncertain but it appears that the decreased pre-existing GFR seems to be associated with a prolonged requirement of catecholamines.

0556

PROGNOSTIC VALUE OF A SERIAL DETERMINATION OF LACTATE, REACTIVE-C-PROTEIN AND LEUKOCYTES IN SEPSIS AND THE IMPACT OF AN EARLY TREATMENT

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INTRODUCTION. Measurement of lactate can be a screening tool for patients with a high risk of death in sepsis. Probably, other biomarkers such as reactive-C-protein and leukocytes could help us to identify these patients.

OBJECTIVES. To determine the prognostic value of a serial measurement of lactate, RCP and leukocytes in sepsis and to evaluate the impact of an early treatment.

METHODS. Prospective observational study, from 2006 to 2010, in a polyvalent intensive care unit (ICU) in an academic hospital. We included all the admitted patients with severe sepsis and/or septic shock. We collected epidemiological and clinical data, administrated treatment and daily measurement of lactate, RCP and leukocytes during 5 initial days. We considered early treatment between the first 3 h in community infections and between first hour in nosocomial infections. Data were analyzed with Chi-square,T test and multivariable logistic regression. We presented results as mean $\pm$ standard deviation, percentage or Odds Ratio (OR).

RESULTS. We included 442 patients (62.9% male), with a mean age of 66.6 $\pm$ 15.1 year old, APACHE II 18.4 $\pm$ 7.9 points and number of organic failure at admission of 1.17 $\pm$ 0.97. The origin of the patients was 64% in a emergency department, 28.1% in a hospital ward and 7.9% from ICU. In-hospital mortality was 31.4%. The more frequent sepsis sources were: respiratory, abdominal and urinary tract. The initial value of lactate (42.6 $\pm$ 29.9 mg/dL), matches with the peak value, whereas the RCP peak (26.9 $\pm$ 12.6 mg/dL) is on the second day and the leukocytes peak in the third day (16,466.6 $\pm$ 9811.9 $\times$ 106/L). The initial value of lactate (49.1 $\pm$ 36.9 vs. 39.8 $\pm$ 25.8 mg/dL; $p < 0.001$) was higher in patients who died. We could not find a prognostic value regarding the initial or peak value of either RCP or leukocytes. If we analyze the serial measurement of lactate, survivor patients have a higher decrease of lactate during the first 24 h. During the first 5 days, both groups tend to decrease lactate values but patients who die keep higher values than survivor patients. Moreover, the lactate difference between each day and the previous day is associated with a higher survival rate. However, we could not find a relationship between the serial measurement of RCP and leukocytes and mortality.

If we look at the impact of an early treatment in our patients, the early antibiotic therapy has a relationship with lower mortality (OR 0.58; 95% IC 0.35–0.98; $p = 0.041$). The group with an early antibiotic treatment has a higher initial lactate value (45.8 $\pm$ 33.8 vs. 39.4 $\pm$ 25.0 mg/dL; $p = 0.030$) and a trend towards a greater initial reduction (13.1 $\pm$ 28.5 vs. 8.0 $\pm$ 26.3 mg/dL; $p = 0.065$). We could not find a relationship between early antibiotic treatment and the serial measurement of RCP and leukocytes.

CONCLUSIONS. The serial measurement of lactate has prognostic value. The early antibiotic treatment has an impact on mortality and could be associated with a decrease in lactate levels.

0557

MORTALITY POST-DISCHARGE IN ICU PATIENTS WITH MULTI-ORGAN FAILURE: PROGNOSTIC FACTORS ON ADMISSION TO ICU

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INTRODUCTION. There are factors at admission on ICU (Intensive Care Unit) that determine the post-ICU mortality and helps to improve the patient's management.

OBJECTIVE. To evaluate the prognostic factors on admission to ICU (Intensive Care Unit) that determine the survival of patients post-discharge.

MATERIALS AND METHODS. Evaluation of patients with multi-organ failure (according to SOFA—Sepsis-related Organ Failure Assessment—criteria) admitted to ICU, excluding neurocritical and politrauma patients. A follow-up was performed, a minimum of 1 year after discharge, and after a telephone call to verify whether the patient had survived or not. A bivariate analysis was conducted; survival function and cox regression.

RESULTS. 565 patients were admitted to ICU with multi-organ failure. 164 patients (29%) died in ICU; 60 patients died on main hospital wards (10.6%). 341 patients were discharged from hospital; of these, 283 households were contacted by telephone (study sample). It was found that 41 patients had died (14.5%). Thus the overall mortality rate is 47.1% (265 patients). The follow-up was carried out a median of 14 months after discharge (P25 10.5 months; P75 19 months). If we compare the patients who survive vs those who die following discharge, the statistically significant variables are: history of arterial hypertension (42 vs. 61%), ischemic heart disease (10.3 vs. 24.4%), chronic bronchitis (13 vs. 31.7%), COPD—chronic obstructive pulmonary disease—(12 vs. 29.3%), chronic renal failure (8.3 vs. 24.4%), chronic liver disease (6.7 vs. 17.1%), neuromuscular disease (1.7 vs. 12.5%), neoplasia (17.7 vs. 31.7%), valvular disease (8.3 vs. 26.8%), tachyarrhythmia (9.3 vs. 22%), hospital admission in the previous year (27.7 vs. 53.7%), chemotherapy/radiotherapy in the previous 6 months (2.3 vs. 9.8%) normal functional status (78.7 vs. 53.7%), SAPS—simplified acute physiology score—III (58 ± 12 vs 65 ± 15), age (59 ± 18 vs. 67 ± 13). Of the patients who die, 50% do so within the first 7 months. Cumulative survival post-discharge at 16 months is 86% of patients. In the Cox regression analysis, the only remaining variables in the model are functional status and SAPS III.

CONCLUSION. The mortality rate of patients with multi-organ failure post-discharge from hospital is close to 15%. The factors that most determine outcome are previous functional situation and SAPS III on admission to ICU.

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0558

SYSTEMIC INFLAMATORY RESPOSE SYNDROME IN CRITICALLY ILL PATIENTS HIV POSITIVE

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INTRODUCTION. The SIRS cause the production of protein and lipid mediators, the direct consequences included multiple organ dysfunction and acute respiratory syndrome. The previous reasons are very important in HIV+ patients.

OBJECTIVES. We want to study the systemic inflammatory response syndrome (SIRS) in HIV+ patients admitted to the ICU.

METHODS. Retrospective analysis of HIV patients admitted in our ICU between January 2005 and December 2009. We analyzed the number of SIRS criteria of each patient and relationship to: nutritional status (albumin, prealbumin and transferrin), immunological (CD4, highly active antiretroviral therapy-HAART-), diagnosis, organ support (hemodynamic, respiratory and renal), ICU length of stay and mortality.

RESULTS. We found 105 patients (70.5% male, mean age 41.05 ± 8.57). 49.5% were treated with HAART at admission. Median CD4 count was: 275.4 ± 362.16/mL. 58.3% of patients had an infection at admission. ICU length of stay was: 8.67 ± 9.88 days, intra UCI mortality was: 28.6%. 72.9% of patients showed criteria of SIRS. The number of SIRS criteria presented in our group (excluding patients with coronary disease) was 2.34 ± 1.09. No significant relationship was found between the number of SIRS criteria and HAART treatment (2.35 ± 1.05 vs. 2.32 ± 1.13), history of alcoholism (2.14 ± 0.94) or intravenous drug (2.78 ± 1.05). Those patients who were admitted to ICU for an infectious disease had a significantly higher number of SIRS criteria (01 vs. 1 ± 2.62, 1.77 ± 1.04, p = 0.000).Patients with SIRS ≥3 had a significantly higher APACHE II (29.67 ± 5.20 vs. 24.44 ± 5.85, p = 0.006). When we had compared those with >2 SIRS criteria versus those with ≤2, we found no differences in CD4 and CD4 nadir. We did not demonstrate differences in nutritional status in both groups (albumin ≥3 SIRS: 2.37 ± 0.62 vs. <2 SIRS: 2.40 ± 0.57; prealbumin, 6.76 ± 4.11 vs. 8.64 ± 2.5; transferrin: 140.28 ± 56.84 vs. 152.27 ± 66.87). We also found no significant differences in terms of ICU length of stay (9.88 ± 9.33 vs. 10.72 ± 9.80 days), or mortality between the two groups (SIRS death group in ICU: 2.56 ± 1.04).

CONCLUSIONS. 72.9% of our patients met the criteria for SIRS. Patients admitted in ICU for a infectious disease met more criteria for SIRS. Patients who met >2 SIRS criteria had a significantly higher APACHE II. This higher severity is not related to an increased need for organ support and mortality. The nutritional and immunological status do not significantly influence the occurrence of SIRS.

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THE INFLUENCE OF THE CAUSE OF MULTI-ORGAN DYSFUNCTION ON MORTALITY IN ICU

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INTRODUCTION. The admission cause in ICU (Intensive Care Unit), has influence on mortality.

OBJECTIVES. To assess which pathologies of multi-organ dysfunction cause higher mortality in ICU.

MATERIALS AND METHODS. Study over 2 years in a medical/surgical ICU including all patients developing multi-organ failure (two or more organs, according to SOFA) the first 24 h of admission; reviewing the percentage with in each pathology that results in exitus.

RESULTS. 592 patients included. 29.4% (174 patients) die in ICU. 100% of patients with tetanus, osteomyelitis, infectious endocarditis and aortic dissection die. A high mortality rate exists in sepsis of unknown origin (73%), acute liver failure (66.7%), cardiorespiratory arrest (63.2%), cardiogenic shock (57.1%), acute cholecystitis (50%), nosocomial pneumonia (48%), pulmonary thromboembolism (44.4%), intestinal obstruction (44.4%), major complicated vascular surgery (42.9%), sepsis of abdominal origin (40%); the following implicate a moderate mortality rate: anaphylactic shock (33.3%), exacerbation of chronic liver failure (33.3%), hemorrhagic shock (32.1%), mesenteric vascular disease (31.3%), secondary peritonitis (28.2%), community acquired pneumonia (26%), postoperative abdominal infectious complications (25%), endovascular septic shock (25%), major complicated abdominal surgery (23.5%), acute pancreatitis (23.5%), soft tissue infection (20%), cholangitis (16.7%), respiratory failure (15%) and intoxication brought on my medication (11.1%), urological sepsis (8.6%) and postoperative respiratory failure (6.7%). Death did not occur in ICU in patients with bowel perforation, eclampsia/preeclampsia, unassociated pancolitis, diabetic ketoacidosis, complicated urologic surgery, suprarenal insufficiency, hypovolemic shock, infectious encephalitis, neuromuscular respiratory disease, epileptic status, acute obstetric problems, gastrointestinal haemorrhage, acute meningitis pancolitis and complicated thoracic surgery. Overall, the leading causes of mortality are: neurological (0%), metabolic (0%), nephrourological (9.1%), intoxication (11.1%), soft tissue (22.7%), respiratory (25, 9%), abdominal (26.7%), cardiac (41.1%), vascular (51.5%) and unknown cause (64.3%). All to a level of significance.

CONCLUSIONS. Knowing that the pathology which causes failure is as important a factor in mortality as the level of dysfunction produced gives us an idea as to how a patient's condition can evolve.

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0560

CLINICAL CHARACTERISTICS AND OUTCOMES ASSOCIATED WITH BLOOD TRANSFUSION IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Treating anaemia with red blood cell (RBC) transfusion to sustain oxygen delivery is frequent—but controversial—in patients with septic shock.

OBJECTIVES. To assess characteristics and outcomes associated with RBC transfusion in patients with septic shock.

METHODS. Prospective cohort study of all adult patients with septic shock in 7 general ICUs in a 5-months period. For all shock days clinical characteristics were registered. For every RBC transfusion clinical characteristics 2 h prior to transfusion were recorded.

RESULTS. 107 of the 213 included patients received median 3 (IQR 2–5) RBC units during the shock period. The median pretransfusion haemoglobin level was 8.1 (7.4–8.9) g/dl and independent of shock day. There was no difference in this trigger value among the 38% of transfused patients who had bleeding and those who had not or between the 65% of transfused patients who had cardiovascular disease and those who had not. Transfused patients had lower haemoglobin values (days 1–5), lower $ScvO_2$ (day 1), higher noradrenalin dose (days 1 and 5) and SOFA scores (days 1 and 5). Transfused patients had higher SAPS II (56 (45=68) vs. 48 (37–61), P = 0.001), more days in shock (5 (3–8) versus 2 (2–4) days, P = 0.0001), longer stay in ICU (9 (4–18) versus 4 (2–8) days, P = 0.0001) and higher 90-day mortality (69 vs. 44% P = 0.007). In the multivariate analysis only age was independently association with 90-day mortality (age (per year) OR 1.07 (95% CI 1.04–1.10); RBC transfusion (y/n) OR 1.9 (0.94–3.9)).

CONCLUSIONS. Half of the patients received RBCs during septic shock. Haemoglobin concentrations were the only measures that consequently differed between transfused and non-transfused patients, and the trigger level was independent of shock day, bleeding and cardiovascular disease. All together, RBC-transfused patients were more severely ill and had substantially increased stay in ICU and 90-day mortality. RBC-transfusion and mortality were not independently associated, but the 95% CI for the OR was wide. Therefore, large RCTs are needed to assess the safety and efficacy of RBC transfusion in patients with septic shock.

GRANT ACKNOWLEDGMENT. The Danish Stratetic Research Council.

RGR and MUH contributed equally to this study and therefore share the first authorship.

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OUTCOME FROM SEPSIS RELATED TO AGE IN A SCOTTISH INTENSIVE CARE UNIT

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INTRODUCTION. Mortality from sepsis in intensive care patients is high [1], and increases with age. This study set out to quantify age-related mortality due to sepsis in our intensive care unit, in the hope that this would help inform management decisions in these patients.

OBJECTIVES. We set out to determine mortality from sepsis in patients over the age of 60 in our intensive care unit and determine whether mortality increased significantly with increasing age.

METHODS. We did a retrospective analysis of patient records over a 5-year period from the beginning of 2004 to the end of 2009. We extracted records for all patients aged 60 or more during this period and then identified all patients with a diagnosis consistent with sepsis. We then determined intensive care and hospital mortality for these patients and stratified the results according to age group by decade.

RESULTS. 939 patients aged 60 and over were admitted during the study period. 452 had a diagnosis consistent with sepsis. Sex distribution and APACHE II scores were similar between the groups (Table 1). Mortality increased with increasing age and patients in their 80 s were significantly more likely to die as a result of their illness than those in their 60 and 70 s (Table 2). APACHE II outcome prediction became less accurate with increasing age (Table 3).

TABLE 1 DEMOGRAPHIC DATA AND SEVERITY OF ILLNESS DATA

Patient group	Age (median, IQ range)	Sex (% male, % female)	APACHE score median, IQ range)
All patients (n = 447)	72 (66–77)	47.53	22 (18–27)
60–69 (n = 166)	65 (62–67)	55.45	21 (17–27)
70–79 (n = 205)	74 (72–77)	50.50	23 (18–27)
80–89 (n = 72)	83 (81–86)	45.55	22.5 (18–26)
90 + (n = 4)	95 (N/A)	37.63	23 (N/A)

TABLE 2 ICU AND HOSPITAL MORTALITY IN PATIENTS WITH SEPSIS

Patient group	ICU mortality n (%)	Hospital mortality n (%)	APACHE II predicted hospital mortality (%)	SMR
All patients (n = 447)	199 (45)	244(55)	48	1.15
60–69 (n = 166)	71 (42)	82 (49)	46	0.93
70–79 (n = 205)	90 (45)	111 (56)	49	1.15
80–89 (n = 72)	35 (52)	51 (68)	50	1.36
90 + (n = 4)	2 (50)	4 (100)	56	1.79

TABLE 3 OUTCOME COMPARISON

Patient age groups	ICU mortality (%) (p value, Chi square analysis)	Hospital mortality (%) (p value, Chi square analysis)
60–69 and 70-79	42 vs. 45 ($p > 0.5$)	49 v 56 ($0.1 < p < 0.5$)
60–69 and 80–89	42 vs. 52 ($0.1 < p < 0.5$)	49 vs. 68 ($p < 0.01$)
70–79 and 80–89	45 vs. 52 ($0.1 < p < 0.5$)	56 vs. 68 ($p < 0.01$)

CONCLUSIONS. Outcomes from sepsis are worse than APACHE 2 predicted outcomes in patients over the age of 70 and this is most marked in patients who are 80 or older. This may have implications on decisions pertaining to admission and continued treatment of elderly patients with sepis.

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0562

PATIENTS WITH SEVERE SEPSIS FROM OUTSIDE OR WITHIN THE HOSPITAL: ANY DIFFERENCES?

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INTRODUCTION. Patients admitted with severe sepsis from within or outside the hospital may differ in terms of disease severity or time before optimal therapeutic management is started. Several barriers to implementing the early goal-directed therapy protocol in the emergency room (ER) have been reported and may lead to delays in the initial management of patients with severe sepsis. To avoid these potential delays, our institution uses a dedicated 'shock room', situated between the ER and the intensive care unit (ICU), to stabilize all acutely ill patients from outside or inside the hospital before transfer to the ICU or another department. Patients are managed jointly by the ICU and the ER teams.

PURPOSE. To compare demographic and clinical characteristics, hemodynamic response to early resuscitation, and outcome in patients admitted to the ICU from within or outside the hospital with a diagnosis of severe sepsis.

METHODS. All adult patients admitted to the ICU were eligible if they met the criteria for severe sepsis. Data collected included demographic and clinical characteristics, APACHE II score, SOFA score, hemodynamic data during the first 6 h of resuscitation, and outcome.

RESULTS. 92 patients with severe sepsis were included, 45 of whom came from outside the hospital (OUT), and 47 from inside the hospital (IN). The IN population had a higher APACHE II score (Table 1) and a higher prevalence of comorbidities, including diabetes and chronic renal insufficiency; they more commonly had a pulmonary site of infection ($p < 0.05$). The hemodynamic response to early resuscitation was similar in the two groups with the same proportion of patients in each group reaching the hemodynamic goals at 6 h (mean arterial pressure >65 mmHg, central venous pressure >8 mmHg and central venous oxygen saturation >70%) and with the same evolution in blood lactate concentration in both groups (Table 1). ICU and hospital mortalities were higher in IN patients than in OUT patients (38% vs 29%; $p < 0.05$ and 51% vs 32%; $p < 0.05$, respectively).

TABLE 1 *P < 0.05 VERSUS OUT; $P < 0.05 VERSUS BASELINE

	OUT (n = 45)	IN (n = 47)
Age (y)	67 ± 14	63 ± 16
Gender, male (%)	62	66
APACHE II score	21 ± 7	24 ± 6*
SOFA score	8 ± 3	9 ± 3
Lact baseline (mEq/L)	3.4 ± 1.3	2.9 ± 2.0
Lact 6 h (mEq/L)	2.2 ± 1.6$	2.1 ± 1.4$
$ScvO_2$ baseline (%)	67 ± 10	65 ± 11
$ScvO_2$ 6 h (%)	69 ± 8	70 ± 10

CONCLUSIONS. Patients admitted to the ICU from within the hospital are more severely ill and have a greater number of co-morbidities than patients admitted from outside. In our special environment, using a dedicated Shock Room, the hemodynamic response to early resuscitation was identical in IN- and OUT-patients. The higher severity of illness and greater number of co-morbidities among the IN-patients may account for their higher mortality rate.

0563

ABDOMINAL COMPARTMENT SYNDROME IN SEVERE ACUTE PANCREATITIS

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INTRODUCTION. With increasing late surgical treatment of severe acute pancreatitis (SAP) abdominal compartment syndrome (ACS) is increasingly recognized as a life threatening complication.

OBJECTIVES. To describe treatment and outcome of patients with SAP and ACS.

METHODS. A retrospective series of all patients admitted with SAP to the intensive care unit (ICU) of a tertiary referral center between 2008 and 2011 was analyzed. Classification of SAP was done according to the Atlanta criteria and ACS was classified according to the criteria of the World Society of Abdominal Compartment Syndrome (WSACS).

RESULTS. A total of 24 patients met the Atlanta criteria for SAP. Intraabdominal pressure (IAP) measurements were performed in 15 patients (63%). All patients in whom IAP measurements were performed had intraabdominal hypertension (sustained or repeated pathologic elevation of IAP ≥12 mmHg), mean 23 (range 15–32).

10 patients (67%) met the criteria for ACS (sustained IAP >20 mmHg associated with new organ dysfunction).

Decompressive surgery was performed in 8 (80%) patients. The mean time between diagnosis of ACS and surgery was 13.9 h (range 2.7–38.5 h).

At the time of decompressive surgery there was bowel ischemia in 1 patient, for which sigmoid resection and loop ileostomy was performed. In 3 patients a relaparotomy was performed 1 day after decompression which showed necrosis of colon and ileum (1 patient), sigmoid perforation (1 patient) and necrosis of terminal ileum and ileostomy (1 patient). In 2 of these patients the IAPs had remained elevated despite decompressive surgery.

A patient who met the criteria for ACS and was managed conservatively died 1 day later. Autopsy showed necrotizing pancreatitis and focal ischemia of the intestines.

Infected pancreatic necrosis (at any point during admission) was found in 7 (88%) patients after decompressive surgery, compared to 12 (75%) of patients without decompressive surgery.

The mortality in the decompressive surgery group was 38%, compared to 43% in the group where IAP was measured and conservative treatment was continued and 20% in the group where no IAP was measured.

CONCLUSIONS. This series confirms earlier reports that ACS is a frequent complication of SAP. Abdominal pressure should therefore be measured routinely in all patients with SAP. The treatment for ACS is immediate decompressive surgery. SAP with ACS is associated with a high rate of infected pancreatic and intestinal necrosis and a high mortality.

0564

THE ASSOCIATION BETWEEN INOTROPE TREATMENT AND 90-DAY MORTALITY IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Administration of inotropes in septic patients with low cardiac output or low central/mixed venous saturation has been recommended in current international guidelines [1]. Inotropes may be beneficial for achieving hemodynamic goals, but the impact of inotrope use on the outcome of these patients is controversial [2, 3].

OBJECTIVES. We aimed to analyze the hemodynamic factors associated with the initiation of inotrope treatment, and the association of inotrope treatment and 90-day mortality in patients with septic shock.

METHODS. Retrospective cohort study in two university hospital intensive care units between January 1, 2005 and December 31, 2009. The data of 259 patients with septic shock and need of pulmonary artery catheter were reviewed from the data management system to elucidate the association of hemodynamic parameters, inotrope use and 90-day mortality.

RESULTS. We found that 63.6% (164 of 258) of patients received inotropic medication during the first 24 h in ICU. Of those, 92.1% received dobutamine, 16.5% levosimendan, and 12.8% epinephrine. Patients receiving inotropes were more severely ill according to APACHE II score ($p < 0.01$). High lactate and low cardiac index during the first 24 h were independently associated with the use of inotropic medication (p-values < 0.001 and < 0.001, respectively). Patients with inotrope treatment had higher 90-day mortality (40.9 vs. 21.3%, $p = 0.002$). High APACHE II score, low stroke volume on first day in ICU, small increase in stroke volume between the first 12 h and hours 24–36 and the use of epinephrine were independently associated with 90-day mortality by logistic regression analysis.

Poor increase in stroke volume was strongly associated with 90-day mortality in patients receiving inotropes ($p < 0.001$), but showed no association with 90-day mortality in the group of patients that did not receive inotrope treatment ($p = 0.93$).

CONCLUSIONS. We found that high lactate levels and low cardiac index during the first 24 h in ICU associated with the use of inotropes in patients with septic shock. Low stroke volume, a small increase in stroke volume, high APACHE II score, and the use of epinephrine were independently associated with 90-day mortality. Poor response to inotrope treatment predicted increased mortality in septic shock.

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0565

ONE YEAR PROSPECTIVE STUDY OF SEVERE SEPSIS AT ADMISSION IN A NORWEGAIN UNIVERSITY HOSPITAL

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INTRODUCTION. Severe sepsis is a great medical challenge, and carries a high mortality. Most data regarding severe sepsis comes from the ICU, but recent data indicates that a number of patients with severe sepsis are never admitted to an ICU [1].

OBJECTIVES. This study was established to describe and follow patients with severe sepsis at admission to a large Norwegian university hospital.

METHODS. Through 2008 a 1-year prospective, case defined. Observational study was undertaken where all acute admissions with severe sepsis to either the high dependency unit (HDU) at the department of infectious diseases, a combined medical ICU/observation unit or the general ICU were identified and included. One observer (SN) had daily rounds to these units in order to identify eligible patients. Patients were classified as having severe sepsis (first 24 h) according to the 2001 criteria [1]. Data were registered prospectively until death or hospital discharge. Patients <15 years were not included.

RESULTS. From a total of 101 791 admissions, 222 patients ($2.2/10^3$) were found to have severe sepsis at admission. According to the hospital referral area this equals 0.5 admissions per 10^3 inhabitants. 135 patients (A) (60.8%) were treated in part of their hospital stay in one of the ICUs, and 87 patients (B) (39.2%) were treated in the HDU. The table shows some major differences in these two groups.

Patients with severe sepsis

Group	Age (mean)	Hospital LOS	ICU LOS	Max lactate	Max creatinine	Fluids first 24 h	Vasoactive drugs	Respirator/ CPAP	Hospital mortality
	years	days (median)	days (median)	mmol/l (mean)	umol/l (mean)	ml (median)			
A	61.8	14.8	4	4.7	224	5900	63%	100%	30.4%
B	66.6	8.7	NA	2.0	146	4500	24.1%	28.7% (CPAP only)	18.4%

NA not applicable

CONCLUSIONS. Our study confirms that many patients admitted to our hospital with severe sepsis are not treated in an ICU. They are older, less severely ill, but also received active treatment (fluids, inotropes and CPAP). Their hospital mortality is less than those treated in the ICU.

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0566

THE IMPACT OF RESCUE THERAPY ON THE OUTCOME OF SEPTIC SHOCK

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INTRODUCTION. Despite revised sepsis campaign guidelines suggestion the use of steroids as rescue therapy in septic shock remains controversial. The purpose of this study was to examine the impact of rescue therapy on the outcome of septic shock patients.

METHODS. Patients charts from January to December 2010 were retrospectively reviewed to identify septic shock patients under hydrocortisone, as rescue therapy. Data regarding SOFA score, hemodynamics, temperature, oxygenation and diuresis during treatment were collected. All statistical analyses were performed with SPSS (version 1.7).

RESULTS. 34 patients in a total of 586 admissions were recognized to be in septic shock under rescue therapy. The 28th day mortality was 68%. Only 47% of patients were responders. There was a statistically significant difference in mortality ($p < 0.0001$) between responders and non-responders, 37.5% versus 94.4%, respectively. There was no improvement in SOFA score or urine output, while hemodynamic improvement was observed only in responders. Patients with SOFA score >8 have entered rescue therapy within the first 7 days, ($p = 0.033$). Mortality was higher in those who have started the therapy later (>7 day) ($p = 0.043$).

CONCLUSIONS. Rescue therapy seems to be beneficial to survival in the group of responders, probably due to tissue perfusion improvement secondary to hemodynamic stabilization.

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Outcome after cardiac arrest: 0567–0579

0567

SOMATOSENSORY-EVOKED POTENTIALS AMPLITUDE VS LATENCY IN PREDICTING NEUROLOGIC OUTCOME AFTER CARDIAC ARREST AND THERAPEUTIC HYPOTERMIA

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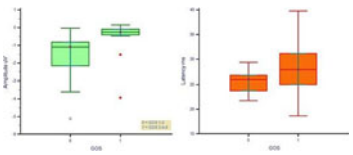
INTRODUCTION. Anoxic coma following cardiac arrest (CA) is a common problem with ethical, social and legal consequences. Current American Academy of Neurology (AAN) guidelines for outcome prediction in survivors have been validated before the therapeutic hypotermia era (TH).

OBJECTIVES. We undertook this study to verify the prognostic value of electrophysiological variables in the TH setting. The analysis focuses on the estimation of the best SSEP component to consider when evaluating a patient treated with TH.

METHODS. We included patients with GCS <9 after both in- and out-of-hospital CA wthout distinction in presentation rythm and ROSC within 60 min. Patients more than 75 years old, with terminal diseases and previous serious neurocognitive disorders were excluded. A total of 30 comatose survivors of CA treated with TH were prospectively studied over a 1-year period. Cardiological and neurological examination, electroencephalography (EEG) and somatosensory-evoked potentials (SSEP) were performed at 32°C, at normothermia and off sedation. Neurological recovery was assessed on ICU discharge and at 6 months, using Glasgow Coma Scale (GCS), Glasgow Outcome Scale-Revised (GOS: 5-dead, 1-good recovery) and Cerebral Performance Categories Scale (CPC).

RESULTS. Using ROC analysis we estimated the cut-off values of SSEP's amplitude (–0.7 μV) and latency (29.39 ms) with the highest sensitivity and specificity (respectively se/sp: 82.3/84.6 and 82.3/53.8%) at 37°C. Using these cut-off values we calculated the relative frequencies and Fisher's exact test which resulted statistically significative for amplitude ($p < 0.01$) but not for latency. Mann–Whitney U test is displayed graphically and is significaive for amplitude ($p < 0.01$) but not for latency.



Mann Whiney graphs

Moreover amplitude correlates both with GOS and CPC at 6-months and with mortality (correlation coefficient and p respecively: 0.497, $p < 0.01$, 0.403, $p < 0.01$ and 0.501, $p < 0.01$).

CONCLUSIONS. Amplitude, more than latency of SSEP, is shown to robustly track neurologic recovery after CA. SSEPs are among the most reliable predictors of poor outcome after CA; however, their amplitude early after resuscitation can enhance the ability to prognosticate recovery of consciousness.

0568

PROGNOSTIC VALUE OF MAGNETIC RESONANCE IMAGING (MRI) IN SURVIVORS OF CARDIAC ARREST

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INTRODUCTION. Prediction of the prognosis of comatose survivors after cardiac arrest (CA), based on clinical or biological data, remains difficult. Brain MRI can help to identify among patients those with poor prognosis, and diffusion tensor imaging (DTI) may be a promising tool in this setting.

OBJECTIVES. To determine the prognostic value of DTI in a cohort of survivors of CA in a multicentre study.

METHODS. 62 comatose survivors of CA underwent brain MRI including a standardized DTI acquisition, 13 ± 8 (mean ± SD) days after CA. Fractional anisotropy (FA), mean diffusibility (MD), axial diffusibility (L1) and radial diffusibility (Lt) were calculated for each individual in 20 predefined white matter regions that were grouped together in 3 anatomically and physiologically relevant larger regions; brainstem, deep brain and sub-cortical regions. Values were normalized to controls to take into account inter-center variability. A value of 1 was considered normal. Clinical outcome was assessed by the Glasgow outcome scale-extended (GOSE) at least 6 months after CA in survivors. Patients with favorable outcome, defined as a GOSE ≥5, were compared to those with unfavorable outcome. Results were expressed as median [IQR].

RESULTS. Of the 62 patients included in the study, 53 (age 51 [42–69]) had a GOSE below 5 (of whom 46 died) and 9 (age 49 [31–58]) had a GOSE at 5 or above. No- and low flow durations in patients with favorable and unfavorable outcome were 10 [4.25–10] and 5 [0–10] min ($p = 0.38$); 30 [17.5–38.5] and 20 [10–35] min ($p = 0.26$). Glasgow coma scale (GCS) at the time of MRI in patients with favorable and unfavorable outcome were 8 [6–13] and 5 [3–7] ($p = 0.01$), respectively. L1 values were within normal in patients with favorable outcome in the 3 predefined regions, whereas they were significantly decreased in patients with unfavorable outcome in deep brain and subcortical regions ($p < 0.05$). Lt values were above controls for both groups, without differences between groups. Prognostic values of these parameters for predicting unfavorable outcome were assessed using ROC curve analysis. The best prognostic parameter was L1 value in deep-brain region, with an area under ROC curve of 0.87 (95% CI, 0.76–0.94). A deep-brain L1 value below 0.97 combined with a sub cortical L1 value below 0.97 yielded to 70% sensitivity and 100% specificity in predicting unfavorable outcome. No clinical parameter had same operating values.

CONCLUSION. DTI and in particular axial diffusibility may be useful in predicting unfavorable outcome in comatose survivors of CA.

GRANT ACKNOWLEDGMENT. French ministry of health, PHRC 2005.

0569

SECRETONEURIN AS AN EARLY MARKER FOR HYPOXIC BRAIN INJURY AFTER CARDIOPULMONARY RESUSCITATION IS NOT INFLUENCED BY THE APPLICATION OF MILD THERAPEUTIC HYPOTHERMIA

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INTRODUCTION. After successful cardiopulmonary resuscitation (CPR) the early and precise evaluation of neurological outcome and prognosis of patients is of great importance. S-100B and neuron-specific enolase (NSE) have already been investigated for their reliability as prognostic markers in patients undergoing mild therapeutic hypothermia (MTH).

OBJECTIVES. In our study we aimed to evaluate the neuropeptide secretoneurin (SN) as an early marker for hypoxic brain injury after CPR and the influence of MTH on SN.

METHODS. We performed a prospective study on all consecutive patients admitted to our intensive care unit after successful CPR. Patients with an observed event and ventricular tachycardia/fibrillation as first monitored rhythm underwent mild therapeutic hypothermia (MTH) using an intravascular cooling device targeting at a temperature of 33°C for 24 h. Serum NSE, S-100B and SN concentrations were measured daily up to 10 days using a radioimmunoassay (RIA) focusing on the first 72 h. Neurological outcome was determined according to the Glasgow Outcome Scale (GOS).

RESULTS. We enrolled a total of 77 patients in our study (54 men, 23 women) with a mean age of 63 ± 14 years, 42% of the patients underwent MTH, 43% had good outcome (GOS 4 + 5) and 57% bad outcome (GOS 1 + 2+ 3). In the first 24 h as well as 24–48 h after CPR patients with poor neurological outcome had significantly higher log SN levels than patients with good neurological outcome, respectively (0–24 h: 4.13 ± 0.72 vs. 3.67 ± 0.62 fmol/ml; $p = 0.015$ and 24–48 h: 3.75 ± 0.72 vs. 3.21 ± 0.70 fmol/ml; $p = 0.009$). In a subanalysis we could observe a significant difference already within the first 12 h after CPR (0–12 h: 4.28 ± 0.65 vs. 3.77 ± 0.76 fmol/ml; $p = 0.047$) and within this time period SN can predict poor outcome with a sensitivity of 25% and a specificity of 100% at a cut-off level of 4.7 fmol/ml (AUC = 0.720 [0.466–0.974]). Concerning log NSE levels there was no significant difference between the patients with poor and good outcome within the first 24 h after CPR but between 24 and 48 h and between 48 and 72 h (24–48 h: 4.05 ± 0.88 vs. 3.15 ± 0.45 ng/ml; $p = 0.0001$; 48–72 h: 4.18 ± 1.00 vs. 2.99 ± 0.57 ng/ml; $p = 0.001$). S-100B turned to be not significantly different between the two groups at any timepoint. The application of mild therapeutic hypothermia did not significantly influence SN levels in the first 72 h.

CONCLUSIONS. Secretoneurin seems to be a promising new marker for the early prediction of hypoxic brain injury after CPR and is not influenced by the application of MTH.

0570

ETIOLOGIC INVESTIGATIONS AFTER OUT-OF-HOSPITAL CARDIAC ARREST: INTEREST OF AN EARLY AND SYSTEMATIC IMAGING PROCEDURE

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INTRODUCTION. Early identification of the cause is of paramount importance after out-of-hospital cardiac arrest (OHCA), involving both emergency mobile services and critical care physicians.

OBJECTIVES. We investigated the ability of our etiologic strategy to provide an early diagnosis of OHCA.

METHODS. Retrospective review of a prospectively acquired intensive care unit database (2000–2010) including all patients with an OHCA without obvious extra cardiac cause for which an early research of diagnosis was conducted (including coronary angiogram and/or brain CT scan and/or chest CT scan with pulmonary angiography) within 24 h after admission. These procedures could be performed separately or be combined, according to a decision algorithm. The judgement criterion was the ability of our imaging procedure to provide with an etiological diagnosis.

RESULTS. Of the 1,274 patients admitted after OHCA during this period, the strategy of early diagnosis research was applied in 896 patients without obvious extra cardiac cause. Median age was 59 years, with a sex ratio M/F of 3/1. Median no flow duration was 4 (0–10) min and low-flow was 15 (9–25) min. A shockable rhythm was found in 560 patients (63%) and ICU survival was 36%. Seven hundred forty-five coronary angiography were performed, of which 452 (61%) identified a coronary lesion deemed responsible for the cardiac arrest. CT scan was performed in 355 patients, allowing diagnosis in 72 patients (20%): stroke in 38 patients (53%), pulmonary embolism in 19 patients (26%), hypoxic origin (pulmonary edema, pneumonia, pneumothorax) in 12 patients (17%) and other etiology in 3 patients (4%). Two hundred and four patients underwent both a CT scan and coronary angiogram. After these diagnostic procedures, a diagnosis was established for 524 patients (59%). The outcomes of patients differed, according to the procedure identifying the etiology:

Outcome after OHCA according to diagnosis tool

	Survival n (%)	Death n (%)	Total
Absence of diagnosis	125 (34)	247 (66)	372
Diagnosis provided by coronary angiogram	192 (42)	260 (58)	452
Diagnosis provided by CT scan	7 (10)	65 (90)	72
Total	324 (36)	572 (64)	896

CONCLUSIONS. A systematic application of diagnostic procedures provides the etiology of 59% of OHCA. In this cohort, coronary angiogram yields a better diagnostic value than brain and/or chest CT. The impact of this strategy in terms of prognosis and therapeutic interventions is being analyzed.

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PERSISTENT PERIPHERAL AND MICROVASCULAR PERFUSION ALTERATIONS AFTER OUT-OF-HOSPITAL CARDIAC ARREST ARE ASSOCIATED WITH POOR SURVIVAL

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INTRODUCTION. The post-cardiac arrest resuscitation phase is characterized by a systemic inflammatory response (SIRS), which may result in systemic hemodynamic alterations. Given the similarities between the inflammatory responses associated with sepsis and the post-cardiac arrest syndrome, it is plausible that inappropriate microcirculatory tissue perfusion may also be present after out-of-hospital cardiac arrest.

OBJECTIVES. To evaluate sublingual microcirculation and peripheral tissue perfusion in the post resuscitation phase after out-of-hospital cardiac arrest.

METHODS. We prospectively evaluated 25 out-of-hospital cardiac arrest patients admitted to the intensive cardiac care unit (ICCU). Complete hemodynamic measurements were obtained directly on ICCU admission (BL), during induced hypothermia (T1), directly following hypothermia (T2) and another 24 h later (T3) In addition, the sublingual microcirculation was observed using sidestream dark-field (SDF) imaging and peripheral tissue perfusion was observed with perfusion index (PI), capillary refill time (CRT), central-to-toe temperature difference (*T*c-toe), tissue oxygen saturation (StO_2) and forearm-to-fingertip skin-temperature gradient (*T*skin-diff).

RESULTS. During hypothermia (T1), all sublingual and peripheral tissue perfusion parameters decreased significantly, followed by a significant increase following rewarming (T2) as compared to BL and T1. Changes in peripheral microcirculatory tissue perfusion were significantly correlated to changes in central body temperature, but not to changes in systemic hemodynamic parameters such as cardiac output or mean arterial pressure. Surprisingly, sublingual and peripheral tissue perfusion parameters at T2 and T3 were significantly lower in non-survivors (n = 6; S vs. NS at T2) (MFI 2.91 ± 0.20 vs. 2.62 ± 0.14, FCD 12.11 ± 0.32 vs. 9.89 ± 0.26, PPV 99.11 ± 1.56 vs. 93.19 ± 2.55, $p < 0.05$). Correspondingly, peripheral tissue perfusion did not increase at T3 in the non-survivors (PI 2.0 ± 0.72 vs. 0.31 ± 0.21, CRT 3.11 ± 1.41 vs. 11.83 ± 3.49, *T*c-toe 5.72 ± 1.69 vs. 9.53 ± 3.07, *T*skin-diff 1.63 ± 2.75 vs. 6.53 ± 2.01). StO_2 showed no difference between groups. In addition, cardiovascular and respiratory SOFA scores were higher in the non-survivor group at T3.

CONCLUSIONS. Following out-of-hospital-cardiac arrest, the early post-resuscitation phase is characterized by abnormalities in sublingual and peripheral microcirculatory perfusion, which are caused by vasoconstriction due to induced systemic hypothermia and not by impaired systemic blood flow. Persistence of these alterations after rewarming was associated with the development of organ failure and death, independent of systemic hemodynamics.

0572

CHARACTERISTICS AND OUTCOME OF STROKE REVEALED BY SUDDEN OUT-OF-HOSPITAL CARDIAC ARREST

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INTRODUCTION. The management of out-of-hospital cardiac arrest (OHCA) of cardiovascular etiology has been widely studied. However, there is a paucity of data about the neurological causes of OHCA.

OBJECTIVES. The aims of this work were to describe the characteristics and outcome of OHCA due to stroke.

METHODS. Retrospective study (1999–2011) conducted in three medical ICUs, with review of prospectively acquired ICU databases focusing on all consecutive patients admitted for OHCA. OHCA characteristics were registered according to the Utstein style. In the three centers, post OHCA management is standardized and follows the same etiologic investigation strategy, including brain CT scan and/or coronary angiography and/or chest CT scan performed at admission. Inclusion criteria were OHCA due to ischemic or hemorrhagic stroke; traumatic and infectious causes were excluded.

RESULTS. During this 12-years period, 3,649 patients were admitted after successfully resuscitated OHCA. Among them, 71 OHCA (2%) were due to stroke. Median age was 55 years [46–60] with a sex ratio M/F of 1:1. If 37% of the patients had no stroke risk factors, anticoagulant or antiplatelet therapy was found in 18% of cases. Warning signs were present in 25 patients: neurological signs for 21 patients (headache n = 10, generalized seizure n = 6, impaired vigilance n = 4 and focal neurological disorder n = 3) and extra-neurological for 4 of them (chest pain n = 2, syncope n = 1, dyspnea n = 1). The pupillary examination after resuscitation was poorly informative, with a majority of unresponsive mydriasis (n = 35) and 7 anisocoria. Median no-flow and low-flow durations were 7 (1–10) and 15 (11–25) min. The initial cardiac rhythm was shockable (VF/pulseless VT) in only 6% of cases. The initial EKG revealed ischemic patterns in 69% of cases (30% ST segment depression, 17% repolarization disorders, 11% ST segment elevation, 11% left bundle branch). The CT scan found an isolated subarachnoid haemorrhage (n = 53), a cerebro-meningeal haemorrhage (n = 9), an ischemic stroke (n = 5), an intra-cerebral hematoma (n = 3) and a subdural hematoma (n = 1). Thirty-two patients (45%) had coronary angiography, but none had coronary abnormalities. All patients died in ICU (brain death n = 37, care withdrawal n = 19); 15 patients had organs harvesting.

CONCLUSIONS. In OHCA victims, isolated pre-hospital data and post-resuscitation clinical findings are poorly informative toward a neurological cause. Even if stroke is a rare cause of OHCA, this advocates for a systematic realisation of brain CT scan, particularly when other explorations are non-contributive. If no survival occurred in this cohort, the possibility of organs harvesting may justify prolonged ICU management.

0573

LONG-TERM MONITORING OF A COHORT OF HOSPITALARY CARDIAC ARREST SURVIVORS

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OBJECTIVES. To establish the long-term evolution of patients who survived a hospitalary cardiopulmonary arrest (CPA) and were discharged from hospital, measuring survival, functional status and overall situation according to the Utstein style.

METHODS. We followed up a cohort of all survivors of at least one episode of hospitalary CPA during a mean period of 9.5 years. The studied cohort, according to Utstein style, was obtained from the cardiac arrests occurred in the medical and surgical center at "Virgen de las Nieves" University Hospital (Granada, Spain) during a period of 30 consecutive months (July 2000–December 2002). The only cardio pulmonary resuscitations (CPR) excluded were those occurred in operating rooms, anaesthetic reanimation and those patients who had been resuscitated or initiated life support maneuvers before admission at the emergency department. To this end, we made telephone contact with the patient or a family member, every 3 months in the first year and then every 6 months to complete a follow-up of 9.5 years (±8.2 months). In these controls, patients were classified according to Glasgow-Pittsburgh's cerebral function categories (CPC) to see the neurological function and with the general function categories of Glasgow-Pittsburgh (OPC) for the overall situation. In the event of exitus, the cause and location were collected. The association between survival at the end of follow-up and optimal neurological and general functional level at hospital discharge were statistically analyzed (CPC/OPC grade 1).

RESULTS. At hospital discharge 47 patients of a total of 203 patients undergoing cardiopulmonary resuscitation survived and were included in the follow-up (23.15% hospital survival). The vast majority of them were discharged in excellent neurological and general functional status (75% optimum degree). At the end of the follow-up 22 patients were still alive (46.8% of discharges and 10.8% of patients with hospitalary CPR), another two could not be located. The distribution of deaths was heterogeneous along the track with an accumulation of cases in the first months. All patients contacted but one were in good shape both neurological (CPC 1) as general situation (OPC 1). Statistically significant association was found between the CPC/OPC degree 1 at discharge and the probability of being alive 5 years after discharge (Fisher statistical test 5.12, $p = 0.024$), but there was no association at the end of the follow up period (Yates statistical test 2.54, $p = 0.11$).

CONCLUSIONS. At the conclusion of a long-term following up of a cohort of survivors to a hospitalary CPR remain alive 46.8% of discharged patients. It was detected an association between good neurological status as general situation at discharge and survival in the medium term (5 years), but in more prolonged periods of time this association was lost.

0574

MICROCIRCULATORY ALTERATIONS AFTER RESUSCITATED CARDIAC ARREST

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INTRODUCTION. Post-cardiac arrest (CA) resuscitated patients often develop a "sepsis-like" syndrome, which may be associated with organ dysfunction. We have shown that microcirculation is impaired after CA[1], however, the time course of these alterations as well as their association with mortality have not been studied yet.

OBJECTIVES. To assess the microvascular density and reactivity disturbances during time after CA and their association with outcome.

METHODS. From April 2009 to March 2011, we prospectively included 30 successfully resuscitated CA patients. Sublingual microcirculation (SM) was assessed using Sidestream Dark-Field videomicroscopy. Thenar oxygen saturation (StO_2) was measured using a tissue spectrometer. A vaso-occlusive test was performed to evaluate StO_2 reperfusion rate (SRR), reflecting microvascular reactivity. Measurements for both techniques were performed at five different time points: within the first 4 h after CA (T0) and 4–12 h (T1), 12–24 h (T2), 24–48 h (T3), 48–72 h (T4) thereafter. We used the difference between modified SOFA score (without neurologic function component) calculated at the moment of the last and first microcirculatory measurements (ΔSOFA) as a marker of evolution of organ dysfunctions, and the difference between microcirculatory parameters (functional capillary density, FCD; proportion of small perfused vessels, PPV; SRR) at the same moments as a marker of microvascular changes.

RESULTS. Among 30 patients (age 60 ± 14 years, 27 men), 25 had a presumed cardiac origin, 14 VF/VT as initial rhythm and 25 a out-of-hospital CA. Median time from collapse to CPR and from collapse to ROSC were 4.5 (3–5) and 15 (11–20) min, respectively. Median APACHE II and SOFA score were 24 (21–27) and 7 (6–9) at admission, respectively. Overall ICU mortality was 43%.

A total of 75 measurements were performed (Table). The sublingual microvascular perfusion was altered at baseline and progressively improved over time ($p < 0.001$ for all). SRR was altered and failed to improve over the study period, but there was considerable inter-individual variability. The changes in FCD, PSPV and SRR were similar between survivors and non-survivors. Mean change in PPV and SRR was higher for patients having improvement in SOFA score (ΔSOFA negative) than others.

Time from CA	<4 h	4–12 h	12–24 h	24–48 h	48–72 h
Temp (°C)	33.2 ± 2.0	32.8 ± 1.1	32.8 ± 0.9	37.3 ± 0.9	37.4 ± 0.9
FCD (n/mm)	8.2 ± 1.2	8.0 ± 2.0	8.8 ± 1.1	10.1 ± 2.1	9.8 ± 2.0
PPV (%)	80 ± 10	78 ± 11	87 ± 8	92 ± 3	91 ± 3
SRR (%/s)	1.18 ± 0.68	1.03 ± 0.34	0.95 ± 0.50	1.48 ± 0.63	1.42 ± 0.65

CONCLUSIONS. Peripheral microcirculation was altered in the early phase of post-resuscitation phase, only microvascular flow improved within 48–72 h after CA. These alterations were associated with changes in SOFA score, suggesting an association between microvascular alterations and organ dysfunction after CA.

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0575

THERAPEUTIC HYPOTERMIA AFTER CARDIAC ARREST: AN ITALIAN REPORT

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OBJECTIVES. Mild therapeutic hypothermia (TH) has been shown to improve neurologic outcome in patients experiencing cardiac arrest (CA) after return of spontaneous circulation (ROSC) [1]. In this observational prospective multicentre study (ICE study) we aimed at investigating the effect of TH on both survival and neurologic outcome.

METHODS. We collected data on CA patients admitted after ROSC, to any of the 17 participating Italian intensive care units (ICU). Patients were managed according to routine clinical practice, including TH [2]. The target temperature to be reached was 32–34°C, which was subsequently maintained for 24 h.

RESULTS. Between January and September 2009, 174 patients experiencing ROSC after CA (129 patients was out of hospital cardiac arrest—HOCA) were admitted to the 17 ICU. TH was instituted in 122 (69.54%) out the entire population. The non TH (group 1) and the TH (group 2) was similar for type of cardiac arrest, rescue time, ROSC time and SAPS II scores (as shown in Table). Intensive care unit (ICU) mortality was 45.3% for non TH group and 38.8% for the TH group ($P = 0.43$). Six-month mortality was 64.7% for the non TH group and 54.5% for the TH group ($P = 0.22$). Cerebral performance category (CPC, a measure of neuro-cognitive outcome) at ICU discharge was 3 [1–4] for the non TH group and 1 [1–3] for the TH group ($P = 0.02$). At 6 months, CPC was 1.5 [1–3] for the non TH group and 1 [1–1] for the TH group.

	Non TH (group 1)	TH (group 2)	P value
Patients (*n*)	**53 (29** OHCA)	**122 (100** OHCA)	
Arrest-BLS (min)	**1.5 [0–5]**	**5 [1–9]**	**0.01**
Arrest ROSC (min)	**17 [10–27]**	**20 [10–30]**	**0.36**
Presentation rhythm (VF/VT)	**29/52 (55.8%)**	**100/122 (82%)**	**<0.01**
SAPS II (ICU admission)	**65 [55–77]**	**62 [52–77]**	**0.22**
Mortality at ICU discharge (*n*, %)	**24/53 (45.3%)**	**47/121 (38.8%)**	**0.43**
Mortality at 6 months (*n*, %)	**33/51 (64.7%)**	**61/112(54.5%)**	**0.22**
CPC 1–2 at 6 months (*n*, %)	**1–5 [1–3]**	**1 [1–1]**	**0.03**

χ^2 test or Wilcoxon-Mann Whitney test as appropriate. Data are expressed as median [interquartile range] unless otherwise specified

BLS basic life support, *VF/VT*, ventricular fibrillation/ventricular tachycardia, *SAPS II* simplified acute physiology score (2nd version), *ICU* intensive care unit, *CPC* cerebral performance category

CONCLUSION. In the centres participating in the study, TH was frequently employed as a therapeutic strategy. Mortality for patients undergoing TH was similar to that of patients non being treated at every time point. CPC was better for patients undergoing TH than for patients not being treated in according with the literature.

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0576

HEMODYNAMIC VARIABLES AND FUNCTIONAL OUTCOME IN HYPOTHERMIC PATIENTS FOLLOWING OUT-OF-HOSPITAL CARDIAC ARREST

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INTRODUCTION. This retrospective cohort study evaluates whether there is association between hemodynamic variables collected during the first 24 h after intensive care unit (ICU) admission and neurological outcome in out-of-hospital cardiac arrest (OHCA) victims subjected to therapeutic hypothermia.

METHODS. Medical records of a 36-bed multi-disciplinary ICU in a university teaching hospital were reviewed for comatose patients admitted after resuscitation from OHCA treated with mild hypothermia from 1 April 2007 until 30 June 2010. The hourly variable time integral of hemodynamic variables during the first 24 h after ICU admission was calculated. Neurologic outcome was assessed at day 28 as favourable or adverse based on a cerebral performance category of 1–2 and 3–5, respectively. Bivariate and multivariate logistic regression models were used to evaluate the association between the hourly variable time integral of different hemodynamic variables or drops below different threshold levels and 28-day outcome.

RESULTS. Of 134 patients included 67 (50%) were classified as having favorable outcome according to the cerebral performance category at day 28. Patients with adverse outcome had a higher mean heart rate (73 [62–86] vs. 66 [60–78]; $p = 0.04$) and received norepinephrine more frequently ($n = 17$ [25.4%] vs. $n = 9$ [6%]; $p = 0.02$) and at a higher dosage (128 μg/h [56–1,004 μg/h] vs. 13 μg/h [2–162 μg/h]; $p = 0.03$) than patients with favorable outcome. Of all hemodynamic variables separately included into adjusted regression models, only the mean perfusion pressure time integral was associated with adverse outcome at day 28 (OR = 1.001, CI 95 = 1–1.003; $p = 0.04$).

CONCLUSIONS. Only a weak association between mean perfusion pressure and norepinephrine need during the first 24 h after ICU admission and functional outcome was observed in this OHCA population treated with therapeutic hypothermia.

0577

HIGH LEVELS OF PLASMA THIOREDOXIN ARE ASSOCIATED WITH EARLY DEATH AFTER CARDIAC ARREST

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INTRODUCTION. High levels of oxidative stress occur after ischemia/reperfusion related to successfully resuscitated cardiac arrest (CA). However, routine biological markers are still lacking. Recently, plasma level of thioredoxin (TRX), an important regulator of the redox system, was shown to be increased in various conditions of oxidative stress and inflammation.
OBJECTIVES. To determine the levels of plasma TRX after CA and to assess their relationships with severity.
METHODS. Monocentric study (07/2006–03/2008) with retrospective review of a prospectively acquired ICU database focusing on all consecutive patients admitted for CA.
CA characteristics were registered according to the Utstein style. Patients were included if they had at least one blood sample at admission or day 1, as part of a serum collection we perform routinely. Plasma level of TRX was measured at admission, day (D) 1, 2 and 3 (Redox Biosciences, Kyoto, Japan). Correlation was performed with a Spearman test.
RESULTS. In 30 healthy volunteers, TRX concentration was found to be 10.7 ng/mL [9.1–20.9].
Among 245 patients admitted after CA, 176 were included (69 exclusions due to lack of blood sample). Characteristics of patients were (median, IQR) age 60 [48–73], "no flow" duration 5 [0–10] min, "low flow" duration 15 [8–25] min, shockable rhythm n = 71 (41%), cardiac etiology n = 93 (53%), SAPS 2 score 68 [60–81], admission SOFA score 9 [6–12], therapeutic hypothermia n = 152 (89%), post-resuscitation shock n = 131 (74%) and ICU mortality n = 107 (61%).
TRX values in ICU survivors and non-survivors were, respectively: 22 ng/mL [7.8–77] versus 72.4 [21.9–117.9] at admission ($p < 0.001$), 5.9 [3.5–25.5] versus 23.2 [5.8–81.4] at D1 ($p = 0.003$), 10.8 [3.6–50.8] versus 11.7 [4.5–66.4] at D2 ($p = 0.22$), and 16.7 [5.3–68.3] versus 17 [4.3–62.9] at D3 ($p = 0.96$). However, areas under ROC curves to predict death were only 0.66 at admission, 0.64 at D1, 0.57 at D2 and 0.5 at D3.
Considering timing of death, patients dying within 24 h had higher TRX levels than in case of late death or survival (respectively, 118.6 ng/mL [94.8–280], 50.8 [13.9–95.7] and 22 [7.8–77], $p < 0.001$); area under ROC curve to predict early death was 0.84. Refractory shock was the cause of 88% of these early deaths.
Admission TRX was significantly correlated with "low flow" duration, SOFA score, and admission lactate concentration, but was not associated with "no flow" duration or SAPS 2 score.
Finally, patients experiencing CA due to a cardiac etiology exhibited lower levels of TRX than in case of extra cardiac cause (46 [11–104] vs. 68 [42–137], $p = 0.01$).
CONCLUSIONS. TRX levels are strongly elevated early after CA, suggesting a high state of oxidative stress. Highest values are found in the most severe patients. Oxidative stress could be a therapeutic target, with TRX dosage as a surrogate to tailor such intervention.

0578

LOW SERUM SELENIUM LEVEL WAS ASSOCIATED WITH POOR PROGNOSIS OF CARDIAC ARREST VICTIMS

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INTRODUCTION. Selenium plays a major role in the intracellular antioxidant system and previous data have shown that low serum selenium level is associated with poor prognosis of critically ill patients.
OBJECTIVES. The aim of this study was to investigate whether serum selenium level is associated with clinical and neurologic outcomes of cardiac arrest victims.
METHODS. This was a prospective, observational study conducted in an emergency intensive care unit (ICU) of a tertiary referral hospital. We enrolled consecutive patients who were admitted to the ICU for postresuscitation care after cardiac arrest, from May 2008 to April 2010. We collected data with respect to demographic findings, arrest and resuscitation factors, severity scores, neurologic findings, application of therapeutic hypothermia, and 6-month mortality and cerebral performance category (CPC). Patients with 6-month CPC score 1–2 was classified as the good prognosis group, whereas CPC score 3–5 as the poor prognosis group. Furthermore, we measured central venous oxygen saturation, serum lactate, neuron specific enolase, troponin I, B-type natriuretic peptide, C-reactive protein, and selenium levels at admission to the ICU. Then we compared the data between the good and poor prognosis group.
RESULTS. Among 52 enrolled patients, 17 were classified as the good prognosis group and 35 as the poor prognosis group. In univariate analysis, non-shockable initial rhythm, low Glasgow coma scale (GCS), abnormal pupillary reflex, high SAPS II, and low serum selenium level were associated with poor prognosis of cardiac arrest victims. In multivariate analysis, low GCS [Odds ratio (OR) = 0.343, 95% confidence intervals (CI), 0.124–0.947, $p = 0.039$], abnormal pupillary reflex (OR = 0.045, 95% CI, 1.782–271.675, $p = 0.016$), and low serum selenium level (OR = 0.959, 95% CI, 0.921–0.999, $p = 0.045$) were independently associated with poor prognosis of cardiac arrest victims. The best cutoff for serum selenium level was 78 μg/L (sensitivity 0.71, specificity 0.83, area under curve = 0.774, 95% CI, 0.635–0.913).
CONCLUSIONS. Low serum selenium level was associated with poor prognosis of cardiac arrest victims.
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QUANTITATIVE CT-SCAN ASSESSMENT OF BRAIN OEDEMA AFTER OUT-OF-HOSPITAL CARDIAC-ARREST

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INTRODUCTION. OHCA is an important cause of mortality. Furthermore, more than 50% of survivors will have long-term neurological impairment. Global ischemia secondary to cardiac arrest is associated to diffuse brain oedema. Experimental data permits to distinguish between cytotoxic, ionic and vasogenic oedema that are explained by different physiopathological mechanisms. CT is able to measure a radiological gravity that is close to the physical gravity. Thus, it is able to determine the weight, the volume and the specific gravity of the different cerebral regions and distinguish between the different types of oedema.
OBJECTIVES. To assess the importance and the different types of cerebral oedema after out-of-hospital cardiac arrest (OHCA).
METHODS. Between January 2009 and August 2010, all OHCA patients were prospectively evaluated. Patients with a previous neurological history or a neurological cause of OHCA were excluded. Quantitative brain CT was realized at day 3. We used the Brainview software (Institut Française des Télécommunications) to determine the volume, the weight and the specific gravity of the different brain regions. Results were compared to age and sex paired control patients that underwent a brain CT for headache and that were finally interpreted as normal.
RESULTS. Twenty-six patients (56 ± 4 years) were included. Initial rhythm were ventricular fibrillation in 7 patients (28%) and asystole in the 19 other patients (72%). Eighteen had unfavorable neurological outcome at 3 months, Glasgow-Pittsburgh Cerebral Performance Category (GP-CPC) 3–5, and 8 had favorable outcome, GP-CPC 1–2. OHCA patients had, compared to control patients, higher total cerebral volume and higher volume of hemispheres (respectively, 98.2 ± 0.2 vs. 97.1 ± 0.2% of the total skull volume, $p < 0.01$ and 85.4 ± 0.3 vs. 83.5 ± 0.3%, $p < 0.001$). Specific gravity did not differ between the two groups, even they were a slight decrease in the OHCA group. Only the specific gravity of the cerebellum was decreased. By comparing the 18 patients with unfavorable outcome, GP-CPC 3–5, with the eight patients with favorable outcome, GP-CPC 1–2, no differences were found for total cerebral volume or for the volume of each individual regions.
CONCLUSIONS. OHCA patients compared to controls have higher total cerebral volume and higher volume of hemispheres at day 3. Specific gravity was not different between the two groups except for the cerebellum. These data suggest that cerebral oedema in the hemispheres and the brainstem is mainly a ionic oedema whereas it is a vasogenic oedema in the cerebellum. This could have important clinical implications since ionic oedema can be pharmacologically blocked.

Trauma 1: 0580–0593

0580

EFFECT OF NOREPINEPHRINE DURING RESUSCITATION OF UNCONTROLLED HEMORRHAGIC SHOCK IN MICE

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INTRODUCTION. Resuscitation of hemorrhagic shock aims to maintain satisfying tissular perfusion while waiting for hemostatic treatment. Vascular filling is the first line therapy but a vasoconstrictor may be associated to avoid hemodilution before transfusion is available. However, norepinephrine administration could have deleterious metabolic effects in the context of hypovolemia.
OBJECTIVES. We therefore evaluated effect of norepinephrine on tissular perfusion and blood loss in a mice model of uncontrolled hemorrhagic shock.
METHODS. Tracheotomized and ventilated Balb/c mice were submitted to uncontrolled hemorrhagic shock under general anesthesia. 35 mL/kg blood was withdrawn during the first 15 min (T0–T15). A 15 min period of equilibration ensued (T15–T30). Mice were then submitted to 60 min of uncontrolled haemorrhage after section of the tail (T30–T90). During this hemorrhagic period, mice were resuscitated by vascular filling (NaCl 0.9%) either with norepinephrine (50 μg/100 g/h) or not. Tail was ligated at T90. Mice were then transfused with withdrawn blood and equivalent volume of ringer lactate. They were observed during 2 h (T90–T210). Seven groups of six mice were constituted: T (no haemorrhage), C (Control with haemorrhage and no resuscitation), VF 50 and VFN 50 (vascular filling to MAP 50 mmHg with or without norepinephrine, respectively), VF 60 and VFN 60 (vascular filling to MAP 60 mmHg with or without norepinephrine, respectively), Nad (norepinephrine alone). Blood gases were sampled at T0, T30, T90, T210. Data are given ±SEM.
RESULTS. Model mortality is 50% (3/6 in group C) with blood loss of 197 ± 18 μL. Base excess at T90 is −17.7 ± 1.7 mmol/L in group C. Blood loss was 370 ± 86, 558 ± 88, 212 ± 28 and 250 ± 44 μL in groups VF50, VF60, VFN50 et VFN60, respectively ($p < 0.01$, ANOVA norepinephrine factor). Vascular filling (NaCl 0.9%) was 1.9 ± 0.5, 4 ± 0.7, 0.7 ± 0.1 et 1.1 ± 0.2 mL in groups VF50, VF60, VFN50 et VFN60, respectively ($p < 0.01$). Base excess at T90 is −13.2 ± 0.9, −14.5 ± 1, −14.3 ± 0.8 and −15.2 ± 0.5 mmol/L in groups VF50, VF60, VFN50 et VFN60, respectively (NS).
CONCLUSIONS. In a mice model of uncontrolled hemorrhagic shock, administration of norepinephrine with vascular filling during MAP-directed resuscitation lead to a reduction in blood loss and vascular filling amounts compared to a resuscitation with vascular filling without norepinephrine. To explain that, norepinephrine could reduce hemodilution and blood loss induced by it. Moreover, norepinephrine doesn't increase metabolic acidosis and tissular hypoperfusion evaluated by base excess. This last result should be confirmed in this model by an evaluation of microcirculation with intravital microscopy.
GRANT ACKNOWLEDGMENT. This work was supported by a grant from "la Société française d'Anesthésie-Réanimation" (SFAR). The authors wish to thank the SFAR for this support.

0581

EFFECTS OF NORMAL SALINE (NS), RINGER'S LACTATE (RL) AND 7.5% HYPERTONIC SALINE (HTS) WITH AND WITHOUT ERYTHROPOIETIN (EPO) ON MICROCIRCULATORY PERFUSION AND TISSUE BIOENERGETICS OF THE SMALL INTESTINE IN A HEMORRHAGIC SHOCK AND RESUSCITATION RAT MODEL

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INTRODUCTION. For hemorrhagic shock in the post-traumatic pre-hospital setting, fluid infusion is helpful in restoring blood volume after hemostasis but tissue oxygenation is limited due to inflammation and microcirculatory defects initiated at time of trauma.

OBJECTIVES. EPO exerts acute hemodynamic and anti-inflammatory effects in addition to its erythropoietic action. We tested the hypothesis that EPO given at the time of resuscitation with NS or RL or 7.5% HTS will improve capillary perfusion and oxygenation in a hemorrhagic shock rat model.

METHODS. The ileal muscular layer of anesthetized rats was prepared for intravital microscopy. The rats were hemorrhaged 30 ml/kg over 10 min via arterial catheter followed by 50 min with no further manipulation of arterial pressure, then randomized to one of 6 resuscitation groups (n = 4/group): NS, NS + EPO, RL, RL + EPO, 7.5% HTS and 7.5% HTS + EPO. Intravenous EPO (1,000 U/Kg) was given at the start of resuscitation with three times the volume of shed blood NS or RL and 4 ml/kg of 7.5% HTS + 1 volume of RL. Baseline, end of shock and end of resuscitation images of capillary perfusion and NADH fluorescence were recorded for analysis.

RESULTS. After shock, all groups had decreased perfused capillary density and increased tissue NADH fluorescence. Post resuscitation all EPO groups had a higher perfused capillary density (cap/mm) as compared within the same treatment: (a) NS + EPO versus NS: 27.30 versus 21.43, $P < 0.02$ (b) RL + EPO versus RL: 22.09 versus 19.30, $P < 0.02$ (c) 7.5%HTS + EPO versus 7.5%HTS: 22.09 versus 19.30, $P < 0.02$. Comparing different resuscitative fluids groups with EPO showed a higher capillary density for NS + EPO versus 7.5% HTS + EPO (27.30 vs. 22.09, $P < 0.01$), no significance differences in perfused capillary density between RL + EPO versus 7.5% HTS + EPO and NS + EPO groups.

Post resuscitation comparison demonstrated decreased NADH fluorescence in both the NS ± EPO and RL ± EPO groups but an increase in the 7.5% HTS ± EPO groups compared to shock. No significant differences in NADH fluorescence were noted for each of the 3 treatment groups with the addition of EPO. Comparison between different resuscitative fluids groups with EPO was significant only for RL + EPO versus 7.5% HTS + EPO, $P < 0.01$. No significant difference in NADH fluorescence was noted between NS + EPO versus RL + EPO and NS + EPO versus 7.5% HTS + EPO.

CONCLUSIONS. In this hemorrhagic shock model, addition of EPO at time of NS or RL or 7.5%HTS resuscitation acutely improves perfused capillary density. RL ± EPO had significant improvement in NADH fluorescence as compared to 7.5%HTS + EPO. This observation suggests beneficial effects of RL + EPO on both oxygen delivery and utilization and worsening with 7.5%HTS ± EPO in tissue bioenergetics that may be relevant for initial resuscitation.

GRANT ACKNOWLEDGMENT. Canadian Forces Health Services, Department of National Defense, Ottawa, Canada

0582

PREHOSPITAL USE OF NOREPINEPHRINE DOES NOT REDUCE TOTAL AMOUNT OF PREHOSPITAL FLUID IN HEMORRHAGIC SHOCK

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INTRODUCTION. Fluid challenge remains a mainstay of resuscitation of hemorrhagic shock. Excessive use of fluids seems associated with adverse outcome (1). In order to maintain a minimal perfusion pressure as recommended (2) and reduce the amount of fluid, vasopressors are routinely initiated in the prehospital management of hemorrhagic shock.

OBJECTIVES. This study evaluated whether the prehospital use of a vasopressor was associated with smaller amounts of fluid administration.

METHODS. In this retrospective study, demographic and clinical data were analyzed from a local registry at a single trauma referral center in a physician-staffed EMS in Ile de France over the year 2010. Hemorrhagic shock (HS) was defined as transfusion requirement of >4 RBC in the first 24 h and/or an arterial systolic pressure <90 mmHg. Patients were stratified according to the ISS and SAPS II scores. Results are expressed in median with interquartile ranges. Statistical methods used were χ^2, Wilcoxon, Student *t* Test and univariate regression.

RESULTS. Among 285 patients, 56 patients were in HS. 14 patients were excluded because in refractory circulatory arrest. Among the remaining 42 patients, 14 had been treated with a vasopressor (norepinephrine, NAD) in the field. Those with NAD received more fluid (Fig. 1). The minimal mean arterial pressure (MAP) was lower in the field in the NAD group (47 mmHg [40–60] vs. 65 mmHg [59–83], $p < 0.001$) but not significantly different on arrival (69 mmHg [52–85] vs. 69 mmHg [55–81]). Those under NAD had a greater SAPS II score (63[46–80] vs. 46[24–61]). There was no difference in mortality after adjustment for SAPS II and ISS. Patients treated with NAD received significantly higher amounts of fluids in the field and had more severe coagulopathy on arrival indicated by a lower PT and greater FFP requirements in 24 h (Fig. 1).

CONCLUSIONS. These observational data suggest that prehospital use of norepinephrine was associated with a higher total amount of fluids in patients in hemorrhagic shock. Use of norepinephrine seemed to be more a surrogate marker of acuity than a strategy. The initiation of NAD allowed restoration of MAP with no increase in blood product transfusion. This observation questions the prehospital use of a vasopressor and calls for further research about this practice.

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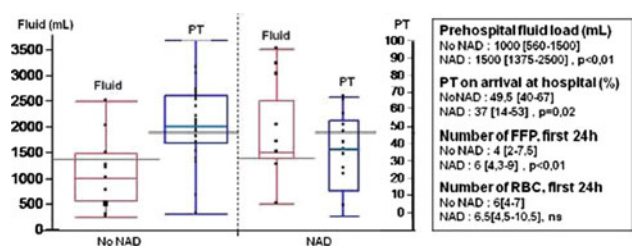

NAD Box Blot

0583

THE IMPACT OF DAMAGE CONTROL RESUSCITATION (DCR) ON OUTCOME IN PATIENTS WITH ABDOMINAL GUNSHOT WOUNDS

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INTRODUCTION. DCR strategies have become more standardized and widely applied over the last 5 years. In order to assess the impact on mortality in patients with severe abdominal gunshot wounds (AGWs) managed with DCR.

OBJECTIVES. To compare outcomes in a group of AGWS patients admitted from 2003 to 2006 (period 1-P1) with a group from 2007 to 2010 (period 2-P2) in a level one trauma center.

METHODS. We identified 162 AGSWs patients managed with DCR in our ICU data registry and analyzed transfusion practices, crystalloid administration and mortality.

RESULTS. RTS, Revised Trauma Score; PATI, penetrating abdominal trauma index; NISS, New Injury Severity Score; PRC, packed red cells; FFP, fresh frozen plasma. See Table 1.

DCR_ordonez

	Period 1 (n = 83)	Period 2 (n = 79)	P value
RTS, Me, IQR	7.55 (5.96–7.84)	6.9 (5.19–7.84)	0.06
PATI, mean ± SD	34 ± 15	34.9 ± 17.6	0.35
ISS, Me, IQR	25 (16–34)	25(18–34)	0.7
NISS, Me, IQR	34 (34–44)	43 (34–50)	0.21
% patients SBP	30.1	48.1	0.016
Total PRC U/24 h	9 (6–17)	8 (6–11)	0.8
Platelets U/24 h	11 (6–17)	12(9–23.5)	0.01
FFP U/24 h	9(5–15)	10(6–16)	0.7
Cryoprecipitate U/24 h	8(6–12)	8(6–12)	0.6
%pts PRC/FFP/plt 1:1:1	45.6	76	p<0.0001
Cell saver use %	1.3	15	0.001
Total intra-operative bleeding, Median (IQR, ml)	3350 (1950–5000)	2150 (1500–3500)	<0.001
Total crystalloids infused 24 h (ml)	9100 (6900–12362)	6400 (4700–8700)	<0.001
Mortality/24 h (%, n)	24.1 (20)	7.6 (6)	0.0042
28 day Mortality (%, n)	28.9 (24)	11.4 (9)	0.006

IQR Interquartile range

CONCLUSIONS. The number of patients undergoing DCR strategies has significantly increased in this severely injured population. More aggressive use of blood products and reduced use of crystalloids resulted in a decrease in intra-operative bleeding. The combined effect of DCR interventions has had a significant impact on mortality in AGWs patients.

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GRANT ACKNOWLEDGMENT. Funded in part by Fogarty International Center NIH Grant No. 1 D43 TW007560-01 and by Fundacion Valle del Lili.

0584

CHANGING USE OF RECOMBINANT FACTOR VIIA (RFVIIA) FOR UNCONTROLLABLE HAEMORRHAGE

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INTRODUCTION. Though rFVIIa is not approved by the FDA for use in uncontrollable haemorrhage, its consideration is proposed by a number of recent reviews [1, 2]. Moreover, evidence to support higher FFP:PRBC transfusion ratio in traumatic haemorrhage is growing [3], and the optimal circumstances for rFVIIa administration appear to be clearer [4].

OBJECTIVES. We sought to evaluate changing use of rFVIIa for uncontrollable haemorrhage in non-haemophiliac critically ill patients in the Cheshire/Merseyside region of North-West England.

METHODS. Retrospective analysis of a database of 50 critically ill adults administered rFVIIa for uncontrollable haemorrhage at 7 ICUs in our region, including trauma, vascular, upper GI, hepato-biliary, colo-rectal, orthopaedic, cardio-thoracic, obstetric and medical patients. Data was analysed according to circumstances of administration and for outcome (in terms of post-rFVIIa PRBC [packed red blood cells] administration and survival) for cohorts of patients receiving rFVIIa up to and including 2006 (n = 26) and from 2007 onwards (n = 24), using t-tests.

RESULTS. Data are presented in Table 1 as mean (standard deviation, where appropriate). Trends towards decrease in PRBC transfusion, increase in pH and increase in FFP: PRBC ratio pre-rFVIIa administration were observed in the latter cohort. A non-significant decrease in PRBC administration was also observed in the latter group, without any increase in ICU survival.

Year	2002–2006 (n = 26)	2007–2010 (n = 24)	p
PRBC pre-rFVIIa	16.7 (10.4)	15.8 (9.4)	0.76
INR	1.4 (0.4)	1.6 (0.4)	0.32
pH	7.26 (0.12)	7.29 (0.15)	0.47
Temperature	35.9 (1.7)	36.0 (1.5)	0.87
FFP:PRBC pre-rFVIIa	0.6 (0.3)	0.8 (0.6)	0.12
Plt:PRBC pre-rFVIIa	0.5 (0.4)	0.4 (0.5)	0.62
No. doses rFVIIa	1.6 (0.9)	1.3 (0.6)	0.21
PRBC post-rFVIIa	6.2 (8.3)	3.6 (3.3)	0.15
ICU survival	53.9%	50.0%	0.79

CONCLUSIONS. There has not been a significant change in timing of administration of rFVIIa for major haemorrhage, nor in co-administration of non-PRBC blood products in our region in recent years. Furthermore, ICU survival post-rFVIIa administration has not increased.

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0585

EVALUATION OF NET FLUID ACCUMULATION DURING RESUSCITATION OF BURNED PATIENTS AND ITS RELATION WITH MORTALITY

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INTRODUCTION. Outcome measures are the first step in determining the consequences of health care. They include mortality, morbidity and quality of life. Because major burns are life-threating conditions, the main priority in discussing outcome measures is mortality as a problem-specific measure. Many studies have shown that mortality seems to be predominantly determined by many variables obtained at admission "predictors" as well as many variables obtained during the hospital course.Net fluid accumulation(NFA) is one of many important factors that correlate with clinical outcome.

OBJECTIVES. To evaluate NFA during resuscitation with ringer lactate (LR) and its relationship with mortality. We hypotheses that rigorous monitoring of the fluid replacement therapy can result in lower fluid retention and this can be effective in the prognosis of the severe burned patient

METHODS. This is a prospective randomized study. The study is carried out in the Service of Burns near University Hospital Center "Mother Teresa" in Tirana, Albania during 2006–2008. Patients are divided in two groups with 55 cases each. In LR group 1 patients are resuscitated conform Parkland formula for adults and Shriner's Galveston for children without modifications, while in LR group 2, the formulas are utilized as a starting point only and the amount of fluid is modified in each case conform clinical situation and urinary output.

RESULTS. There is statistically significant difference regarding NFA in two groups. ($p = 0.001$).There is statistically significant difference between amount of fluids given and complications ($p = 0, 08$).The majority of cases that has deceased (70% of them) have been accompanied with higher values of NFA in the period of resuscitation. There is statistically significant difference between mortality and TBSA ($p = 0.036$), coo morbidities ($p = 0.015$), cause of burn ($p = 0.004$), inhalatory injury ($p = 0.027$).The degree of NFA correlate with a linear positive relationship with morbidity (Kendall's tau_br $= 0.143$, $p = 0.019$) and with a negative relationship with mortality (Kendall' tau_br $= 0.234$, $p = 0.001$). Mortality as the primary endpoint of outcome is 16% in group 1 and 9% in group 2.

CONCLUSIONS. Giving the smaller amount of fluids necessary for adequate resuscitation can be effective in creating a successful and specific therapy for each burn patient. In morbidity and in mortality influence predictor factors as well as method of resuscitation maintaining constant values of NFA.

0586

THE INDICATIONS OF SPLENIC ANGIO-EMBOLIZATION IN NONOPERATIVE MANAGEMENT OF BLUNT SPLENIC TRAUMA ARE THEY CLEARLY ESTABLISHED? STUDY ON A COHORT OF 208 CIVILIAN BLUNT SPLENIC TRAUMA PATIENTS

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INTRODUCTION. Nonoperative management (NOM) is considered as standard treatment of blunt splenic trauma with hemodynamic stability. For few years, splenic angio-embolization (SAE) has been used as an adjunct to NOM of the splenic injuries. SAE indications are nowadays based on computed tomographic (CT) criteria proposed by Sabe[1] defining splenic injuries at high-risk (HR) and low-risk (LR) of NOM failure; All patients with splenic injury at HR should be embolized. Nevertheless, these criteria were used in only one study and seem to lack of specificity.

OBJECTIVES. The main aim of our study was to evaluate these Sabe's criteria[1] in terms of risk of NOM failure on a cohort of patients with blunt splenic injury treated by observation. Another aim was to seek additional criteria predictive of NOM failure.

METHODS. All patients consecutively admitted between January 2005 and December 2009 to our level 1 trauma center with blunt splenic injury were included. For each patient we collected the main clinical, CT and angiographic data, their initial management and outcome. Splenic injuries were classified by AAST grade [2]. Patients treated by NOM (observation alone) were classified into HR and LR group according to Sabe's criteria [1] (at least one of these CT sign: blush, pseudo-aneurysm, grade 3 with large hemoperitoneum, grade 4 and/or 5). The clinical characteristics influencing the NOM failure were especially studied. The predictive values to NOM failure were calculated for HR criteria, then we have included significant criteria influencing the NOM failure to propose higher predictive values.

RESULTS. Of 208 patients who met inclusion criteria, 35 (17%) underwent surgical treatment, 12 (6%) NOM with SAE and 161 (77%) NOM with observation. Among these 161 patients (35 AAST grade I, 64 II 33 III, 18 IV and 11 V), 129 (80%) were male, mean age 36.1 ± 18.7 years, mean ISS 20.8 ± 15.4. Forty-nine (30%) had HR criteria and 112 (70%) BR criteria. Thirteen patients (8%) suffered a failure of observation management; Among all the patients' clinical characteristics, only HR criteria and age were significantly at risk of NOM failure. The statistical threshold for age was at 50 years. Positive predictive value of HR criteria to NOM failure was at 18% and negative predictive value at 96%. The corresponding values were at 67 and 90%, respectively in patients ≥50 years old and at 5 and 100%, respectively in patients <50 years old.

CONCLUSIONS. Indications of SAE based on the Sabe's HR criteria [1] still lack specificity; indeed, only 18% of patients in HR group suffered a failure of NOM. This is especially true in young patients with age <50 years. Age must be considered to identify patients requiring SAE, Sabe's HR criteria[1] should be only used for patients' ≥50 years old.

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0587

EVALUATION OF TRAUMA AND HYPOTHERMIA

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INTRODUCTION. Early information on temperature status after trauma is not always available from the patients at hospital arrival with consequences for future treatment. In order to assess the effect of hypothermia on physiological responses after trauma we developed a swine model with moderate to severe vascular injury (HEM) and soft tissue injury (STI) with normo- and hypo-thermia.

METHODS. Anesthetized Yorkshire pigs (37.5 ± 4.4 kg, n = 64) were instrumented and ventilated. An intravascular temperature probe (Thermoguard, Zoll medical) was placed in the right femoral vein for internal temperature regulation at either 38.0 ± 0.2°C (normothermic) or 33.0 ± 0.6°C (hypothermic) conditions. Control animals (n = 12, SHAM) were instrumented only. Experimental animals were either hemorrhaged (n = 26, HEM) using a 6 mm femoral punch or subjected to STI using a captive bolt pistol to produce a midshaft femoral fracture. Animals were resuscitated after 10 min with 500 ml Hextend (HEX) or nothing (None). All vital signs data were continuously recorded for up to 3 h. Hematology and coagulation (thromboelastography) parameters were assessed at the experimental (33 or 38°C) temperature.

RESULTS. In these experiments, the temperature was well-controlled and hypothermia was attained at ~70 min after the onset of trauma. Uncontrolled femoral bleed was 27.3 ± 6.2% estimated blood volume, comparable in all HEM groups, and one bullet produced a bone fracture with massive muscle damage in all STI groups. The survival rate was comparable in all groups. After injury (HEM or STI), urine was comparable in the hypo- and normo-thermic animals but reduced ($p < 0.05$) in the non-resuscitated animals. We observed that with SHAM animals reducing temperature to 33°C had a direct effect on reducing heart rate and mean arterial pressure (MAP), resulting in lower cardiac output; this temperature effect was attenuated in STI animals and nonexistent in HEM animals. MAP dropped sharply after haemorrhage in all HEM groups and moderately in STI groups; it increased rapidly after HEX resuscitation. Pulmonary pressure was the least affected by temperature in all groups. After injury, platelet numbers decreased in the resuscitated animals due to hemodilution and slightly decreased in the non-resuscitated animals influenced by the cold temperature. There was no coagulopathy as no significant differences between thromboelastography variables could be detected among all groups. No STI animals developed acidosis and 3 normothermic animals (out of 26 animals) in the HEM group exhibited increased lactate > 4 mM and decreased base excess < -2); these animals died.

CONCLUSIONS. These experiments examining the effect of hypothermia on animals subjected to haemorrhage and soft tissue injury indicated no detrimental effect on hemodynamics and hematology parameters. No acidosis or platelet activation, which could have led to coagulopathy, was observed in hypothermic animals.

Grant HJF 304304-1.00-63094.

0588

USE OF EPOETIN ALFA AND INTRAVENOUS IRON IN TRAUMA PATIENTS

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INTRODUCTION. Anaemia is common in trauma patients and is associated with the use of blood transfusion, which are correlated with poor clinical outcomes. Two prospective, randomized studies from Corwin et al. (EPO-2, 2002; EPO-3, 2007) demonstrated that the use of epoetin alfa in critically ill patients does not reduce the incidence of red-cell transfusion but may reduce mortality among patients with trauma. In that studies epoetin was given subcutaneously.

OBJECTIVES. The aim of our study was to evaluate the influence of intravenous using of epoetin alfa in trauma patients on haemoglobin level, incidence of red-cell transfusion and the rate of thromboembolic events.

METHODS. 48 patients with trauma and blood loss aged 36.9 ± 9.1 years were examined. Haemoglobin level for second day less than 10 g/dl was criterion of inclusion. Exclusionary criteria were: persist bleeding or rebleeding; thromboembolic events in the anamnesis; severity at admission more than 27 on APACHE II score or death within the first 10 days after trauma; chronic nephritic insufficiency, dialysis. Patient were treated randomly with either only 100 mg intravenous iron (control group, n = 23), or intravenous iron plus intravenous epoetin alfa (study group, n = 25). 40,000 units epoetin alfa administered at second day after admission. Study period was 21 days. Haemoglobin level, total amount of RBC, volume of RBC transfused at first, second and third weeks and the number of thrombotic events were evaluated. Data analysis was performed using SPSS for Windows 12.0.0

RESULTS. Level of haemoglobin at day 1 after admission was 105.8 ± 2.9 in the study group and 100.8 ± 3.7—in control group. During the study period level of haemoglobin did not differ between the groups, except for the period from twelfth to fourteenth days. So, for thirteenth day haemoglobin level in the study group and control group was 101 ± 6.49 and 77.2 ± 7.44 ($p < 0.05$), respectively. The total amount of RBC did not differ groups, but significantly reduction was found in group with EPO in comparison with control on second week (Table 1).

Data on RBC transfusions

Variables	Study group (n = 25)	Control group (n = 23)	P
Total volume of RBC per subject during the study period (ml)	1,556 ± 149	1,931 ± 351	0.33
Volume of RBC per subject per day (ml)	39 ± 5.9	33 ± 4.1	0.6
Volume of RBC per subject during first week (ml)	1052 ± 162	1327 ± 146	0.2
Volume of RBC per subject during second week (ml)	205 ± 32	328 ± 41	0.02
Volume of RBC per subject during third week (ml)	102 ± 9	115 ± 11	0.36

Thrombotic vascular complications did not differ in groups (Table 2).

Thrombotic events

Thrombotic vascular events	Study group (n = 25), patients (%)	Control group (n = 23), patients (%)	P
Myocardial infarction	0	0	–
Stroke	0	0	–
Pulmonary embolism	0	0	–
Deep veins thrombosis	6 (24)	4 (17)	0.8

CONCLUSIONS. Single use of 40,000 ED epoetin alfa intravenously provide the significant but short-term gain of haemoglobin in trauma patients. Probably for achievement of steadier haemopoetic effect, epoetin alfa should be administered twice a week in a reduced dose.

0589

ACUTE KIDNEY INJURY IN TRAUMA ICU: OUR EXPERIENCE IN LEVEL I TRAUMA CENTRE

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INTRODUCTION. Acute kidney injury has been difficult to assess due to lack of Standard definitions. However, risk, injury, failure, loss and end-stage kidney (RIFLE) criteria have been proposed to classify AKI as a uniform consensus.

OBJECTIVES. To study the association of AKI with ISSTo analyse the incidence of AKI in critically ill trauma patients.

METHODS. Case records of 100 consecutive patients admitted to the trauma ICU of a level 1 trauma centre were analyzed for incidence, demographics, ISS, AKI as per RIFLE, and their association with ICU stay and outcome.

RESULTS. AKI according to RIFLE occurred in 26% trauma patients in the ICU. As per urine output criteria 14 patients had AKI while 19 patients had AKI according to creatinine. Maximum RIFLE criteria as per class R, class I and class F were seen in 10, 5 and 11%, respectively. Mean age of patients with and without AKI were 32.8 ± 16.1 and 32.4 ± 17.6 years, respectively ($p = NS$). Ten patients were <12 years, two of these had AKI as per RIFLE (1 risk as per UO, 1 failure as per S. creatinine). Five patients were aged >65 years (1 failure as per UO, 1 at risk as per UO). Trauma patients were predominantly male (88 vs. 12), however, none of the female patients developed AKI as per RIFLE ($p = 0.032$). The relative risk male developing AKI as compared to female was 1.194(95% CI: 1.080–1.319). Although the patients with AKI had a tendency towards higher ISS (16.9 vs. 14.4) it was not statistically significant ($p = 0.08$). Mortality was 30% however, AKI was associated with a significantly higher risk of mortality ($p < 0.0001$) with a relative risk of 4.269. (95% CI: 2.395–7.609). None of the patients (4) who had documented renal trauma, develop AKI as per RIFLE criteria.

CONCLUSIONS. AKI is a frequent complication in trauma patients admitted to the ICU. Male sex is significantly associated with occurrence of AKI. There was no significant association of AKI with age or ISS. However, presence of AKI as per RIFLE criteria was associated with significantly higher mortality.

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0590

EFFECTS OF STRATEGY FOR CT RADIATION DOSE REDUCTION FOLLOWING TRAUMA TEAM ACTIVATION

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BACKGROUND. Emergency physicians utilize multiple computed tomography (CT) and multiple trauma patients who visited emergency department were exposed to clinically significant radiation doses from CT imaging during the first 24 h of their stay. Recently, there are many efforts to decrease ionizing radiation exposure.

METHODS. All multiple trauma patients following trauma team activation from July 2009 to Feb 2010 (intervention group) were included in a prospective, observational study. We started low dose CT protocol at May 2009, to compare that, we reviewed patients as control group from July 2008 to Feb 2009(control group). All patients met our institutional adult trauma team activation criteria. Individual radiation dose reports calculated by the CT scanner were used to determine radiation dose from each CT scan. Radiation doses calculated by CT scanner were converted to effective dose by multiplying conversion coefficient.

RESULTS. Total 90 patients included in this study, in group A 58 patients were enrolled. There was no difference in mean number of CT scans per patient was observed in the control group compared with the intervention group (4.75 ± 1.39 vs. 4.57 ± 1.46, $p = 0.569$). Furthermore, There were no significant differences in other variables: for example, age, sex and injury severity between two groups. However, the median effective dose of the total CT scans per patient significantly decreased from 71.98 mSv (IQR 47.74–107.88) to 28.94 mSv (IQR 23.59–37.52) ($p < 0.001$).

CONCLUSIONS. After low dose CT protocol was imposed, cumulative effective dose of total CT scans significantly decreased, especially chest-abdomen CT. However, for decreasing adverse effects of ionized radiation, it is required more efforts such as decreasing the number of CT scans or using alternative imaging methods.

0591

LIMITS OF AGREEMENT BETWEEN STANDARD LABORATORY AND THE POINT OF CARE DEVICE HEMOCHRON SIGNATURE ELITE® IN HEMORRHAGIC SHOCK

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INTRODUCTION. Point of care devices could considerably facilitate the early management of hemorrhagic coagulopathy [1]. The Hemochron Signature Elite® (HSE®) allows easy point of care determination of the aPTT and INR but it has not been validated in hemorrhagic shock.

OBJECTIVES. To determine the limits of agreement between the HSE and the standard laboratory methods in hemorrhagic shock.

METHODS. In this monocenter study, patients in hemorrhagic shock defined by transfusion of more than 4 RBCs in the first 24 h or by an arterial systolic pressure <90 mmHg were included over a period of 3 months. Laboratory INR and aPTT were compared to simultaneous measurements performed with the HSE®. Incomplete or out of range measurements were excluded. The limits of agreement were defined as: <5% of Hemochron measurements to be 25% superior or inferior to the corresponding laboratory value [2]. Bias was calculated according to Bland and Altman, correlation determined between various biological and clinical variables.

RESULTS. 20 patients in hemorrhagic shock were included allowing 29 out of 36 comparisons, because seven measurements were excluded since out of range. The bias between INR-HSE® and laboratory was −0.33 (SD 0.63) with a correlation of 0.65. The bias aPTT-HSE® and laboratory was 0.78 (SD 0.8) with a correlation of 0.73. 30% of INR-HSE® and 65% of aPTT-HSE® were out of the limits of agreement. INR-HSE® was correlated to the patient temperature (0.61) and lactatemia (0.8) but not to fibrinogenemia or the amount of transfused blood products. The aPTT was not correlated with any clinical or biological items.

CONCLUSIONS. In this preliminary report, despite a good correlation, INR and aPTT measured by the HSE®, did not have a good agreement with standard laboratory methods in hemorrhagic shock. A new study with a more important sample seems necessary to eventually determine corrective factors to compensate for the important bias. This seems indispensable before integration of Hemochron Signature Elite® measurements into a clinical management algorithm.

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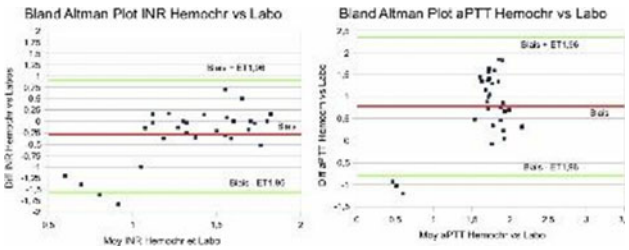

INR aPTT BA

0592

PREHOSPITAL DYNAMIC TISSUE O_2 SATURATION RESPONSE PREDICTS THE NEED FOR LIFE SAVING INTERVENTION IN TRAUMA PATIENTS

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INTRODUCTION. There exists a need for reliable, non-invasive means of identifying tissue hypoxia in the prehospital evaluation of trauma patients and correct it through life saving interventions (LSI) for hemorrhagic shock.

OBJECTIVES. We conducted a prospective, blinded, observational study to evaluate the ability of NIRS StO_2 (InSpectra StO_2 monitor, Hutchinson Industries) in conjunction with an vascular occlusion test (VOT) measures of desaturation rate (DeO_2) and reoxygenation rate (ReO_2) to provide early detection of shock states in trauma patients arriving to a single Level I trauma center.

METHODS. The primary outcome was the ability to predict the need for LSIs. We obtained a convenience sample of 194 trauma patients transported a critical care transport service from April to November of 2009.

RESULTS. In-hospital mortality was 3% [95% confidence interval (CI) 1.1–6.6]. Thirty one percent (95% CI 22–35%) were admitted to the intensive care unit, 6% (95% CI 3.6–11.1%) had an emergent operation, 10% (95% CI 2.5–9.2%) required transfusion, 10% were treated with prehospital intubation and 19% required mechanical ventilation. The mean length of mechanical ventilation was 0.8 days (95% CI 2.3 days). A delayed DeO_2 was predictive of the need for LSI ($p = 0.007$), while a delayed ReO_2 was predictive of mortality ($p = 0.005$).

CONCLUSIONS. Measuring functional parameters like StO_2 VOT is feasible during prehospital air trauma transport and that prehospital DeO_2 is associated with need for LSI in this trauma population.

GRANT ACKNOWLEDGMENT. This work was supported in part by NHLBI HL07820.

0593

MANAGEMENTS FOR MAJOR TRAUMA PATIENTS IN THE EMERGENCY INTENSIVE CARE UNIT BY EMERGENCY PHYSICIANS

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INTRODUCTION. In Korea, a few trauma surgeons work in trauma care system. Therefore, role of emergency physicians has grown in our alternative trauma care system.

OBJECTIVES. The aim of this study was to evaluate the quality of trauma care of our hospital, in which emergency physicians care for major trauma patients in the emergency intensive care unit (ICU) in consultation with intervention radiologists and surgeons.

METHODS. This was a retrospective observational study conducted in an emergency ICU of a tertiary referral hospital. We enrolled consecutive patients who were admitted to our emergency ICU with major trauma, from March 2007 to September 2009. We collected data with respect to demographic findings, mechanisms of injury, the trauma and injury severity score (TRISS), emergency operation, angiographic intervention, and 6-month mortality. Then, we compared between observed survival and predicted survival of the TRISS of the patients. The Hosmer–Lemeshow test and calibration plots by ten groups of each decile of predicted mortality were presented to evaluate the fitness of TRISS. P values of >0.05 mean fair calibration.

RESULTS. Among 116 patients, 12 (10.34%) were dead within 6 months after admission to the ICU, and 29 (25.00%) and 38 (32.80%) patients received emergency operation and angiographic intervention, respectively. The mean injury severity score and revised trauma score were 36.97 ± 17.73 and 7.84 ± 6.75, respectively. The observed survival and the predicted survival of the TRISS were 89.66% [95% confidence interval (CI), 84.03–95.28%] and 69.85% (95% CI 63.80–75.91%), respectively. The calibration plots showed that the observed survival of our patients was consistently higher than the predicted survival of the TRISS ($P < 0.001$).

CONCLUSIONS. The observed survival of an alternative trauma care system of our hospital, in which emergency physicians care for major trauma patients in the emergency ICU in consultation with intervention radiologists and surgeons was higher than the predicted survival of the TRISS.

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0595

CARDIOVASCULAR DYSFUNCTION IN SEVERE INFLUENZA (H1N1) INFECTION

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INTRODUCTION. Cardiovascular dysfunction may occur during H1N1 influenza infection but has not been well characterized.

OBJECTIVES. To assess the incidence and the severity of myocardial dysfunction in patients with H1N1 infection.

METHODS. We reviewed all demographic, echocardiographic, hemodynamic and ventilatory data from patients with H1N1 infection (suspected or confirmed according to the WHO definition) within 24 h of admission in our department of intensive care from October 2009 to March 2011. Left ventricular ejection fraction and right to left ventricular area ratio were used to quantify left and right ventricular functions. Data are presented as n (%) or median (percentiles 25–75).

RESULTS. We treated 46 patients [49(34–62) years] of whom 52% were confirmed. All patients had severe respiratory failure [PaO_2/FiO_2 ratio 136 (92–148)]: 65% required mechanical ventilation and 7 required veno-venous extracorporeal membrane oxygenation (ECMO). Mean arterial pressure was 74 (73–83) mmHg, heart rate 112 (104–125)/min and central venous pressure 13 (4–15) mmHg. Norepinephrine was used in 14 [dose 0.23 (0.175–1) mcg/kg min] and dobutamine in 8 [dose 20 (12.5–20) mcg/kg min]. An echocardiographic exam was obtained on admission in 39 patients (tables), demonstrating abnormal left ventricular function in 46% and moderate to severe right ventricular dilation in 41%. Very few cases (6.5%) had abnormal regional wall motion.

Left ventricular ejection fraction				
	>0.6	0.4–0.6	0.3–0.4	<0.3
n (%)	21 (54)	6 (15)	7 (18)	5 (13)

Right to left ventricular area				
	<0.6	0.6–0.8	0.8–1.0	>1.0
n (%)	22 (59)	7 (19)	3 (8)	5 (14)

CONCLUSIONS. Left and right ventricular dysfunction can be frequently observed in these patients with severe H1N1 infection.

Tissue oxygenation & perfusion: 0594–0606

0594

BIOAVAILABILITY AND ANTIPLATELET EFFECT OF HIGH DOSE OF CLOPIDOGREL IN CRITICALLY ILL PATIENTS

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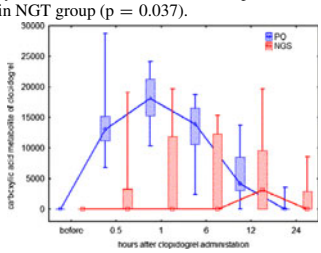
INTRODUCTION. Bioavailability and effect of clopidogrel in the form of crushed tablets administered via nasogastric tube (NGT) have not been established. The way of this administration may lead to reduced absorption, ineffective drug levels and reduced effect, which may result in stent thrombosis and reinfarction.

OBJECTIVES. Comparison of pharmacokinetic and pharmacodynamic response to high loading dose of clopidogrel in critically ill patients with AMI and patients who were scheduled for coronary angiography with stent implantation.

METHODS. Patients were divided into two groups: NGT ($n = 9$, unconscious after CPR, mechanically ventilated with therapeutic hypothermia) who have been administered clopidogrel in the form of crushed tablets via NGT and peroral group (PO; $n = 10$, patients with CAD undergoing planned PCA stenting) who have swallowed clopidogrel in the form of intact tablet. Pharmacokinetics was measured by HPLC in all patients before and 0.5, 1, 6, 12, 24 h after administration of loading of clopidogrel. In five patients in each group TEG Platelet Mapping before and after administration of initial dose of clopidogrel were measured to monitor clinical effect on platelet function. Nonparametric statistics was used for analysis and $p < 0.05$ was considered significant.

RESULTS. The carboxylic acid metabolite of clopidogrel was detected in all patients in PO group. In eight patients, the maximum concentration was measured in the range of 0.5–1 h after the initial dose. In 4 patients in the group of NGT the clopidogrel was not detected at all, and for the rest of patients the absorption was significantly delayed (Fig. 1). All patients in PO group reached clinically relevant inhibition of ADP receptor after 24 h monitored by TEG compared to only one in NGT group ($p = 0.037$).



The comparison of concentration of clopidogrel

CONCLUSIONS. This study showed that the bioavailability of clopidogrel is disturbed in hemodynamically unstable critically ill patients who require deep sedation, therapeutic hypothermia, mechanical ventilation, high doses of catecholamines and in whom clopidogrel is administered in the form of crushed tablets via NGT. Monitoring of clinical effect of clopidogrel in this group of patients is warranted.

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0596

LACTATE AND $SCVO_2$ TRENDS AS PREDICTORS OF ORGAN FAILURE: A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Lactate (LCT) and central venous oxygen saturation ($ScvO_2$) may reflect adequacy of tissue perfusion and their normalisation are used as resuscitation endpoints.

OBJECTIVES. We hypothesise that LCT and $ScvO_2$ trends (reflecting effectiveness of resuscitation) following ICU admission independently predict changes in the severity of organ dysfunction (as defined by SOFA) since adequate resuscitative efforts should theoretically improve organ function.

METHODS. Population: We did a retrospective single-centre cohort study using data from the comprehensive electronic clinical information system (CareVue™). All admissions between 04/2004 and 07/2009 who had LCT and $ScvO_2$ measured within the first 24 h after admission were included. Baseline, daily follow-up (physiological, SOFA), ICU length of stay (LOS) and mortality data were recorded.

ANALYSIS. Descriptive analysis used standard statistical techniques. We performed longitudinal linear regression modelling treating day 1–4 changes in LCT and $ScvO_2$ as the main predictor variables, and the longitudinal day 2–5 change in total (t-) SOFA score as dependent variable. Other potential confounders/effect modifiers were also included, but variables included in the SOFA calculations were excluded. We did include renal replacement therapy (RRT) as it may confound the estimates for LCT. To account for the correlation due to repeated measurement, we used a mixed effects model with random intercept for each cluster (patient). Slopes (sl) are presented as coefficients (95% CI) and intercepts (int) in base units.

RESULTS. Demographics: 1,454 patients were included. Mean (SD) age, APACHE 2 and $ScvO_2$ were 63 (16.1) years, 19.2 (6.3) and 68.6 (10.3), respectively. Median (IQR) LCT and t-SOFA was 3 (2.9) and 7 (5), respectively. 75.9% of patients had at least 1 organ failure at admission. Median (IQR) ICULOS was 7 (10) days and ICU mortality was 22.6%. On average LCT decreased (sl: −2.5; −2.2 to −2.8) while $ScvO_2$ increased (sl: 0.59; 0.33–0.86) from day 1–4, both suggesting effective resuscitation. Organ function, reflected by t-SOFA trends, also improved from day 2–5 (sl:−1.27; −1.02 to −1.52).In multivariable analysis LCT and $ScvO_2$ trends were both associated with t-SOFA trends: LCT-sl: 0.12 (0.08–0.15); ScvO2-sl: -0.02 (−0.03 to −0.01). Interestingly RRT was also strongly associated with t-SOFA trends (sl: 2.16; 1.87–2.45).

CONCLUSIONS. Improvements in LCT and $ScvO_2$ are associated with improvements in aggregate organ function. This finding suggests that effective early and on-going resuscitation leads to improvements in subsequent organ function.

0597

HOW CRITICAL IS EARLY INITIATION OF EXTRACORPOREAL MEMBRANE OXYGENATION FOR RESCUE SUPPORT IN SEVERE REFRACTORY CARDIOGENIC SHOCK?

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INTRODUCTION. Severe refractory cardiogenic shock (SRCS) carries an almost 100% mortality rate despite high-dose inotropics and intra-aortic balloon pump (IABP). Urgent veno-arterial extracorporeal membrane oxygenation (VA-ECMO) can be considered for cardiac support in SRCS, yet indication, optimal timing and predictors of successful VA-ECMO therapy remain to be established.

METHODS. VA-ECMO support was performed in the cardio-thoracic intensive care unit in mechanically ventilated patients with SRCS (n = 29, 20 male, age 61 ± 11 years), mainly via femoral vascular access (n = 25), and combined with IABP (n = 19). SRCS was due to ischemic (n = 11) and non-ischemic (n = 3) cardiomyopathy (CMP) or after cardiac surgery (CS, n = 15).

RESULTS. VA-ECMO was technically accomplished in all patients with a mean duration of 3.4 (1–13) days. At hospital discharge and after a follow-up period of 18 (4–36) months, survival was comparable in CMP (36%) and CS (33%) patients. Importantly, survival was related to early initiation of VA-ECMO (<8 h after onset of complaints) in CMP patients: 100% survival in non-ischemic CMP versus 50% in ischemic CMP. Late initiation of VA-ECMO (>8 h) was associated with death in all CMP patients, independent of infarct size (p = ns) and metabolic compromise (pH, lactate; p = ns). Complications, although generally minor and non-limiting, were: insertion site bleeding (n = 10), sepsis (n = 4), cerebral (n = 2), and lower limb ischemia (n = 2). In CS patients, survival was not predictable by analysis of metabolic derangements (pH, lactate; ns), perfusion and ischemic times during surgery.

CONCLUSIONS. In SRCS, VA-ECMO cardiac support provides substantial survival benefit, especially in patients with non-ischemic cardiomyopathy. However, early initiation, i.e., <8 h after onset of complaints, seems decisive for optimal short- and long-term outcome.

0598

CARDIOGENIC AND SEPTIC SHOCK PROFILES EVALUATION WITH A PULMONARY CATHETER

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INTRODUCTION. Despite advances in understanding the pathogenesis and therapy of circulatory shock, clinical evaluation and empirical treatment of such critically ill patients is difficult, especially when patients are already receiving vasoactive agents [1].

OBJECTIVES. To evaluate and compare the "haemodynamic profiles" found in cardiogenic and septic shock patients with the pulmonary catheter in a general intensive care unit (ICU).

METHODS. We conducted a retrospective study, enrolling patients admitted in the ICU since January 2008 to March 2011, with the diagnosis of cardiogenic and septic shock, monitored by VigilanceÔ, with the Edwards Swan Ganz CCO_{mb}V ref 774HF75 catheterÔ. We collected and analysed the following parameters: age, length of stay (LOS), SAPSII score, SOFA score and ICU mortality. The hemodynamic profiles were established by mean arterial pressure (MAP), cardiac index (CI), stroke volume index (SVI), pulmonary capillary wedge pressure (PCWP), central venous pressure (CVP), left ventricular work index (LVWI) and systemic vascular resistance index (SVRI). The data are showed as mean ± standard deviation. We compared the two different shock diagnostic groups of patients using the student *t* test and Mann–Whitney test.

RESULTS. We analysed 756 hemodynamic data evaluated during 72 h, related to 36 patients that fulfil all the inclusion criteria: 27 had septic shock and 9 cardiogenic shock. Total mortality in ICU was 47.2 (17)%.

Difference between cardiogenic and septic shock

	Cardio genic shock	Septic shock	p
Age	45 ± 13	68 ± 9	<0.0001
SAPSII	60 ± 15	51 ± 17	0.2
SOFA	10 ± 3	9 ± 3	0.2
LOS	9 ± 6	15 ± 14	0.1
Mortality	56%	44%	<0.0001
MAP	81 ± 16	79 ± 14	0.5
CI	3.4+1.4	3.4 ± 1.2	0.9
SVI	35 ± 17	35 ± 12	0.9
PCWP	18+9	14 ± 5	0.03
CVP	12 ± 8	10 ± 4	0.2
LVWI	29.2+15	31 ± 12	0.5
SVRI	1856 ± 884	1836 ± 793	0.9
Norepinephrine	0.7+0.6	1.7 ± 1	0.02

CONCLUSIONS. We did not find any specific hemodynamic pattern, differentiating cardiogenic and septic shock. This could be due to the beginning of vasoactive drugs perfusion before starting monitorization. The unique significant variable found was wedge pressure values. Mortality was higher in cardiogenic shock.

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0599

StO_2 CHANGES AFTER TRANSFUSION OF PACKED RED BLOOD CELLS IN CRITICAL CARE PATIENTS

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INTRODUCTION. Perioperative transfusion in cardiac surgery is associated with increased and mortality. Fluid replacement is frequently required in response to hemodynamic instability or the SIRS seen after cardiopulmonary bypass. Haemoglobin level decreased until transfusion is prescribed, without any massive bleeding. Noninvasive measures of StO_2 was used to monitor thenar tissue oxygenation and its variability according to the patient status, before and after transfusion. Many studies have demonstrated that StO_2 correlates with either mixed or central venous oxygen saturation.

OBJECTIVES. Monitor the variations of StO_2 before and after transfusion, and its correlation between mixed central venous oxygen saturation.

METHODS. Prospective, observational study in post-operative cardiac surgery patients that were transfused, not in hemorrhagic shock. StO_2 was continuously monitored associated with dynamic measures and blood tests were done according to the protocol of the department.

RESULTS. 42 patients with a median age of 7 0 years, IGS II of 46 [18], and euroscore of 12.8% [19]. Surgery went from aortic valve replacement 66.7%, CABG 28.6%, both 26.2%, aortic dissection 14.3%, redux 9.5%. Mains results are shown in the table.

	Before transfusion	After transfusion	*p*
StO_2% (baseline)	81 ± 7	83 ± 6	0.3
StO_2 Peak	90 ± 7	93 ± 4	0.01
StO_2 deoxygenation slope	−10.7 ± 3.6	−12.6 ± 4.6	0.1
StO_2 reoxygenation slope	2.0 ± 0.9	3.0 ± 1.5	0.001
THI	10.7 ± 3.0	11.5 ± 2.7	0.2
ScVO2%	61.6 ± 8.5	66.2 ± 9.7	0.001
p(a–v)CO2 (mmHg)	7.0 ± 4.0	6.8 ± 2.6	0.7
Lactate (mmol/l)	1.9 ± 1.2	1.8 ± 0.9	0.4
pH	7.36 ± 0.1	7.35 ± 0.1	0.9

CONCLUSIONS. In this study no change was observed in basic continuous StO_2 monitoring before and after transfusion. However, dynamic measurements are well correlated with improved $ScvO_2$, without changes in usually modified parameters of tissue hypoperfusion. StO_2 and its dynamic measures could be an early monitoring tool for tissue oxygenation.

0600

THE ABILITY OF STROKE VOLUME VARIATION OBTAINED WITH ARTERIAL WAVEFORM ANALYSIS TO PREDICT FLUID RESPONSIVENESS IN A SPONTANEOUSLY BREATHING PATIENT

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INTRODUCTION. Stroke volume variation (SVV) is regarded as a good predictor of intravascular depression[1], but it can only be adopted in cases of patients who are supported by a positive pressure controlled ventilator. In a spontaneously breathing patient, previous studies have not supported the use of SVV, due to the irregular nature of rate and tidal volumes.

OBJECTIVES. The goal of this study is to assess the usefulness of SVV monitoring in patients not only under mechanical ventilation but also with spontaneous breathing.

METHODS. SVV was measured in 69 consecutive patients in the ICU (47 mechanical respiratory support, 22 spontaneously breathing) after a transthoracic esophagectomy. Arterial pressure monitoring via a radial artery catheter was connected to the FloTrac sensor, and SVV was calculated by arterial waveform analysis on the Vigileo Monitor (Edwards Lifesciences, Tokyo, Japan). When SVV values increased above 15%, we regarded the trend as a suggestive change. A patient with systolic arterial pressure (SAP) of <80 mmHg was defined as hypotensive, and fluid resuscitation was required. Volume challenge was performed using 250 ml of 5% plasma protein fraction over 1 h. Patients with an increase of SAP more than 80 mmHg were considered as responders to the fluid challenge.

RESULTS. A possible hypotension occurring within 12 h after surgery appeared in 57% of mechanical respiratory supported patients (M-group) and 41% of spontaneously breathing patients (S-group). Sensitivity and Specificity for predicting possible hypotension using a trend of SVV were 88 and 87% in the M-group, and 56 and 100% in the S-group, respectively. Volume responsiveness after fluid resuscitation in a patient who had an upward trend of SVV showed a sensitivity of 92% and a specificity of 67% in the M-group. In the S-group, the volume responsiveness of the SVV indicated a sensitivity and specificity of 100%.

CONCLUSIONS. Even in a patient with spontaneous breathing after transthoracic esophagectomy, SVV trends closely related with possible hypotension, and predicted fluid responsiveness.

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0601

POSITIVE TEST OF ISCHEMIA IN WOMEN WITH NORMAL CORONARY ARTERIES. LONG-TERM FORECAST

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INTRODUCTION. Coronary heart disease (CHD) has some peculiarities in the case of women, both in terms of prevalence, and in relation to the pathophysiology and clinical presentation. There is a higher percentage of absence of epicardial coronary lesions after cardiac catheterization, and percentage of microvascular disease and endothelial dysfunction.

OBJECTIVES. Our aim was to analyze the prognostic impact of the existence of ischemia induced by ischemia test, isotopic study and/or stress test prior to cardiac catheterization performed in the prognosis of women with chest pain and normal coronary arteries as an expression the existence of coronary microvascular disease.

METHODS. Retrospective analysis of all women consecutively admitted for chest pain and absence of angiographic coronary disease, from August 1998 to December 2008, supplemented with a median follow up of 62.5 months. Prognostic variables were studied, and established a set of survival analysis.

RESULTS. We included 181 women with a mean age of 62.5 ± 8.6 years. 24.4% were diabetic and 69.4% hypertensive. In 28.2% of cases there was a TIM with inducible ischemia (predominantly isotopic study). Receiving antiplatelet therapy in 71.8% of cases, 34.3% beta blockers, calcium antagonists 69%, 49.7% ACE inhibitors and/or ARBs, 32% nitrate and 40.9% statins. The mean ejection fraction of left ventricle was 70.2 ± 10.3%. After completing the follow-up showed a total mortality of 9% (0.7% of cardiovascular causes). The 17.2% had a hospitalization for ACS, requiring 1.5% in coronary revascularization. Admitted for heart failure 3.7% of patients. Overall, 19.4% developed a major cardiovascular event (MACE) during follow up. After multivariate analysis, the presence of inducible ischemia by TIM predicted lower risk of long-term mortality, OR 0.12, 95% CI, 0.01–0.9 and a trend towards lower risk of MACE, but not reach statistical significance, OR 0.3, 95% CI, 0.1–1.1.

CONCLUSIONS. Women with chest pain clinic and angiographically normal coronary arteries, in terms of cardiovascular mortality, have an excellent long-term prognosis. The presence of a positive test for ischemia predicts a better outcome, which is justified by the existence of coronary microvascular dysfunction as the origin of clinical angina.

0602

LONG-TERM PROGNOSTIC REPERCUSSION OF PREINFARCTION ANGINA

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INTRODUCTION. Patients with angina in the week before myocardial infarction have a better prognosis during the in-hospital phase. However, the long-term prognostic repercussion of preinfarction angina is unknown.

OBJECTIVES. The aim of our study was to establish the influence of preinfarction angina on the patient's prognosis, both in-hospital phase and after long-term follow-up.

MATERIALS AND METHODS. We analyzed 290 patients who had a first myocardial infarction between January 2000 and December 2001 without previous heart disease or angina of more than a week earlier. We divided according to presence of angina in the previous week [sample A, 107 patients (p)] or lack of it (sample B, 183p) and studied its epidemiological characteristics, use of thrombolysis and other pharmacological management, and in-hospital and long-term follow-up cardiovascular complications (cardiovascular death, admission for acute coronary syndrome, heart failure or coronary revascularization procedure) with a median follow-up of 56.4 months, completed in 96% of cases.

RESULTS. We did not found differences in baseline characteristics between the two groups; mean of age 62 years old, 75% men, 24% diabetics, 36% anterior wall infarction, 70% thrombolysis with a "door-to-needle" delay of 220 min. Cardiovascular mortality was higher in sample A, 10.3% (11p), 3.8% during first hospitalization and 6.5% after follow-up, compared to 24% (44p) in sample B (11.5 and 12.5%) ($p = 0.004$). After multivariate analysis, preinfarction angina was associated with lower cardiovascular mortality in long-term follow-up (mOR 0.43; 95% CI, 0.19–0.98; $p = 0.04$).

CONCLUSIONS. In our series, angina in the week before myocardial infarction was associated with lower long-term cardiovascular mortality.

0603

RED BLOOD CELL TRANSFUSIONS AND TISSUE OXYGENATION IN ANEMIC HEMATOLOGICAL OUT-PATIENTS

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INTRODUCTION. It is the expectation that red blood cell (RBC) transfusions improve the oxygen availability at the microcirculatory level. However, there is little clinical evidence that this actually occurs [1, 2].

OBJECTIVES. In this study we tested the hypotheses that anemia in a chronically anemic patient group with a relatively healthy microcirculation would be associated with low tissue oxygen saturation (StO_2) and hemoglobin availability (THI) and that these parameters would increase following RBC transfusions.

METHODS. Near-infrared spectroscopy (NIRS) was used to determine StO_2 and THI in the thenar eminence and sublingual tissue prior to and 30 min after RBC transfusions in 20 chronically anemic out-clinic (onco-)hematological patients.

RESULTS. The patients received 2.7 ± 0.7 bags of leuko-depleted blood, with an age of 16 ± 9 days, infused intravenously at the rate of 1.5 h/bag. RBC transfusion increased the hematocrit from 26 ± 2.3 to 32 ± 2.6 ($p < 0.05$), the hemoglobin level from 5.1 ± 0.5 to 6.9 ± 0.7 mmol/L ($p < 0.05$), and the mean arterial pressure from 85 ± 13 to 95 ± 16 mmHg ($p < 0.05$). Following RBC transfusion, thenar StO_2 increased from 82 ± 4 to 85 ± 5% ($p < 0.05$), thenar THI increased from 11.4 ± 2.2 to 13.0 ± 3.6 AU ($p < 0.05$), sublingual StO_2 increased from 84 ± 5 to 89 ± 5% ($p < 0.05$), and sublingual THI increased from 15.0 ± 3.5 to 16.4 ± 4.6 AU ($p < 0.05$).

CONCLUSIONS. Although anemia in chronically anemic out-clinic (onco-)hematological patients was not associated with low StO_2 and THI levels, RBC transfusions were successful in increasing these parameters. In this study we identified that it is not the chronic nature of anemia that is the factor limiting the efficacy of RBC transfusions in some anemic patient groups.

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0604

EFFECTS OF BIS MALTOLATO OXOVANADIUM (BMOV) ON RENAL OXYGENATION AND FUNCTION IN A RAT MODEL OF RENAL ISCHEMIA AND REPERFUSION

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INTRODUCTION. Renal ischemia–reperfusion (I/R) occurring during vascular surgery and shock affects renal microcirculation preventing proper tissue reperfusion and leading to renal hypoxia, oxidative stress, and irreversible damage with renal failure. BMOV has demonstrated protection against ischemic cascades while supporting tissue repair and is counteractive against apoptosis and vascular endothelial dysfunction.

OBJECTIVES. In this study we have tested the hypothesis that BMOV may prevent development of I/R induced renal failure, measured with renal microcirculatory oxygenation, renal function and oxidative stress.

METHODS. 22 male Wistar rats were randomly allocated into the following groups: BMOV 7 mg/kg ($n = 6$); BMOV 15 mg/kg; ($n = 6$), fluid resuscitation ($n = 6$) and I/R control ($n = 4$). Renal microvascular oxygenation was measured using a dual-wavelength time-domain phosphorimeter. Urine samples were collected for analysis of urine volume and creatinine concentration. Both the intensity and the distribution of iNOS, IL-6, L-FABP, NGAL and MPO staining were scored.

RESULTS. Systemic hemodynamics were not different between experimental groups. Ischemia reperfusion phase was followed by a 1 h treatment phase. At this time point, mean arterial pressure (MAP) and renal blood flow (RBF) was not significantly affected in high and low dose BMOV treated and fluid resuscitated groups (MAP 80.5 ± 18.3, 80.2 ± 12.4, 90.3 ± 19.5 mmHg and RBF 2.6 ± 0.6, 2.89 ± 0.3, 3.28 ± 0.15 ml/min, respectively). Renal cortical oxygenation was more effectively corrected after 1 h treatment with high (71.3 ± 6.2 torr) comparing to low dose (64.1 ± 6.5 torr) BMOV treated and fluid resuscitated (54.5 ± 5.0 torr) groups ($p < 0.05$). Renal medullary oxygenation were similarly higher in BMOV treated groups comparing to fluid resuscitation group, however, did not reach the significance level (54.5 ± 5.4, 48.1 ± 3.3, 48.8 ± 2.2 torr, respectively).Similarly renal function, measured by creatinine clearance rate, was higher in high dose BMOV treated group, however, was not significant (1.11 ± 0.43, 0.94 ± 0.39, 0.87 ± 0.25 ml/min/g). I/R injury led to inflammatory activation, BMOV treatment significantly decreased inflammatory activation ($p < 0.001$).

CONCLUSIONS. I/R injury resulted in renal microcirculatory oxygenation deficit and reduction of renal function and inflammatory activation which persisted after fluid resuscitation. Comparing to fluid resuscitation alone, low and high dose BMOV treatment were successful in correcting microcirculatory oxygenation deficit, renal function, and also in reducing inflammatory activation.

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0605

COULD YOU REPEAT VASCULAR OCCLUSION TEST WITH NEAR INFRARED SPECTROSCOPY TO DETERMINE A MODIFICATION OF THE MICROCIRCULATION AND WHAT IS THE MINIMAL SIGNIFICANT VARIATION?

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INTRODUCTION. The near infrared spectroscopy (NIRS) assesses the haemoglobin saturation in the tissue (StO_2). StO_2 parameters obtained after a vascular occlusion test (VOT) assess the quality of the microcirculation. We do not know the reproducibility of this test and if a first VOT change results obtained with the subsequent VOT.

OBJECTIVES. To examine if we obtain a modification of VOT parameters when we repeat the VOT and if we do not have modification of the StO_2 recovery slope, what is the coefficient of variation of this parameter, to determine the minimal significant modification (2 × coefficient of variation).

METHODS. We included septic shock patients treated with norepinephrine and with a mean arterial pressure stable since at least 1 h. All patient were ventilated and received sedation. The thenar muscle StO_2 was continuously measured with Inspectra™ model 650 (Hutchinson Technology™) before and during VOT. We performed three consecutive VOT (VOT 1, 2 and 3) without modification of therapeutics during the interval between the first and the third VOT. The objective was 40% for StO_2 to stop the ischemic period. The interval was 5 min between the end of the hyperaemic period and the next occlusion. Baseline StO_2, StO_2 occlusion slope, StO_2 recovery slope and StO_{2max} (maximal value of the StO_2 during the hyperaemic period) were measured. We performed a test ANOVA for repeated measurement of a parameter to know if we have a modification of this parameter. We measured the coefficient of variation of the recovery slope.

RESULTS. We included 24 patients, with a mean of 53 [31–86] years old, 69% were mal, and the mean dose of norepinephrine was 1.7 ± 1.4 mg/h.

At VOT 1, 2 and 3 mean arterial pressure was, respectively, 89 ± 4, 91 ± 4, 90 ± 4 mmHg, the heart rate was 96 ± 3/min, 98 ± 4/min, 99 ± 4/min, the StO_2 baseline was 76 ± 3, 76 ± 3, 76 ± 3%, StO_2 occlusion slope was 7.69 ± 1.02%/min, 7.24 ± 0.96%/min, 7.51 ± 0.89%/min, StO_2 recovery slope was 3.28 ± 0.45%/s, 3.38 ± 0.41%/s, 3.50 ± 0.45%/s and StO_2 max was 86 ± 3, 86 ± 3, 86 ± 3%. We did not find significant modification of the VOT parameters. The coefficient of variation was 8.4% [5.1–11.6] for the recovery slope.

CONCLUSIONS. When we repeated VOT using an objective at 40% of StO_2 to stop the ischemic period we did not have a significant modification of the microvascular parameters obtained during subsequent VOT because we have previously perform VOT.

The coefficient of variation was 8.4% so the minimal significant modification of the recovery slope was 16.8%. In the future when a therapeutic lead to a modification of more than 20% of the recovery slope probably this therapeutic change characteristics of the microcirculation assess by near infrared spectroscopy.

0606

CLINICAL SIGNIFICANCE OF EARLY LACTATE CLEARANCE ON PROGNOSIS IN PATIENTS WITH HEMORRHAGIC HYPOVOLEMIC SHOCK

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INTRODUCTION. The sensitivity and specificity of single lactate concentrations as markers of tissue hypoperfusion have been debated; however, serial measurements or lactate clearance over time may be better prognosticators of organ failure and mortality in patients with hemorrhagic hypovolemic shock.

OBJECTIVES. To evaluate the correlation between the prognosis and the early lactate clearance in patients with hemorrhagic hypovolemic shock.

METHODS. Prospective observation and collecting the data of 92 patients with hemorrhagic hypovolemic shock. APACHE II score, the mortality and the lactate clearance after 6 h were measured. The patients were analyzed with respect to survival and nonsurvival, low lactate clearance and high lactate clearance.

RESULTS. There was no statistical difference between the two groups in age, sex, APACHE II score and the baseline of lactate. The early lactate clearance in survival group was significantly more than that in the nonsurvival group (29.8 ± 15.2 vs. 9.8 ± 9.1%, $p < 0.01$) The mortality was in high lactate clearance group significantly less than that in the low lactate group(11.3 vs. 42.9%, $p < 0.001$).

CONCLUSIONS. The early lactate clearance is a good prognostic factor of hemorrhagic hypovolemic shock.

Evaluating NIC patients: 0607–0619

0607

DIAGNOSTIC VALUE OF BRAIN MRI IN INTENSIVE CARE UNIT

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INTRODUCTION. Magnetic Resonance Imaging (MRI) has gradually established itself as the reference morphological examination in neurology. Its diagnostic value is proven in ischemic vascular and inflammatory diseases and tumors. For patients with traumatic head injury, it is more sensitive than CT for the detection of brain damages. MRI is however, cumbersome to perform in ICU patients and is associated with high morbidity. To our knowledge the diagnostic value of MRI has not been previously be assessed in this population.

OBJECTIVES. To assess the diagnostic value of MRI in intensive care unit.

METHODS. Patients who underwent MRI from January 2001 to December 2008 were retrospectively identified. Only patients who underwent brain MRI were included. The indications for examination, its results and the opportunity to confirm or disprove a presumptive diagnosis were noted.

RESULTS. We identified 89 patients who underwent brain MRI. They were 55 ± 2 years old and had a SAPS 2 score of 49 ± 19. Among them, 65 patients (70%) had been admitted for a neurological reasons and 28 (30%) for other reasons. The neurological reasons of admission were: comas (25, 38%), in whom 1/3 had fever, seizures or status epilepticus (17, 26%), meningitidis (10, 15%), delirium (6, 9%), strokes (4, 6%), cardiac arrest (1, 2%) and 2 (4%) for miscellaneous reasons. Among all patients, MRI was preceded by a lumbar puncture in 57 patients (64%), an electroencephalogram in 47 patients (53%) and a CT in 62 patients (70%). MRI was perform to confirm the following suspected diagnosis: ischemic stroke for 19 patients (21%), cerebral thrombophlebitis for 12 (13%), brain abscess for 16 (18%) and encephalitis for 7 patients (8%). 33 MRI (37%) were normal. MRI finally confirmed 24 strokes, 6 posterior reversible encephalopathy, 3 central nervous system vasculitis, 2 brain abscesses, 2 brain tumors, 2 encephalitis, 2 inflammatory diseases, 1 cavernomatose disease and 1 pituitary apoplexy. A positive diagnosis (i.e., when MRI allowed asserting a diagnosis) had been made by MRI in 56 patients (63%) and a negative diagnosis (i.e., when MRI could exclude a presumptive diagnosis) in 84 patients (94%). MRI was conclusive in 81 patients (91%).

CONCLUSIONS. In intensive care unit, brain MRI has a high diagnostic value for both patients admitted for neurological reasons and those admitted for non-neurological reasons. It was conclusive in 91% of cases.

0608

CAN EARLY BEDSIDE CALORIC VESTIBULO-OCULAR RESPONSES PREDICT EMERGENCE FROM VEGETATIVE STATE IN ICU?

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INTRODUCTION. The early detection in ICU of signs of consciousness is thus crucial both for prognosis, i.e., minimally conscious state patients (MCS) have more favorable outcome as compared to vegetative state patients (VS), and for end-of-life decisions. However, the diagnosis of patients with DOC in ICU patients is challenging at bedside.

OBJECTIVES. To determine if bedside caloric vestibulo-ocular responses (VOR) are able to predict emergence from clinically determined vegetative state (VS) or consciousness recovery in the ICU.

METHODS. Twenty-six severe brain injured patients that were clinically in VS were included. Horizontal VOR were tested at bedside by cold water irrigation of the external auditory canal. Visual inspection evaluated the presence of a slow drift toward the side of stimulation (tonic deviation) as well as the presence of a rapid compensatory movement/jerk back to the midline (nystagmus). Patients were then divided into two groups according to whether they eventually regained consciousness or not.

RESULTS. Patients were 59 ± 21-years-old. Thirteen out of 26 patients ultimately recovered consciousness and 13 remained unconscious. Thirteen patients (100%) presented tonic deviation during VOR testing in the group that recovered consciousness and 11 (85%) in the group that remained unconscious. All the patients that recovered consciousness (13, 100%) presented a nystagmus during VOR testing compared to only 1 of 11 patients (8%) in the group that remained unconscious. Sensitivity of nystagmus during VOR testing to predict recovering of consciousness was 1.00, specificity was 0.92, positive predictive value was 0.93 and negative predictive value was 1.00.

CONCLUSIONS. Previously, in the 70s, Plum and Posner (In Diagnosis of Stupor and Coma, Oxford University Press) have described the results of VOR testing in psychogenic unresponsiveness. Compared to comatose patients that presented only tonic deviation toward the cold-water stimulated ear, psychogenic unresponsive patients presented a tonic deviation associated to a nystagmus toward the opposite direction of cold-water irrigation further suggesting that nystagmus at VOR could be associated to consciousness. Bedside VOR testing in clinically VS patients seems able to predict the emergence from vegetative state and could help to preclude active medical treatment withdrawal and to indicate the need for further complementary explorations, i.e., event-related potentials, functional MRI or PET-scan.

0609

PREDICTORS AND PROGNOSIS OF STATUS EPILEPTICUS IN ELDERLY PATIENTS

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INTRODUCTION. Status epilepticus (SE) is a medical emergency associated with significant morbidity and mortality. SE is defined as a continuous seizure lasting more than 30 min, or two or more seizures without full recovery of consciousness between any of them.

OBJECTIVES. Our objective was to assess risk factors and prognosis in elderly patients with refractory status epilepticus (RSE).

METHODS. We retrospectively analysed all episodes of status epilepticus (SE) in elderly patients, treated between 2008 and 2010, in Emergency Clinical County Hospital Constanta. The predictive and prognostic features of RSE were compared with non-RSE (NRSE).

RESULTS. A total of 53 episodes fulfilled our criteria of SE. Of these 72% were refractory to first line anticonvulsants. The mean age of patients with SE was 73.2 (SD 8) years. Encephalitis was significantly more often the primary cause in RSE ($p < 0.05$), whereas low levels of antiepileptic drugs were significantly more often associated with NRSE ($p < 0.001$). Hyponatraemia within the first 24 h after onset of status activity was significantly more often associated with RSE ($p < 0.05$). In RSE, compared with NRSE, we found significantly longer duration of seizure activity ($p < 0.001$), more frequent recurrence of epileptic activity within the first 24 h after the end of seizure activity ($p < 0.001$), and longer stay in hospital ($p < 0.001$).

CONCLUSIONS. SE in elderly patients is frequently refractory to first line anticonvulsant drugs. Encephalitis is a predictor for RSE, which is associated with markedly poor outcome, in particular, the development of post-SE symptomatic epilepsy. Thus, prevention of this most severe form of SE should be the primary target of treatment of SE in elderly patients.

0610

EARLY MONITORING OF NOSOCOMIAL MENINGITIS WITH PROCALCITONIN IN PATIENTS WITH EXTERNAL VENTRICULAR DRAINS (EVD)

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INTRODUCTION. Several factors are implicated in the increased vulnerability of multiple trauma victims to infection, especially in intensive care units (ICU). According to recent literature the incidence of EVD related infections ranges from 2 to 27% [1].

OBJECTIVES. To assess the accuracy of serum procalcitonin in predicting central nervous system (CNS) infection in patients with EVDs.

METHODS. Thirty six adult patients with severe head trauma were enrolled in this prospective study, after exclusion of other causes of fever, patients were subjected to daily procalcitonin, and daily CSF cultures.

RESULTS. Five patients developed nosocomial bacterial meningitis, and all had an elevated serum procalcitonin concentration. The mean serum procalcitonin level in patients with bacterial meningitis was 16.6 ng/ml (range 2–41.7 ng/ml). A serum procalcitonin level >0.5 ng/ml had a positive predictive value for bacterial meningitis of 100% and a negative predictive value of 90%.

CONCLUSIONS. In absence of other nosocomial infections, early high serum procalcitonin concentrations >0.5 ng/ml appear to be a reliable indicator of bacterial CNS infection in patients with EVD.

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GRANT ACKNOWLEDGMENT. This work was supported by Tawam Hospital "In affiliation with John Hopkins University", AlAin, UAE. Special thanks to all members of the Critical Care Medicine, neurosurgery and clinical pathology Departments for their tremendous help throughout the study.

0611

GLASGOW COMA SCALE SCORE IN UNPLANNED EXTUBATIONS

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INTRODUCTION. Unplanned extubations (UE) occur in 3–12% of intubated patients [1]. After UE normal reintubation rate is approximately 50% [2].

OBJECTIVES. To describe the incidence and outcome of (deliberate) UE.

METHODS. Retrospective observational study in all mechanically ventilated patients in a Dutch 30 bed mixed-neurosurgical ICU.

INTERVENTIONS. No.

RESULTS. From January 2010 to March 2011 889 patients were mechanically ventilated during a total of 5,286 days. Mean time spend on ventilators was 6.1 days. Daily interruption of sedation was common practice, physical restraints were often used and tube fixation was performed with a fixation lace (fixsond). 34 UE occurred in 34 patients. The incidence of UE was 3.8 or 0.6% per ventilation day. Reintubation was necessary in only 24% ($n = 8$) within 24 h and in 2% ($n = 1$) within 24–48 h. The majority, 74% ($n = 25$) was managed without reintubation. In the group not requiring reintubation 68% were male, in the reintubation group this was 44% ($p = 0.25$, Fisher's exact test). Half of the UE were neuro (-surgical) patients, in 26 of the 34 (76%) UE a Glasgow Coma Scale (GCS) score was reported; in the remainder the Richmond Agitation and Sedation Scale (RASS) was recorded. There was no significant difference between median GCS scores prior to UE in both groups, (both median GCS 10, $p = 0.33$, Mann–Whitney *U* test).

CONCLUSIONS. In our population incidence of UE is low as well as the reintubation rate: 74% of the UE did not require reintubation, suggesting unjustified delay of planned extubation. The GCS score prior to UE was not a predictor of reintubation.

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0612

THE FIRST EXPERIENCE IN THE WEANING FROM MECHANICAL VENTILATION VENTILATOR-DEPENDENT PATIENTS AFTER FOSSA POSTERIOR NEUROSURGERY WITH LOW RESPIRATORY DRIVE USING ASV MODE

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INTRODUCTION. The ventilator-dependent patients with the brain stem lesion after fossa posterior neurosurgery demonstrate the reduction of respiratory drive. Such patients are difficult to wean from mechanical ventilation (MV) because the early reduction of respiratory support can lead to the fatigue of respiratory center, hypoxia and secondary brain damage. Such common mistake, caused by underestimation of brain stem dysfunction mechanically ventilated patient with high level of activity and communication. In order to protect the patient from development vicious circle of fatigue-hypoxia–secondary brain damage-hypoxia the doctor have two options. Either to stay with the patient day and night, or to decrease respiratory support very slowly. The new intellectual closed-loop mode ASV seems to be able to substitute sleepless doctor in the weaning of such patients from MV.

OBJECTIVES. To evaluate the advantages of ASV in the weaning from MV the patients after fossa posterior neurosurgery.

METHODS. 22 patients after fossa posterior neurosurgery required prolongation of mechanical ventilation because of respiratory drive reduction were included in the study. In 10 patients (study group) we used ASV mode. And in 12 patients (control group) we used SIMV + PS mode with gradual reduction of mandatory breathes rate and the level of pressure support and subsequent switch to pressure support mode. Continuous respiratory monitoring was adjusted in all the patients of study group. Values of total respiratory rate, spontaneous respiratory rate, tidal volume, inspiratory pressure, P0.1 for each spontaneous breath, $etCO_2$ were recorded.

RESULTS. All the patients included in the study were successfully weaned. Weaning duration in study group (13.8 ± 4.8 days) was significantly lower than in control group (23.1 ± 9.2 days). Initially in the study group the percent of spontaneous breathes was $9.0 \pm 6.2\%$. We observed gradual rise of percent of spontaneous breathes during period of mechanical ventilation in ASV mode. To the moment of the discontinuation of the respiratory support the spontaneous breathes covered 100% of minute ventilation in all patients of the study group. The value of P0.1, that is a surrogate of respiratory drive, initially was below normal values in all patients and gradually increased during mechanical ventilation. We observed gradual reduction of support pressure, adjusted automatically by ASV mode, while patients increased their spontaneous breathing activity.

CONCLUSIONS. In patients after removal of the fossa posterior tumors the respiratory drive reduction manifest in the reduction of spontaneous respiratory rate and P0.1 value. The use of ASV mode in this category of patients allows to decrease the duration of mechanical ventilation.

0613

PLASMA EXCHANGE PROCEDURES: IMMUNEOADSORPTION AND PLASMAPHERESIS IN NEUROLOGIC DISEASES: RESULTS IN PATIENTS OF THE NEUROLOGIC INTENSIVE CARE UNIT REGENSBURG FROM 2009 TO 2011

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INTRODUCTION. Treatment concepts of B-cell associated autoimmunological diseases are immunosuppressive regimens and B-cell directed strategies like monoclonal antibodies. On the other side plasma exchange procedures (plasmapheresis or immunoadsorption) are thought to be effective in these diseases by removal of antibodies. Immunoadsorption might be more effective than plasmapheresis. The present study summarises our experiences in both procedures.

METHODS. Between 2009 and 2011 we performed plasmapheresis in 36 patients and immunoadsorptions in 14. There were no differences between the indications. The underlying disease was: multiple sclerosis (n = 12), myasthenia gravis (n = 11), myelitis (n = 9), paraneoplastc syndromes (n = 5), NMDA receptor positive encephalitis (n = 3), CIDP (n = 2), myositis (n = 2), neuromyotony (n = 2) Guillain Barrè syndrome (n = 2) neuritis of the optic nerve (n = 1) and haemorrhagic brain stem encephalitis (n = 1)

RESULTS. About 50% of patients of each group improved significantly, regardless of which procedure was performed. Immunoadsorption was preferred in patients who underwent surgery and in patients who were expected to need many cycles of therapy.

CONCLUSIONS. In our patients immunoadsorption and plasmapheresis led to similar results regardless of the underlying disease.

There is good evidence for plasma exchange procedures in some indications like myasthenic crisus. For other diseases, e.g., NMDA receptor positive encephalitis, the situation is unclear, especially if combined with other therapies.

Moreover, there is no evidence that immunoadsorption is better than plasmapheresis. A further problem is the lack of standardized procedures resulting in large differences of technical methods in published studies. In conclusion, a study comparing both methods with standardized procedures in different diseases is warranted.

0614

INFLUENCE OF PEEP LEVEL ON ICP AND OXYGENATION OF BRAIN IN PATIENTS WITH ACUTE STROKE

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INTRODUCTION. Problem of choose respiratory support in patients with stroke is still important.

OBJECTIVES. Study influence of PEEP level on ICP and oxygenation of brain in patients with acute disturbance of cerebral circulation by hemorrhagic type.

METHODS. Was held prospective research at group of 14 patients with age range between 51 and 69 years (12 males and 2 females), with hemorrhagic stroke under the medicine sedation and respiratory support. All patients was operated in first 24–36 h from the beginning of the disease (trepanation of scull, removing of intracranial hematoma, installation of ICP pressure sensor). In a moment of income level of conscious (by GCS) varied between 9 and 12 points (average score 10); by Hemphill scale—average score was 2 points (from 1 to 3).

During the research patients was under neuro-monitoring in the volume of: level of ICP (Spigelberg ICP—monitor HBM 26.1/FV 500), level of $SvjO_2$ on the side of lesion, SrO_2, transcranial dopplerography, determination of linear velocities in middle brain arteries (Vmca) and resistive index (Ri).

Research was made in three stage: Stage 1—definition of $PEEP_1$ on the level of 5 mbar, fixation indices of gas composition of blood and indices of "neuro-monitoring"; Stage 2—stepwise during 5–10 min, level of PEEP increase till 10 mbar ($PEEP_2$), at the same time was adjust the parameters of ventilation (on the base of PIP, P_{mean}, $PetCO_2$), after 25–30 min was made analysis of gas composition in arterial blood (for confirmation of normal ventilation) and readout of neuro-monitoring; Stage 3—stepwise increasing of PEEP till 15 mbar, ($PEEP_3$) with followed repetition manipulations which described in stage 2 of study.

RESULTS. In $PEEP_1$—mean level of ICP was 18.5 ± 3 torr; $SvjO_2$ 61.2 ± 5.6%; SrO_2 on the side of lesion—72.6 ± 0.9%; SrO_2 on the opposite side—57.6 ± 2.4%; Vmca on the side of lesion—54.0 ± 9.8 cm/s; Vmca on the opposite side was 10.5%; Ri on the side of lesion was increased for 1.1%; Ri on intact side-growth for 1.2%.

However changes in PEEP-level from 10 to 15 mbar ($PEEP_3$)—on the contrary contributed to increase of mean values of ICP for 2.4% from the original. While $SvjO_2$ increased for 8.7%, SrO_2 decreased on the side of lesion for 0.3%, but on the opposite side increased for 9.7%. Mean value of Vmca on the side of lesion decreased for 5.6%; on the intact side decreased for 8.2%; Value of Ri on the lesion side was increased for 7.9%; mean value of Ri on intact side was not changed.

CONCLUSIONS. Assessing the impact of different levels of PEEP on ICP, the change of blood oxygenation in the bulb of internal jugular vein on the side of the lesion, blood flow velocities in middle cerebral arteries and the resistive index showed that the increase in the level of PEEP up to 15 mbar, does not entail a substantial increase in intracranial pressure, as well as significant changes in the indices of oxygenation and cerebral blood flow.

0615

SEPSIS AND SEPTIC SHOCK EPIDEMIOLOGY IN PATIENTS WITH INTRACRANIAL HEMORRHAGE

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INTRODUCTION. Sepsis and septic shock are the life-threatening complications and the leading causes of mortality in ICU patients. While patients with intracranial haemorrhage are known to be at higher risk for infection and subsequent complications, there is no data about sepsis and septic shock incidence in such patients.

OBJECTIVES. The aim of this study was to assess sepsis and septic shock epidemiology in patients with intracranial haemorrhage.

METHODS. All patients with intracranial haemorrhage admitted to the neurosurgical ICU between 01.01.2010 and 01.01.2011 (n = 352) enrolled in the study. The average age was 48 years, 165 (47%) were male. Diagnoses on admission were subarachnoid haemorrhage n = 242, traumatic brain injury n = 68, hemorrhagic stroke n = 28. Sepsis and septic shock were diagnosed by ACCP/SCCM (1992) criteria.

RESULTS. The incidence of sepsis and septic shock were 22 and 12.2% subsequently. We did not find any significant differences in septic complications in patients with cerebral aneurism rupture (sepsis 21.4%, septic shock 12.4%), traumatic brain injury (sepsis 29.4%, septic shock 13.2%) and hemorrhagic stroke (sepsis 21.4%, septic shock 14.2%). The main sources of infection were nosocomial pneumonia (60.4%) and intra-cranial infections (25.6%). We did not observe sepsis and septic shock in patients who stayed in the ICU <3 days (n = 121). Mortality in this group was 5.8%. Among patients who stayed in the ICU more than 3 days 153 patients did not develop septic complications. Mortality in this group was 7.8%. Sepsis without septic shock developed in 35 patients who stayed in the ICU > 3 days and was accompanied by mortality increase to the extent of 22.8%. Sepsis with septic shock was diagnosed in 43 patients who stayed in the ICU >3 days and dramatically increased mortality to 74.4%. There were no significant differences in the mortality rates in relation to the etiology of the subarachnoid haemorrhage. The main risk factor of sepsis and septic shock development were Glasgow Coma Scale score less than 11 and SAPS II score more than 23 on admission to the ICU.

CONCLUSIONS. 1. Sepsis and septic shock incidence in patients with intracranial haemorrhage are 22 and 12.2% subsequently. 2. Frequency of septic complications does not differ in patients with traumatic brain injury, subarachnoid haemorrhage and hemorrhagic stroke. 3. Sepsis and septic shock are associated with mortality increase to the extent of 22.8 and 74.4% subsequently. 4. The main risk factors of sepsis and septic shock development are GCS <11 and SAPS II score >23.

0616

MUSCULAR RELAXANTS AND CRITICAL ILLNESS MYOPAHTY

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OBJECTIVES. To evaluate the possible relationship between the use of neuromuscular blockers and the development of critical illness myopathy (CIM).

METHODS. In a prospective study, 59 patients with multiorgan dysfunction (SOFA > 6) were analyzed through electromyography (EMG) on admission and on a weekly basis, looking for pathological spontaneous activity (PSA). A muscular biopsy was performed for electronic microscopy study in 26/59 patients. The 95% clinical effective dose (ED95) of muscular blockers was calculated for each patient and the total accumulated dose (TAD) from admission was adjusted to the patient's weight. Both groups of patients, with and without CIM, were compared using the Mann–Whitney *U* for non parametric analysis.

RESULTS. All the patients with pathological biopsies (23/26 muscle with typical CIM changes), had PSA in the EMG study. When the muscular biopsy was normal (3/26), the EMG study did not show PSA. TAD for patients with CIM was significantly higher than in patients without CIM

CONCLUSIONS. The TAD of neuromuscular blockers administered to critically ill patients that show myopathy is significantly higher than the TAD of patients without it. We cannot rule out that the use of neuromuscular blockers could be directly or indirectly involved in the development of CIM.

0617

LOW P0.1 VALUE AS PREDICTOR OF WEANING FAILURE IN PATIENTS OPERATED FOR THE FOSSA POSTERIOR TUMORS REMOVAL

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INTRODUCTION. The main respiratory problem in the patients with brain stem lesions is inability to generate adequate respiratory drive. Conventional weaning predictors are often inappropriative in this category of patients. High P0.1 is used as a surrogate of the excessive work of breathing and predictor of weaning failure. We used P0.1 value as respiratory drive surrogate and weaning predictor in patients after posterior fossa neurosurgery.

OBJECTIVES. To evaluate P0.1 level in patients with suppressed respiratory drive after removal of posterior fossa tumors.

METHODS. 25 patients after posterior fossa neurosurgery were included. Patients received long-time ventilation because of other reasons such as intracranial or somatic complication were excluded from the study. The patients in the study were divided in two groups regarding of weaning success. The first group of 15 patients was successfully extubated in the first 24 h after surgery. The second group of ten patients needed prolongation of mechanical ventilation because of insufficient respiratory activity. Mechanical ventilation in all patients was performed by respirators Hamilton G5. The mode ASV was used in all patients. P0.1 value was measured for each spontaneous breath. Basic respiratory monitoring including respiratory rate (RR), tidal volume (TV), rapid shallow breathing index (RSBI), arterial oxygen saturation (SaO_2), end tidal CO2 ($etCO_2$) was provided. After complete recovery of the consciousness spontaneous breathing test (SBT) was performed. P0.1, RR, TV, RSBI, SaO_2, $etCO_2$ were monitored during SBT. The SBT duration was 60 min. RR <6 or more than 30, TV <200 ml, SaO_2 <92% or $etCO_2$ higher 45 mmHg were criterions for discontinuation of SBT. Patients passed SBT were successfully extubated.

RESULTS. The mean level of P0.1 in patients successfully weaned and extubated in the first 24 h after neurosurgery (group 1) was 4.4 ± 1.2 that was significantly higher than in patients who required prolonged ventilation (group 2), 1.2 ± 0.6 ($p < 0.05$). In successfully weaned patients (group 1) we observed a significant rise of P0.1 value during SBT from 4.4 ± 2.2 to 6.9 ± 3.4 ($p < 0.05$). In patients with respiratory drive impairment needed prolonged ventilation (group 2) P0.1 value during SBT was 1.4 ± 0.9. We did not observe the rise of P0.1 value from initial level ($p > 0.1$) during SBT in weaning-failed patients.

CONCLUSIONS. The level of P0.1 in patients with respiratory drive suppression after posterior fossa neurosurgery was significantly decreased in comparison with intact respiratory drive patients. The absence of P0,1 rise during SBT in patients after posterior fossa neurosurgery was associated with a respiratory drive impairment and was a predictor of weaning failure.

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0618

VENTILOMETRY TEST AS PREDICTIVE IN NEUROCRITICALS ILLS IN MECHANICAL VENTILATION: INITIALS RESULTS

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INTRODUCTION. Predictive scores supply objectivity, security and precociousness in the weaning of mechanical ventilation (MV) minimizing errors. The rate and rhythm of breathing are controlled in bulb and pons, recurrent in neurocriticals and/or neurosurgicals patients depending of the injured region.

OBJECTIVES. Evaluate ventilometry and inspiratory muscular strength (manovacometry) as predictive on weaning of MV in neurocritical and/or neurosurgicals ills that showed success or failure.

METHODS. Prospective and controlled study being the dates collected in Neurosurgical-ICU from the patients undergoing in VM on PSV modality, Glasgow coma score (GCS) >7 points were include in the study and age <18 years old were excluded. There was two groups of patients: G1: Success on weaning 48 h without use of VM; G2: Inssuccess when return of VM before 48 h. Ventilomery (minute volume-minV; tidal volume-tV; respiratory rate-RR and Tobin index-IRRS) were done during 1 min using ventilometer in intubated and tracheostomized patients; Inspiratory maximal measuring was according with Müller maneuver (occlusion in inspiratory valve for 30 s of the manovacuometer) in end of expiratory period. The Tobin index (IRRS) were done with the division of the respiratory rate with spontaneous current volume that the patient done. This measurements were submitted in the both phases: pre and post weaning of VM during 24, 48 h and 5°day (D5) post-weaning too. The test *t* Student were uses being $p < 0.05$ statistically significant.

RESULTS. Ninety seven neurocriticals ills underwent neurosurgery with APACHE II average in 18.7 ± 6.57, risk of death in 27.23 ± 19% and GCS average of 9 ± 1.6 points. The gender male were 67% with average age of 44 ± 17.6 age and female were 32.9% with average age of 57.12 ± 17.6 age showed significance ($p = 0.000$). The mean of MV were in 22.48 ± 20.4 days and the patients were intubated (25.5%) and tracheostomized (74.2%) with average in 13,50,05 ± 19.8 days. When compared the variables of ventilometry in G1 (success) with G2 (insuccess), only tV showed significance during 24 h post-weaning ($p = 0.006$). During 48 h post-weaning the variables minV, tV, RR and maxIP was statistically significants, respectively ($p = 0.001$; $p = 0.019$; $p = 0.049$; $p = 0.005$). On D5 post-weaning also was significant in minV and sCV ($p = 0.052$; $p = 0.034$). After 24 and 48 h there were four and eight failures during the study (G2), therefore was obtained 87.6% of success and 12.3% insuccess in our initial study.

CONCLUSIONS. The success was height and suggests a differential on this measurements to this population, will be necessary more trials.

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0619

RELATION OF VENTRICULAR HAEMORRHAGE WITH MORTALITY IN PATIENTS WITH CEREBRAL HAEMORRHAGE ADMITTED TO THE ICU

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OBJECTIVES. To analyze the relation between intraventricular haemorrhage and hospital death in patients admitted to the ICU with non-traumatic cerebral haemorrhage.

METHODS. We undertook a multicentre study in three hospitals, the Virgen de las Nieves hospital in Granada, the Traumatológico in Jaen and Carlos Haya in Malaga, to evaluate all patients admitted to the ICU with non-traumatic cerebral haemorrhage, including non-traumatic subarachnoid haemorrhage. Data were collected in Granada during 2003 and the first 4 months of 2004, in Malaga from July to November 2005 and in Jaen from July 2005 to March 2006. A cranial CT was done in all patients on admission. A protocol was used to record prospective information, including intra-ICU and hospital mortality and the variables needed to calculate the APACHE II and III and SAPS II indexes. The statistical analysis was done with SPSS, using the Student *t* and χ^2 tests, and logistic regression for data analysis.

RESULTS. The total sample comprised 203 patients, 135 in Granada, 35 in Jaen and 33 in Malaga. Their mean age was 55 ± 14.69 years, the APACHE III was 51.48 ± 33.02 and the Glasgow score on admission was 9.55 ± 4.8. Mortality in the ICU was 35.5% and in the hospital 42.9%. The depth of coma on admission (Glasgow score) was 12.07 ± 4.16 in those who survived and 6.16 ± 3.41 in those who died in the hospital ($P < 0.001$).Mortality in the patients with subarachnoid haemorrhage was 26.2% and in those admitted with cerebral haemorrhage 59.6%. Ventricular haemorrhage (18 missing) was present in 88 patients, with a mortality of 68.2%. Mortality in the 97 patients with no intraventricular haemorrhage was 20.6% ($P < 0.001$). A difference was found according to the diagnosis. In the patients with subarachnoid haemorrhage, mortality in the patients with ventricular haemorrhage was 51.3% whereas in those without intraventricular haemorrhage it was 9.1%. Mortality in the patients admitted with non-traumatic cerebral hematoma with intraventricular haemorrhage was 81.6% and in those without intraventricular haemorrhage it was 35.7%; in both cases the differences were significant. The multivariate analysis showed that mortality in these patients was related with the depth of coma on ICU admission, as assessed with the Glasgow coma scale (OR 0.75; 0.69–0.84), with the type of haemorrhage (OR 2.71; 1.14–6.40) and with the presence of intraventricular haemorrhage (OR 6.25; 2.67–14.6).

CONCLUSIONS. The presence of intraventricular haemorrhage in patients admitted to the ICU with subarachnoid haemorrhage or non-traumatic cerebral hematoma is an important predictor of mortality, independently of the type of haemorrhage and the depth of coma at admission.

General perioperative care 3: 0620–0632

0620

TRANSCATHETER AORTIC-VALVE IMPLANTATION FOR AORTIC STENOSIS: A NEW ALTERNATIVE IN PATIENTS WITH HIGH SURGICAL RISK

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INTRODUCTION. Aortic stenosis is a heart disease with a high rate of death among untreated patients. Surgical replacement improves survival but at least 30% of patients can not undergo surgery because of high risk. Transcatheter aortic-valve implantation (TAVI) has been suggested as a less invasive treatment for this group of patients.

OBJECTIVES. To define the clinical profile of the patients underwent TAVI admitted in our intensive care unit (UCI).

METHODS. We analyzed baseline characteristics of the patients, echocardiographic findings, immediate development during UCI stay, complications, length of stay and UCI mortality.

RESULTS. We recorded 16 patients. Table 1 expresses the principal baseline characteristics of the patients. Table 2 expresses the echocardiographic and analytic findings before and after TAVI. The aortic valve area before catheterism was 0.46 ± 0.22 cm^2. The complications during the procedure were: atrial fibrillation (AF) (12.5%), atrioventricular block (AVB) that required transitory endovenous pacemaker (6.3%), bundle branch block (BBB) (31.3%), ventricular arrhythmia (6.3%), cardiac arrest (6.3%), major vascular problems (25%), severe bleeding (12.5%). The 50% of the cases had some kind of complications during ICU stay. Some of them were AF (12.5%), BBB (56.3%), bradycardia/AVB that required definitive pacemaker implantation (12.5%), heart failure (25%), prolonged mechanical ventilation (6.3%), non-invasive ventilation (12.5%), major bleeding (12.5%), sepsis (6.3%), renal failure (6.3% that needed renal-replacement therapy), major vascular complications (6.3%). One patient suffered from cardiac tamponade. The 37.75% of the patients needed some kind of transfusion. We did not detect any myocardial infarction. Only one patient died as a consequence of septic shock and multiorgan failure. The length of stay in ICU was 3.9 ± 3.5 days.

Principal baseline characteristics

Age 79.9 ± 6.2	Gender Female 56.3%	High blood pressure 93.8%	Dyslipidemia 25%	Ischemic cardiopathy 43.8%	Heart failure 68.8%	Peripheral vascular disease 6.3%	Cerebral vascular disease 18.8%
Obesity 18.8%	COPD 25%	Renal failure Slight 31.3% Moder.12.5% Seve.6.3%	Bundle branch block 12.5%	Pacemaker 12.5%	Cardiac surgery 12.5%	NYHA I 21.4% II 21.4% III57.2%	Additive euroscore 7 ± 2

Echocardiographics and analytic findings

	Left ventricular ejection (%)	Aortic valve gradient (mmHg)	Aortic regurgitation (%)	Hemo-globin	Creati-nine	CK-MB	Troponin	ECG Changes (%)
Preprocedure	51 ± 14.2	90.8 ± 21.8	68.8	11.6 ± 1	1.6 ± 1.1			62.3
Postprocedure	59.1 ± 9.1	7.6 ± 8.8 ($p < 0.001$)	13.8	9.8 ± 1.4	1.4 ± 1.2	4.4 ± 4	4.0 ± 2.2	37.5

CONCLUSIONS. In our setting, the clinical profile of the patient undergo TAVI is around 80 years old, with high blood pressure, pulmonary hypertension, severe cardiac symptoms and high surgical risk. In spite of the fact that there is a 50% of morbidity, the patient use to present a satisfactory clinical progress with a significant reduction in the aortic valve gradient. The most frequent complications are new BBB, heart failure, major vascular problems and major bleeding. Even though our small group of patients and our actual learning curve our results seem to be promising and similar to other results in current literature.

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0621

AN AUDIT OF ENDOTRACHEAL CUFF PRESSURES ON ADMISSION TO CARDIAC SURGICAL INTENSIVE CARE

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INTRODUCTION. Recent studies have shown that postoperative respiratory complications can be related to endotracheal cuff pressures [1], and it is known that anaesthetists are unreliable at gauging cuff pressure by palpation alone [2]. We planned to measure the cuff pressures found in a cardiac surgical population on admission to intensive care to investigate our practice. In this way we would then be able to revise our management if required.

METHODS. Fifty randomly selected patients had their endotracheal cuff pressures (Portex Profile™) measured by a VBM pressure manometer within 60 min of their arrival on the post surgical care unit. All staff involved with the anaesthetic care were unaware of the audit. The cuffs were inflated by trained anaesthetic assistants and in the majority of cases the pilot balloon was palpated to guide inflation.

RESULTS. 34 males and 16 females were measured. All patients had undergone cardiac surgery with CPB. Mean cuff pressure was 79.6 cmH_2O (SD 22.2)

Cuff pressures				
Pressure	<25	25–30	31–50	>51
Number (%)	2 (4)	1 (2)	6 (12)	41 (82)

CONCLUSIONS. It is thought that a high tracheal cuff pressure may cause ischaemic mucosal necrosis. Tracheal mucosal blood flow is thought to fall when the cuff pressure is >22 mmHg and reduces markedly >30 mmHg. 15 min >50 mmHg would cause ischaemic injury [3]. During a period of CPB where MAP is approximately 60 mmHg these ischaemic changes may be seen at lower inflation pressures. Pressures <25 cmH_2O are thought to increase the risk of aspiration. This audit has shown that our estimation of cuff pressure is poor and this may promote respiratory complications. We suggest that all ETT cuff pressures are monitored with a hand pressure gauge on insertion of the tube and a device should be available in all anaesthetic rooms.

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0622

CAN THE COMBINATION OF BEMIPARIN AND EPIDURAL ANAESTHESIA REDUCE THE LEVEL OF POSTOPERATIVE THROMBOTIC COMPLICATIONS AT THE PATIENTS AFTER TOTAL HYSTERECTOMY?

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INTRODUCTION. Each year in the world the cancer of reproductive system is diagnosed in more than 600,000 women. In 8–35% of patients with cancer of reproductive system pulmonary embolism was the cause of death, and at 43%—the background for other fatal complications.

OBJECTIVES. The results of surgical treatment of 79 patients after hysterectomy under prolonged epidural anaesthesia during the period from 2008 to 2010 entered the study. Condition of hemostasis was monitored by 12 standard biochemical tests, as well as the new instrumental method—haemoviscoelastography preoperatively, intraoperatively and every day during 10 days after surgery.

METHODS. Prevention of thrombotic in group 1 (37 patients), conducted by bemiparin 3,500: the first injection 12 h before surgery, then at 6 h after the operation in the future once a day for 10 days, group 2 (42 patients) received heparin 5,000 units: the first injection 6 h before surgery, then 6 h after the operation, then 4 times per day for 10 days.

RESULTS. All included in the study patients prior to surgery in the hemostasis system detected a shift towards hypercoagulation and inhibition of fibrinolysis: increase in MA (maximum density of the clot, fibrin-platelet constant of the blood) at 20.7% ($p < 0.001$), reduction of IRCL—the intensity of the retraction and clot lysis to 13.6% ($p < 0.05$) in both groups compared to normal rates. At first day after surgery in patients treated by bemiparin (group 1) declines MA, ICD—the intensity of coagulation drive to 12.7 ($p < 0.05$) and 9.6% ($p < 0.001$), respectively, and IRCL increase by 4.6% ($p < 0.05$) compared with preoperative. In group 2, there was a similar picture: the reduction of MA and ICD to 10.3 ($p < 0.001$) and 6.6% ($p < 0.05$), respectively, and IRCL increase by 4.4% ($p < 0.001$). At fifth day condition of hemostasis in both groups came almost to the same value—a moderate hypocoagulation, normal activity of fibrinolysis. At seventh day of postoperative period, thrombotic complications developed in 1 patient of first group (2.70%). In the second group, complications developed in 4 (9.52%) patients: in three cases—deep venous thrombosis and in one case—coagulopathic bleeding.

CONCLUSIONS. Using combination of bemiparin and epidural anaesthesia reduces the level of postoperative thrombotic complications, such as deep venous thrombosis, massive bleedings at the patients after total hysterectomy. Using haemoviscoelastography enables quickly identify disorders of hemostasis in patients after hysterectomy before, during and after the surgery.

0623

FLUID BALANCE AS A PREDICTOR OF MORTALITY IN ELECTIVE ESOPHAGECTOMY

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INTRODUCTION. Despite advances in peri-operative management of patient undergoing esophagectomy, the mortality and mobility remains high [1]. Respiratory complications are the most common determinant of mortality and morbidity in these patients [2]. We wanted to answer the following questions: (1) is there an association between the fluid status of the patient with morbidity. (2) is there an association between the fluid status and the need for respiratory support.

METHODS. We collected the number of patients having elective thoraco–abdominal esophagectomy from March 2009 to December 2010. We assessed the fluid balance during the first 24 h following surgery, the length of stay (LOS) in the ICU and hospital, relationship between the 24 h fluid balance to the LOS and the need for respiratory support.

RESULTS. We had 39 patients admitted to the ICU following an elective thoraco-abdominal esophagectomy. There were 2 deaths in the post operative period (mortality 5.26%). During the first 24 h, 82% of the patients had fluid optimization with a cardiac output monitor. Increase in 24 h fluid balance was associated with an increase LOS (Chart 1) in the ICU (Pearson correlation coefficient = 0.304, P = 0.035), but there was no statistically significant increase in LOS in the hospital (Pearson correlation coefficient = −0.127, P = 0.229). Increase in fluid balance in the first 24 h of admission was not associated with an increased need for advanced respiratory support (Pearson correlation coefficient = −0.229, p = 0.08).

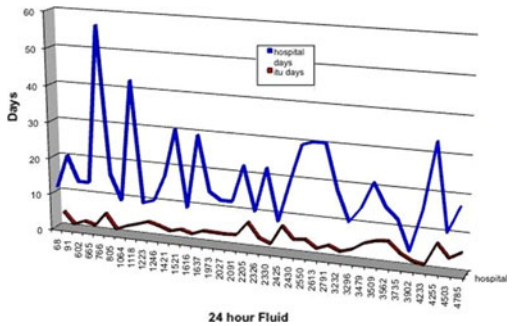

Chart 1

CONCLUSION. Increase in fluid balance in the first 24 h was associated with an increase in LOS in the ICU. However, it was not associated with an increase in LOS in the hospital or the need for advanced respiratory support. This might be due to the fact that fluid optimization was performed using a cardiac output monitor thereby minimizing the risk of pulmonary complications secondary to fluid accumulation. Adequate fluid optimization using cardiac output monitor minimizes the risk of developing pulmonary complications.

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0624

HOSPITALISATION IN ICU AFTER BARIATRIC SURGERY: CAUSES AND PROGNOSIS

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INTRODUCTION. Obesity is a major public health problem since about 30% of the European population is overweight and 10% suffer from obesity. Over the last years, surgical treatment of obesity has strongly developed but this surgery has a mortality rate between 0.1 and 2% [1].

OBJECTIVES. We aimed to describe the reasons for admission into intensive care unit after bariatric surgery, and the mortality rates associated.

METHODS. This is a monocentric retrospective study. We analyzed patients admitted into intensive care after bariatric surgery in a French university teaching hospital with strong experience in bariatric surgery over a 10 years period from January 2000 to December 2010. We recorded demographic data, gravity scores, admission mobile and mortality rates. Data are expressed in absolute (percentage) and average ± SEM.

RESULTS. 103 patients were admitted in intensive care, aged 45 (±10.3), with a BMI of 51.6 (±11.5) kg/m^2. Amongst these patients 50 had undergone initial surgery in another hospital and were therefore referred to us. Most common hospitalization mobiles were intra abdominal infections (57.3%), respiratory complications (19.4%), bleeding (8.7%), and acute renal failure (5.8%). Amidst 59 intra abdominal infections, 40 had had bariatric surgery in another centre. Gravity scores IGS and APACHE II were, respectively, 36 (±20) and 15 (±9). Global mortality rate was 17.5%, but was 22.5% for patients admitted for intra abdominal infection.

CONCLUSIONS. Over 10 years, we received 103 patients for bariatric surgery complications. 50 were referred from another centre. Main admission mobile was post operative intra abdominal infection and these kinds of patients had a higher mortality rate. In opposition with literature data, no patient was admitted for pulmonary embolism and only one patient secondarily developed pulmonary embolism.

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0625

CARDIAC EVALUATION PRIOR TO RENAL TRANSPLANTATION

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INTRODUCTION. Renal transplantation (RT) is the treatment of choice in patients with terminal renal failure. Compared with the dialysis, it improves quality of life, and also the amount of it. Cardiovascular disease is the most common cause of mortality and graft loss after RT. The association between kidney disease and coronary disease is well established, so special care must be taken in the cardiological assessment carried out before being added to the renal transplant waiting list.

METHODS. We analyzed 30 patients on the kidney transplant waiting list, between June 2009 and 2010.

RESULTS. The study included 30 patients on the kidney transplant waiting list. The main reason for transplantion was diabetes mellitus in 12 (27.9%) patients, followed by vascular disease in 10 (23.5%) patients, poliquistic kidney disease in 3 (7%) patients, glomerulonephritis in 2 (4.7%) patients, systemic disease in 1 (2.3%) patient, hereditary disease in 1 patient, obstructive uropathy in 1 patient, non filiated in 3 (7%) patients. They were predominantly male 22 (73.3%) patients, and the mean age was 56.8 years old. The cardiovascular risk factors collected showed that 28 (93.3%) patients had hypertension, 22 (73.3%) had dyslipidemia, 11 (36.6%) suffered from diabetes, 4 (13.3%) were active smokers. We found that 13 (43.3%) patients had previous cardiopathy, 2 (6.6%) previous cerebral stroke, 3 (10%) peripheral arterial disease, 3 patients had permanent atrial fibrillation, and 6 (20%) patients had the same previous organ transplant. An electrocardiogram, echo-doppler and a clinical assessment were performed on all the patients. We found that 2 (6.6%) patients had systolic dysfunction, 10 (33.3%) patients had left ventricular hypertrophy and 23 (76.6%) patients had diastolic dysfunction. A complementary test was needed in 22 patients: 16 (53.3%) myocardial perfusion gammagraphy and 6 (20%) stress echocardiography. A cardiac catheterization was performed in 14 (46.4%) patients; in 3 patients a revascularization procedure was carried out, 2 with percutaneous transluminal coronary angioplasty and 1 with coronary artery bypass surgery. Since the beginning of the study, 5 patients were transplanted; they were followed up for 6 months, without any cardiological events.

CONCLUSIONS. Cardiovascular disease is the leading cause of mortality in RT patients. With the decline in the number of actual donors, the increased demand and the high prevalence of kidney disease, protocols for ensuring the safety of these patients are necessary. The cardiological clinical assessment before inclusion on the renal transplant list, was sufficient to predict the absence of post-transplant coronary complications. Additional procedures were not necessary when there were no clinical signs that suggest the presence of coronary ischaemia.

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0626

TRANSCATHETER AORTIC VALVE: INITIAL EXPERIENCE IN A TERTIARY REFERRAL UNIVERSITY HOSPITAL

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INTRODUCTION. Aortic stenosis is the most common valvular disease. Many patients with age-associated diseases, due to high surgical risk may not be operated.

OBJECTIVES. The goal is to analyze our initial experience with percutaneous transcatheter aortic valve prosthesis type CoreValve® Medtronic.

METHODS. Patients which prosthesis inserted between December 2009 and November 2010, were included. Patients over 75 years with native valve disease, or over 65 years with one of the following conditions Child A and B cirrhosis, chronic respiratory failure with FEV1 <1L, previous cardiac surgery, pulmonary hypertension over 60 mmHg, right ventricular failure, thoracic skin lesions, connective tissue diseases, cardiac cachexia, and with the following: anatomical valve area less than 0.6 cm^2, ring diameter between 20 and 27 mm, sinotubular junction <43 mm, femoral accessibility (>6 mm), abdominal and thoracic aorta without disease. To ensure that the anatomical features are consistent with previously procedures, transesophageal echocardiography, cardiac catheterization, cardiac CAT scan, femoral arteriography of abdominal and thoracic aorta, were performed.

RESULTS. Eighteen prostheses were placed in 18 patients with median age (IQR): 78.5 (75.25, 79.75), with EuroSCORE 9 $\pm$ 6 (logistics 12.46%). Immediate insertion success was achieved in all of them: 18 (100%). Moderate aortic insufficiency: 2 (11.1%). Rhythm disorders: need for definitive pacemakers: 5 (27.7%) but 3 of them recovered sinusal rhythm. Other complications: femoral hematoma: 1 (5%) with active bleeding requiring two iliac artery stents and non-oliguric renal failure: 1 (5%). ICU median stay (IQR): 1 (1.1), hospital median stay (IQR): 9.5 (8.0, 16.0). There was no mortality.

CONCLUSIONS. We inserted 18 percutaneous aortic valve prosthesis in 18 aortic stenosis patients, with low morbidity and no mortality. The most relevant complication was that five patients required permanent pacemaker insertion.

0627

USE OF THE VACUUM-ASSITED CLOSURE (VAC) IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Surgical site infection is one of the most important health problems, with high morbi-mortality. The vacuum-assisted closure (VAC) is a not invasive and dynamic system that has been proven to be useful in infected wounds control. It helps to promote the cicatrization by means of the application of negative pressure in the place of the wound, favoring the reduction of the area of the wound, eliminating the excess of fluids and stimulating the angiogenesis.

OBJECTIVES. The purpose of the present study was to describe our experience with the therapy VAC in complex wounds and to evaluate its effects in infected wounds as well as the associate morbidity.

METHODS. Retrospective study of all patients admitted in our ICU during 2010, who were treated by therapy VAC. We recorded clinical and demographical data, APACHE II on admission, evolution during the application of the VAC; complications, stay in the ICU and mortality. Descriptive statistics was applied by calculation of mean, median or percentages.

RESULTS. Among 18 patients, the age (mean $\pm$ SD) was 54.20 $\pm$ 18.46 years, and more frequently male (80%). APACHE II on the admission was 30.40 $\pm$ 8.44. Almost 90% had BMI > 30. Most of our patients were healthy (without respiratory, vascular, liver and kidney history). There were no immunodeficiency and 60% were diabetic. In our study, three were the main reasons for UCI admission: pancreatitis (45%), abdominal severe traumatism (12%) and abdominal sepsis (43%). The principal motive of placement of the VAC was intraabdominal hypertension (64%); the duration of the treatment was of 18.60 $\pm$ 8.24 days. In 65% of the cases, VAC was used late, at least 10 days from the beginning of the infection. This therapy was used by big wounds in 100% of patients; and in 87% of the cases, there was exhibition of intraperitoneal organs. Most of the patients needed surgery before and after the application of the VAC (86 and 78%) and the complete closing of the wound in 38% of the cases. 80% needed norepinephrine, 90.9% needed mechanical ventilation, and 95% had fever. 80% of patients had a bacterial infection documented by positive cultures. 100% had antibiotics from the first day of admission to the unit. There were complications associated directly with the VAC in 67% of the cases but no serious bleeding events. The stay was 29 (14–51) days. Mortality was 68%.

CONCLUSIONS. This study is only a clinical observation concerning VAC's use in our center. The bibliography describes a beneficial effect of the therapy VAC on patients with surgical infected wounds and/or peritonitis, in relation to more speed and precocity in closing of the same ones, even in presence of severe infections. In our series, the high mortality was waited in view of the mean APACHE on admission. It would be able only hanging to realize analysis as for the cost of the system VAC, this way like to extend our series to be able to recommend his employment in big populations.

0628

SUCCESSFUL PREVENTION OF RHABDOMYOLYSIS (RML) IN BERIATRIC SURGERY IN INTENSIVE CARE SETTINGS

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INTRODUCTION. Rhabdomyolysis (RML) has been increasingly recognized as a complication of bariatric surgery [1]. It is potentially fatal postoperative complication in morbidly obese surgical patients.

OBJECTIVES. Our objective was to examine the effects of interventions, implemented before and after surgery periods for morbidly obese patients to reduce the incidence of rhabdomyolysis in an intensive care unit (ICU).

METHODS. An experimental study was conducted in a surgical ICU. Multiple interventions were used to optimize rhabdomyolysis prevention. The series of actions were performed during two phases. From January 2009 to December 2009 [control phase 1 (P1) 20 patients]. From January 2010 to December 2010 [phase 2 (P2) 20 patients], we intervened in these processes at the same time that performance monitoring was occurring at the bedside, interventions were implemented using our beriatric rhabdomyolysis bundle which consist of prevention of RML. It begins with careful intra-and post-operative padding of all pressure points and close attention to patient positioning post operatively, minimizing operative time, adequate peri and post-operative hydration, and close postoperative monitoring are obviously essential.

RESULTS. The incidence density of RML in the ICU per 20 patients was 20% in phase 1 (4 patients), reduced to 5% (1 patient) in phase 2.

CONCLUSIONS. These results suggest that reducing RML rates to zero is a complex process that involves multiple performance measures and interventions.

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GRANT ACKNOWLEDGMENT. This work was supported by Alexandria University. Special thanks to all members of the ICU, and General surgery Departments for their tremendous help throughout the study.

0629

AGE AND APACHE 2 SCORE AS PREDICTORS OF MORBIDITY FOLLOWING ESOPHAGECTOMY

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INTRODUCTION. Pre and intra-operative risk factors play a major role in the outcome following esophagectomy for oesophageal cancer. Age and pre-existing pulmonary disease have been shown to have a significant influence on the patient mortality and morbidity [1, 2]. We wanted to find out if age and apache 2 score of the patient had any influence in predicting the morbidity following esophagectomy.

METHODS. We collected the number of patients having elective thoraco–abdominal esophagectomy from March 2009 to December 2010. We assessed the age of the patient, apache 2 score on admission, the length of stay (LOS) in the ICU and hospital, relationship between age and apache 2 score to the LOS, thereby estimating the morbidity associated with esophagectomy.

RESULTS. We had 38 patients admitted to the ICU following an elective thoraco–abdominal oesophagectomy. Median age of the patients at the time of surgery was 64 (39–85) years. Increase in age did not have any influence on the LOS in the ICU (Pearson correlation coefficient $= -0.085$, $p = 0.304$) or in the hospital (Pearson correlation coefficient $= -0.068$, $p = 0.34$). An increase in apache 2 score was associated with a significant increase in LOS in the ICU (Pearson correlation coefficient $= 0.443$, $p = 0.002$). A high apache 2 score was associated with increase duration of ventilatory support (Chart 1, Pearson correlation coefficient $= 0.48$, $p = 0.0011$). However, an increase in apache 2 scoring had no effect on the duration of hospital stay (Pearson correlation coefficient $= -0.156$, $p = 0.174$).

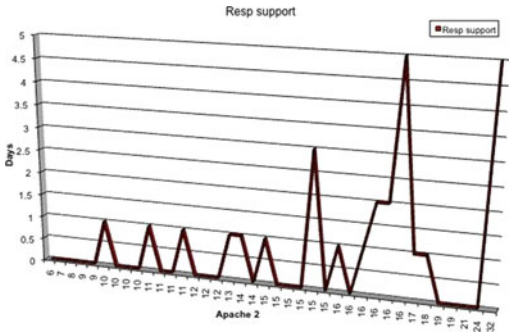

Chart 1

CONCLUSION. In our study, age did not have any influence on the LOS in the ICU or hospital. Apache 2 score was an independent variable associated with an increase in LOS in the ICU. Patients with high apache 2 score needed more days of advanced respiratory support. This might be due to the fact that apache 2 score gives a cumulative account of the pre-morbid status and the physiological reserve of the patients, thereby affecting the LOS in the ICU.

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0630

TREATMENT ESCALATION PLANS IN PATIENTS WITH FRACTURED NECK OF FEMUR

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INTRODUCTION. There are around 76,000 fractured hips in the UK every year, and surgery is the definitive treatment for the majority of cases [1]. Mortality rates range from 10 to 30% [2–6] and ASA grade has been proven to be the only factor that predicts the risk of complications. Patients categorised as ASA III are 3.78 times more likely to have complications than ASA II, and ASA IV 7.39 times more likely [7]. Studies have also shown ASA grade III and IV patients are 6–8 times more likely to have unplanned ICU care. Treatment escalation plans (TEPs) have been used to try and reduce cardiac arrest calls and critical care reviews in our institution.

OBJECTIVES. To assess whether there is appropriate use of TEPs in patients with fractured neck of femur.

METHODS. We retrospectively analysed the clinical notes of thirty consecutive patients admitted to the trauma ward in our hospital over a 6-week period with radiologically confirmed fractured neck of femur. Their ASA grade was calculated and evidence of TEP recorded.

RESULTS. 30 patients' notes were reviewed and 3 patients were not treated surgically. Overall 13% ($n = 4$) of patients had TEPs. 47% ($n = 14$) of patients were ASA III or greater. Of this high risk group, 21% ($n = 3$) had TEPs.

CONCLUSIONS. In this study group the use of TEPs was sporadic at best. Their use was not aimed at high risk patients where they may provide more benefit and reduce cardiac arrest calls and critical care outreach review.

Suggestions for improving practice include the mandatory use of TEPs for all patients with fractured neck of femur or the targeting of TEPs for those patients ASA III or greater.

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0631

TREATMENT OF LOBAR ATELECTASIS BY ENFORCEMENT OF COUGH WITH TRANSTRACHEAL CATHETER

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INTRODUCTION. The development of dystelectasis and retention of mucus are well known complications of patients breathing spontaneously after cardiac surgery using the cardiopulmonary bypass circuit (CPB). These complications can add to morbidity and mortality in case of insufficient therapy. One way of treatment is to perform a miniature tracheotomie, but this did not become a common option due to its invasivity and the related side effects. In contrast, the placement of a transtracheal catheter for the regular instillation of natural saline to enforce productive cough is a less invasive but more effective alternative.

OBJECTIVES. Aim of this observational study was to evaluate the practicability as well as possible complications of this procedure.

METHODS. Prospective feasibility study of patients with dystelektasis (verified by chest- X-ray) or retention of mucus due to their muscular weakness, lack of cooperation or lack of vigilance. We perform the placement of an miniature transtracheal catheter in Seldinger technique (Arterial Leader Cath, 20G, 2.7 F, Fa. Vygan, Aachen, Germany), which is used to instill a small bolus of natural saline intermittently. We evaluate the practicality, complications, amount of reintubations as well as the hospital mortality.

RESULTS. Since May 2010 we included 105 patients (68 males, 37 females, age 70 ± 10 years). The placement of this catheter was feasible in case of 104 (99%) patients. One puncture was interrupted due to a subcutaneous hematoma. The placement of the catheter was performed in average on the third postoperative day (2.8 ± 2.9) and the first day after extubation (1 ± 1.3). The retention time averaged 4 days (3.74 ± 2.84). 12 patients (11%) needed reintubation due to respiratory distress. We did not see any placement complications which needed further treatment. The overall hospital mortality in this patients amounts to 2% (2 patients).

CONCLUSIONS. The placement of a transtracheal catheter and the instillation of natural saline to enforce productive cough is very safe to handle, not added to an increased amount of postoperative complications and offers an alternative to miniature tracheostomy that is easy to learn.

0632

LESS CARDIAC HEMOSTATIC REINTERVENTIONS BASED ON ROTEM

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INTRODUCTION. Cardiac surgery still associates a high postoperative bleeding risk. We analyzed the utility of thromboelastometry (ROTEM) in the management of significant postoperative bleeding after cardiac surgery in patients with cardiopulmonary bypass (CPB).

METHODS. We analyzed ROTEM parameters (EXTEM, INTEM, HEPTEM and FIBTEM) in patients aged over 18 years, operated on CPB during a 4 month period and having a chest drainage over 400 ml in the first 6 postoperative hours. Demographic data, type of intervention, CPB and aortic cross-clamp duration and minimal temperature on CPB were registered. Haematocrit, haemoglobin, platelet count, APTT, INR and the level of fibrinogen were measured preoperatively, at the end of the intervention, in the first 6 postoperative hours, and during the 6–12 postoperative hours. The blood transfusion products as well as the hemostatic reintervention and complications were also registered. Data are expressed as mean $\pm$ standard deviation (SD)

RESULTS. From 148 patients operated during the study period there were 7 patients (5 males, 2 females with a mean age of 59 ± 12.4 years) that met the proposed criteria. The drainage in the first 6 postoperative hours was 907 ± 567 ml (400–2,100 ml). Five patients were on aspirin preoperatively and all seven patients received tranexamic acid (3–6 g) during the intervention. At least one ROTEM parameter was affected in all seven patients. Following the ROTEM algorithm for coagulation factors and protamine supplementation we succeeded to avoid haemostatic reintervention in four patients. In these patients bleeding stopped after correction the deficiencies. The blood product usage (mean values) during the first 6/12 h was: PRBC $2.4 \pm 1.13/4.14 \pm 2.03$ Units, FFP $2.86 \pm 2.73/3.57 \pm 3.36$ Units, and PC $0.57 \pm 1.51/1 \pm 2.6$ Units. There was an increased incidence of prolonged mechanical ventilation, atrial fibrillation, acute renal failure and neurologic dysfunction in the group of high drainage patients compared to those with normal bleeding.

CONCLUSIONS. Evaluation of bleeding cause post cardiac surgery is difficult. The use of ROTEM parameters helped us to optimize the management of bleeding and to reduce the number of reinterventions to control haemostasis after cardiac surgery.

General perioperative care, stress, immunology, inflammation & organ dysfunction: 0633–0639

0633

PROPHYLACTIC FACTOR XIII ELEVATES NEUTROPHIL RECRUITMENT IN PATIENTS WITH ALCOHOL USE DISORDERS (AUD) AFTER NECK DISSECTION

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INTRODUCTION. In AUD patients bleeding and wound infections cause prolonged hospital stay [1–4]. Neutrophils as first line of innate immune defence degrade an inhibitor of coagulation (tissue factor pathway inhibitor) in vessel wall cells [5]. Patients with AUD have lower levels of Factor XIII and therefore an impaired coagulation caused by liver dysfunction and malnutrition. These patients might benefit from a prophylactic application of Factor XIII preventing from infectious and bleeding complications.

OBJECTIVES. The objective was to prevent infectious and bleeding complications by prophylactic application of Factor XIII and to reduce the length of hospital stay (LOS) in these patients.

METHODS. After ethical approval and informed consent, 23 patients scheduled for upper digestive tract surgery were randomly allocated to two groups: placebo (n = 12) and Factor XIII (Fibrogammin® HS, CSL Behring comp) (n = 11) and were treated according to the following protocol: Before surgery BS 1: 2,500 IE FXIII/Placebo BS 2; Postoperative: 1,250 IE FXIII/Placebo - BS 3; POD1: 1,250 IE FXIII/Placebo BS 4; POD2/POD3: 1,250 IE FXIII/Placebo; POD4: BS 5; POD10: BS 6

Blood samples (BS) were analyzed for cell subsets and coagulation function. Infection was diagnosed according to CDC-Criteria. Statistics: non-parametric Mann–Whitney *U* test.

RESULTS. Basic patient characteristics did not differ between groups. Comparing the peripheral blood subsets the most important result of our trial is that on the POD1 the neutrophil subset [/nl] was significantly ($p = 0.006$) elevated in FXIII group (median 13.90, IQR 9.10–15.54) compared to placebo (median 7.76, IQR 4.14–8.86). Infections were seen in two cases in each group. There were no significant differences regarding the intraoperative blood loss (FXIII median 500 ml, IQR 300–700 ml vs. placebo median 500 ml; IQR 350–875 ml; $p = 0.833$). Hospital stay did not differ between groups (FXIII median 12 days; IQR: 10 to 16 days vs. placebo median 14 days; IQR 11–18 days; $p = 0.413$).

CONCLUSIONS. FXIII showed better recruitment of neutrophil granulocytes. However, clinical relevance e.g., preventing from infectious and bleeding complications as well as hospital LOS did not differ between groups.

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0634

LACTATE AND BIOCHEMICAL MARKERS RELEASE AFTER ATRIAL FIBRILATION ABLATION CONCOMITANT WITH CARDIAC SURGERY: CRIOABLATION VS BIPOLAR RADIOFREQUENCY

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INTRODUCTION. Surgical ablation of atrial fibrillation (AF) using crioablation or bipolar radiofrequency (BRF) allows recovery of sinus rhythm in patients with AF who undergo open-heart surgery. There are few data about the release of cardiac necrosis biomarkers after surgical ablation by different sources of energy.

OBJECTIVES. We sought to evaluate the profile of biochemical markers of myocardial damage and lactate after surgical ablation and its correlation with postoperative complications and length of stay (LOS).

METHODS. Observational prospective study. We studied patients who underwent AF ablation concomitant to cardiac surgery. Surgical AF ablation was performed with endo-epicardial Maze III pattern using crioablation (Group A) or bipolar RF (Group B) as sources of energy. Data collected and compared between groups: surgical procedure; serial biochemical markers: lactate, troponines, CPK and CPK-MB; ICU and hospital LOS and postoperative complications. Statistical analysis: Data expressed as mean + standard deviation. *t* Student test for paired data and χ^2 for cualitative data.

RESULTS. To abstract date 31 patients were enrolled: 21 in group A and 10 in group B. There were no differences in demographic data and surgical procedure performed. We detected abnormally high concentrations of lactate, troponines, CPK and CPK-MB in both groups not related to the presence of low cardiac output clinically relevant or the presence of ischemic events. There were no statistically significant differences in lactate but troponines, CPK and CPKmb were statistically significantly higher in group A. ICU–LOS was statistically significantly longer in group B. The incidence of respiratory complication was higher in group B but no statistically significant. We did not observe differences in other postoperative complications or needs for inotropes.

Differences between lactate and troponine levels

Time (h)	Lactate (mmol/l)				Troponine I (pg/ml)			
	1	6	12	24	1	6	12	24
Crioablation	2.9 ± 1.4	3.6 ± 2.3	3.9 ± 3.1	2.9 ± 2.4	47.3 ± 40.8*	37.3 ± 26.2*	23.5 ± 24.3*	14 ± 15.5*
Bipolar RF	3.8 ± 2.1	3.6 ± 1.9	4.1 ± 1.1	3.5 ± 1.7	13.9 ± 6.7*	15.2 ± 7.4*	13.7 ± 8.4*	9.2 ± 5.5*

Differences in ETI time, ICU-LOS and Hospital LOS

	Crioablation	Bipolar RF
Endotraqueal intubation time (h)	15.1 ± 16.6	8 ± 7.4
ICU-LOS (days)	8 ± 11.2*	15 ± 26.5*
Hospital LOS (days)	14.1 ± 13.2	19.6 ± 25

CONCLUSIONS. Surgical AF ablation is associated with elevation of lactate with no evidence of hypoperfusion state maybe related to specific interaction energy-tissue. Troponines, CPK and CPKmb are abnormally higher in crioablation AF group compared to bipolar RF. Nevertheless, it correlates with shorter ICU-LOS. Biochemical markers and lactate could not differentiate patients with hypoperfusion state or coronary ischemia in this subgroup of patients. Their prognostic value remains unclear.

0635

NOISE IN THE OPERATING ROOM—A LITERATURE REVIEW

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INTRODUCTION. Noise is a general stressor, and out of consideration for both patients and staff, noise in the operating room should be avoided as much as possible. In the Guidelines for Community noise issued by the World Health Organisation (WHO), it is pointed out that patients in the hospital are particularly vulnerable to noise, because their situation reduces their capacity to cope with stress [1]. Noise levels in the operating room should therefore be kept as low as possible. The question is whether patients and staff actually experience noise and if it affects them negatively.

OBJECTIVES. This study was conducted with the aim of identifying the current knowledge about noise in the operating room upon which new research can be built.

METHODS. A systematic literature search on the topic was conducted. A search for primary research articles written in English was performed in the Medline, Cinahl and Cochrane databases using the following search terms: noise, operating room, operating theatre. Abstracts were searched for suitable articles and the reference lists of these articles were examined for additional sources. Each study was assessed according to the strength of the evidence and the quality of the study including the following quality indicators: aim, inclusion, data collection and end points. The studies was rated from A to D, with A representing a well-designed study and D representing a study with major flaws.

RESULTS. Eighteen relevant articles were identified and categorized as follows: • Noise levels, • Noise sources, • Staff performances, • Patient's perceptions of noise.

All studies had nonexperimental study designs and the level of evidence was found to be no higher than 3. In general the quality of the studies was high. 60% was rated A. The rest was rated B and C.

CONCLUSIONS. • Noise levels in the operating room in general exceed recommended levels, • Noise sources are related to equipment and staff behavior, • The main effect of noise on staff performances is related to impaired communication, resulting in a negative effect on patient safety, • There is a lack of literature on patient's perception of noise in the operating room, • Further research using experimental designs is needed.

REFERENCE. 1. WHO. Guidelines for Community noise. World Health Organisation; 1999.

0636

IN SEARCH OF THE IDEAL IMMUNOSUPPRESSANT. RENAL FAILURE AND LIVER TRANSPLANTATION

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INTRODUCTION. Renal dysfunction is a common complication in the postoperative liver transplant. Basiliximab (Simulect™) is an anti CD25 monoclonal antibody for T lymphocytes by preventing their proliferation. It is used for the induction of immunosuppression in renal transplant after surgery, as well as to alleviate the discomfort of the the post-liver transplantation to be nephrotoxic and allows the introduction of nephrotoxic calcineurin inhibitors later.

OBJECTIVES. Profile of patients in whom the basiliximab was used so as to analyze the presence of renal dysfunction in the immediate postoperative liver transplant, and follow-up at 3 and 6 months in the group that used Basiliximab in the group than did not.

METHODS. Retrospective cohort study in which 103 patients were included undergoing liver transplantation in the Carlos Haya Hospital and admitted to our ICU from January 2008 to December 2010. Basiliximab was used in patients who either had previous renal dysfunction baseline creatinine >1.3 mg/dl and/or significant ascites at the discretion of the surgeon or the transplant indication was acute liver failure. In patients who used Basiliximab was delayed introduction of calcineurin inhibitor between 5 and 7 days.

RESULTS. 103 Patients, 73 (70.9%) male and 30 (29.1%) female, aged on average 53.24 ± 1.21 were analyzer. The median stay in ICU was 4 days. The average figure for serum creatinine prior to transplant was 1.31 ± 1.21. Transplant indication was: (Table 1). ALCOHOL 20.6% (n = 21). VHB 3.9% (n = 4) VHC 28.4 (n = 29) ALCOHOL + VHC 21.6% (n = 22) ALCOHOL + VHB 4.9% (n = 5) VHB + VHC 2.9% (n = 3) CRIPTOGENICA 2.9% (n = 3) I. HEPÁTICA AGUDA 4.9% (n = 5) POLIQUISTOSIS 3.9% (n = 4) INMUNO 4.9% (n = 5). Of the 103 patients 70 patients received basiliximab and 33 noyt. Of the patients receiving Basiliximab 22.9% had renal dysfunction prior to transplantation, while at the ICU discharge had a 25.7, 38.6% at 3 months and 35.7% at 6 months while those who received Basiliximab none had previous renal dysfunction, 18.2% developed renal dysfunction at discharge from ICU, 33.3% at 3 and 6 months by 36.4%. No significant differences between groups. Mortality Simulect group was 21.1 and 13.8% non Simulect. In total was 15.2% of patients.

CONCLUSIONS. Patients who received no Basiliximab tend to develop a more significant increase in presence of renal dysfunction in the immediate postoperative liver transplant patients who received them and this trend continued in follow-up.

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0637

ANAEROBIC THRESHOLD AND ANASTOMOTIC LEAK—PREDICTIVE CAPACITY OF CARDIOPULMONARY EXERCISE TESTING IN A DISTRICT GENERAL HOSPITAL

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INTRODUCTION. Cardiopulmonary exercise (CPX) testing is a validated outcome predictor for high risk patients in the perioperative period [1, 2].

OBJECTIVES. To assess the utility of the anaerobic threshold as a risk factor for anastomotic leak in high risk post-operative patients.

METHODS. The study period ran from January 2008 until May 2010. CPX testing was performed as part of a planned pre-operative assessment on 85 surgical patients. A retrospective chart review was performed of all patients undergoing major GI and urological surgery that had pre-operative CPX testing within the study period. Ethical approval was not sought for this study as all patients were receiving CPX testing as part of a planned pre-operative work-up. There was no protocol to admit patients to the intensive care unit post-operatively based on CPX test results alone. The patient's age, anaerobic threshold and post-operative outcomes were noted.

RESULTS. Patients in whom anaerobic threshold (AT) could be reached and had a surgical anastomosis formed, were included in the study. This included 12 upper GI cases, two lower GI cases and three urology cases. These patients had a mean age 68.4 years and mean AT 10.24 ml/min/kg, median AT 9.2 ml/min/kg with IQR 8.9–11.5 ml/min/kg. Three of these patients developed post-operative anastomotic leak; two patients' post-esophagectomy and one patient post-ileal conduit with urinary diversion procedure. The lowest anaerobic thresholds achieved in patients for esophagectomy were 7.1 and 8.1 ml/min/kg, and these were achieved by the two patients who went on to develop anastomotic leaks. The patient with the ileal conduit leak had an AT 9.0 ml/min/kg and was the only patient within the study group to die within 30 days post-surgery. The data demonstrated no correlation between AT and ICU length of stay, however, there was non-significant evidence of indirect correlation between AT and hospital length of stay. There was non-significant evidence of direct correlation between patient age and AT within the study group. This surprising result is likely secondary to greater morbidity within the younger age group requiring pre-operative CPX testing.

CONCLUSIONS. Cardiopulmonary exercise testing has a validated role as a pre-operative screening test prior to high-risk surgery, however, no evidence exists correlating AT and anastomotic failure. This case review has indicated that such a correlation is likely to exist and a low AT may be considered a risk factor for post-operative anastomotic leak. Subsequently surgical teams should consider CPX results when planning anastomotic formations.

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0638

USING AN INTRAVASCULAR TEMPERATURE CONTROL SYSTEM TO REVERSE EARLY BURN-ASSOCIATED HYPERTHERMIA

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INTRODUCTION. We report a burn patient with hyperthermia successfully treated with an intravascular heat exchange system.

METHODS. A 60-year old woman was intubated and admitted to the intensive care unit due to a severe inhalational injury and a 45% body surface area burn to face, chest and both arms after an explosion of an alcohol-based regiment in a confined environment. Upon admission, the patient's core temperature was 39.2°C and reached 40.9°C within 9 h after the initial injury. Conventional cooling methods led to no significant decrease in body temperature. She became extremely unstable, hypotensive, hypercapnic and her ventilation was aggravated, needing increasing oxygen mixtures. Initial screening revealed no sign of infection, while her X-ray was normal. An Icy®, ALSIUS Corporation, Irvine, CA, USA intravascular heat exchange central venous catheter (Coolgard 3000® device) was inserted via the femoral route.

RESULTS. It took 5 h to reduce the patient's core temperature to below 39°C and a further 6 h to reach the target temperature of 37°C where it was maintained. Within 24 h the patient was hemodynamically stabilised and ventilatory demands were diminished. The treatment was temporarily stopped on several occasions, in order to reevaluate core temperature, perform regular screening for sepsis detection, excision of the burn wounds and split skin grafting and change the intravascular catheter. The use of Coolgard was continued for a total of 336 h and terminated when the patient was no longer hyperthermic. Episodes of infection and septicaemia were properly treated and she was extubated 34 days after admission. Patients suffering from severe burns often become hyperthermic early in the course of their critical illness. Various cooling methods are currently used, but they are of limited efficacy. In our case, the use of an intravascular heat exchange system treated hyperpyrexia, reduced CO_2 production, normalised ventilatory requirements and induced cardiovascular stability. We chose to lower core temperature to normal levels, as hypothermia can cause vasoconstriction which may not be beneficial to wound healing.

CONCLUSIONS. An intravascular heat exchange is a bedside device, easy to manage and can be used as an alternative method of treating early hyperthermia after burns.

0639

PULMONARY VASODILATION AND IMPROVED RENAL FUNCTION BY A NEW NO DONOR IN SIMULATED EXPERIMENTAL ABDOMINAL AORTIC ANEURYSM SURGERY

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INTRODUCTION. Aortic cross clamping and declamping is an unavoidable need during certain surgical procedures such as open aortic aneurysm repair. Complication rate and mortality are considerable due to the resultant ischemia and reperfusion injury causing multiple organ dysfunction, including kidney failure and lung injury with pulmonary hypertension. Therapy that can abrogate the ischemia and reperfusion injury is highly needed.

OBJECTIVES. To investigate the pulmonary and renal effects of a new intravenous NO donor (the organic mononitrites of 1,2-propanediol; PDNO) in an animal model of simulated elective open abdominal aortic surgery.

METHODS. Anesthetised and ventilated pigs were subjected to a 90 min abdominal aortic cross-clamping and a 10 h reperfusion period in an intensive-care like setting. The animals were supplemented with fluids and norepinephrine and the ventilation was adjusted as needed. One group of animals received a continuous i.v. infusion of PDNO throughout the study period. A short intermittent dose response study of PDNO was done before ischemia and at 9 h of reperfusion in order to investigate tolerance development. The other group was control. Physiological parameters and markers for organ damage were sampled.

RESULTS. In the control group ($n = 6$) aortic cross clamping and declamping resulted in pulmonary hypertension, decreased oxygen uptake and lowered or no urine output. Compared to the control group, PDNO ($n = 6$) increased cardiac index, effectively counteracted the increase in pulmonary vascular resistance ($p < 0.05$) and decreased the systemic vascular resistance ($p < 0.05$) without causing systemic hypotension or hypoxemia. PDNO also restored oxygen uptake. At 10 h of reperfusion, urinary output was normal in the PDNO group. Serum creatinine levels were lower in the PDNO group compared to the control group ($p < 0.05$). The dose–response study showed that PDNO exhibited NO donor vasodilating properties with fast on and off responses (a few minutes). Tolerance to the NO donor did not develop during the study period.

CONCLUSIONS. Intravenous administration of new organic nitrites has beneficial effects in experimental aortic cross clamping and declamping by counteracting pulmonary hypertension and by vasodilating the systemic circulation. Improvement of oxygen delivery and uptake may contribute to reduced acute kidney injury. Importantly the NO donor does not induce tolerance. The fast on and off responses make the use of it highly controllable.

GRANT ACKNOWLEDGMENT. Supported by grants from the Swedish Heart–Lung Foundation, the European Space Agency, the Fraenckel foundation, the Lars Hierta Foundation, Karolinska Institutet (MD/PhD program grant) and an unrestricted educational grant from CF Research and Consulting AB, Stockholm, Sweden.

Solving problems in the ICU: 0640–0653

0640

ICU OUTPATIENT CLINIC VU UNIVERSITY MEDICAL CENTRE; USEFUL OR NOT

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INTRODUCTION. Assessing outcome in terms of mortality after prolonged stay on an ICU is easy. It is far more difficult to measure post ICU morbidity in terms of quality of life and psychological consequences. Research has shown that post ICU patients can suffer from physical and psychological problems [1, 2]. In 2007 we organized an ICU patient reunion day. Invalid aftercare was a major complaint. Therefore, we started in 2009 an ICU outpatient clinic pilot. The purpose was to retrospect at ICU patient care, assessing current activities of daily life, measuring patient satisfaction and potential requirement of an ICU outpatient clinic visit.

METHODS. Patients with an ICU length of stay for more than 5 days are selected, and must be discharged for 6 weeks before being invited. ICU nurse and doctor prepare themselves with focus on disease course, wounds, delirium, medication and post IC follow up. The ICU nurse receives the patient and relatives reviewing the ICU stay and the hospital stay thereafter based on the questionnaire, filled in prior. This includes activities of daily living, pain experience, post traumatic stress disturbances and dreams. The ICU nurse has the knowledge and experience to review and reflect the stay for the patient and relatives. Feedback is also focussed on how they experienced the ICU care en hospitality. Specific medical questions can be answered when the doctor joins the conversation. A visit to the ICU ward is a possibility. The ICU nurse registries the results, the ICU doctor reports them to the general practitioner.

RESULTS. A total of 73 patients were invited. 31 patients actually came. Reasons for no show were: active rehabilitation program 33%, re admission 33% and no necessity/distance 33%. In general patients value their health less than before ICU admission. They have different physical and emotional complaints. Patients and their relatives are more satisfied after a visit on our ICU outpatient clinic. They all valued the visit with a 8, on a scale from 1 to 10.

CONCLUSIONS. During the patient reunion day patients and relatives gave feedback about their need for post ICU care. Therefore, we started an ICU outpatient clinic. We experienced better patient and relatives satisfaction. One visit was satisfactory for most of the patients. A high drop out was seen partly due to timing of visit with active rehabilitation programs running. A side issue was positive feedback of outcome of our patients which leads to motivation of the whole intensive care team. Improvement of ICU aftercare can lead to better quality of care. Further improvement in aftercare is needed with special attention on rehabilitation.

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0641

PRACTICE IN URGENT WARFARIN REVERSAL: A SURVEY WITH BRAZILIAN ANESTHETISTS AND INTENSIVISTS

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INTRODUCTION. Warfarin use has been increasing worldwide recently. This could be explained by aging of the population and associated illness. Major bleeding is the most severe adverse event expected in long term therapy—from 1–5% per year. Unscheduled surgeries can result from this picture, being a challenge for anesthetists and intensivists (A/I). In such cases, rapid anticoagulation reversal is desired. Recent guidelines recommend the prothrombin complex concentrate + Vitamin K use, although still with poor adherence. There are few studies evaluating day-by-day clinicians practice/knowledge in this field

OBJECTIVES. Evaluate practice in urgent warfarin reversal by anesthetists and intensivists in Brazil

METHODS. During the Brazilian Intensive Care Congress and the Brazilian Anesthesiology Congress in 2010 anonymous questionnaires were answered by practicing physicians. It consisted of five questions: Country location (Region), staff specialty, how prevalent severe spontaneous bleeding caused by warfarin occur in their practice, how often anticoagulation reversal is required to unschedulled surgeries, and what is currently used for proper reversal.

RESULTS. 790 (100%) questionnaires were answered by practicing A/Is. 483 (61%) were anesthetists and 307 (39%) intensivists. Most (58.2%) were from the most developed Brazilian region (Southeast). A/I often need to reverse anticoagulation for unscheduled surgeries in 16.1% (127) and 26.7%(210) for severe spontaneous bleeding. The treatment of choice was:- Fresh Frozen Plasma : 51.1% (404)- fresh frozen plasma + Vit K: 18% (142)- prothrombin complex concentrate : 5.6%(44)- prothrombin complex concentrate + Vit K : 3.3% (26)- AFVII : 0.8% (6).

CONCLUSIONS. Reversal of warfarin anticoagulation due to severe bleeding is common practice in Brazilian hospitals. Despite recent guidelines aiming at restricting fresh frozen plasma overuse, the majority of Brazilian A/I surveyed still use it as their first option in this scenario.

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GRANT ACKNOWLEDGMENT. CSL BEHRINGER.

0642

STATIN THERAPY IN CRITICAL ILLNESS: AN INTERNATIONAL SURVEY OF INTENSIVE CARE PHYSICIANS

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INTRODUCTION. Statins may prevent the onset of infection-related acute organ failure. We conducted an international survey to inform the design of a planned future trial and to assess the practice and opinions of ICU physicians in Australia/New Zealand (ANZ) and United Kingdom (UK).

METHODS. Survey questions were developed through an iterative process. The resulting 26 items included were reviewed by an expert group for content and clarity and grouped into three core domains as follows: (a) background and demographic information; (b) current use of statin therapy in ICU patients; and (c) hypothesis and study design. The questions were further refined following pilot testing and testing-retesting by 25 ICU physicians from Australia, Canada and the UK. We used the online Smart Survey™ software to collect responses.

RESULTS. Of 239 respondents (62 from ANZ and 177 from UK) 58% worked in teaching hospitals; 78.2% practised in "closed" units, and 71% reported a mixed medical and surgical case mix. Simvastatin was the most frequently (77.6%) prescribed statin in the UK compared to atorvastatin (66.1%) in ANZ. Main reasons for the choice of statin in the UK and ANZ were preadmission prescription and pharmacy availability. Most (65.3%) respondents would currently 'never' start a statin to prevent organ dysfunction and most (89.1%) would currently 'never' start a statin to treat organ dysfunction. Interestingly, a minority (11%) of respondents reported they would 'never' start a statin in ICU for new cardiac indication. There was marked heterogeneity in responses regarding decisions to continue prior statin therapy after ICU admission. Opinions about the risks of major side effects of statins (e.g., transaminitis, elevated creatine kinase, rhabdomyolysis) when prescribed in critically ill patients varied—49% 'strongly agreed/agreed' that the risks are low, while 41% 'neither agreed/disagreed' and 10% 'disagreed/strongly disagreed'.

The majority (84.5%) of respondents 'strongly agreed' that a preventive study is needed. More than half (56.5%) favoured rates of organ failure as the primary outcome for such a study, while 40.6% favoured mortality.

CONCLUSIONS. Despite differences in the type of prescribed statin, intensivists in the UK and ANZ reported broadly similar prescription practices. There is broad support in both communities for a RCT testing the hypothesis that statin therapy prevents the onset of new organ failure.

GRANT ACKNOWLEDGMENT. The survey was endorsed by the Intensive Care Society, UK and the Australian and New Zealand Intensive Care Society, Australia.

0643

RESULTS OF 2 YEARS WITH AN AUDIO RECORDING SYSTEM TO AUDIT IN-HOSPITAL CARDIAC ARREST MANEUVERS AT A THIRD LEVEL UNIVERSITY HOSPITAL. IMPROVING GUIDELINE ADHERENCE

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INTRODUCTION. Obtaining an accurate audit of all important data following recommendations of the Utstein style and measuring time intervals between actions performed during a cardiac arrest (CA) is not an easy task. There are four actions considered important during the process that are related to patient outcomes: collapse-Cardiopulmonary resucutation (CPR) initiation, collapse-defibrillation, collapse-intubation; collapse-medication.

PURPOSE OF THE STUDY. The purpose of the study is to demonstrate that the introduction of a recording system during in-hospital cardiac arrest permits an accurate process audit, recording all important data, following recommendations of the Utstein style (US).

MATERIALS AND METHODS. Prospective study carried out between January 2008 and December 2009. An audio recording system was introduced into the CPR team inventory. The device has a timer to record all events during reanimation and therefore audit the time intervals. Afterwards the recordings were reviewed and the US data completed. The CPR team attended all in-hospital CA. This included hospitalized patients and non-hospitalized patients. Patients hospitalized in critical, cardiac and emergency areas were excluded. The variables analyzed were: number of team alerts, number of CA, number of recorded CA, number of items registered in the Utstein style and number of "false arrest" alerts. Quantitative variables with normal distribution were expressed using the mean. We compared the number of items registered in the US during recorded CPR and non-recorded CPR with a *t* Student test. The statistical study was performed with SPSS v 18, Chicago, IL, USA. The study was approved by the Research Ethics Committee of the Hospital.

RESULTS. During the period of the study, 119 CPR team alerts took place: 64.5% (64) were real CA. The most common rhythm was asystolia: 60.93% (39), in second place pulseless electrical activity: 75% (12). Ventricular fibrillation was 10.93% (7) and 6.2% (4) was a pulseless ventricular tachycardia. Return of spontaneous circulation was obtained in 33.84%. Recorded CA were 57.8% (37) of all real CPR. The mean number of items registered in the recorded CPR was 18.18 (±3.2) versus 15.96 (±4.13) items in the non recorded CPR ($p = 0.023$). In recorded CPR the mean times registered were: arrival (alert-arrival):1.80 (±3.88) min; CPR start (alert-CPR start): 0.63 (±0.38) min; intubation (arrival-intubation):8.42(±4.64) min; first adrenaline (arrival- 1st adrenaline):3.30 (± 1.98) min.

CONCLUSIONS. The audio recording system is an easy tool to implement during CPR. It permits the register of a larger number of items per patient, improving the US adherence and allows the audition of the intervals of time between the different actions.

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0644

NATIONAL SURVEY OF CRITICAL CARE PHARMACISTS' VIEWS AND INVOLVEMENT IN CLINICAL RESEARCH

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INTRODUCTION. The involvement of Canadian critical care pharmacists in clinical research is currently not well documented. Recently, two large multicenter studies evaluating use of pharmacotherapy in Canadian intensive care units were successfully performed by pharmacists [1−2].

OBJECTIVES. Our objectives were to describe the experience and views about clinical research of Canadian critical care pharmacists.

METHODS. We conducted a national survey of critical care pharmacists. National hospital pharmacy associations and individual hospital pharmacy departments across Canada were reached and a contact list of critical care pharmacists was created. Questionnaire domains and items were developed through an iterative process, then pre-tested, validated (pilot-testing, clinical sensibility testing) and distributed to the identified sample of pharmacists. The survey was self-administered and a mixed-mode format was used (four series of electronic distribution followed by a paper copy mailed solely to pharmacists who requested it). Only surveys with more than 70% of questions completed were retained for analysis.

RESULTS. We invited 325 pharmacists from 129 hospitals across Canada to participate. A total of 215 from all regions completed the survey (66% response rate). Participants were asked to comment on their research experience in the last 5 years; 92 respondents (43.0%) had never been involved, while 70 (32.7%) had participated at least once or twice and 52 (24.3%) had participated three times or more in research protocol development. Ninety-three (43.7%) had presented results at least one or twice. Regarding publication of research findings, 34 (15.9%) had at least one first author publication and 51 (23.8%) had published as co-authors. When asked about research interest and opportunities, 138 (64.5%) expressed a strong interest in research, 133 (61.9%) responded they had opportunities to be involved in research, and 108 (50.2%) indicated adequate pharmacy administration support was available. However, 173 (80.8%) felt they had insufficient protected time to carry out research. The vast majority strongly believed keeping up with new research information was an important part of their job (97.2%). Critical care pharmacists' involvement in research was desirable (97.2%), and many expressed desire to be more involved in research (80.2%).

CONCLUSIONS. As a group, Canadian critical care pharmacists are very interested and are involved to varying degrees in clinical research. Opportunities are present but dedicated time and administration support appear to be potential barriers.

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GRANT ACKNOWLEDGMENT. Canadian Society of Hospital Pharmacists.

0645

SALINE (0.9%) AND HYPERCHLORAEMIC ACIDOSIS: DO WE KNOW WHAT WE ARE PRESCRIBING?

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INTRODUCTION. Saline (0.9%) is one of the most commonly prescribed intravenous fluid. Due to its high chloride content, infusion of even small volumes can cause hypochloremic acidosis, which may be associated with adverse systemic effects [1] and can cause diagnostic confusion, potentially resulting in incorrect management decisions and prolonged ICU stay. Compared to equivalent balanced solutions, saline has been shown to be consistently inferior in in vitro, animal, volunteer and patient studies [1]. GIFTASUP guidelines recommend balanced salt solutions in preference to 0.9% saline for routine fluid maintenance [2].

OBJECTIVES.

• To determine the prevalence of 0.9% saline prescribing on the wards and theatre prior to ICU admission in a UK district general hospital. • To determine the incidence of hypochloremic acidosis caused by 0.9% saline. • To investigate doctors' knowledge of fluid electrolyte composition and awareness of published guidelines.

METHODS. All patients admitted to ICU at North Middlesex Hospital between 1/10/10 and 31/12/10 were included. The volume of 0.9% saline administered in the 48 h preceding ICU admission along with admission blood gas and serum electrolytes were recorded. Prevalence of hypochloremic acidosis was investigated in all patients. A questionnaire on fluids was completed by doctors across all grades in medical, surgical and anaesthetic specialties.

RESULTS. 52/73 (71%) of patients admitted to ICU were prescribed at least 1 1 0.9% saline within 48 h preceding ICU admission. The mean corrected serum chloride was 107.7 mmol/l if no saline had been administered compared to 110.8 mmol/l in those given saline, although there was no dose–response effect. Saline administration increased the risk of hyperchloraemia by 24%.

Hyperchloraemia in relation to 0.9% saline

	Hyperchloraemia (number of patients)	No hyperchloraemia (number of patients)	% Incidence of hyperchloraemia
0.9% Saline prescribed	47	5	90.4
No 0.9% Saline prescribed	14	7	66.7

Hyperchloraemia was associated with increased incidence of acidosis. 37 doctors across all grades and specialties completed the questionnaire. 17/37 (46%) were unaware of electrolyte composition of 0.9% saline and its unphysiologically high chloride content. 32/37 (86%) were unaware of guidelines on fluid prescribing.

CONCLUSION. Saline (0.9%) increases the risk of hypochloremic acidosis and is overprescribed by clinicians. Knowledge of fluid composition amongst doctors is generally poor. It is suggested that all doctors concerned should undergo further training in fluid prescribing to ensure the optimal fluid is prescribed whilst minimising the risk of hypochloremic acidosis.

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0646

GENDER DIFFERENCES IN THE IN-HOSPITAL PROGNOSIS OF PATIENTS ADMITTED FOR NON-ST-SEGMENT-ELEVATION CORONARY SYNDROME

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INTRODUCTION. Cardiovascular diseases are the leading cause of death in women. There are controversial data about the influence of gender on the prognosis of patients hospitalized for acute coronary syndrome.

OBJECTIVES. Our aim was to analyze the prognostic repercussion of gender in patients admitted for non-ST-segment-elevation coronary syndrome (NSTEACS).

MATERIALS AND METHODS. We studied 715 patients admitted for NSTEACS, from January 2004 to December 2005, comparing by gender of the patient, the complication rates in mortality, heart failure (HF), severe arrhythmic events (defined as serious ventricular arrhythmias or advanced atrioventricular block), recurrent ischemia (RI) and a combined objective comprising all the above, as complicated NSTEACS.

RESULTS. 31.9% (228 patients) were women, more elderly than men (39% aged ≥75 years vs. 19.5%, p = 0.0001), more prevalence of hypertension (70.2 vs. 59, 8%, p = 0.004) and diabetes (49.6 vs. 35.9%, p = 0.0001). Women had a higher percentage of NSTEACS complicated by HF (25.9 vs. 9.4%, p = 0.0001). After multivariate analysis, female gender was a predictor of complicated NSTEACS (mOR 1.82, 95% CI, 1.07–3; p = 0.018) and NSTEACS complicated by HF (mOR 2.4, 95% CI, 1.48–3.9; p = 0.0001), whereas male gender was an independent predictor of NSTEACS complicated with IR (mOR 2.78, 95% CI, 1.02–7.52; p = 0.04). Gender was not an independent predictor of in-hospital mortality (p > 0.05).

CONCLUSIONS. In our series, female gender predicted greater risk of complicated NSTEACS and NSTEACS complicated with heart failure. Male gender predicted greater risk of recurrent ischemia.

0647

ACADEMIC COMMUNITY—NON-GOVERNMENTAL ORGANIZATION COLLABORATION IN HAITI: A MODEL FOR DISASTER RESPONSE AND FUTURE ENGAGEMENT FOR CRITICAL CARE EDUCATION

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INTRODUCTION. The 2010 Haiti earthquake resulted in an overwhelming number of casualties and injuries. Invited governmental and non-governmental organizations (NGOs) became crucial to Haiti's recovery [1, 2]. The NGO Partners In Health (PIH) has been providing healthcare in rural Haiti since 1987, primarily in preventive healthcare, TB and HIV/AIDS, but also through medical training, clinics and schools. (3) Following the earthquake, previously established ties between PIH and Dartmouth College and its healthcare system led to a multi-team response. This preventive medicine NGO and US academic community changed into a disaster relief collaboration that unlike many response efforts, persists to the present.

OBJECTIVES. To outline a process for academic insitutions and healthcare systems to collaborate with an NGO to respond to a disaster and develop a long-term relationship for healthcare and education in Haiti.

METHODS. The abstract is descriptive and observational.

RESULTS. "Dartmouth Haiti Response," a collaboration among Dartmouth College, Medical School, Medical Center, and PIH, has forged a long-term endeavor to provide medical education and direct clinical care, including advanced surgery and critical care, to this rural healthcare setting. 1. Deployed 51 healthcare professionals in 5 months. 2. Performed 50 surgeries; treated ∼120 critically ill patients; performed daily dialysis for patients with crush syndrome; provided ∼150 physical therapy consults; and managed ∼200 emergency patients. 3. Teams conducted bedside and classroom training sessions for Haitian healthcare providers. 4. Dartmouth plastic surgery/critical care team in Feb 2011 conducted 34 operations, implemented basic critical care support with post-operative wound care, conducted preoperative consultation on Internal Medicine patients, and assisted in diagnostic care with portable ultrasound. 5. 5 Haitian students attend Dartmouth College and Medical School. 6. Dartmouth conducts real-time tele-medical education to Haiti.

CONCLUSIONS. Dartmouth Haiti Response to the earthquake could be a model for universities and academic medical centers in disaster relief. Even in rural, austere settings, intensive care medicine expands healthcare's reach and capability. (4) As such, Dartmouth is developing possible future collaborative steps in four areas: 1) sending periodic medical/surgical work trips, 2) partnering with a rural community site, 3) planning education initiatives, and 4) collaborating with the development of a new tertiary care teaching hospital.

These efforts will not only solidify the partnership but also lead to improved clinical, tertiary care and education for Haiti.

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0648

TIMI RISK SCORE: A VALUABLE TOOL IN THE PROGNOSTIC STRATIFICATION OF NON-ST-SEGMENT-ELEVATION ACUTE CORONARY SYNDROME

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INTRODUCTION AND AIMS. Prognostic stratification of acute coronary syndrome is of vital importance, determining the strategy in these patients. The aim of this study was to analyze the importance of TIMI Risk score (TRS) as a prognostic tool of non-ST-segment-elevation acute coronary syndrome (NSTEACS).

MATERIALS AND METHODS. Retrospective analysis of all patients consecutively admitted with NSTEACS, from January 2004 to December 2005. Clinical and epidemiological characteristics and prognostic variables were studied, completing follow-up for a median of 24 months.

RESULTS. We included 715 patients, 31.9% women. In 73.4% of cases the acute coronary event corresponded to an unstable angina and the other 26.6% to a non-q wave myocardial infarction. 61.3% of the patients had a TRS moderate to high risk (≥3), corresponding to patients with higher comorbidity (Charlson Index 2.9 ± 2.2 vs. 1.4 ± 0.6, p = 0.0001). Highest scores in the TRS associated with greater development of heart failure (3.6 ± 1.2 vs. 2.6 ± 1.3, p = 0.0001) and mortality (3.9 ± 1.1 vs. 2.7 ± 1.3, p = 0.0001) in-hospital phase. This relationship remained after completing the long-term follow-up (3.5 ± 1.2 vs. 2.6 ± 1.3, p = 0.0001 for heart failure and 3.6 ± 0.9 vs. 2.6 ± 1.3, p = 0.0001 for mortality). After adjustment, the TRS predicted higher risk of presenting complicated forms of acute coronary events both during and long-term hospital (OR 1.6, 95% CI, 1.3–2.0 and OR 1.3, 95% CI, 1.1–1.4, respectively).

CONCLUSIONS. The TIMI Risk score is a valuable tool in the prognostic stratification of patients admitted for non-ST-elevation acute coronary syndrome.

0649

THE IMPORTANCE OF ACCURATE PATIENT EXAMINATION WITH SYNCOPE IN EMERGENCY CARE

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INTRODUCTION. In emergency care syncope accounts for up to 1.5% of seeking medical help and up to 6% of hospital admittance. The etiology is not always clear before the discharge of the patient.

AIMS. The aim of this study was to assess the accuracy of following the guideline on syncope treatment in emergency care, to highlight the weakest points in the care delivery process and give recommendations for the practice.

METHODS. A retrospective chart review was conducted in a Hungarian city (Keszthely). Both prehospital and hospital data were collected including all patients presenting with an episode of syncope to ambulance care between January 1, 2007 and December 31, 2008 ($N = 226$). Patients reporting loss of consciousness because of epilepsy or traumatic brain injury were excluded. SPSS 15.0 was used for statistical analyses. Beside descriptive statistics, χ^2, t test and ANOVA were carried out.

RESULTS. In the examined period the frequency of syncope was 5.9%. Although several studies report about more female being affected in this study the gender distribution did not show significance; male: 105 (46%); 121 (54%). The most cases are reported among the patient with 25–59 ages. In the prehospital care not all of the diagnostic modalities were implemented. In all cases blood pressure was measured at the onset of the examination but it was controlled later only in 21.1% ($p < 0.05$). ECG was not carried out in 52 cases out of 161 (32.5%) however, patients were transferred into hospital. Although Shellong-test and Head-up tilt test were available in the hospital in many cases patients were discharged without specifying the cause of syncope (89.3%).

CONCLUSIONS. Applying all possibilities of physical examination on the spot may reduce the patient admittance to the hospital. The clarification of the causes of syncope should be forced using HUTT and Shellong test more frequently in the emergency care. A syncope outpatient unit should be established in bigger medical centres.

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0650

EFFECTS OF THE WORKSHOP OF HANDS-ON RESPIRATORY MANAGEMENT FOR PHYSICIANS IN JAPAN

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INTRODUCTION. Mechanical ventilation is an essential technique in critical patients. Despite the need for systemic mechanical ventilation management education to acquire specific knowledge and skills for patients' management, there is no respiratory management education either in medical school or in training programs in Japan.

OBJECTIVES. Mechanical ventilation is an essential technique in critical patients. Over the last decade, new mechanical ventilation and non-invasive ventilation techniques and equipment have been developed. Specific methods of mechanical ventilator management can improve mortality and decrease the duration of mechanical ventilation [1]. Despite the need for systemic mechanical ventilation management education to acquire specific knowledge and skills for patients' management, there is no respiratory management education either in medical school or in training programs in Japan.

METHODS. Physicians applied via internet from all of Japan. The program consisted of multidisciplinary teachers and accepted the first thirty applicants each time. The two-day program contained interactive lectures, hands-on practices with mechanical ventilators, and simulation with mechanical ventilators. All attendees completed an anonymous evaluation of all aspects of each session, including volume, speed, difficulty, the level of understanding, and satisfaction on a scale of 1–5. All the questionnaire forms had a place to write comments, including impression, improvements and other comments.

RESULTS. Six out of twenty-nine (21%) attendees were not physicians in-training but specialized physicians. Although one theoretical topic seemed difficult for the attendees, overall volume, speed, difficulty, and the level of understanding were good in both theoretical and practical sessions. The attendees' satisfactions with the practical sessions were very high. There were positive opinions on multidisciplinary teachers and the structure of this program.

CONCLUSIONS. A combination of theoretical and practice education in mechanical ventilation is effective for both physicians in-training and specialized physicians. Education in mechanical ventilation by multidisciplinary teachers offers various aspects of respiratory management and seems valuable. However, the evaluation of the attendees' practical skills and the long-term follow-up of educational effectiveness will be required in this experimental program in the future.

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0651

MAINTENANCE OF ARTERIAL CATHETERS WITH HEPARIN. IT IS TIME TO STOP!

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INTRODUCTION. In ICU settings arterial catheters (AC) are used to manage critically ill patients. Maintaining the patency of these catheters is important for continuous hemodynamic evaluation and therapeutic adjustment. Heparinized solutions are used for this purpose although the increasing literature describes the use of saline solutions for the same reason. The authors compare the use of heparinized versus saline solution in the maintenance of AC and to detect changes in aPTT, platelet count, and local inflamatory signs, in a double blind randomized trial.

METHODS. Since Oct 5 2010, all ICU patients with AC were randomized to receive heparinized solution (5 IU/ml) or saline solution. AC patency and functionality was compared in both group every 6 h and aPTT, platelet count and local inflammatory signs each 24 h. Pts with thrombocytopenia, receiving anticoagulant or fibrinolytic treatment were excluded.

RESULTS. 452 days of AC were observed in 96 pts during which 227 days with saline solutions and heparinized in the rest. 7 pts were excluded. The median duration of catheters in place was 3.52 days in the saline group and 4.01 days in the heparinized group. We recorded 5 AC with local inflammatory signs in the heparinized group and 4 in the saline solution group that were replaced in a septic context. 20 local haemorrhage and 1 AC obstruction was observed in the heparinized group versus 20 local haemorrhage and 5 AC obstruction in the saline group (3 of them in the same patient). The aPTT was 10% higher in the heparinized group.

CONCLUSIONS. In this stage of investigation, we have some preliminary findings, to be confirm at the end of the study. The comparison of the two populations revealed similar results despite the used solution. These results do not encourage the use of heparinized solutions because they do not have an effective cost/benefit relation and because of potential iatrogenic problems described in the literature. So, should we continue to use heparinized solution for AC maintenance?

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0652

COMPLIANCE OF HAND HYGIENE PRACTICES IN RADIOLOGY TECHNICIANS AND HEALTHCARE WORKERS AND ITS IMPACT ON THE MORTALITY RATE IN INTENSIVE CARE UNIT OF A SECONDARY LEVEL HOSPITAL IN INDIA

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INTRODUCTION. Hospital acquired infections pose a very real and serious threat to all the patients who are admitted to hospitals [1]. Pathogens are readily transmitted on healthcare workers' hands and hand hygiene substantially reduces this transmission [3]. Evidence-based guidelines for healthcare workers' hand hygiene practices exist, but compliance with these is very low.

OBJECTIVES. To quantify the compliance rate of hand hygiene protocols in the ICU and to access the outcome of the training methods to improve the compliance.

METHODS. A prospective study of compliance of hand hygiene practices was conducted in 14 bedded ICU of our hospital over a period of 10 months from May 2010 to Feb 2011. All the radiology technicians and nursing staff working and visiting the ICU of both the sexes were included in the study. A team of three unbiased persons observed the compliance of the healthcare workers for multiple sessions of 1 h each during this period. Compliance was calculated as number of times hand hygiene was performed/number of the hand hygiene opportunities (before touching patient and surroundings, before doing any sterile procedure etc [2]). After observing for 4 months active intervention was done to improve the compliance in form of training, lectures, paper distributions to the workers. Again the compliance was noted for next 6 months. Mortality rate of the ICU pts was observed. Culture and sensitivity patterns of various body fluids sent after 72 h of admission were studied over this period to know the incidence of hospital acquired infections.

RESULTS. Initially the nursing staff compliance was around 45% only. Radiology technicians compliance was still lower only 25%. Though it increased to reach around 55% for nursing staff and 50% for the radiology technicians after training and education of the workers. There was significant increase in compliance for radiology technicians as compared to other healthcare workers but still full compliance was never achieved. Total admissions in initial 4 months were 221 and mortalities were 21.26%. In next 6 months out of total 405 pts the mortalities were 19.01%. There was a corresponding decrease in mortality rate with increase in hand hygiene practices. It may not be the only factor in decreasing the mortality rate, but has a significant contribution.

CONCLUSIONS. After intervention radiology technicians performed better than the staff nurses. The promotion of hand hygiene not only improved the compliance but also contributed towards the decline in mortality rate.

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0653

MULTITISSUE DONOR: A MEMORY EXERCISE

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INTRODUCTION. Human tissues are being increasingly used in different therapeutic procedures in the last years. From 1 January 2011 these humans tissues can only be distributed by administratively authorized Tissue Banks (RD 130/2006 about quality and safety of cells and tissues; RD 159/2009 about sanitary products regulation), in order to guarantee its traceability and a proper biomonitoring program.

OBJECTIVES. To raise sanitary professionals awareness of the needs and utility of obtaining human tissues for transplantation.

METHODS. Annual hospitalary course on donation and transplants (2006–2010), periodic clinical rounds in Servicio de Cuidados Críticos y Urgencias. Retrospective analysis of multitissue donors in the last 5-year period, in a hospital without Neurosurgery Department.

RESULTS. In this period we have had 45 multitissue donors with a mean age of 54.91 years (range 24–67). 70% were men, cause of death was cardiorespiratory arrest in 53.4% of cases (50% out of hospital), a neurological disease in 10% of patients, cardiogenic shock 10%, hemorrhagic shock 6.7% and others 16.7% (massive pulmonary embolism, respiratory failure, anoxic encephalopathy). 86.7% of patient died in the intensive care unit, and 13.3% in the emergency department. Corneas and osteotendinous tissue was obtained in all donors, and in two cases cardiac valves and vascular segments from heart block. Length of hospital stay was usually <1 day (60% of cases), and only in 20% it was extended to 4–5 days at most.

CONCLUSIONS. This type of donor is mainly a cardiac patient (sudden cardiac death, cardiogenic shock), followed by severe brain damage that does not evolve to brain death. Assistential workload is low because in most cases length of stay was shorter than 1 day. Donor detection was always based in assistant professional sensitivity to tissue donation process, which makes him/her call transplant coordination.

0655

INDIRECT CALORIMETRY IN THE ICU: A SYSTEMATIC COMPARISON OF THREE INSTRUMENTS ON MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Indirect calorimetry (IC) provides information to optimize nutritional therapy for critically ill patients, reducing both morbidity and mortality. The most commonly used instrument for IC on mechanically ventilated patients (Deltatrac Metabolic Monitor) is no longer in production, and previous studies comparing Deltatrac to new instruments on the market have generally not been performed on mechanically ventilated patients. A recent comparison between Deltatrac and two new instruments (CCM Express, Quark RMR) showed similar results for all devices in spontaneously breathing subjects [1].

OBJECTIVES. The aim of this study was to perform a systematic comparison of three instruments for IC on mechanically ventilated patients: CCM Express, Quark RMR and Deltatrac Metabolic Monitor.

METHODS. Sequential measurements of resting energy expenditure (REE) with all instruments were performed in randomized order on resting and continuously fed intubated ICU patients. Measurements were performed for a minimum 10-min period with the CCM and Quark and 20 min with Deltatrac. At the end of the sequence a repeated measurement was performed with the first instrument, and averages calculated. Food quotient (FQ) was calculated based on nutritional therapy for a 3-h period during measurements. All instruments were calibrated daily in accordance to manufacturer's specifications.

RESULTS. 48 measurements were performed on 24 patients; mean SOFA-score 6, BMI 18.3–43.1. REE from Harris-Benedict 1,627 ± 292 kcal/24 h (mean ± SD). CCM measured 64% higher mean REE than Deltatrac and Quark ($p \leq 0.005$). There was no difference in REE between Quark and Deltatrac ($p = 0.166$). All instruments measured different respiratory quotient (RQ) values, only CCM corresponded to calculated FQ ($p = 0.134$). Deltatrac measured an unphysiological RQ ($RQ \leq 0.7$) in 27% of measurements.

REE, RQ, VO2, VCO2 and MV results

	REE (kcal/24 h)	RQ	VO_2 (ml/min)	VCO_2 (ml/min)	MV (L/min)
Deltatrac	1,749 ± 389	0.74 ± 0.06	261 ± 57	193 ± 44	9.7 ± 2.3
CCM Express	2,876 ± 656	0.87 ± 0.06	408 ± 94	352 ± 78	11.6 ± 2.6
Quark RMR	1,788 ± 494	0.81 ± 0.07	259 ± 72	211 ± 59	9.1 ± 2.4

All values: means ± SD

CONCLUSIONS. This study shows an unacceptable discrepancy between instruments for clinical application in the ICU. Considering the importance of adequate nutritional therapy in this patient group, more work is required from manufacturers to accurately determine gas exchange in critically ill patients.

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Nutrition in ICU: 0654–0664

0654

SEVERE VITAMIN D DEFICIENCY CORRELATES WITH POOR OUTCOME IN INTENSIVE CARE PATIENTS

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INTRODUCTION. Vitamin D (VitD) deficiency seems highly prevalent in the community. Pleiotropic effects of VitD like immunomodulation and effects on muscle strength may be of special importance to critically ill patients [1].

OBJECTIVES. To determine the prevalence of VitD deficiency in critically ill patients and relate VitD status to clinical outcome.

METHODS. In a prospective observational cohort study performed from March 2009 until March 2010 in a 20-bed mixed ICU, we measured 25-hydroxyvitamin D (25OH-D) on admission in all consecutive patients. Patients received enteral feeding. Additional VitD was not supplied. Severe VitD deficiency was defined as: 25OH-D ≤25 nmol/L (to convert values to ng/ml, divide by 2.5). For clinical outcome, we compared hospital stay, observed and predicted mortality between VitD cohorts.

RESULTS. 25OH-D was measured in 1,232 patients (Table 1). The prevalence of severe VitD deficiency was 28%. Baseline characteristics and clinical outcome of the patients with severe deficiency and those without are presented in the table.

	25OH-D ≤25 nmol/L	25OH-D >25 nmol/L	P value
Nr	345	887	
Age[1]	66 (56–75)	67 (59–74)	0.25[4]
Female (%)	42	27	<0.001[5]
COPD (%)	14.2	9.0	0.008[5]
Infection on admission (%)	24	16	0.002[5]
Hospital stay (days)[1]	12 (8–22)	10 (7–17)	0.006[4]
APACHE IV PM (%)[2]	22 (19–25)	16 (15–18)	0.001[6]
Hosp Mort (%)	17	11	0.003[5]
SMR[3]	0.81 (0.62–1.02)	0.70 (0.57–0.84)	NS

[1]median(IQR), [2]predicted mortality Mean(95%CI), [3]standardized mortality ratio (95%CI), [4]Mann–Whitney *U*, [5]χ^2, [6]ANOVA

CONCLUSIONS. To our knowledge, this is the largest prospective Vitamin D cohort study in critically ill patients. In this cohort, 28% of the patients had severe Vitamin D deficiency. Patients with severe deficiency were more often female, more severely ill, more often had a history of COPD, an infection on admission, a longer hospital stay, and a higher predicted and observed hospital mortality. Severe Vitamin D deficiency might increase the susceptibility to disease and decrease the response to treatment. Alternatively, severe disease might decrease serum 25OH-D concentration. Randomized controlled intervention studies are needed to support this hypothesis.

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0656

ASSOCIATION OF HYPERKALEMIA AT CRITICAL CARE INITIATION AND MORTALITY

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INTRODUCTION. Hyperkalemia is likely to contribute to morbidity and mortality in critically illness. Surprisingly, the prevalence and significance of hyperkalemia in the critically ill is not known.

OBJECTIVES. The purpose of this study was to investigate the association between Potassium at the initiation of critical care and all cause mortality.

METHODS. In two tertiary care centers in Boston, USA, we performed an observational study of 39,705 medical and surgical patients, age ≥18 years, who received critical care between 1997 and 2007. The exposure of interest was the highest Potassium on the day of critical care initiation and categorized as 4.0–4.5, 4.5–5.0, 5.0–5.5, 5.5–6.0, 6.0–6.5, ≥ 6.5 mEq/L. Vital status was determined by the Social Security Administration Death Master File. Logistic regression examined death by days 30, 90 and 365 post-critical care initiation, and in-hospital mortality. Adjusted odds ratios were estimated by multivariable logistic regression models. Adjustments included age, race, gender, white blood cells, blood urea nitrogen, creatinine, Deyo-Charlson Index, red cell transfusions, patient type (medical versus surgical), sepsis, renal replacement therapy, acute kidney injury, diabetes mellitus and glucose.

RESULTS. Hyperkalemia on critical care initiation was present in 8.8% (K > 5.5 mEq/L), 4.7%, (K > 6.0 mEq/L) and 2.9% (K > 6.5 mEq/L) of patients. Potassium was a particularly strong predictor of all cause mortality 30 days following critical care initiation with a significant risk gradient across Potassium groups following multivariable adjustment: K 4.5–5.0 mEq/L OR 1.28 (95% CI, 1.19–1.38; P < 0.0001); K 5.0–5.5 mEq/L OR 1.49 (95% CI, 1.35–1.64; P < 0.0001); K 5.5–6.0 mEq/L OR 1.77 (95% CI, 1.56–2.00; P < 0.0001); K 6.0–6.5 mEq/L OR 1.73 (95% CI, 1.45–2.07; P < 0.0001); K >6.5 mEq/L OR 1.81 (95% CI, 1.57–2.09; P < 0.0001); all relative to patients with K 4.0–4.5 mEq/L. Similar significant robust associations post multivariable adjustments are seen with death by days 90 and 365 post-critical care initiation as well as in-hospital mortality. The Potassium-mortality association is independent of acute kidney injury, HbA1c, inpatient use of Beta 1 selective blockade, ACE inhibitors or Angiotensin Receptor Blockade. There is effect modification with regard to transfusion, inpatient potassium supplementation and NSAID use where the potassium-mortality association was seen in patients with K > 5.5 mEq/L but not with K 4.5–5.5 mEq/L.

CONCLUSIONS. The data demonstrate that potassium at critical care initiation is very strongly associated with the risk of death and that this risk is independent of other risk factors. In the absence of transfusion, inpatient potassium supplementation or NSAID administration there is a significant risk of mortality even at modest elevations of potassium.

GRANT ACKNOWLEDGMENT. NIH K08AI060881.

0657

DIFFERENCE BETWEEN CRITICAL CARE INITIATION ANION GAP AND PRE-HOSPITAL ANION GAP IS PREDICTIVE OF MORTALITY IN CRITICAL ILLNESS

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INTRODUCTION. Despite commonplace use of the standard anion gap, existing data do not provide clear guidelines for its interpretation or its ability to predict clinical outcomes. The difference between critical care initiation standard anion gap and pre-hospital admission standard anion gap (ΔAG) has not been studied nor compared to the physical chemical approach.

OBJECTIVES. We hypothesized that the ΔAG is associated with all cause mortality in the critically ill population.

METHODS. We performed an observational study on 18,985 patients, age ≥18 years, who received medical or surgical critical care between 1997 and 2007 in two tertiary hospitals in Boston, USA. The exposure of interest was ΔAG and categorized as < 0, 0–5, 5–10, and >10 mEq/L. Logistic regression examined death by days 30, 90 and 365 post-critical care initiation and in-hospital mortality. Adjusted odds ratios were estimated by multivariable logistic regression models. Adjustment included age, gender, race, hematocrit, WBC, creatinine, BUN, Deyo-Charlson Index, transfusions and sepsis. The discrimination of DAG for 30-day mortality was evaluated using ROC curves on a subset of patients with all laboratory data required to analyze the data via physical chemical principles ($n = 664$).

RESULTS. ΔAG was a strong predictor of all cause mortality 30 days following critical care initiation with a significant risk gradient across ΔAG quartiles following multivariable adjustment: ΔAG < 0 mEq/L OR 0.75 (95% CI, 0.67–0.81; $P < 0.0001$), ΔAG 5–10 mEq/L OR 1.56 (95% CI, 1.35–1.81; $P < 0.0001$), ΔAG > 10 mEq/L OR 2.18 (95% CI, 1.76–2.71; $P < 0.0001$), all relative to patients with ΔAG 0–5 mEq/L. Similar significant robust associations post multivariable adjustments are seen with death by days 90 and 365 post-critical care initiation as well as in-hospital mortality. Effect modification is absent with lactic acidosis. Inclusion of albumin correction to both pre-admission and critical care initiation standard anion gap did not materially change the ΔAG-mortality association. Limiting the cohort to patients with standard anion gap at critical care initiation of 10–18 mEq/L also did not materially change the ΔAG-mortality association. In a subset of patients, ($n = 664$), who had complete data to employ physical chemical principle analysis, ΔAG has similarly moderate discriminative ability for 30 day mortality in comparison to albumin corrected anion gap (ACAG), standard base excess (SBE) and strong ion gap (SIG). ROC curve areas for acid base variables follows: ΔAG AUC $= 0.58$ (95%CI 0.54–0.63), ACAG AUC $= 0.64$ (95%CI 0.60–0.68), pH AUC $= 0.59$ (95%CI 0.53–0.63), SBE AUC $= 0.58$ (95%CI 0.54–0.64), SIG AUC $= 0.55$ (95%CI 0.50–0.59).

CONCLUSIONS. ΔAG is a predictor of the risk of all cause patient mortality in the critically ill. The moderate discrimination of ΔAG for mortality is similar compared to the SBE, SIG and the albumin corrected anion gap.

GRANT ACKNOWLEDGMENT. NIH K08AI060881.

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THE RADIOGRAPHIC APPEARANCE OF NASOGASTRIC TUBES

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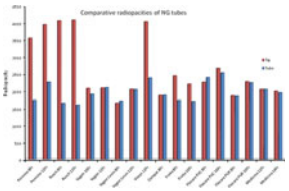
INTRODUCTION. Nasogastric (NG) tubes are inserted in the vast majority of Intensive Care patients. Administration of drugs or commencement of enteral feeding into a misplaced tube can cause significant morbidity and mortality.
The use of radiography is the most accurate way to confirm NG tube position especially when the use of acid-suppressing drugs limits the use of gastric aspirate pH testing.

OBJECTIVES. To demonstrate the considerable variation in radiopacity between different makes of NG tube and highlight that this has important implications for patient safety.

METHODS. 18 different types of NG tube were selected for investigation. All tubes were radiographically imaged using a standardised x-ray protocol over a plain radiographic plate. The images were then subjected to greyscale analysis using software to give a quantitative comparison of their radiopacity. The numerical value quoted is directly proportional to radiographic opacity.

RESULTS. The radiopacity values ranged from 1,599 to 2,536. 14 of the 18 (78%) tubes had a radiopaque strip to aid radiographic identification. The most radiopaque tube studied was the Flocare PVC 10Fr feeding tube, the measurement of opacity taken at the radiopaque strip. This was followed by the Flocare PVC 8Fr and the Viasys 12Fr tubes.7 of the 18 (39%) tubes had weighted radiopaque tips and of these tubes, the one with the most radiopaque tip was the Rusch 12Fr PVC Ryles tube. The opacity values are shown in Fig. 1.



CONCLUSIONS. There is considerable variation in the radiopacity between different NG tubes from different manufacturers. This study has successfully demonstrated the variability in radiopacity between different makes of NG tube. We believe that radiopacity should be considered as an important attribute when selecting NG tubes for use in the ITU where tube insertion and confirmation of position can be particularly problematic.

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0659

ZINC DEFICIENCY IN CRITICALLY ILL PATIENT WITH SIRS

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INTRODUCTION. Zinc is an essential trace element that needs to be in an adequate level in human body due to its role as a metalloenzyme, and it helps to maintain structural integrity of molecules involved in the metabolism of other nutrients. Zinc is involved in all levels of intermediary metabolism, key in the structure of DNA. Critically ill patient presents hypermetabolic, proinflammatory, immunosuppressed and high-oxidative stress state, making him susceptible to zinc deficiency.

OBJECTIVES. The objective is to study and compare the nutritional status of zinc in a healthy population with a critical patient with systemic inflammatory response syndrome (SIRS) from different hospitals in the provincial area of Granada (Spain) and assessing the possible inadequacy in the zinc intake and its subsequent clinical or subclinical deficiency, to shed light on the real requirements in these patients.

METHODS. 117 healthy subjects (CG) and 65 ICU patients (PG) were included previous informed consent, and nutritional assessment of zinc was carried out. A 72-h recall was used in CG, and in PG zinc support was 7-day followed in ICU. Plasma and erythrocyte zinc were determined after wet-mineralization by AAS.

RESULTS. 17% of CG is zinc-deficient (12–15 mg/day, normal values in Europe). In PG, who has received PN and EN, zinc deficiency is 66 and 50%, respectively. Plasma deficiency was found in 16% of GC, and 21% and 24% of PG have zinc deficiency at baseline and 7 days, respectively. Surprisingly, 35% of CG and 70% of PG were erythrocyte zinc-deficient. Thus, we found a significant correlation ($p < 0.05$) between plasma and erythrocyte zinc values at the beginning and at the end of study.

CONCLUSIONS. It is recommended monitoring of zinc status by erythrocyte levels, because zinc is stored and is more stable and representative, taking into account that plasma zinc fluctuates more easily and even more when critical ill patient has a limited situation were zinc is an essential highly involved metal.

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WEIGHT WATCHERS: ACCURACY OF ESTIMATED HEIGHT AND WEIGHT ON ICU AND IMPACT ON CALCULATED NUTRITIONAL REQUIREMENTS

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INTRODUCTION. Drug dosing and nutritional requirement in intensive care may be calculated based on actual weight, estimated weight or ideal body weight (the calculation of which is based on height and gender). Enteral nutrition is commonly associated with both overfeeding and underfeeding [1].

OBJECTIVES. We assessed the accuracy of visual estimated weight, visual estimated body mass index and supine measured length in order to assess the discrepancy between calculated nutritional requirements based on actual and estimated weight.

METHODS. Eight observers each measured the supine height using a paper tape measure and visually estimated the weight and body mass index category of seven volunteers. These were compared to actual measured standing height using a stadiometer and weight measured by standing scale. Weight estimations were used to calculate nutritional requirements according to ESPEN guidelines [2].

RESULTS. Measured supine height approximated closely to actual (standing) height with an average error of 1.39%. Estimation of weight was less accurate with an average error of 9.7%. The margin of error was under 10% in 58.9% of cases and under 20% in 94.6% of cases. Estimation of BMI category was poor with only 57.1% of assessments in the correct category. The weight and BMI of obese participants was consistently underestimated with no accurate assessments in this category. Using average estimated weight for the calculation of nutritional requirements resulted in errors of −410 to +141 kCal/day.

CONCLUSIONS. Use of measured supine height, and therefore calculation of ideal body weight, is accurate. Use of visually estimated weight and body mass index are not reliable measures particularly in individuals with BMI >30. The accuracy of weight estimation is improved by using averaged estimates of several observers.Use of estimated weight is likely to contribute to errors in calculations of estimated energy requirements, in particular tending towards underfeeding. Both over- and underfeeding are associated with less favourable outcomes. When possible patients in critical care should be weighed on admission, particularly for patients who appear underweight (BMI < 18.5) or obese (BMI > 30).

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0661

A PROSPECTIVE STUDY OF BIOCHEMICAL AND CLINICAL PROFILE IN CASES OF ORGANOPHOSPHORUS POISONING: FACTORS DETERMINING OUTCOME

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INTRODUCTION. Organophosphorus poisoning is the most common poisoning in India because of its easy availability.Young, productive age group individuals in moments of stress are the most susceptible. Standard treatment involves the administration of intravenous atropine and oximes to counter the acetyl cholinesterase inhibition at the synapse, but the efficacy of oximes is uncertain. Management of organophosphorus poisoning is still a challenging propositionHence we undertook a study to evaluate the clinical and biochemical profile of O.P. poisoning in Chittoor and neighboring districts of Andhra Pradesh, India, one of the regions with the highest suicidal OP poison comsumption belt in the country.

OBJECTIVES. 1. Difference in the clinical profile of patients receiving PAMand atropine (within 6 h of poisoning)—Group A. Atropine only—Group B. 2. To study the correlation between serial BuChE levels and clinical profile of patients with OP poisoning.

METHODS. Prospective study. 75 patients with OP poisoning during April 2008 to 2009. Diagnosis from history taken either from patient or from patient's relatives. Intravenous atropine and pralidoxime administered as soon as possible. Pralidoxime administered to only those patients presented within 6 h of consumption of the OP compound. Butyryl cholinesterase levels measured on admission and every alternate day until the patient's stay in ITU.

RESULTS. Independent Sample t test, Mann–Whitney test and χ^2 tests were used for assessing the data for statistical significance40% cases were brought to the hospital within 6 h of poisoning. The mean BuChE levels increased gradually over 6 to 7 days. No difference in the clinical profile between those receiving and not receiving PAM. BuChE levels did not correlate significantly with the clinical profile of the patients. Mean Atropine Dose in Group A was 59.67 mg in comparison to 41.32 mg in Group B. BuChE levels on admission in Group A was 340.6 IU/L abd Group B was355.1 IU/L.Mean BuChE levels in Group A was1151.3 IU/L. While in Group B it was1127.5 IU/L Days on ventilator was on an average 8.45 days in Group A and 10.47 days in Group B.

CONCLUSIONS. Treatment with PAM initiated within 6 h has not shown any difference in BuChE reactivation as measured by serial BuChE levels. Pralidoxime is a weaker oxime and is expensive, unstable in aqueous solution and in the Indian scenario cannot or may not be started within 1 h of poisoning. BuChE levels did not co-relate significantly with the clinical profile of the patients.

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0662

IMPORTANCE OF MONITORING IN IRON AND COPPER STATUS, AND ITS ASSOCIATION IN CRITICAL ILL PATIENT

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INTRODUCTION. Malnutrition is the most common cause of mortality and one of the principal health problems, mainly affecting to those patients admitted in ICU, where the inability of intake and their disease situation is habitual. Copper and iron are essentials nutrients, because a minimum daily intake is necessary for the correct function of cellular activity. Deficiency of one or more of those metal ion causes anemia, general weakness, depression of immune function, having a key role against oxidative stress through antioxidant enzymes.

OBJECTIVES. Assessment of Cu status in a collective of patients admitted in ICU for a period of 7 days, establishing their plasma levels and studying a possible relationship with other mineral, such as Fe.

METHODS. Multicenter observational study with a sample of 65 subjects, with an average age of 63.7, from the province of Granada. Inclusion criteria: SIRS and APACHE $\geq$ 15. Cu and Fe were analyzed by AAS in plasma samples, mineralized by wet way, at the beginning and the seventh day of their stay in ICU. Informed consent and ethical committee acceptance were included.

RESULTS. 100% of patients with enteral nutrition (EN) or parenteral nutrition (PN) have deficient supply of Fe during an ICU stay of 7 days. 83.3% of individuals had inadequate Fe supply with PN + EN. In patients who received EN and PN nutrition, the inadequacy of the diet is 38.5 and 100%, respectively. A deficiency of Fe and Cu in plasma was observed at the beginning in 87.5 and 30.8% of patients, respectively, which decreased to 78.8 and 10.7%, respectively. A correlation was found between both mineral intake ($p = 0.01$), possibly due to the polimineral supply.

CONCLUSIONS. Monitoring of minerals such as copper and iron status is necessary, being essential for a structural stability of molecules at cellular level, and on this way, being able to palliate the hipercatabolic situation in which the patients are immersed, avoiding deficiency that may worse their evolution.

0663

HYPERNATRAEMIA IN A GENERAL INTENSIVE CARE UNIT-IS THERE A SIMPLE SOLUTION?

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INTRODUCTION. Hypernatraemia is a common and potentially serious problem on the intensive care unit (ICU), with an incidence of 5–7%. ICU patients are at risk because of the serious nature of the disease process that precipitates their admission to ICU. Hypernatraemia has been shown to be an independent predictor for mortality in ICU patients [1].

OBJECTIVES. Thus our aims were to:

- determine the incidence of hypernatraemia on our ICU.
- to assess daily sodium load.
- to determine the factors which contribute to hypernatraemia.

We have adopted the British Consensus Guidelines on Intravenous Fluid Therapy for Adult Surgical Patients (GIFTASUP) guidance for the purpose of our audit [2].

METHODS. Retrospective review of the case notes of all patients admitted to ICU over 15 days in January 2010. We recorded daily electrolytes; fluid balance; enteral and intravenous fluids intake and the amount of sodium administered.

RESULTS. On 45% (19/42), of ICU patient days, serum sodium was above 145 mmol/L. On 17% of the days it exceeded 150 mmol/L. On 38% (16/42) days, average sodium load was appropriate (50–100 mmol/L) It exceeded 100 mmol/L on 60% (25/42) of the days and it was over 200 mmol/l on only 24% (6/25) of these days. On 89% (17/19) of the hypernatraemic days, mean enteral water intake was 228 mL. On 74% (30/42) of ICU days fluid balance was negative, (mean deficit 1,084 mL) However, on only 38% (12/30) of these days was the negative fluid balance associated with hypernatraemia. (In 1 patient hypernatraemia was observed 12 of 13 days, and on 8 of these days the patient had a negative balance). An elevated baseline creatinine (>120 mmol/L) was recorded on 42% of all ICU days. 32% of the time this was associated with hypernatraemia. 0.9% saline is the commonest carrier for infusion drugs. The length of stay correlated with the likelihood of developing hypernatraemia.

CONCLUSION. The incidence of hypernatraemia is higher in our ICU than is reported in the literature. This may reflect the way data was collected with number of patient days as the denominator. ICU-acquired hypernatraemia is multi-factorial: renal dysfunction; positive sodium loads and length of stay all play a role. It cannot be assumed to be because of a negative fluid balance. Maintenance of normonatraemia may improve patient outcome therefore we propose the following:

- Education of medical staff of mortality risk.
- Increase free water when a negative fluid balance is associated with rising sodium levels.
- Increase awareness of the sodium load in drug infusions especially when being fed enterally.

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HYPERNATREMIA IN CRITICAL CARE PATIENTS

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Acquired hypernatremia is a common disorder in ICU patients and an independent riskfactor for mortality [1]. In general it is assumed that hypernatriemia is caused by a negative water balance. However, many of the patients have edema. The physiological response to a hyperosmolar state is an increased secretion of ADH (antidiuretic hormone) resulting in a maximum retention of free water. This results in an (age dependent) maximum urine osmolality of $\pm$1,000 mosm/kg H_2O. Hoorn at all identified in their study on hypernatremia in ICU patients that 38% of the patients had a positive fluid balance [1]. A Possible explanation is a disturbed urinary sodium excretion. To investigate this hypothesis, we conducted a study in ICU patients with a positive fluid balance and hypernatremia.

METHODS. In a half year period we included ten consecutive patients with a hypernatriemic hyperosmolar state.Inclusion criteria were a serum sodium level >150 mmol/l and a normal or minimal impaired renal function (No hemofiltration needed). In these patients we collected data on fluid balance, urine production and haemodynamic parameters. We measured serum: Na, K; creatinine, urea and osmolality, and calculated fractional sodium excretion and osmolgap. In a 24 h urine sample we measured: sodium, potassium, creatinine, and osmolality. The endogenous creatinine clearance was calculated

RESULTS AND DISCUSSION. We observed a group of patients with severe edema and consequently a positive fluidbalance with hypernatremia (mean 158.4 mmol/l), who had a high plasma osmolality (mean 348.6) and a relatively low urine osmolality (mean 500.4). This could be explained by a renal tubular dysfunction and/or an abnormal neuroendocrine function (lack of ADH, reset osmostat) in combination with upregulation of the RAAS system. Further studies are needed to identify what the main cause is of developing hypernatremia in the critical care patient with a positive fluid balance. These studies should also adress the above hypothesis.

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Clinical nursing challenges: 0665–0677

0665

PREVALENCE, MANAGEMENT AND CLINICAL CHALLENGES ASSOCIATED WITH ACUTE FECAL INCONTINENCE (AFI) IN THE ICU AND CRITICAL CARE SETTINGS: THE FIRST (FECAL INCONTINENCE RE-EVALUATION STUDY) PROGRAMME

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INTRODUCTION. The management of fecal incontinence with diarhhoea (AFI) in the critical care setting is a priority in order to reduce the risk of perineal dermatitis, skin breakdown and transmission of infection [1, 2], but there is a lack of data on the prevalence [3].

OBJECTIVES. The FIRST Programme aims to collect data around AFI in the critical care setting within Europe; prevalence and clinical consequences, and the awareness, management, and challenges of AFI for healthcare professionals.

METHODS. A cross-sectional, descriptive survey was conducted in Germany, Italy, Spain and the UK. Data were collected from ICUs or critical care units using a questionnaire containing 20 questions for the healthcare professional, and 6 for hospital pharmacists or purchasing personnel. Results are reported here. The survey has been extended to other European countries and a prospective, observational study is being set up in Germany, Italy, Spain and the UK. Approximately 15 ICUs/critical care units per country will enroll up to 15 patients on the second episode of AFI in 24 h and follow for up to15 days, or until they leave the ICU. Daily observations of routine care will be recorded.

RESULTS. A total of 962 survey questionnaires were completed by nurses (60%), physicians (29%) and pharmacists or purchasing personnel (11%) in Germany, Italy, Spain and the UK. Estimated prevalence of AFI ranged from 9 to 37% of patients on the day of the survey. Patients with AFI commonly had compromised skin integrity. Reducing the risk of cross-infection and protecting skin integrity were rated as the most important clinical challenges. There was generally low awareness of nursing time spent managing AFI episodes by some hospital personnel, but 60% of respondents estimated that 10–20 min are required for managing an AFI episode, requiring 2–3 healthcare staff. The key reported benefits of fecal management systems (FMS) were reduced risk of cross-contamination and infection, and reduced risk of skin breakdown. The main reason reported for not using FMS was lack of availability or that devices were not included in the hospital guidelines. Data from the survey extension will also be presented along with any preliminary data from the observational study.

CONCLUSIONS. AFI in the critical care setting may be an underestimated problem and further research is warranted. The survey has been extended to a further seven European countries and an observational study set up to collect more robust data.

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GRANT ACKNOWLEDGMENT. ConvaTec, Skillman, New Jersey.

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EFFECT OF A PROGRAM TO IMPROVE PREVENTION MEASURES OF CATHETER-RELATED BLOODSTREAM INFECTIONS IN A MEDICAL ICU

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INTRODUCTION. Catheter-related bloodstream infection (CRBSI) is the third cause of nosocomial infection in Spanish ICUs, being the incidence rate in 2009 of 2.48 infections per 1,000 catheter days. Different studies have showed the positive influence of training and prevention programs in the reduction of the incidence of CRBSI.

OBJECTIVES. The aim of the present study is to analyze the effect of a prevention program (Bacteriemia Zero) on the incidence of CRBSI in a medical ICU.

METHODS. Prospective cohort study performed in a 12 bed medical ICU (October 2007 - August 2010). From October 2007 to January 2009 standard catheter care was performed; from February 2009 to August 2010 prevention measures established in the "Bacteriemia Zero" protocol were applied. Data regarding intravascular catheters and cultures were obtained through the clinical record.

RESULTS. From October 2007 to January 2009, 766 intravascular catheters were inserted (3,480 catheter days) and 14 CRBSI were diagnosed, with an incidence of 4.02 CRBSI per 1,000 catheter days. From February 2009 to August 2010, 643 intravascular catheters were inserted (2,814 catheter days) and 3 CRBSI were diagnosed, with an incidence of 1.06 CRBSI per 1,000 catheter days. A statistically significant reduction in the incidence of CRBSI was observed ($p < 0.01$) after the implementation of the "Bacteriemia Zero" protocol.

CONCLUSIONS. CRBSI is one of the more important preventable adverse events from health care. The development of care bundles and protocols to reduce its impact has an important effect in the reduction of the incidence in a medical ICU.

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0667

THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA (VAP)—A REVIEW IN NURSING LITERATURE

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INTRODUCTION. One of the infections in the critical care is ventilator-associated pneumonia (VAP). It is linked with the prolonged intensive care and hospital stay and increased mortality (Comeau & Adkinson 2006).

OBJECTIVES. The aim of this literature review was to examine what kind of evidence-based nursing activities there has been developed to prevent VAP. For the development of nursing, it is necessary to know what evidence-based practices have been identified as good and proper. In addition, it is necessary to identify areas for further studies.

METHODS. The retrieval was carried out (11.4.2010 and 11.3.2011) in four international databases Cinahl, ERIC, PubMed and The Cochrane Library. The search was limited to the inception of the period 2000–2010, adults, nursing and in the studies published in Finnish or English. The keywords used were "pneumonia, ventilator-associated", "prevention" and "evidence-based". The keywords were used both alone and interchangeably. The queries were used for MeSH-terms and as free-text searches with cut off the word either * or $ mark.

RESULTS. Total of 236 publications were found in the databases. After limits 60 publications were chosen for closer look at the title, abstract and/or full-text level. They were revised with specific inclusion and exclusion criteria. Pediatric care, neonatal care, with specific diagnosis group, only medical evidence-based care (e.g., antibiotics policy), other than the preventive measurements of VAP or duplicates were excluded. After analyses 28 (= n) studies were included in the final analysis. The effect of nursing activities on preventing VAP was studied on the 79% (22/28) of the reports. Commonly used design was a survey, observational study or educational intervention. Only 36% (10/28) of the designs were RCTs (randomized controlled trial), which can be expected to display a high degree of evidence. Most of the reports had shown the evidence of the lifting of the head of the bed. The second common was oral care alone in conjunction with the VAP bundle, which was thirdly common. The VAP bundle included following nursing activities; lifting the head of the bead, hand hygiene, pausing sedation, monitoring, documenting and implementation of drug therapy for stomach acids.

CONCLUSIONS. More knowledge is needed of the implementation of evidence- based nursing activities, especially about the effect of the oral care combined to VAP bundle care. In some circumstances it is useful to examine the individual method's (hand hygiene, oral care, and documentation) impact and possible changes in the incidence of VAP. Thus they are the core of the good quality in nursing. It is also important to study the effectiveness of the educational intervention by measuring nurses' knowledge and attitudes.

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0668

BELIEFS, ATTITUDES AND PRACTICES OF ORAL CARE: A COMPARISON BETWEEN EUROPEAN AND IRANIAN INTENSIVE CARE NURSES

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INTRODUCTION. Oral care is a key nursing intervention in the intensive care unit (ICU). Information about European ICU nurses' oral care practices and beliefs is available from a multicenter questionnaire survey [1]. Recently, a similar survey using the same questionnaire was conducted in Iran.

OBJECTIVES. To compare type and frequency of oral care practices and attitudes, beliefs and knowledge between EU and Iranian (IR) ICU nurses.

METHODS. A Persian translation of the questionnaire used by Rello et al. [1] was distributed among 187 ICU nurses in four university hospitals in Kerman, Iran. Obtained data was compared with the European findings [1].

RESULTS. Questionnaires were completed by 131 IR nurses, mostly females (76%) with a median age of 30 years and median working experience of 4 years. Only 1 nurse had a Master's degree. The EU sample included more Masters ($p = 0.014$), was older (median 40 years; $p < 0.001$) and more experienced (median 14 years; $p < 0.001$). Oral care in intubated patients is considered high priority by 88% of EU versus 40% of IR nurses only ($p < 0.001$). Cleaning the oral cavity is found to be difficult by 68% of EU versus 52% of IR respondents ($p = 0.04$). Compared to 37% of EU nurses, only 23% of IR nurses consider oral health of intubated patients to worsen over time despite their efforts. In EU, respondents consider cleaning the oral cavity a nurse responsibility (90%); only 17% of IR nurses share this opinion, 80% considering this to be a task for nursing aids. Of the EU respondents, 76% report having received adequate training on providing oral care versus 40% of IR nurses only ($p < 0.001$). Both EU (93%) and IR (71%) nurses express the desire to learn more about oral care ($p = 0.08$). Oral care is administered once (20 vs. 11%), twice (31 vs. 17%) or three times (37 vs. 37%) daily in EU versus IR, respectively. In both EU and IR oral care consists principally of mouth washes, mostly with chlorhexidine (EU 61%; IR 29%). IR nurses also use normal saline to rinse the oral cavity (12 vs. 0% in EU) and foam swabs are available for 22% of EU nurses, but not in IR. Manual toothbrushes are used in 41% in EU, and in 15% only in IR ($p = 0.002$). Electric toothbrushes are not used in the EU nor in the IR cohort. All (100%) EU versus 62% only of IR nurses reported having sufficient time to clean the oral cavity of intubated patients at least once daily.

CONCLUSIONS. We found many differences between EU and IR ICU nursing staff characteristics, and oral care practices, attitudes and knowledge. These might be related to differences in cultural, organizational and educational backgrounds. Evidence-based recommendations for oral care might reduce variation in practices worldwide.

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GRANT ACKNOWLEDGMENT. S. Labeau holds a doctoral grant from University College Ghent and the ESICM ECCRN-Edwards Nursing Science Award 2008.

0669

CHANGEOVERS OF NOREPINEPHRINE INFUSION PUMP IN PATIENTS WITH SHOCK: A RANDOMIZED TRIAL COMPARING AUTOMATIC AND MANUAL RELAYS WITH TWO SYRINGE DRIVERS. THE ARIBA STUDY

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INTRODUCTION. Circulatory failure requires careful intravenous administration of vaso-active drugs. These potents drugs have very short half-life and must be maintained at constant plasma concentration, with the aim to achieve constant effect on the cardiovascular system and subsequent hemodynamic stability. They require intravenous infusion of high concentration solutions at low flow rate using syringe pump. However, the syringe containing the vasoactive drugs have limited capacity and require changeover on a regular basis. Much of the time changeover are managed with two syringe pumps: one with the empty syringe and one with the new full syringe. The relay between these two syringes can be managed manually by the nurse or automatically with new devices which synchronize the start of the full syringe and the stop of the empty one. We hypothesized that electronically driven relay may provide more continuous supply of the vasoactive drug and subsequent more hemodynamic stability than the relay driven by the nurse.

OBJECTIVES. To compare two modes of changeovers using two syringe drivers: a manual mode (MM) and an automatic mode (AM).

METHODS. Patients treated with norepineprine were randomly allocated in one of two groups. In the MM group, changeovers of noradrenaline infusion pump were managed with two syringe pump by the nurse who stopped the ending infusion while a new one was started. In the MA group changeovers of noradrenaline infusion pump were managed with two syringe pump by the nurse assisted with Orchestra Intensive Base (Fresenius Kabi) which automatically stop or start the infusion pumps. Informed consents were obtained from patients or next of kins.

RESULTS. 50 patients were included. Mean age was 64 years, mean SAPS II was 65.3 and sex ratio was 3.5 male/1 female. Shock was related to sepsis in 76% of the patients. Mortality rate was 36%. 404 relays were analyzed: 193 in the MM group and 211 in the AM group. Overall variations of more than 20% of MAP were more frequent in MM group than in AM group (31 vs. 16%; $p < 0.001$). Decrease of more than 20% of PAM after the relay was more frequent in MM group than in AM group (20.2 vs. 10.9%, $p = 0.012$). Rates of severe hypotension (PAM < 50 mmHg) after the relay were similar in both groups. However, in the subgroup of patients receiving more than 0.5 microgr/kg/min, severe hypotensions were more frequent in the MM group than in the AM group (20.6 vs. 11.9%, $p = 0.023$).

CONCLUSIONS. Changeovers of norepinephrine infusion pump with automatic relays were associated with less hemodynamic instability compared with changeover with manual relays. We recommend to use such automatic devices in patients with severe shock.

0670

THE ACCURACY AND CLINICAL RELEVANCE OF WEIGHT MEASUREMENT IN CRITICAL CARE

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INTRODUCTION. To facilitate optimum treatment, many routine interventions used within Intensive Care (ICU) such as mechanical ventilation, nutrition and inotropes require a precise weight. The American Society of Health System Pharmacists suggest that any medication dose administered that is ≤ or >5% of correct dosage is a medication error [1] and an error of ≤ or >10% may lead to a fatal dose [2].

OBJECTIVES. To determine the accuracy and clinical relevance of weight measurements in one adult ICU.

METHODS. A non-probability convenience sample of 100 patients were weighed using a standard procedure on portable bed scales within 24 h of admission (M-60011- Marsden Weighing Machine Group Ltd, Oxfordshire, England). The error for this device is <200 g per 300 kg. Data was extracted from the observation chart, hospital notes, ward charts, staff, patient and relatives to identify the source and chronicity of the charted weight. Six pre-defined weight based interventions were recorded daily for each patient; cardiac output monitoring, inotrope usage, weight based medications, mechanical ventilation, renal replacement therapy and nutrition. Comparison was made between actual and charted weight, under and over reporting levels were set at >5%.

RESULTS. The mean patient age was 61.8 years (SD 17.1). The mean charted weight 74.8 kg (SD 17.7) and actual weight 76.0 kg (SD 17.7). Charted weights were estimated in 61% of cases and 39% were retrieved from patient documentation. 60% of charted weights were inaccurate by >5 and 31% by ≥10%. Actual versus charted weight showed a mean bias of −1.2 kg (levels of agreement −17.0 kg −14.6 kg [2 SD]). 95% of patients received at least one weight-based intervention with the majority (73%) receiving between three and six interventions during their stay on ICU.

CONCLUSIONS. The actual weight of ICU patients is not accurately reflected by the charted weight. This has a direct impact on many interventions, including medications used for ICU patient care. ICU patients should be weighed on admission, this might be facilitated by the use of integral bed scales.

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0671

CLINICAL PROGRESSION OF SEPSIS, SEVERE SEPSIS AND SEPTIC SHOCK IN A COHORT OF PATIENTS FROM TEN COLOMBIAN HOSPITALS

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INTRODUCTION. A simple linear progression from infection to septic shock is debatable, as complex individual mechanism may explain several differences in the clinical course of septic patients.

OBJECTIVES. We aim to estimate the progression and determinants of infectious states (infection without sepsis, sepsis, severe sepsis and septic shock) during the first 7 days of hospitalization, as well as its relationship with early hospital mortality.

METHODS. Cohort study in ten general hospitals in the four main cities of Colombia. We recruited consecutive patients admitted in emergency rooms (ER), intensive care units (ICU) and general wards from September 1, 2007 to February 29, 2008 with confirmation of infection according to the CDC definitions. We recorded demographic, clinical and microbiological characteristics; APACHE II and SOFA scores; requirement of ICU; length of stay (LOS) and all-cause mortality. A logistic longitudinal data analysis with GEE was performed to estimate infectious trajectories according to several independent variables, and a Cox regression with time-dependent covariables was used to estimate the determinants of mortality during the first week.

RESULTS. Analysis of 2681 inpatients showed that progression from infection to septic shock is increased by baseline APACHE II (OR = 1.02, 95% CI = 1.01–1.02) and SOFA (OR = 1.15, 95% CI = 1.14–1.17) scores, as well as by intra-abdominal and respiratory sources of infection (OR = 1.30, 95% CI = 1.18–1.44 and OR = 1.20, 95% CI = 1.09–1.31, respectively). Only skin and soft tissue as infectious sources decrease the progression to severe states (OR = 0.91, 95% CI = 0.83–0.99). The main determinants of mortality during the first week were change from sepsis to severe sepsis (HR = 2.11, 95% CI = 1.12; 3.98) and from severe sepsis to septic shock (HR = 2.96, 95% CI = 1.48; 5.90), baseline APACHE II (HR = 1.06, CI 95% = 1.04, 1.09) and SOFA (HR = 1.09, CI 95% = 1.03; 1.14) scores, respiratory sources of infection (HR = 1.72, 95% CI = 1.10; 2.70), other sources (HR = 1.89, 95% CI = 1.28; 2.80) and gram negative bacteria in blood cultures (HR = 0.60, 95% CI = 0.37; 0.97).

CONCLUSIONS. Our results suggest a differentiated progression from infection to septich shock according to ithe nfectious sources and the initial physiological response. These determinants, jointly with the infectious progression itself and the results of blood cultures, are the main correlates of early mortality. These findings underline the importance of a deep clinical and microbiological search in infected patients.

GRANT ACKNOWLEDGMENT. COLCIENCIAS, grant 1115-3431-9154, Universidad de Antioquia—Vicerrectoria de Investigaciones.

0672

ASSESSING BASIC OBSERVATION MONITORING IN SEVERELY ILL AND AT RISK PATIENTS

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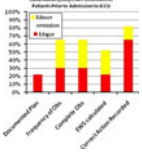
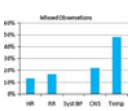
INTRODUCTION. Early warning scores (EWS) are physiological scoring systems that protect patient safety by detecting clinical decline. In the UK, NICE guidelines (CG50) advise that physiological track and trigger systems should be used to monitor all adult patients in acute hospital settings [1]. For the most part EWS are used as a screening tool and previous research has shown good compliance with routine frequency monitoring. However, in a small subset of severely ill patients, EWS are assessed more frequently and thus the EWS is used as a method of active observation. Ensuring accurate monitoring in this group of patients is of great importance as these are the patients most at risk of clinical deterioration. We aimed to assess compliance with EWS monitoring plans in this high risk patient group.

METHODS. Twenty three observation charts filled in on the wards prior to admission to critical care were collected over a 4-week period in a UK general hospital. They were analysed for the presence of a monitoring plan, compliance with requested frequency of observations, completeness of all EWS parameters, calculation of EWS and correct documentation of action points.

RESULTS.



Observation chart omissions



Missed observations

Of the charts assessed 22% did not have a documented monitoring plan. Considering major omissions alone, 30% had major gaps in frequency, 30% lacked key observations, in 22% EWS were not calculated and in 65% of cases there were major omissions in action point documentation. Temperature was the most common parameter missed.

CONCLUSIONS. Sub-optimal observations may delay or prevent the recognition of clinical deterioration. Thus this research highlights a key area for improvement to support patient safety. Improvement is likely to be best achieved through a multifaceted approach incorporating an increased educational emphasis on high frequency monitoring and practical changes to the monitoring and charting systems.

REFERENCE. (1) NICE clinical guidelines 50, http://www.nice.org.uk/CG50.

0673

THE USE OF VACUUM TUBE TECHNIQUE FOR COLLECTING THE STERILE URINE SPECIMEN FROM URETHRAL CATHETER

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INTRODUCTION. Sterile urine specimen collection from the urethral catheter requires basic nursing skills. In the literature, only the basic information regarding the administration of this procedure is presented, and scientific studies with respect to this subject are not currently provided.

OBJECTIVES. In this study, during the sterile urine specimen collection procedure, both the administration of the vacuum tube technique and the evaluation of its efficacy were intended. For this purpose, the sterile urine specimens collected by the vacuum tube technique and by injector were compared with respect to their urine contamination rates, the detrusor pressure values created during the procedures and the unfavorable situations.

METHODS. This is a quasi-experimental study. Among these total 144 patients who constitute the sampling, the sterile urine specimens collected by vacuum tube technique (both from the port and the catheter) were specified as the "experimental group" of the research (288 specimens), and the sterile urine specimens collected with injectors (both from the port and the catheter) were specified as the "control group" of the research (288 specimens), and totally 576 specimens were evaluated. Before the realization of this research, besides the approval of the ethics committee, a written permission from the center where the research was carried out was also received. The informed consent forms were used for the purpose of receiving the written consents of the patients who were volunteered to participate in the research. Mean, standard deviation median, interquartile range, chi-square test, Mann–Whitney *U* test and Kruskal–Wallis were used for data analysis.

RESULTS. Although there was no contamination any of the urine specimens collected by vacuum tube technique, contamination was detected in 0.9% of the urine specimens collected by injector. During the process of sterile urine specimen from urethral catheter, the difference between the detrusor pressure values which vacuum tube technique and injector occured in bladder was not statistically found insignificant ($p > 0.05$). The difference between the two techniques for unfavorable situations was statistically significant ($p < 0.01$).

CONCLUSIONS. It was demonstrated that the vacuum tube technique is a reliable technique for the collection of the sterile urine specimens which can prevent certain unfavorable situations. For this reason, sterile urine specimen collection from the patients with urethral catheters is recommended to be performed by the vacuum tube technique.

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GRANT ACKNOWLEDGMENT. The authors thank all patients for agreeing to join the study and biostatistician for their support and suggestions.

0674

PREDICTING THE RISK OF PRESSURE ULCERS IN PATIENTS IN A SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Although it is well known that pressure ulcers are associated with negative patient outcomes and increased hospital cost, there is little research related to pressure ulcers in an intensive care unit population.

OBJECTIVES. To determine the risk factors for pressure ulceration in an intensive care setting, to evaluate the Braden scale as a predictor of pressure ulcer risk in critically ill patients, and to determine whether pressure ulcers are likely to occur early in the hospital stay.

METHODS. Patients were enrolled in the study within 24 h of admission to the intensive care unit; data were collected every other day until discharge from the intensive care unit.We collected data, using a form we developed that contained demographic and clinical factors found in previous research and in our clinical practice to be associated with pressure ulcers.The Braden scale was used to assess repeatedly 120 adult patients without pressure ulcers in a surgical intensive care unit, and the patients' skin was inspected routinely for pressure ulcers.

RESULTS. Twenty-six of 120 patients developed at least one pressure ulcer (incidence = 21.6%) after an average stay of 5.3 days. The Braden scale, which measures six characteristics of skin condition and patient status, proved to be a primary predictor of ulcer development. No ulcers developed in the 41 patients whose Braden score was 14 or higher. The likelihood of developing a pressure sore was predicted mathematically from the Braden score. A lower Braden Scale score, the presence of diabetes mellitus, being underweight, and patient age 70 years or older independently predicted the development of a pressure ulcer.

CONCLUSIONS. Findings from this study suggest that, in addition to a low Braden Scale score (Braden scores ≤ 13), age >65 years and a diagnosis of diabetes may represent clinically relevant pressure ulcer risk factors in the surgical intensive care population and that patients with these factors may benefit from more aggressive preventive care.

0675

QUALITY OF LIFE IN H1N1-INDUCED ARDS SURVIVORS: DATA FROM MULTIDISCIPLINARY FOLLOW UP CLINICS IN A REFERRAL ECMO CENTER

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INTRODUCTION. Intensive Care Unit (ICU) follow-up clinics have been introduced to address the special healthcare needs by survivors after ICU experience[1]. As referral center for ARDS and for extracorporeal membrane oxygenation (ECMO), we recently reported our experience of season 2009/2010 of swine flu (H1N1) induced ARDS[2]. Here we show the results of follow-up activity in the same patients at 1 year after the critical illness.

METHODS. This study was performed by the institutional multidisciplinary ICU follow up clinic physicians and nurses led at the ICU of Emergency Department (Careggi Teaching Hospital, Florence, Italy). All survivors admitted for the novel pandemic influenza from September 2009 to January 2010 with a ICU stay higher than 72 h were invited to attend the clinic at 3, 6, and 12 months after ICU discharge and assessed for: health-related quality of life (HRQoL) as measured by the Short Form-36 (SF-36) and the EuroQoL (EQ-5D); anxiety and depression as measured by the Anxiety and Depression Scale (HADS) and post traumatic stress disorder (PTSD) symptoms as measured by Impact Event Scale-revised (IES-r); neurological status as measured by Glasgow Outcome Scale (GOS) and Glasgow Outcome Scale extended (GOS-E); functional status as measured by Basic Activity of Daily Living (BADL) and Disability Rating Scale (DRS).

RESULTS. In the study period, 12 patients were admitted in our ICU for H1N1 induced ARDS, 7 of which treated with ECMO and the other 5 with protective ventilation. The median SAPS II was 36 (IQR 27.75–44.75) and median ICU length of stay was 16.5 days (IQR 10.5–25.5). One patient died during ICU stay, and a second one was not possible to contact at the 1-year follow up. At 12 months follow up assessment data showed: (1) good neurological recovery (median 5 for GOS, median 7 for GOS-E); full functional status (median 6 for BADL, median 1 for DRS); (2) good physical and psychological well-being (median 55.5 for SF-36 ISF and 48 for SF-36 ISM; median 5.5 for EQ-5D; median 80 for VAS); (3) presence of anxiety, depression and risk to develop PTSD symptoms (median 42.5 for IES-r and 12.5 for HADS).

CONCLUSIONS. The data here reported, despite the limited sample, show that survivors from ARDS induced by HINI flu had a good neurological recovery, full autonomy in the BADL, and a good level of HRQoL. These data suggest also the presence of psychological disorders risks due to the ICU and critical illness experience.

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0676

EFFECTS OF 3STEP ACTIVITY BY BST CONTROL GUIDELINE IN SURGICAL INTENSIVE CARE UNITS ON IMPLEMENTATION OF NURSES RELATED TO PROTOCOL AND RESULTS OF BLOOD GLUCOSE OF PATIENTS

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INTRODUCTION. Critical patients become hyperglycemia regardless of DM history, because they have lack and tolerance in glycogenic ability and producing insulin, stress reaction and variety of medication. Therefore, they have to maintain a target BST by intensive monitoring. Although many studies (which is) based in a variety of BST control guidelines for critical patients have being published, there are insufficient studies (which is) related perception, implementation and BST control result of nurse (who is) using BST control guidelines.

OBJECTIVES. In this study, since 2009, we have applied BST control guidelines steps. And then we have analysed and evaluated perception, implementation and BST control for critical patients.

METHODS. Researchers hold a pre-test. 1st phase, adaptation of BST control guidelines (which is) led by nurse. 2nd phase, revision of target BST and guidelines. 3rd phase through automatic calculation computerization of injected insulin dosage and revision of hypoglycemia criteria, we have surveyed nurse perception, implementation of BST measurement time and insulin dosage and BST result. And then we have analyzed statistical data through using SPSS 12.0.

RESULTS. The results of research are statistically significant. In nurse cognition of BST control and guidelines, it increased by 41 ± 6.0 from pre-test score (36.8 ± 4.5) by total scare 55. In nurse implementation of BST control guidelines, BST measurement time implementation increased by 96% from accuracy 65%. In accuracy of insulin dosage, it increased by 94% from pre-test score (66.9%).In BST results, hyperglycemia of the whole BST measurement deceased by 16% from pre-test (37%).

CONCLUSIONS. From now on, I suggest (that) we need continuous improvement of problems (which are) related BST control and analysis of effect. Especially, we need to research of BST control guidelines for feeding patients. And also, there are lots of problems (which are) influenced prognosis of critical patients not only BST control but nutrition, infection and ICU delirium. Finally we propose that we need to have a broad variety of studies for critical patients.

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0677

REDESIGN OF WORK PLAN IN AN INTERMEDIATE CARE AREA IN A CARDIOTHORACIC SURGERY DEPARTMENT

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INTRODUCTION. A multi dimensional work plan was developed for improving quality care and achieving uniform work processes in an intermediate care area (ICA) in a cardiac surgery department.

OBJECTIVES. To re-design the health care service in an ICA according to evidence based practice in order to standardize the health care delivery.

METHODS. Intervention involved four elements: – *Organization structure* re organization of the ICA in accordance with parallel model. A physical director coordinates the medical education and administrative activities of the ICU and ICA. The director and the nurse manager are responsible for the quality of care, workload and budgetary issues in the area.

– *Staff training* an educational format including instruction and clinical experience was provided to nursing team. This program includes one-on-one clinical education and classroom study of critical care courses including ECG and dysarythmia class, CPR, homodynamic monitoring and more.

– *Defining patient mix* to assess Patient who may need intermediate care area in accordance with an accepted assessment which sums the monitoring and therapeutic modalities used within the previous 24.

– *Defining new practices* identifying guidelines for admission and discharge policies and protocol for IV infusion and definition of authorities such as shift manager. Also, a new agenda was established to ensure equal division of the labor.

RESULTS. Redesign involved structural change in which ICA facilities were increased: two beds were allocated to the unit, a separate storage room accessible for staff, including consumable storage—pharmacy, intravenous fluids, internal nutrition, refrigerator, etc. Department staff was trained to work in the redesigned area and quality care checkups were performed. Patient mix includes more complicated patients according to the new criteria. Procedures over patients involve bronchoscope and cardioversion which are performed in the ICA.Medical and nursing care is delivered through treatment practices including various modes of physiological support, pharmaceutical and monitoring modalities—all are implemented in computer software.

CONCLUSIONS. Two years after the redesign of the ICA the project shows improvement in overall treatment. Future plans include further staff training and developing nursing practices.

0679

ESTIMATION OF OPTIMAL PEDIATRIC CHEST COMPRESSION DEPTH BY USING COMPUTED TOMOGRAPHY

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INTRODUCTION. For infant and child resuscitation, current BLS guidelines recommend a compression depth of one third to one half of the AP chest diameter. Specific evidence for target depth of chest compression parameters in children are not known or published; thus, therapeutic targets for pediatric chest compression are based on extrapolation and extension from adults, animal models, and consensus interpretation of the literature.

OBJECTIVES. The purpose of this study was to characterize the compressible and incompressible diameters by using computed tomography and to compare with compression ratio to compressible diameter between children and adults if the simulated compression depth were delivered according to the current guideline.

METHODS. A total of 122 consecutive pediatric (between 0 and 8 years) chest CT scans and 204 consecutive adult (between 18 and 60 years) chest CT scans were analyzed. Compressible and incompressible diameters were measured at mid-sternum in children and at inter-nipple line in adult. Compression ratio to compressible diameter was calculated at simulated one-third and one-half AP compressions in children and at simulated 5-cm compression in adult.

RESULTS. The ratio of compressible diameter to antero-posterior diameter were 0.59 ± 0.03 and 0.64 ± 0.03 in adult and children, respectively. In adult, compression ratio to compressible diameter was 0.41 ± 0.05 at simulated 5-cm chest compression. In children, those were 0.52 ± 0.03 at one-third chest compression and 0.79 ± 0.04 at one-half chest compression. There were significant difference between children and adult in the compression ratio to compressible diameter ($p < 0.001$).

CONCLUSIONS. A simulated pediatric chest compression targeting approximately one-third or one-half AP chest depth seems to be too deep comparing with adult. So we suggest that one-fourth to one-third chest compression can be more feasible and safe than one-third to one-half chest compression in current guideline.

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Pediatrics 2: 0678–0686

0678

EDUCATIONAL INTERVENTION TO REDUCE NOSOCOMIAL INFECTION RATES IN THE PEDIATRIC INTENSIVE CARE UNIT

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INTRODUCTION. Nosocomial infections (NI) are known as a potentially cause of morbidity and mortality. Children admitted to the Pediatric Intensive Care Units (PICU) are especially vulnerable to NI because of the high prevalence of use of invasive devices during their stabilisation.

OBJECTIVES. To evaluate whether an educational intervention would reduce NI rates in a PICU.

METHODS. Prospective observational study focused on the incidence of NI in three periods: 1 year before the intervention (period 1), 1 year during the intervention (period 2) and 1 follow-up year (period 3). We included all patients admitted to the PICU >24 h. The intervention consisted of two initiatives: an educational program targeting hand hygiene and the implementation of infection-control practices focused on maintenance of external devices. NI was defined by the Center for Disease Control criteria. Variables collected were age, gender, diagnosis, severity using PRISM2 score, length of stay in PICU and in hospital, evolution and risk factors to develop NI. Device-days and NI episodes were collected daily. Statistical analysis: χ^2 was used to compare categorical variables; *t* Student or Mann–Whitney test were used to compare continuous variables. We analysed risk factors to develop NI through multiple logistic regression.

RESULTS. During the study 851, 822 and 940 patients were admitted, respectively, in the three periods. There were no differences on age, gender and severity. The rates of NI were reduced from 32.84/1,000 patients-day in period 1 to 12.5/1,000 patients-day in period 2, $p = 0.001$. The rate of catheter related bacteraemia (CRB) was reduced from 8.1 to 6/1,000 central venous catheter (CVC)-days, $p = 0.64$; the rate of ventilator associated pneumonia (VAP) decreased from 28.3 to 10.6/1,000 ventilation- days, $p = 0.005$; the rate of urinary tract infections (UTI) was reduced from 23.3 to 6.6/1,000 urinary catheter-days, $p = 0.000$. In period 3, an improvement in NI rates was observed: BRC 4.6/1,000 CVC-days, VAP 7.3/1,000 ventilation-days and UTI 5.2/1,000 urinary catheter-days. There was a reduction in hospital length of stay from period 1 to period 2: 18.56 ± 56.15 to 14.57 ± 16.81 days, $p = 0.035$. Mortality rate decreased, 44 exitus/851 in period 1 and 27/822 in period 2, $p = 0.056$ without statistically significant differences. The multiple logistic regression analysis revealed that variables independently associated with NI were: period 1, OR 2, 06 (IC 95% 1.23–3.41) and severity, OR 1.129 (IC 95% 1.09–1.06). Medical diagnosis at admission was a protective factor, OR 0.564 (IC 95% 0.33–0.95).

CONCLUSIONS. The implementation of infection-control practices is useful to decrease nosocomial infection rates and morbidity associated.

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0680

EFFECTIVENESS AND SAFETY IN PERCUTANEOUS CARDIAC PROCEDURES IN PEDIATRICS

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INTRODUCTION. Percutaneous procedures in Pediatrics represent the best therapeutic option for some congenital heart diseases. We offer curative or palliative therapies. Compared with cardiac surgery, they can reduce the morbidity in terms of reduced length of stay at hospital, absence of thoracotomy/median sternotomy, without increasing mortality.

METHODS. We analyzed the therapeutic percutaneous procedures performed in our department in patients younger than 18, between January 2009 and March 2011. From 317 catheters, 96 were therapeutic. Our objective was to determine the effectiveness and safety of these procedures.

RESULTS. 53 patients were male (55.2%) and 43 women. Femoral aproach (arterial or venous) was performed in 100% of patients, with the following distribution: Closure of ductus arteriosus in 29 patients (30.5%), ASD closure in 16 patients (16.8%), angioplasty of aortic coarctation 12 (12.5%), pulmonary valvuloplasty in 11 patients (11.6%), aortic valvuloplasty in 7 patients (7.4%), pulmonary branches angioplasty in 6 patients (6.3%), angioplasty intrastent 5 (5.3%), stent to maintain patency of the ductus 4 (4.2%), pulmonary artery stenting 3 (3.2%), embolization of fistulas/MAPCAs in 2 patients (2.1%). The devices that were used were: Amplatzer septal occluder 16, Amplatzer ductal occluder I 12, Amplatzer ductal occluder II 10, Coil 6, Amplatzer vascular plug II 2, Amplatzer muscular VSD occluder 1.
A good result was obtained in 82 (85%) of procedures, suboptimal result in 8 (8.3%), and failure in 6 (6.3%). There were a total of 9 (9.4%) complications: Dissection of the ductus arteriosus 1, pulmonary artery dissection 1, coil embolization 1, RV infundibulum spasm 1, atrial flutter 1, ventricular fibrillation 1, grade III aortic insufficiency 1, bleeding puncture femoral and artery spasm 1, femoral artery thrombosis 1. All these complications were solved properly. There was no mortality in our serie.

CONCLUSIONS. Percutaneous therapy is an effective and safe in children. In our series the complication rate was acceptable, similar to that observed in other series.

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0681

EVALUATION OF A PROTOCOL FOR POSTOXYGENATOR GASES MANAGEMENT IN AN ECMO PROGRAMME

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INTRODUCTION. ECMO is a well recognised therapy for cardiorespiratory rescue. Due to its high efficacy, the oxygenator membrane can rapidly change the concentration of oxygen (O_2) and CO_2 with undesirable effects. This is particularly critical in the initial reperfusion period after cardiopulmonary arrest (E-CPR). In 2010 we introduced a tighter control of postoxygenator gases in order to avoid hypocapnia and hypo/hyperoxia.

OBJECTIVES. To evaluate protocol adherence and investigate possible correlations between circuit settings and biological variables. To test whether pre-determined settings can minimise blood gas deviations.

METHODS. Review of postoxigenator gases, simultaneous venous oxygen saturation (continuously monitored via ECMO circuit) and ECMO parameters (flow, sweep gas flow and FiO_2) for every patient admitted to our PICU for VA ECMO during the period February 2010 to February 2011. The time spam was chosen to compare pre and post protocol periods. Data was analysed for: Correlation between FiO_2/pO_2, FiO_2/SvO_2 and sweep gas flow/CO_2. Capability: comparing pre and post protocol values for pO_2 and CO_2, with respect to therapeutic range. Time to obtain first postoxygenator gas percentage of adequate response to abnormal values

RESULTS. Wide variability of pO_2 and pCO_2 for gas flow and oxygen range. Gas analysis is necessary for monitoring purposes. No significant ($p = 0.617$) change in the proportion of hypocapnic episodes pre and post protocol. Hyperoxia significantly reduced ($p = 0$), but not totally controlled. Adequate response to hyperoxia only in 38% of cases. Response to hypoxia in 52% of instances. Response to hypocapnia was 24%.

CONCLUSIONS. Despite protocol introduction for gas exchange control while on VA ECMO, patients repeatedly experienced potentially injurious values of both pO_2 and pCO_2. Oxygenator settings cannot accurately predict blood gas response due to wide individual and time-based variability. A significant proportion of samples remained out of range and response was suboptimal. Moreover, one cannot rule out occult deviations between measures. Furthermore, there are potential risks intrinsic to blood sampling from the ECMO circuit. In this regard, continuous blood gas analysis would appear theoretically as a better option for protocol compliance.

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0682

A NEW FORMULA FOR OPTIMAL PEDIATRIC ENDOTRACHEAL INTUBATION DEPTH USING MAGNETIC RESONANCE IMAGING

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INTRODUCTION. There have been introduced a few formula to predict the practical airway length from upper incisor to carina (UI-C) for optimal positioning of endotracheal tube in children. Previous proposed formulas required height or age of children but have limitation in emergency situation.

OBJECTIVES. The aim of this study is to propose a new simplifed formula using upper incisor-sternal notch (UI-SN) to predict the airway length for the optimal positioning of endotracheal tube through magnetic resonance imaging (MRI) in pediatric patients.

METHODS. From August 2000 through September 2010, total 30 pediatric patients (aged 1 day–8 years) who had taken MRI for C-spine or whole spine were analyzed. Two of them were excluded because of the hyper-extended neck position and no visualization of carina on sagittal MRI. We measured the variables such as curved airway length from upper incisor to carina (UI-C), straight length from upper incisor to sternal notch (UI-SN) and from the clivus to sternal notch (C-SN). Linear regression was used to analyze the relationship among the measured variables.

RESULTS. The average age was 3.5 ± 2.6 and male was 15 (54%). Mean length of UI-C and UI-SN were 16.0 ± 2.8 and 8.8 ± 2.1 cm, respectively. There was close linear correlation between UI-C and UI-SN ($P < 0.001$). By linear regression, a formula was obtained as UI-C (cm) $= 1.25 \times$ UI-SN (cm) + 5.0, R^2=0.873.

CONCLUSIONS. The airway length from the upper incisor to the carina (UI-C) with the head placed in the neutral position can be well predicted by the straight length from the upper incisor to the sternal notch (UI-SN) in the same position. The proposed simplified formula (UI-C=1.25 $\times$ UI-SN + 5, UI-C: curved airway length from upper incisor to carina, UI-SN: straight length from the upper incisor to sternal notch) can provide good guidance to determine the optimal positioning of endotracheal tube in pediatric patients.

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0683

ULTRASOUND DILUTION TECHNIQUE AS A MINIMALLY INVASIVE WAY TO DETECT INTRA-CARDIAC SHUNT

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OBJECTIVES. Ultrasound dilution (UD) technique is a minimally invasive method used to determine cardiac output (CO) and volumetric variables of preload, such as total end-diastolic volume index (TEDVI) and active circulation volume index (ACVI) and central blood volume index (CBVI) [1]. This technique may also be useful in detecting intra-cardiac shunting. Our hypothesis was that UD (COstatus, Transonic Systems, Inc, NY, USA) is a good method to detect shunting in a porcine atrial septal defect (ASD) model.

METHODS AND RESULTS. Seven anesthetized piglets (1 month of age 10 kg body weight) were studied at baseline (base) and after atrial septostomy with partial pulmonary artery occlusion (ASD R-L). Pulmonary artery flow (Qp) and Aortic blood flow (Qs) were measured by surgically implanted ultrasound flow probe. Shunt fraction was calculated as Qp/Qs. Shunt status, CO, TEDVI, ACVI and CBVI were measured by UD technology with COstatus device. Data were analyzed using Kruskal–Wallis analysis; CO agreement to Qp and Qs was determined by Bland–Altman. Patency of ASD-RL shunt was confirmed by angiogram in all animals. PA occlusion significant decreased CO. ASD RL stage decrease CBVI but not TEDVI and ACVI. UD success rate in detecting R-L shunt was 86% when $Qp/Qs < 0.80$ and 100% when $Qp/Qs < 0.5$.

CONCLUSIONS. Ultrasound dilution technique was successful in identifying R-L shunt in atrial septal defect model.

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GRANT ACKNOWLEDGMENT. NIH SBIR R44HL061994.

0684

EPIDEMIOLOGIC SURVEILLANCE OF NOSOCOMIAL PNEUMONIA IN A PEDIATRIC INTENSIVE CARE UNIT (PICU)

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INTRODUCTION. Ventilator-associated pneumonia (VAP) is believed to be the most frequent infection in patients admitted to the intensive care unit (ICU). Moreover, the organisms causing nosocomial pneumonia often may be difficult to treat, increasing so the morbidity, duration of PICU stay and the mortality rate.

OBJECTIVES. To evaluate the incidence of VAP, duration of mechanical ventilation, duration of PICU stay, the pathogen organisms causing nosocomial pneumonia and the mortality rate.

METHODS. This is a prospective study. Are included all patients admitted at the PICU over a period of 1 year. Nosocomial pneumonia was defined according to the guidelines prepared by National Nosocomial Infection Surveillance (NNIS) system.

RESULTS. During the study period, 560 patients were hospitalized in PICU, of whom 41patients (7.3% of admissions) has been intubated and maintained in mechanical ventilation. 19.5% of mechanical ventilated patient were positive for nosocomial infections. The most common causative organisms were Pseudomonas aeruginosa (50% of cases), followed by Klebsiella (12.5%), Acinetobacter (12.5%) and other gram negative.The mean PICU stay was 13 days for nosocomial infection group versus 6.5 days of patients without VAP. Mortality rate remain high constituting 2.8% of all admissions and 39% of ventilated patients with no significant difference between the two groups. Nosocomial pneumonia was presented only in patients staying more than 3 days in mechanical ventilation.

CONCLUSIONS. VAP is a significant problem in our PICU resulting in increased mean stay and corresponding hospital cost. Duration of MV increased the risk of developing nosocomial pneumonia in our cases. This highlights the need that PICU staff should follow all general infection control measures related to respiratory equipment.

0685

JUNCTIONAL ECTOPIC TACHYCARDIA IN CONGENITAL HEART DISEASE: NOT A RARE COMPLICATION

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INTRODUCTION AND OBJECTIVES. Junctional ectopic tachycardia (JET) is a not rare complication in post-surgery congenital heart disease (CHD). It may be hemodynamically bad tolerated by the patient. We describe our experience in these tachycardias.

MATERIALS AND METHODS. Between 2006 and 2010, there were in our center 22 JET secondary to cardiac surgery. We analyze the types of surgery performed, the consequences and the treatment administered. The surgeries procedures were: ventricular septal defect closure: 11 (50%), Tetralogy of Fallot: 5 (22%), ostium primum closure with mitral cleft: 2 (9%), total anomalous pulmonary venous drainage: 2 (9%), atrioventricular septal defect: 1 (4.5%), extracardiac fontan: 1 (4.5%).

RESULTS. In all of these tachycardias we performed the following steps: reduction of vasoactive amines, correction of anemia, ionic and acid–base balance, digitalis impregnation, and cooling to 35°C. When the heart rate was <140 beats/min, we started transient stimulation with dual-chamber pacemaker. In 16 patients, we finally got sinus rhythm in a mean of 27 h. 6 patients (23%) did not get an adequate decrease in heart rate, experiencing a significant decline of cardiac output, so we decided to treat with amiodarone intravenous. All of them got down the heart rate in a few hours of treatment, re-establishing sinus rhythm in 4 patients. 2 patients developed complete AV block, requiring permanent pacemaker implantation. There was only one death in the group, not associated with tachycardia, and not in the group that was given amiodarone.

CONCLUSIONS. Most of the JET responds properly to the conventional treatment described. Intravenous amiodarone is a valid alternative when the tachycardia does not respond to conventional treatment, with severe cardiac output impairment.

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0686

INCIDENCE AND OUTCOME OF SEVERE DIABETIC KETOACIDOSOS IN CHILDREN

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INTRODUCTION. Diabetic ketoacidosis (DKA) in children is a serious acute complication of type I diabetes mellitus (TIDM) and continues to be an important cause of morbidity and mortality in these patients. A delay in diagnosis or starting appropriate therapy, however, increases the morbidity and mortality rates.

OBJECTIVES. To establish incidence of DKA among patients admitted to PICU and to recognize difference between patients with known TIDM and those who had new onset diabetes at presentation of DKA.

METHODS. Retrospective, non-randomized observational study was carried out in the multidisciplinary ICU of the Tertiary Care University Children¢s Hospital. From 6274 PICU admissions during 2003–2010 years 93 (14.82%) comply with DKA criteria and were included in the study. M/F ratio was 47/46. 32 patients had new onset diabetes, remaining had a previous history of diabetes and received insulin therapy. Age of patients varied from 13< 214 months, mean age was 144 months. Body weight range from 10.5 < 85.2 kg, mean body weight was 37.76 kg. Acid–base status, glucose, electrolytes, amount of fluid given during resuscitation until resolution of acidosis was recorded. Patients were treated according ISPAD consensus guidelines. Three patients (3.2%) received sodium bicarbonate to counteract acidosis.

RESULTS. Peak mean glucose concentration was 26.69 mol/l (range 10.3 < 85.2 mmol/l). There was a difference between patients having new onset diabetes (group A) and those who have established TIDB and received insulin therapy (group B) in blood glucose level (group A vs. group B) 31.31 versus 26.8 mmol/l, ($p = 0.047$). There was a predictable difference in age between groups: 162.64 months (group B) versus 108.69 months (group A), $p = 0.00002$). pH varies from 6.7 to 7.28, mean pH was 7.06 Mean sodium concentration was 137.35 mmol/l, range 119 < 157 mmol/l. Mean time (in h) until resolution of acidosis was 17.65 h, range 5 < 28 h. Amount of fluids infused to normalize homeostasis range from 37.46 to 375.58 ml/kg, mean 127.13 63.22 ml/kg. There was a statistically significant difference in homeostasis normalization time between groups: 16.25 h in group B versus 19.90 h in group A, $p = 0.043$. Amount of fluids given until resolution of acidosis differs from 111.57 ml/kg (group B) versus 156.18 ml/kg (group A), $p = 0.0054$. One patient having new onset diabetes died from cerebral edema. Mortality rate was 1/93 (1.07%).

CONCLUSIONS. We find statistically significant difference in patient's age between groups A and B in glucose concentration, homeostasis normalization time, amount of fluids given until resolution of acidosis. One third of children (34.4%) with DKA in our study had previously undiagnosed new-onset TIDM. Cerebral edema is a main cause of mortality.

Poster Corner Sessions
Ventilation side effects: 0687–0696

0687

EFFECTS OF POSITIVE END EXPIRATORY PRESSURES ON LUNG AND DISTAL ORGANS IN MODELS OF PULMONARY AND EXTRAPULMONARY ACUTE LUNG INJURY IN THE PRESENCE OR ABSENCE OF INTRA-ABDOMINAL HYPERTENSION

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INTRODUCTION. Pulmonary (p) and extra-pulmonary (exp) acute lung injury (ALI) differ according to their pathophysiology, even though ALI patients undergo similar ventilatory therapy. So far, however, no experimental study has investigated the impact of different positive end-expiratory pressure (PEEP) levels in ALIp and ALIexp in the presence of intra-abdominal hypertension (IAH).

OBJECTIVES. This study compared the effects of three different levels of PEEP in ALIp and ALIexp models associated or not with IAH.

METHODS. Wistar rats (n = 72) were randomly allocated to receive *Escherichia coli* lipopolysaccharide intratracheally (200 μg, ALIp) or intraperitoneally (1 mg, ALIexp). After 24 h, they were randomized into subgroups with or without IAH. Animals developed IAH by inserting gauze into abdominal cavity reaching a maximum stabilized intra-abdominal pressure equal to 15 mmHg. They were then ventilated with $FiO_2 = 0.4$, $V_T = 6$ ml/kg, and PEEP of 5, 7 or 10 cmH_2O during 1 h (End). Respiratory system (rs), lung (L) and chest wall (w) static elastances (Est), arterial blood gases, lung histology (light and electron microscopy), interleukin (IL)-1β, IL-6, caspase-3 and type III procollagen (PCIII) mRNA expressions in lung tissue, as well as the number of lung, liver, kidney and villi cell apoptosis were analyzed.

RESULTS. Est,rs, Est,L, Est,w, PaO_2, $PaCO_2$, and pHa were comparable at Baseline in all groups. In the presence of IAH, we found that: 1. PEEP of 5, 7 or 10 cmH_2O led to oxygenation improvement independent of ALI etiology; 2. Est,w increased after surgery and remained increased until End; 3. PEEP7 led to lower Est,L and less alveolar collapse in ALIexp, but yielded reduced alveolar-capillary membrane, epithelial and endothelial damage, cell apoptosis in lung tissue, as well as mRNA expression of IL-1β, IL-6, PCIII, and caspase-3 in both ALI groups; 4. PEEP10 resulted in hyperinflation in both ALI groups; 5. IL-1β, IL-6 PCIII, and caspase-3 mRNA expressions were higher only in ALIexp ventilated with PEEP10 as well as in ALIp with PEEP5; and 6. Liver, kidney, and villi cell apoptosis remained increased independent of PEEP level.

CONCLUSIONS. In the presence of IAH, PEEP7 improved lung mechanics and morphology and induced less epithelial, endothelial, and alveolar capillary membrane damage as well as cell apoptosis in lung tissue independent of ALI etiology. However, in ALIexp, PEEP10 led to increased expression of IL-1β, IL-6 PCIII, and caspase-3 in lung tissue while lower PEEP resulted in higher expression of these mediators in ALIp. Therefore, PEEP should be set not only according to IAH but also to the etiology of ALI.

GRANT ACKNOWLEDGMENT. CNPq, PRONEX-FAPERJ, FAPERJ, CAPES.

0688

PHYSIOLOGICAL EFFECTS OF INSPIRATORY PAUSE PROLONGATION IN MECHANICALLY VENTILATED PATIENTS WITH ARDS

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INTRODUCTION. Some studies have shown decreases in $PaCO_2$ when the inspiratory pause (Pinsp) is prolonged [1].

OBJECTIVES. The aim of our study is evaluate the effects of prolongation of the Pinsp in terms of gas exchange and respiratory mechanics in patients with ARDS and explore the possibility of reduction in tidal volume (Vt) to keep isocapnia.

METHODS. We studied eleven patients with early ARDS and permissive hypercapnia ($PaCO_2 \geq 45$ mmHg) ventilated according to our usual clinical practice. The study was performed in 3 phases: 1. Basal ventilation; 2. Pinsp prolongation until one of these three situations: Pinsp = 0.7 s or PEEPi > 1 cmH_2O or I:E ratio = 1:1; 3. Decrease Vt to obtain identical $PaCO_2$ to phase 1 (baseline settings). In each phase we collected arterial blood gases, respiratory and hemodynamic variables. Statistical analysis: ANOVA and Wilcoxon test were used when appropriate. The results are expressed in mean and standard deviation.

RESULTS. The mean age was 57 ± 12 years and SAPS II at admission was 47 ± 16. The mean FiO_2 used was 59 ± 12% and the Pinsp was prolonged to 0.7s in all the patients in phase 2. The main findings are detailed in the table.

Variable	Phase 1 (baseline)	Phase 2 (prolongation pinsp)	Phase 3 (decreasing Vt)	ANOVA (p)
Vt (ml)	371 ± 77	371 ± 77	330 ± 65	<0.001[b, c]
RR (rpm)	22 ± 2	22 ± 2	22 ± 2	1
PEEP (cmH_2O)	11 ± 2	11 ± 2	11 ± 2	1
PEEPi (cmH_2O)	0.3 ± 0.2	0.4 ± 0.4	0.4 ± 0.4	0.363
Vd/Vt (%)	69 ± 7	64 ± 9	63 ± 9	<0.001[a, b]
Pplat (cmH_2O)	25 ± 3	25 ± 3	22 ± 3	<0.001[b, c]
Ph	7.30 ± 0.07	7.32 ± 0.07	7.29 ± 0.07	<0.001[a, c]
$PaCO_2$ (mmHg)	55 ± 9	52 ± 8	56 ± 10	<0.001[a, c]
PaO_2 (mmHg)	100 ± 23	100 ± 24	107 ± 31	0.240

Vt tidal volume, *RR* respiratory rate, *PEEPi* intrinsic positive end-expiratory pressure, *Vd/Vt* dead space/tidal volume ratio, *Pplat* plateau pressure

[a]Statistical significance between phase 1 and phase 2 [b]Statistical significance between phase 1 and phase 3 [c]Statistical significance between phase 2 and phase 3

CONCLUSIONS. The prolongation of the inspiratory pause in ARDS patients with hypercapnia consistently decreases dead space and $PaCO_2$ levels. This strategy allows a Vt reduction with a significant drop in Plateau pressure while maintaining isocapnia.

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IMPACTS OF SPONTANEOUS BREATHING DURING LUNG PROTECTIVE VENTILATION IN EXPERIMENTAL ACUTE LUNG INJURY: SPONTANEOUS BREATHING DOES NOT ALWAYS GOOD

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INTRODUCTIONS. Spontaneous breathing (SB) preserved during lung protective ventilation might act differently, depending on different transpulmonary pressure (P_{TP}). Furthermore, even though some investigators have claimed that SB might generate potentially injurious P_{TP}, we have no convincing data to prove the downside of SB, so far.

OBJECTIVES. The goal of this study was to test our hypothesis that (1) compared with low tidal volume ventilation (LTV) preserved SB gently, LTV with strong SB may lead to improve lung aeration, resulting in better respiratory function and reduction of lung injury; and (2) potentially injurious P_{TP} might be generated by SB, which could lead to lung injury, even though lung protective ventilation is applied.

METHODS. Thirty-two lavages-injured rabbits were randomized to receive 4-h lung protective ventilations with (a) LTV group: tidal volume (V_T) of 6 ml/kg, (b) LTV+ SB_{strong} group: V_T of 6 ml/kg with SB preserved substantially, (c) moderate V_T ventilation (MTV) group: V_T of 7–9 ml/kg, and (d) MTV+ SB_{strong} group: V_T of 7–9 ml/kg with SB preserved substantially. All groups had the same positive end-expiratory pressure (PEEP) of 8 cmH_2O and plateau pressure ($P_{plateau}$) of <30 cmH_2O. Respiratory variables including gas exchange, lung compliance and hemodynamic variables were measured every 60 min. Differential cell counts in bronchoalveolar fluid (BALF) and distribution of lung aeration and collapse using lung histology were analyzed.

RESULTS. LTV+ SB_{strong} had the most favorable oxygenation (285 ± 108 mmHg at 4 h, $p < 0.05$) and lung compliance ($p < 0.05$), associated with better lung aeration by minimizing atelectasis (atelectasis in diaphragmatic slice; 24.2 ± 16.2%, $p < 0.05$). Whereas, MTV+ SB_{strong} yielded significant increased atelectasis with hyperinflation (atelectasis in diaphragmatic slice; 83.2 ± 6.9%, $p < 0.05$), associated with extremely increased neutrophils in BALF ($p < 0.05$), even when delivered with comparable PEEP and $P_{plateau}$ < 30 cmH_2O. Although all groups except MTV+ SB_{strong} had P_{TP} of <30 cmH_2O, MTV+ SB_{strong} showed the highest P_{TP} of >33 cmH_2O ($p < 0.05$).

CONCLUSIONS. Our results demonstrate that strong SB during LTV, rather than gently, improves lung aeration by decreasing atelectasis, which contribute to less lung injury and, when SB is preserved, injurious P_{TP} could be generated even when $P_{plateau}$ is limited <30 cmH_2O. These results indicate that SB preserved during mechanical ventilation has a potential risk of deteriorating lung injury, and neither V_T nor $P_{plateau}$ targeted lung protective ventilation is sufficient to reduce lung injury.

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IMPACT OF SIGH DURING PRESSURE CONTROL OR PRESSURE SUPPORT VENTILATION ON LUNG AND DISTAL ORGAN IN EXPERIMENTAL PULMONARY AND EXTRAPULMONARY ACUTE LUNG INJURY

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INTRODUCTION. The use of recruitment maneuvers (RMs) has been proposed as an adjunct to assisted and controlled mechanical ventilation to re-expand collapsed lung tissue in acute lung injury (ALI). A RM with sigh improves arterial oxygenation and lung mechanics independent of mechanical ventilation strategy: pressure control ventilation (PCV) or pressure support ventilation (PSV). However, so far, no study has evaluated the impact of sigh during PCV or PSV on lung and distal organ injury in ALI.

OBJECTIVES. To test the hypothesis that sigh during PCV or PSV may lead to different respiratory effects depending on the etiology of lung injury.

METHODS. Male Wistar rats (n = 48) were randomly allocated to receive *Escherichia coli* lipopolysaccharide intratracheally (200 μg, ALIp) or intraperitoneally (1 mg, ALIexp). After 24 h, they were randomized into subgroups ventilated with PCV or PSV to achieve V_T of 6 ml/kg and, after 10 min, they were further randomized to be recruited with sigh (S, 10 sighs/h) or not. All rats were ventilated with $FiO_2 = 0.4$ and PEEP = 5 cmH_2O for 1 h. Ventilatory and mechanical parameters, arterial blood gases, lung histology (light and electron microscopy), and interleukin (IL)-6, IL-1b, caspase-3, and type III procollagen (PCIII) mRNA expressions in lung tissue, as well as the number of apoptotic cells on lung, liver and kidney were analyzed.

RESULTS. Assisted ventilation modes led to better functional improvement and less lung and kidney injury compared to PCV. Sigh during PSV, compared to Sigh during PCV, yielded: 1) oxygenation improvement, though PaO_2 was higher in ALIexp than ALIp; 2) a similar reduction in the amount of alveolar collapse in ALIexp; 3) a higher fraction area of alveolar collapse in ALIp; 4) a greater reduction in IL-6, IL-1b, PCIII, and caspase-3 mRNA expressions in ALIexp than ALIp, even though all these mediators were higher compared to PSV without sigh; and 5) less alveolar epithelium injury, and number of cell apoptosis in lung and kidney independent of ALI etiology.

CONCLUSIONS. Sigh during PSV led to greater beneficial effects on respiratory function and a reduction in lung and kidney injury compared to Sigh during PCV. These effects were more enhanced in ALIexp compared to ALIp.

GRANT ACKNOWLEDGMENT. CNPq, PRONEX-FAPERJ, FAPERJ, CAPES.

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EARLY START OF HIGH-FREQUENCY PERCUSSIVE VENTILATION (HFPV) PROVIDES ADEQUATE OXYGENATION AND VENTILATION AND MAY BENEFICIALLY INFLUENCE OUTCOME IN SEVERE ARDS

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INTRODUCTION. HFPV is a flow-regulated, time-cycled ventilation mode that combines the beneficial effects of high-frequency and conventional ventilation and additionally enhances mobilisation and drainage of bronchial secretions. Only few studies have investigated the efficacy of HFPV in adult patients with ARDS, thereby mainly focusing on patients who failed conventional ventilation.

OBJECTIVES. We evaluated the use of HFPV as a first-line ventilation technique in patients with severe ARDS.

METHODS. Prospective case study in early (within 12 h of fulfilling diagnostic criteria) and severe (P_aO_2/F_iO_2 <150 mmHg) ARDS. HFPV was provided by the VDR 4 Percussionnaire® (Volumetric Diffusive Respirator, Bird Technologies, Sandpoint, ID, USA). Starting settings were: high-frequency rate of 500 beats/min, peak inspiratory pressure of 40 cmH_2O, T_i/T_e of 1.5:1, oscillatory PEEP/CPAP of 10 cmH_2O, and F_iO_2 of 100%. Ventilation and oxygenation were governed to keep pH >7.30, SpO_2 >95%, and P_aCO_2 between 35 and 45 mmHg. HFPV was considered to be successful when the patient could be switched to and finally weaned from conventional ventilation. No other adjuvant respiratory treatment or aids were allowed during the study.

RESULTS. 27 patients (age 50 ± 16 years; APACHE II 23 ± 9) were consecutively enrolled. Mean HFPV duration was 5.5 ± 2 days. Mean pH, P_aCO_2, and P_aO_2/F_iO_2 before start of HFPV were respectively 7.28 ± 0.13; 59 ± 23 mmHg, and 112 ± 37 mmHg. Within 24 h, pH and P_aCO_2 reached normal levels which were maintained thereafter. P_aO_2/F_iO_2 increased by respectively 70, 90, and 100% from day 1 to day 3 of HFPV treatment. 21 (78%) patients were weaned from ventilation. Six patients died during HFPV; 3 with refractory ARDS and 3 from unrelated causes. Overall ICU mortality was 40%. HFPV did not cause haemodynamic distress or bronchopulmonary complications.

CONCLUSIONS. Early institution of HFPV in patients with severe ARDS is safe, causes rapid and persistent improvement of oxygenation and ventilation, and may improve overall outcome.

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MATCHING PEEP TO THE DEGREE OF INTRA-ABDOMINAL PRESSURE: EFFECTS ON THE CARDIORESPIRATORY SYSTEM

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INTRODUCTION. We previously showed that positive end-expiratory pressures (PEEP) up to 15 cmH_2O were not able to prevent intra-abdominal hypertension (IAH) induced lung volume decline [1]. In contrast to this, matching PEEP to the corresponding intra-abdominal pressure (IAP) did prevent IAH induced lung volume decline [2]. However, this PEEP strategy was not associated with improved oxygenation in a healthy porcine lung model [2].

OBJECTIVES. This study examined the effect of IAP matching PEEP on P/F ratio, end-expiratory lung volume (EELV), and cardiac output (CO) in a porcine sick lung model of IAH.

METHODS. Nine adult pigs (48 ± 6 kg) received standardized anesthesia and ventilation. Oleic acid was given intravenously to produce acute lung injury. Two pigs served as controls. In 7 pigs, 3 levels of IAP (baseline, 18, and 22 mmHg) and different levels of PEEP were randomly generated. At baseline IAP, PEEP of 5 and 15 cmH_2O were applied. At both levels of IAH, 3 levels of PEEP with varying degrees of matching the corresponding IAP were applied: PEEP = 5 cmH_2O, PEEP = ½ IAP (cmH_2O) + 5 cmH_2O (moderate PEEP), PEEP = IAP (cmH_2O) (high PEEP). We measured P/F ratio, EELV, and CO.

RESULTS. Increasing IAP from baseline to 22 mmHg IAH (5 cmH_2O PEEP) decreased P/F ratio (−55%), EELV (−45%) and CO (−7%). There was a dose related increase in P/F ratio and EELV and a decrease in CO when IAP matching PEEP was applied. At 22 mmHg IAH, moderate PEEP increased P/F ratio by 60% and EELV by 44% and decreased CO by 12%. High PEEP increased P/F ratio by 162% and EELV by 279% and decreased CO by 30%.

CONCLUSIONS. In a porcine lung injury model, IAP-matching levels of PEEP were able to protect against IAP-induced decline in oxygen level and lung volume but were associated with reduced cardiac function.

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GRANT ACKNOWLEDGMENT. This study was supported by the ICU Research Fund, Sir Charles Gairdner Hospital.

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SELECTIVE PEEP TITRATION IN LATERAL DECUBITUS POSITION DURING ALI—A PRELIMINARY REPORT

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INTRODUCTION. In acute lung injury (ALI), three lung zones are commonly found. These zones might be "redesigned" by turning the subject to the lateral decubitus position. With differential lung ventilation (DLV), lungs might be ventilated with lower PEEP to the non-dependent lung and higher PEEP to the dependent lung.

OBJECTIVES. We hypothesized DLV should reduce overdistension in the non-dependent lung as well as reduce collapse in the dependent lung with similar or improved oxygenation. The aim of this study was to compare (conventional) global PEEP and differential PEEP on oxygenation, lung mechanics and on collapse/overdistension in a porcine ALI model. The results on oxygenation and lung mechanics from the first three studied animals are presented.

METHODS. 3 Pigs (22.5–27 kg) were anesthetized, intubated and ventilated with volume controlled ventilation ($FiO_2 = 1$; TV: 8 ml/kg).Femoral artery, jugular venous and pulmonary artery catheters were inserted.ALI was induced with lung lavage to obtain a PaO_2/FiO_2 ratio of <150 mmHg. The pigs were then tracheostomized and the tracheal tube was changed with a left sided double-lumen tube. The position was changed to lateral decubitus. Pigs were transferred to the CT-unit and DLV was started using two synchronized ventilators (Servo 900, Siemens Sweden).After a recruitment maneuver, both lungs were ventilated with pressure controlled ventilation ($FiO_2 = 1$; driving pressure: 8 cmH_2O) to determine the "optimal PEEP" by decreasing PEEP from 20 to 0 cmH_2O in steps of 2 cmH_2O. The PEEP levels obtaining the best tidal volume for each lung were defined as "selective best PEEP"s (sPEEP) for each lung. The PEEP level obtaining the best total tidal volume of two lungs was defined as "global best PEEP" (gPEEP).After determination of best sPEEP and gPEEP levels, lungs were ventilated again with VCV ($FiO_2 = 1$; TV: 8 ml/kg) in a randomized order with these two different settings during 15 min each.

RESULTS. There was a decrease in PaO_2 and increase in ventilator pressures after lung lavage in all pigs. Mean sPEEP's were 15.7 (18; 15 and 14) cmH_2O and 7.6 (10; 5 and 8) cmH_2O for the dependent and non-dependent lungs, respectively; and the gPEEP was 11 (11; 10 and 12) cmH_2O. Ventilation with sPEEP's has obtained a PaO_2 of 7.91 (8.3; 8.84 and 6.59) kPa, compared to the one with gPEEP with 6.57 (6.39; 7.62 and 5.71) kPa. Peak inspiratory pressures with sPEEP's were 21.8 (20.1; 21.5 and 23.9) cmH_2O (dependent), and 13.5 (9.1; 13.8 and 17.7) cmH_2O (nondependent), whilst it was 18.8 (15.9; 17.6 and 23) cmH_2O with gPEEP. The CT images are not yet analyzed.

CONCLUSIONS. DLV with two sPEEP's was associated with a better oxygenation compared to one gPEEP. Non-dependent lung has required less PEEP than the dependent lung, which has also reflected in inspiratory pressures; this fact has probably lead to a more appropriate distribution of ventilation during DLV.

GRANT ACKNOWLEDGMENT. Swedish Research Council (5315) and the Swedish Heart–Lung Fund.

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HIGH-FREQUENCY OSCILLATORY VENTILATION EXPERIENCE AT AN ACADEMIC ICU IN CHILE: REVIEW OF 2 YEARS OF TREATMENT

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INTRODUCTION. High frequency oscillation ventilation (HFOV) is an alternative technique of ventilation. Although some centres increasingly use it in adults patients who do not tolerate conventional mechanical ventilation (CMV), few studies has developed until now.

OBJECTIVES. To review and evaluate our clinical experience with HFOV during the last 2 years at Clinica Indisa, Chile; and to describe patient epidemiological characteristics, ventilator parameters progression, and outcomes.

METHODS. A retrospective chart review of all patients treated with HFOV at Clinica Indisa, Chile during 2009 and 2010 was performed. We evaluated patient demographics, laboratory test results and diagnosis at ICU admission, time spent in CMV prior to HFOV connection, ventilation and oxygenation parameters at the time of connection and its progression during HFOV, and patient outcomes. Laboratory test results and ventilator parameters during HFOV were evaluated at 7:00 a.m. for all patients. Co-interventions and ICU mortality were also recorded. A p value <0.05 was considered to be statistically significant.

RESULTS. A total of 28 patients (21 men and 7 women) with a mean of 42 years (SD ± 12.2), an Acute Physiology and Chronic Health Evaluation [APACHE] II score at ICU admission of 24.2 (SD ± 7.9) and with severe ARDS, due in most cases to severe pneumonia and severe burns (46.4 and 17.9%, respectively), underwent into HFOV during the period of study. A total of 33 episodes were recorded, with a mean duration of CMV prior to HFOV connection of 112.7 h (SD ±104.3). The mean values at connection time to HFOV were 100.9 (SD ± 54.0) for the PaO_2/FiO_2 and 29.9 (SD ±19.6) for the Oxygenation Index (OI). Patients treated with HFOV showed a significant improvement in PaO_2/FiO_2 after 48, 72 and 96 h of connection, regardless of patient's final outcome; we also observed non statistically significant improvement in OI after 48, 72 and 96 h after starting HFOV. During these 2 years, no major complications attributed to HFOV (i.e. pneumothorax) occurred. The mean duration of HFOV was 125.2 h (SD ± 120.1). The overall mortality during HFOV treatment was 71.4%. Of all patients, 17.8% experienced a weaning failure to CMV, requiring re-connection to HFOV, with an observed mortality of 100% in this group.

CONCLUSIONS. HFOV has shown beneficial effects in PaO_2/FiO_2 in our unit, and may be an effective and valid rescue therapy for adults with severe oxygenation failure who do not respond to CMV. Re-connection requirement may be seen as a mortality predictor factor, rather than a risk factor itself. No pneumothorax occurred during high-frequency ventilatory support. Mortality rates observed in our center are consistent with international data.

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IMPACT OF HIGH FREQUENCY OSCILLATORY VENTILATION ON RIGHT VENTRICLE IN ACUTE RESPIRATORY DISTRESS SYNDROME

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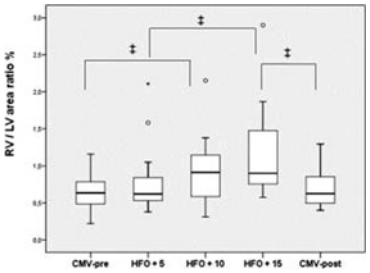

[RV/LV ratio]

INTRODUCTION. High Frequency Oscillatory Ventilation (HFOV) is proposed for mechanical ventilation during Acute Respiratory Distress Syndrome (ARDS). HFOV may theoretically achieve all the goals of lung protective ventilation. However the level of mean airway pressure (mPaw) to apply is still in debate. One could make the hypotheses, that the more the pressure is, the more the strain on right ventricle (RV) could be.

OBJECTIVES. Therefore, the goal of the present study was to evaluate, using transesophageal echocardiography (TEE), whether increasing mPaw level during HFOV would induce a right ventricle dilatation.

METHODS. Patients were submitted to a 6 h-period of conventional lung-protective mechanical ventilation (CMV pre period) in volume controlled mode with a tidal volume (Vt) of 6 mL/kg of predicted body weight adjusted to obtain a plateau pressure (Pplat) <30 cmH_2O and a PEEP and FIO_2 settled according to the algorithm of the PaO_2 {ARDS net, ARMA trial}. Then, patients were switched to HFOV. After a recruitment maneuver, the pressure amplitude of oscillation and the oscillation frequency were then adjusted to achieve a $PaCO_2$ very close to the $PaCO_2$ measured during CMV pre period. The protocol consisted of 3 one-hour periods of HFOV, in a randomized order, with a mPaw level calculated by adding 5, 10 or 15 cmH_2O to the mPaw recorded during the CMV pre period. Transesophageal echocardiography (TEE) was performed before the switch to HFOV, at the end of each HFOV period. Right ventricular end-diastolic area (RVEDA) and left ventricular end diastolic area (LVEDA) were measured. RVEDA/LVEDA ratio was calculated at each time of the protocol. Patients were monitored with a pulmonary artery catheter for measurement of invasive hemodynamics parameters. Arterial blood gas was also performed at each step of the protocole.

RESULTS. Sixteen patients were included. Direct lung injury was the main condition. During HFOV at the highest mPaw (+15), a significant increase in mean PAP and PAOP was observed while CI and mean artery pressure (MAP) decreased, resulting in increased requirements in vasopressor infusion. The higher levels of mPaw during HFOV (+10,+15) were associated with a worsening of RV function, as indicated by a significant increase in RVEDA/LVEDA ratio and a significant incidence of paradoxical interventricular septal motion (from 12 up to 73%).

CONCLUSIONS. Highs levels of mPaw during HFOV must be used with cautions to preserve the right ventricle.

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THE EFFECT OF THE TRIGGER VARIABLE ON THE INEFFECTIVE TRIGGERING INDEX IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. Ineffective triggering of a ventilator-delivered breath may occur in as many as one-third of inspiratory efforts [1]. It is accentuated by an insensitive inspiratory trigger [2]. There is a considerable and growing interest in optimizing the patient-ventilator interaction. The ineffective triggering is the commonest form of patient-ventilator dyssynchrony accounting for more than 80% of asynchronous breathes. It is frequently observed in intubated COPD patients and patients with dynamic hyperinflation [3].

OBJECTIVES. To determine the correlation between high rates of ineffective triggering within the first 24 h of mechanical ventilation with mechanical ventilation duration, and to study the effect of the trigger variable on the ITI (Ineffective Triggering index) in mechanically ventilated patients.

METHODS. The study was carried out on 150 mechanically ventilated adult patients in Alexandria University Main Hospital (EGYPT). The patients were categorized into two equal groups according to their trigger variable (pressure and flow).Patients undergo a 10-min observation period within the first 24 h of mechanical ventilation to identify Ineffective Triggering Index(ITI) (=number of ineffective breaths/number of total breaths). The effect of the triggering method (flow versus pressure) on ITI was compared between the two groups. The primary end point was the number of days on mechanical ventilation out of 28 days between patients with ITI ≥10% and those with ITI <10%.

RESULTS. The ITI <10% in pressure triggering group was 36/75 (48%) while 39/75 (52%) had ineffective triggering ≥10%. The ITI <10% in flow triggering group was 41/75 (54.7%) while 34/75 (45.3%) had ineffective triggering with no significant statistical difference between the 2 groups ($\chi^2 = 0.667$, $p = 0.414$). The number of days on mechanical ventilation out of 28 days in the pressure triggering group was 6.89 ± 5.73 with ITI <10% while it was 17.44 ± 9.0 with ITI ≥10% ($Z = 4.954^*$, $p < 0.001^*$) while the results in the flow triggering group was 8.10 ± 6.87 with ITI <10% while it was 14.29 ± 9.11 with ITI ≥10% ($Z = 3.180^*$, $p = 0.001^*$).

CONCLUSIONS. There is no effect regarding the trigger variable (pressure or Flow) on the Ineffective Triggering index (ITI) in mechanically ventilated patients. The number of days on mechanical ventilation out of 28 days was significantly higher with ITI ≥10% in both pressure and flow triggering groups.

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DELIRIUM IN THE ICU: THE IMPACT OF A NON-PHARMACOLOGICAL PREVENTION STRATEGY

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INTRODUCTION. Delirium affects 11–89% of ICU patients [1, 2] and is associated with higher mortality [2], prolonged length of stay [1] and cognitive dysfunction [3]. In this prospective study we introduced a non-pharmacological delirium prevention strategy in a mixed medical/surgical ICU. We hypothesised that teaching ICU staff to systematically incorporate anti-delirium measures into routine patient care would reduce use of potentially deliriogenic medications such as benzodiazepine infusions and lead to a reduced incidence of syndromal and subsyndromal delirium (SSD).

OBJECTIVES. We aimed *firstly* to assess the impact of this multicomponent intervention, and *secondly* to determine the predictive factors and incidence of delirium in our ICU.

METHODS. A series of non-pharmacological delirium prevention measures collectively termed "Delirium Prevention Bundle" was implemented in the ICU. Delirium, subsyndromal delirium (SSD), sedation, coma, pain, length of stay and sedative/analgesic drug requirements were measured pre- and post-implementation. Data were analyzed using Mann–Whitney and Fisher tests. Predictors for delirium and prolonged ICU stay were examined using logistic regression.

RESULTS. There was a trend toward reduced sedative/analgesic drug dosage in the post-bundle group that approached statistical significance (Table 1). Delirium, subclinical delirium, sedation, and coma scores and length of stay were unchanged. Decreasing day 1 GCS and increasing non-CNS SOFA score independently predicted delirium. Admission APACHE II score was the only predictor of SSD. Delirium was the only multivariate predictor of prolonged ICU stay (odds ratio 4.9 (95% CI 1.8, 13.2) (P = 0.002).

CONCLUSIONS. A multimodal behavioural intervention strategy with proven efficacy in other clinical settings [4] had no detectable effect on ICU delirium. This suggests that ICU environmental factors and sensory disturbance have minimal influence on delirium aetiology. Our results show that ICU delirium is predicted by early GCS and non-CNS SOFA scores allowing early identification of high risk patients. Early risk stratification before delirium onset may allow clinicians to practice targeted risk reduction, and may give researchers a framework for mechanism-oriented observational studies.

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Sedation Practices

Parameter	Pre-implementation of Bundle (n = 79)	Post-implementation of Bundle n = 64	P values (pre-post)
Morphine dose (mg)	54 (11, 200)	20 (4, 29)	0.053
Morphine Use (patients)	18	11	0.47
Propofol dose (mg)	730 (365, 1,019)	410 (225, 860)	0.06
Propofol use (patients)	44	41	0.20
Fentanyl dose (mcg)	1550 (784, 2,700)	1,608 (844, 2,855)	0.95
Fentanyl use (patients)	41	41	0.01

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INTEREST OF PUPILLOMETRY TO ASSESS SEDATION-ANALGESIA NEEDED DURING NOXIOUS PROCEDURES IN ICU SEDATED PATIENTS

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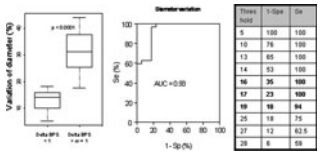
INTRODUCTION. Pupillometry is a reproductive, non-invasive method based on automated flash light device assessing objective pupillary parameters [1] linked to pain perception.

OBJECTIVES. To study whether pupillary variations (variation rate) can predict painful sensations during noxious stimuli.

METHODS. Eligibility criteria: sedated patients (benzodiazepines + morphinomimetics, BPS = 3 [2]) in the days following invasive surgery for cervical necrotizing fasciitis (CNF), complicated or not with mediastinitis, requiring a surgical debridement three times a day. Pupillometric test before debridement (calibrated flashlight of one second at 320 Lux, Neurolight ID MED) is done by recording pupillary parameters including variation rate. During debridement: clinical evaluation: heart rate (HR), mean arterial pressure (MAP) and Behavior Pain Score (BPS). Noxious procedure was defined as an increase of at least one point of the BPS (change in facial expression, upper limb movement or ventilator asynchrony, ΔBPS ≥ 1). The additional analgesia was decided blindly from pupillometric values. Comparison of 2 groups according to BPS increase during debridement: group ΔBPS < 1 and group ΔBPS ≥ 1. Statistics: non parametric tests. Test evaluation by ROC curve.

RESULTS. 37 patients with cervical cellulitis (8 of them with mediastinitis), H/F ratio = 22/15, age 54 years [40–63], SAPS II 36 [27–48]. Period measures was 2 days [1–3]. Hemodynamic parameters were not different between the 2 groups: HR 86 ± 12 and 97 ± 9 bpm, MAP 92 ± 18 and 84 ± 14 mmHg, group ΔBPS ≥ 1 and ΔBPS < 1 respectively.



Threshold	1-Spe	Se
5	100	100
10	76	100
13	65	100
14	53	100
16	35	100
17	23	100
18	18	94
25	18	75
27	12	62.5
28	6	50

[ROC curve and variation rate threshold]

CONCLUSIONS. The threshold of a variation rate <17% before noxious stimulus seems predictive of total patient's tolerance during debridement (sensitivity of 100%) in our study. A prospective on-going study will assess the decision of analgesia majoration using this 17% threshold.

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0699

THE COMPARISON OF DIFFERENT METHODS OF FENTANYL USE IN THE EARLY POSTOPERATIVE PERIOD OF CORONARY ARTERY BYPASS SURGERY

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INTRODUCTION. The use of opioids for pain control after cardiac surgery improves recovery via decreasing pain scores and stress response.

OBJECTIVES. The effects of transdermal fentanyl on pain control and stress response was compared to the use of intravenous fentanyl in the first 48 h after elective coronary artery bypass surgery.

METHODS. Fifty adult patients aged 40–70 years (ASA II–III) undergoing elective coronary artery bypass surgery were included. The patients were divided into two groups in a prospective randomized, double-blinded study design. In group 1, transdermal placebo patch (TD-placebo group) was applied whereas in group 2, Duragesic® 100 μg transdermal (TD) fentanyl patch (TD-fentanyl patch group) was used in the first 48 h postoperatively. All patients received patient controlled analgesia (PCA) with intravenous (IV) fentanyl during this period. Postoperatively, pain level was evaluated with pain intensity score, numerical rating scale, Ramsay sedation scale. Total amount of fentanyl use was recorded in the first 24th and 48th h postoperatively. The blood levels of cortisol and ACTH were measured in the preoperative period, at the end of surgery, 6th, 24th and 48th h postoperatively.

RESULTS. Postoperative analgesia was adequate in both groups in the first 48th h depending on pain scales. There were no differences in respect to hemodynamic and respiratory parameters as well as pain scores. Although total IV fentanyl consumptions via PCA at the 24th and 48th h postoperatively were higher in the TD-placebo group, the differences were not statistically significant as compared to the TD-fentanyl patch group (141 ± 66 and 258 ± 88 mcg vs. 61 ± 7 and 139 ± 22 mcg). The cortisol values at the 24th h and the ACTH values at the 48th h postoperatively were higher in the TD-placebo group as compared to TD-fentanyl patch group (p = 0.015 vs. p = 0.003, respectively).

CONCLUSIONS. The use of TD-fentanyl patch for pain control after coronary artery bypass surgery is an alternative analgesic method that has advantages of being a noninvasive method that provides effective analgesia, high patient compliance with low side effect profile.

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0700

IMPACT OF THE CAMBRIDGE DELIRIUM GROUP ON THE USE OF DELIRIOGENIC DRUGS IN A U.K. INTENSIVE CARE UNIT

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INTRODUCTION. Critically ill patients are often treated with sedatives and analgesics to allow endotracheal tube tolerance and ventilator synchrony, reduce pain and anxiety, and improve patient safety. These drugs may be associated with an increase in delirium, immobility, increased length of stay (LOS), and impact on health economics and post-ICU quality of life. Delirium and its prevention in the critically ill is frequently neglected. The Cambridge Delirium Group (CDG) aimed to reduce the incidence of drug associated delirium by using a novel multidisciplinary preventative approach. We focused on improving awareness, implementing daily assessment and rationalising drug therapy in line with NICE CG103 [1].

OBJECTIVE. The aim of this study was to ascertain the impact of the CDG on the use of deliriogenic drugs in our ICU.

METHODS. We analysed routinely collected data from 2008, 2010 and 2011 for the first 3 months of each of the 3 years, both before and after establishment of the CDG. Year 2009 was omitted from the analysis as CDG was only started in 2010.

RESULTS. To ensure comparability, we looked for any statistically significant differences in age and illness severity (APACHE II). There was no statistically significant difference in patient age (one-way ANOVA; P = 0.3446) between the groups. The length of ICU stay was similar for the three groups (one-way ANOVA P = 0.4161). Survival rates between the groups were not significantly different. APACHE II scores in 2011 were higher than that of 2008 (one-way ANOVA, P < 0.0001), but there is no significant difference for patients admitted between 2010 and 2011(one-way ANOVA P = 0.1268). During the study period there was an increase in the usage of shorter acting analgo-sedation with remifentanil, and an increase in the use of antipsychotics such as Olanzapine and Quetiapine (Fig. 1).

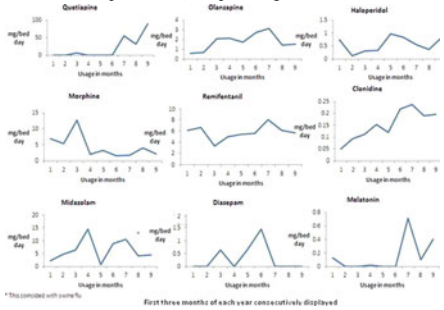

Fig. 1 Drug usage during the study period

CONCLUSION. During the reviewed period there was a reduction in the use of deliriogenic drugs. An increase in the shorter acting agents for analgo-sedation with a concomitant increase in the usage of antipsychotic drugs and alpha-2-agonists, rather than sedative agents for the treatment of agitated delirium was also observed. The increased use of midazolam during month 7 correlated with the increase of Adult Respiratory Distress Syndrome (ARDS) during the swine-flu epidemic.

REFERENCES. 1. National Institute for Clinical Excellence. Delirium: diagnosis, prevention and management. London: Department of Health. 2010.

0701

DELIRIUM DETECTION AND MANAGEMENT IN CRITICAL CARE PATIENTS: 2 YEARS EXPERIENCE IN A UK CRITICAL CARE UNIT

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INTRODUCTION. Limited data on the prevalence of delirium in UK critical care patients exist [1]. Although recommended, delirium screening of critical care patients is not routine practice in many countries, including the United Kingdom (UK) [2]. All general critical care patients in Sheffield Teaching Hospitals NHS Foundation Trust (STH) receive routine delirium screening supported by clinical practice guidelines on the prevention and treatment of delirium, including pharmacological management.

OBJECTIVES. To describe the prevalence of delirium in a large UK critical care population, including delirium subtypes and use of pharmacological management.

METHODS. Retrospective evaluation of all patients admitted to the general critical care units of STH over a 2-year period (November 2008 to October 2010). Delirium positive patients we identified by the bedside nurse using the Intensive Care Delirium Screening Checklist (ICDSC) [3]. ICDSC screening is undertaken once every 8–12 h shift according to unit practice. All patient data were downloaded from the critical care clinical information system (MetaVision, iMDsoft, Massachusetts, USA). Registered STH Audit Department Service Evaluation No. 2740.

RESULTS. ICDSC results were available for 5,604 patients, of which 1,590 were intensive care (ICU) patients. 1,251 (79%) of the ICU patients received mechanical ventilation. The delirium prevalence rates were 22, 45 and 49% for all critical care patients, all ICU patients and mechanically ventilated ICU patients respectively. Delirious patients had a median of 2.0 (1.0; 5.0) positive ICDSC screens. Based on motoric subtypes; 40% had hypoactive, 33% mixed and 27% of patients had hyperactive delirium. Of the 1,043 delirium positive patients, 591 (56.7%) received targeted pharmacological therapy for delirium symptoms (Table 1). Median drug doses patients received were relatively low and comparable to another ICU report in which routine delirium screening reduced the cumulative haloperidol dose patients received [4].

TABLE 1 PHARMACOLOGICAL MANAGEMENT

Drug	Number of patients	Median (IQR) dose (mg)
IV haloperidol	505	5.0 (2.0; 10.5)
IV lorazepam equivalents	217	2.0 (1.0; 6.0)
IV clonidine	151	5.31 (2.93; 11.71)
PO/IM olanzapine	53	20.0 (5.0; 40.6)

CONCLUSIONS. A retrospective review of delirium prevalence in a large UK critical care population demonstrated that routine screening can be implemented into clinical practice. Delirium was relatively common in critically care patients, particularly in those that received mechanical ventilation. More than half of all critical care patients received specific pharmacological management, although at relatively low drug doses.

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0702

ORAL MELATONIN DECREASES NEED FOR SEDATIVES AND ANALGESICS IN CRITICALLY ILL

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INTRODUCTION. The analgesic/sedative therapy is necessary notwithstanding presents important side effects. Critically ill frequently present alterations of the circadian rhythm, delirium and agitation episodes with the risk of receiving additional sedation. The dramatically reduced endogenous blood melatonin level (both in the basal levels and in night peaks) could play a role in this context.

OBJECTIVES. Reducing the need for sedatives and analgesic drugs by the oral administration of melatonin in high-risk critically ill [1] treated with conscious sedation [2].

METHODS. Double-blind RCT between placebo and Melatonin (3 × 2 mg), administered daily at 8 and 12 p.m. from the third ICU day until discharge. Inclusion criteria: age ≥18 years, SAPSII >32 points, expected mechanical ventilation (MV) ≥4, practicability of gastroenteric tract. All patients were treated according to the local guidelines: propofol or midazolam during the first 48 h, immediate introduction of enteral sedation with hydroxyzine (until 600 mg/die) and supplementary lorazepam (until 16 mg/die) if necessary. Therapy was titrated at least three times a day, in order to obtain a conscious sedation (RASS = 0) as soon as possible.

RESULTS. 96 patients enrolled: age 72 [60–77] years, SAPS II 41 [34–54] points, MV 11 [6–22] days. Diagnosis: 17 pancreatitis, 37 acute lung diseases, 23 acute heart diseases, 19 other. The analgesic/sedative therapy during the first 3 ICU days (clinical stabilization) was not different between groups. Melatonin administration determined: early weaning from sedatives and analgesics (Fig. 1; $p = 0.0005$); significant decrease in total administered doses of hydroxyzine: 2,700 (100–8,050) versus 300 (0–2100), $p < 0.001$; BDZP equivalents: 1 (0–105) versus 0 (0–8), $p < 0.001$; haloperidol: 0 (0–15.9) versus 0 (0–3), $p < 0.001$; propofol: 20 (0–980) versus 0 (0–40), $p < 0.001$; opiates: 2.5 (0–82.5) versus 0 (0–20), $p < 0.001$; decrease of pain events (VNR > 3): 28.6 versus 23.7%, $p < 0.001$; anxiety (VNR > 3): 34.3 versus 29.8%, $p < 0.001$; agitation (longer than 1 h): 34.3 versus 32.2%, $p < 0.001$; decrease in physical restraints use: 41.8 versus 31.1%, $p < 0.001$; higher RASS: 0 [−1–0] versus 0 [0–0], $p = 0.003$.

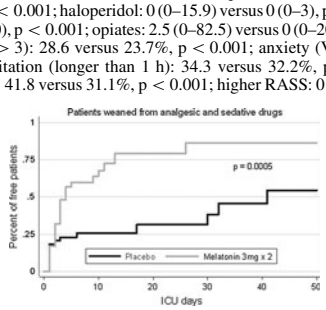

Fig. 1.

CONCLUSIONS. Oral melatonin significantly decreased the need for sedative and analgesic drugs in critically ill high-risk patients treated with awake sedation (Clinicaltrial.gov n° NCT00470821).

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0703

VALIDITY AND RELIABILITY OF THE PORTUGUESE VERSION OF THREE TOOLS TO DIAGNOSIS DELIRIUM: CAM-ICU, CAM-ICU FLOWSHEET AND ICDSC

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INTRODUCTION. Delirium is a frequent form of acute brain dysfunction in critically ill patients and is associated with increased mortality, longer hospital stay and long-term cognitive impairment. Several detection methods have been developed for use in these patients.

OBJECTIVES. This study has the objective to validate the Brazilian-Portuguese CAM-ICU and to compare the sensitivity and specificity of three diagnostic tools (ICDSC, CAM-ICU and CAM-ICU Flowsheet) for delirium in a mixed population of critically ill patients.

METHODS. The study was conducted between July and November of 2010 in four intensive care units (ICU) in Brazil. Patients were screened for delirium by a psychiatrist or neurologist as the reference rater using the Diagnostic and Statistical Manual of Mental Diseases, Fourth Edition (DSM-IV), and subsequently by an intensivist rater using a Portuguese translation of the CAM-ICU, CAM-ICU Flowsheet and ICDSC (Intensive Care Delirium Screening Checklist).

RESULTS. One hundred and nineteen patients were evaluated: 38.6% were diagnosed with delirium by the reference rater. The CAM-ICU had sensitivities of 72.5% [95% confidence interval (CI) 55.9–84.9%] and specificity 96.2 [95% CI 88.5–99.0%], the CAM-ICU Flowsheet had sensitivities of 72.5% [95% CI 55.9–84.9%] and specificity 96.2% [95% CI 88.5–99.0%] and the ICDSC had sensitivities of 96.0% [95% CI 81.5–99.8%] and specificity 72.4% [95% CI 58.6–83.0%]. High agreement between CAM-ICU and CAM-ICU Flowsheet (kappa coefficient = 0.96).

CONCLUSIONS. CAM-ICU Brazilian–Portuguese version is a valid and reliable instrument for the assessment of delirium among critically ill patients. The three instruments CAM-ICU, CAM-ICU Flowsheet and ICDSC are good diagnostic tools in critical ill ICU patients and the CAM-ICU was the most specific. In addition, the CAM-ICU Flowsheet presented an excellent correlation with the CAM-ICU and may be employed in general ICU patients.

0704

INCIDENCE OF DELIRIUM IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Delirium incidence in the ICU has been reported in 20–80% of patients.

OBJECTIVES. Describe the incidence of delirium in a medical-surgical ICU and identify risk factors for its occurrence.

METHODS. Prospective observational study during 4 months. The CAM-ICU test was administered during the first 10 days of his or her stay to every patient admitted in the ICU in order to assess the presence of delirium. The presence of delirium was correlated with different pre-established clinical variables (underlying diagnosis, gender, age, smoking status, alcohol consume, arterial hypertension, diabetes, chronic conditions, depression, dementia, immobilization (defined as bed-ridden state for ≥48 h), hypoxemia, fever, use of benzodiazepines, morphine, phentanyl, corticosteroids and mechanical ventilation.

RESULTS. Three hundred and fifty eight patients were included. Among the 121 patients admitted after a surgical procedure, 27 showed a CAM ICU test positive for delirium (22.31%; 95% CI = 15.25–30.78). In the group of patients admitted because of a medical condition (n = 237), 79 (33.33%; 95% CI 27.36–39.73) had a positive test. In an univariate analysis several conditions were a risk factor for the presence of delirium (Table 1).

Table 1

	CAM ICU+, *n* (n = 106) (%)	CAM ICU− (n = 252) (%)	OR (95% CI)	P
Medical condition	79 (74.53)	158 (62.70)	1.74 (1.05–2.89)	0.031
Age ≥65 years	79 (74.53)	135 (53.57)	2,53 (1.53–4.19)	<0.0001
Alcoholism, n (%)	7 (6.67)	4 (1.59)	4.43 (1.27–15.46)	0.02
Dementia, n (%)	12 (11.32)	2 (0.79)	15.96 (3.51–72.64)	<0.0001
Bed-ridden state/ hypoxemia, n (%)	25 (23.58)	28 (11.11)	2.47 (1.36–4.48)	0.003
Benzodiazepines, n (%)	47 (44.34)	46 (18.25)	3.57 (2.17–5.88)	<0.0001
Phentanyl, n (%)	47 (44.34)	83 (32.94)	1.62 (1.02–2.58)	0.041
Corticosteroids, n (%)	32 (30.19%)	38 (15.08)	2.44 (1.42–4.18)	0.001
Mechanical ventilation, n (%)	45 (42.45)	28 (11.11)	5.90 (3.40–10.23)	<0.0001

In a multiple logistic regression model (Forward & Backward Stepwise) dementia (OR = 15.64, 95% CI = 3.26–75.10, p = 0.001), mechanical ventilation (OR = 5.55, 95% CI = 3.02–10.21, p = <0.001), use of alcohol (OR = 4.76, 95% CI = 1.10–20.69, p = 0.037), use of benzodiazepines (OR = 2.55, 95% CI = 1.43–4.56, p = 0.001) and age older than 65 years old (OR = 2.54, 95% CI = 1.43–4.56, p = 0.001) remained predictive for the presence of delirium.

CONCLUSION. In the univariate analysis patients admitted because of a medical condition had a higher incidence of delirium but multivariate analysis showed dementia, alcoholism, use of benzodiazepines, mechanical ventilation and older age were the best predictive factors.

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0705

PREDICTION OF AUTONOMIC RESPONSES TO PAINFUL STIMULI IN SEDATED PATIENTS USING NOCICEPTIVE REFLEXES, BIS, BPS AND PROPOFOL DELIVERY RATE

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INTRODUCTION. Prediction of physiological reactions to painful stimuli in sedated individuals remains challenging. The nociceptive flexor reflex threshold (NFR-T) has proven to be a predictor of responses to noxious electrical stimuli in anesthetized volunteers with satisfying accuracy [1].

OBJECTIVES. The aim of this prospective observational study was to test the NFR-T as a predictor of pain induced autonomic reactions [changes in mean arterial blood pressure (MAP) respiratory rate (RR)] of sedated postoperative patients. The predictive power of the NFR-T was compared with those of the Bispectral Index (BIS), the propofol delivery rate (PDR) and the Behavioral Pain Score (BPS).

METHODS. After approval from the local ethics committee and obtaining informed written consent the study was performed in 40 sedated patients following cardiac surgery. Analgosedation consisted of continuous propofol infusion supplemented by intermittent administration of piritramide. Reaction to painful stimuli mainly tracheal suction and tetanic electrical stimulation (80 mA, 30 s) on the wrist were assessed. Prior to each stimulus the baseline values of RR and MAP were assessed. An increase of the RR by 5/min or more and change of the MAP by more than 5 mmHg within 2 min after the stimulation were regarded as positive autonomic reaction. The BPS, BIS, NFR-T and PDR assessed immediately before the painful stimulation were used for analysis. The NFR-T was determined using a previously published algorithm [2]. To compare the performance of the NRF-T, BIS, PDR and BPS in predicting presence or absence of reactions to the painful stimuli the prediction probability PK was calculated for each parameter. Statistical testing was performed by the PKDMAKRO [3].

RESULTS. 287 noxious stimuli (129 suctions and 152 tetanic stimuli, 6 others), were assessed. During the stimuli patients were deeply sedated by propofol (median PDR 2.78 mg/kg/h). Before 95% of the stimuli the RASS was −4 or lower and the BIS: 48 ± 16 (mean ± SD). Only the NFR-T predicted blood pressure responses (MAP 83 pos. reactions) better than chance (0.66 ± 0.04). The prediction probabilities of respiratory responses (RR 62 positive responses) were comparable for NFR-T (0.64 ± 0.05) BIS (0.65 ± 0.05) and propofol delivery rate (0.65 ± 0.05). BPS score predicted none of the responses better than chance.

CONCLUSIONS. Pain induced changes of MAD and RR seems to be determined differentially. Propofol concentrations have a greater influence on RR changes than on MAP changes which could explain the higher predictive power of the BIS. The good performance of the NFR-T makes it a promising candidate for predicting pain induced responses even in an environment in which hemodynamic responses are limited due to cardiac surgery and the administration of vaso-active drugs.

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GRANT ACKNOWLEDGMENT Supported by BMWi.

0706

SEDATION IN SPONTANEOUSLY BREATHING PATIENTS ADMITTED WITH DELIRIUM TREMENS IN FIVE INTENSIVE CARE UNITS IN THE GALICIAN HEALTH SERVICE, SPAIN

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OBJECTIVES. To describe the experience in 5 Intensive Care Units (ICUs) of the Galician Health Service (SERGAS), in terms of sedation in spontaneous breathing (SB) patients admitted with the diagnosis of delirium tremens (DT).

METHODS. A retrospective and observational study of patients admitted with DT was carried out from January 2009 to October 2010. The following parameters were analyzed: age; gender; APACHE II score; medical history of liver disease (hepatopathy); previous Hospital admission due to DT; specific reason for admission (agitation control, seizures, respiratory failure,...); length of ICU stay; type of sedatives used: propofol (PF), midazolam (MDZ), other benzodiazepines (oBZD): diazepam (D), lorazepam (L), chlordiazepoxide (Cd) and neuroleptics (NRL): haloperidol (H), tiapride (T); mean dosage (md); days of sedation in SB; sedation strategies; sedation control (scores) and complications (intubation and mechanical ventilation, seizures, pneumonia, arrhythmia,...). We also analyzed the type of nutrition, need of catecholamines and renal failure (creatinine > 1.8 mg/dL) during the period they were receiving sedative drugs in SB.

RESULTS. 71 patients were admitted with DT, 60 men (11 women); age: 55 ± 12 years old; APACHE II score: 13 ± 9; medical history of liver disease: 41; previous Hospital admission due to DT: 12; reason for ICU admittance: agitation control 51, seizures 12, respiratory failure 6, other 2. Length of ICU stay of SB patients: 8 ± 2 days; days of SB sedation: 6.7 ± 2.4. Sedatives used: PF 57 (md: 2.32 ± 0.99 mg/kg/h) days 5 ± 3.12; MDZ 12 (md 3.81 ± 2.16 mg/h) days 4.25 ± 1.66; oBZD 43 [D 23 (md 43.33 ± 21.8 mg/day), L 12 (md 25.75 ± 5.7 mg/day), Cd 9 (md 53 ± 21 mg/day) days 4.3 ± 2.5; NRL 54 (H 27 (md 32.65 ± 17.10 mg/day) T 17 (md 670 ± 440 mg/day)] days 4.6 ± 2.4. Sedation strategies: PF + NRL 19 patients, MDZ + NRL 14 patients, PF + oBZD 11, PF + NRL + oBZD 25, other 2. Sedation control scores: GCS 32 patients, RASS 16 patients, Ramsay 6 patients, none 17 patients. Complications: intubation and mechanical ventilation 10 patients, pneumonia 5 patients, seizures 4 patients, arrhythmia 2 patients, high digestive hemorrhage 2 patients, electrolyte alterations 4 patients. Type of nutrition: enteral 37 patients, oral 30 patients, parenteral 4 patients. Need of catecholamines: 4 patients. Renal failure: 4 patients.

CONCLUSIONS. The main reason for admittance to an ICU due to DT was psychomotor agitation control (72%). The sedatives more commonly used in our series were: PF (80%), NRL (70%), being the sedation strategy most commonly used the combination PF+NRL+oBZD (35.5%). The most common complication was intubation and need for mechanical ventilation (14%).

0707

INDICATORS USED BY CLINICIANS TO ASSESS PAIN IN THE BRAIN INJURED

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INTRODUCTION. The assessment of pain in critically ill brain-injured patients is challenging for health professionals. In addition to be unable to self-report, the confused and stereotyped behaviors of these patients are likely to alter their "normal" pain responses. Therefore, the pain indicators observed in the general critically ill population may not be appropriate.

OBJECTIVES. To identify behavioral and physiological indicators used by clinicians to assess pain in critically ill brain-injured patients who are unable to self-report.

METHODS. A mixed-method design was used with the first step being the combination of the results of an integrative literature review with the results of nominal groups of 12 nurses and four physicians. The second step involved a web-based survey to establish content validity. Fourteen experts (clinicians and academics) from three French speaking European countries rated the relevance of each indicator. A content validity index (CVI) was computed for each indicator (I-CVI) and for each category (S-CVI).

RESULTS. The first step generated 52 indicators. These indicators were classified into six categories: facial expressions, position/movement, muscle tension, vocalization, compliance with ventilator, and physiological indicators. In the second step, the agreement between raters was high with an Intraclass Correlation Coefficient of 0.88 (95% CI 0.83–0.92). The I-CVIs ranged from 0.07 to 1. Indicators with an I-CVI below 0.5 (n = 12) were not retained, resulting in a final list of 30 indicators. The CVI for this final list was 0.75 with categories ranging from 0.67 (compliance with ventilation) to 0.87 (vocalization).

CONCLUSIONS. This process identified specific pain indicators for critically ill brain-injured patients. Further evaluation is in progress to test the validity and relevance of these indicators in the clinical setting.

0708

COMPARISON BETWEEN CLONIDINE AND DEXMEDETOMIDINE FOR SEDATION AND ANALGESIA IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Clonidine, which is used mainly as an anesthetic adjuvant and a second-line anti-hypertensive and Dexmedetomidine, used for sedation and analgesia in ICUs, are alpha-2 adrenergic agonists. Dexmedetomidine use in ICUs is increasing as this drug becomes more widely known and recent studies show its safety and efficacy for sedation and analgesia in critically ill patients. There are no studies comparing these two drugs for this purpose until the moment.

OBJECTIVES. To evaluate the safety and efficacy of clonidine compared to dexmedetomidine for sedation and analgesia in patients under mechanical ventilation.

METHODS. An open-label, controlled, randomized trial was conducted. Adult patients with an expected mechanical ventilation time of more than 24 h were randomly assigned to receive either Clonidine (G1 = 10) or Dexmedetomidine (G2 = 10). Patients presenting hypotension or bradycardia were excluded. Both drugs were titrated to achieve light sedation (RASS scores between −2 and +1). Other sedatives and analgesic drugs were withdrawn according to individual responses. Cortisol levels were measured for all patients at the beginning of the studied drug infusion and after 24 h. Initial infusion rates were 0.4 and 0.3 μg/kg/h in the clonidine and dexmedetomidine group respectively. Maintenance dosages were adjusted according to the target sedation level. Patients' demographic, clinical and therapeutic data were analyzed. Drug efficacy was assessed by the time spent on the ideal level of sedation. Safety was assessed by the impact on heart rate (HR), mean arterial pressure (MAP) and in-hospital mortality. ANOVA, Student t test and c2 (significant $p < 0.05$) were used for statistical analysis.

RESULTS. Mean age was higher in G2 with no statistical significance compared to G1. APACHE II score (G1 = 17.4 and G2 = 18) and mortality rate (G1 = 27.4 and G2 = 25.9) were similar in both groups. Mean ICU length of stay was 14.1 (G1) and 21.3 (G2) days (p = NS). The average cortisol levels were 29.7(G1) versus 44.8(G2) and 41.7(G1) versus 67.1 μg/dL (G2) on 0 and 24 h, respectively. The mean infusion rates were 0.57 μg/kg/h (G1) and 0.47 μg/kg/h (G2). No patient had HR below 60 bpm or MAP below 80 mmHg (Figs. 1, 2). There was no decrease in the average cortisol levels in both groups. Mortality was 30% (G1) and 20% (G2). Target sedation was achieved in 74.4% of the times in G1 and 86.6% in G2 (p = 0.07).

CONCLUSIONS. In this cohort, Clonidine showed to be as safe and efficient as Dexmedetomidine for sedation and analgesia in critically ill patients under mechanical ventilation.

0709

INCIDENCE, CAUSES AND OUTCOMES OF DELIRIUM IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Delirium is an acute decline in attention, perception and cognition. Delirium is most often caused by physical or mental illness and is usually temporary and reversible. Incidence in critically ill patients is high.

OBJECTIVES. The aim of the study was to record incidence, major risk factors and outcomes of delirium in critically ill patients.

METHODS. Prospective clinical study included 1,200 critically ill patients in 14-bed intensive care unit of CHC Bezanijska kosa, Belgrade in past 6 months. Observation period was from 24 to 96 h. All patients underwent preoperative evaluations, including medical history, physical examination, laboratory tests, and assessment of physical and cognitive functions. Diagnosed delirium was clinical, based on standard algorithm including Diagnostic and Statistical Manual of Mental Disorders (DSM-lV-TR) and The Confusion Assessment Method (CAM). Richmond Agitation and Sedation Scale for Sedation, and Numerical Rating Scale for Pain, were used as well. Patients were monitored in order to determine major complication rates, length of stay, and discharge disposition.

RESULTS. Average age of examined patients was 64 years (34–94). Delirium was detected in 450 patients (37.5%). Hyperactive delirium was recorded in 76/450 (16.8%), hypoactive in 74/450 (16.4%), mixed in 300/450 (66.7%) patients. Incidence of delirium was increased up to 40% in older than 70 years. Incidence of delirium in surgical patients was 32% (144/450 patients), after major abdominal (40%), thoracic (5%), or vascular (7%) operations. The average time to onset of delirium was 2.1 $\pm$ 0.9 days and the mean duration of delirium was 3.0 $\pm$ 5.1 days. Several preoperative variables were associated with increased risk of delirium including older age ($P < 0.001$), impaired functional status ($P < 0.001$), pre-existing dementia ($P < 0.001$), and pre-existing comorbidities ($P < 0.001$). Other causes of delirium were: apstinential syndrome related with psychoactive subsistence PAS in 4%, metabolic and endocrine dysfunction in 3%, neoplastic and cancer diseases 1%, Systemic infections 3%, cerebrovascular diseases □ 1%, multiorganic failure □ 1%.

CONCLUSIONS. Delirium is associated with poor outcomes such as prolonged hospitalisation, functional decline, and increased use of chemical and physical restraints. The most common risk factors for delirium include older age, prior cognitive impairment, major surgical interventions, surgical infection, alcohol abstinence, severe illness or multiple co-morbidities.

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GRANT ACKNOWLEDGMENT. Department of intensive care CHC Bezanijska kosa, Belgrade.

0710

AUTONOMIC NERVOUS SYSTEM ACTIVITY DURING SURGICAL STRESS INDEX BASED ANALGESIA

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INTRODUCTION. Surgical Stress Index (SSI) has been recently conceived as tool for the measurement of the nociception–antinociception balance during general anesthesia. Untreated nociception leads to increased sympathetic tone, but the relationship between SSI and autonomic nervous system is poorly understood.

OBJECTIVES. We conducted a blinded, prospective randomized controlled trial to measure the sympatho-vagal balance activity assessed noninvasively with the Heart Rate Variability (HRV) during laparoscopic cholecystectomy with and without SSI based analgesia.

METHODS. 28 ASA I and II patients, age 18–65 years, scheduled for elective laparoscopic cholecystectomy were randomized to receive intraoperative analgesia to obtain SSI <50 (Group A, n = 15) or to receive analgesia based on the judgement of the anesthetist blinded to SSI value (Group B, n = 13). In both groups analgesia was maintained with remifentanil target controlled infusion (TCI) (effect-site concentration between 4 and 15 ng/ml), and hypnosis was maintained with sevoflurane to obtain state entropy (SE) between 40 and 60. Haemodynamic variables, SSI values and low frequency to high frequency ratios (LF/HF, a measure of sympatho-vagal balance), were recorded before induction of anaeshtesia (basal), 5 min after pneumoperitoneum insufflation (T1), and 5 min after pneumoperitoneum withdrawal (T2).

RESULTS. Basal systolic blood pressure (SBP), heart rate (HR), SE, SSI, and LF/HF were similar in both groups. During maximum noxious visceral stimulus evoked by pneumoperitoneum insufflation (T1), SBP, HR were similar, but LF/HF was significantly lower in Group A (median 0.65, IQR 0.44–1.24 vs. median 2.5, IQR 1.09–5.07, p = 0.012). There was a trend toward lower SSI value in Group A even if not significant (median 36, IQR 28–52 vs. median 46, IQR 35–62). After pneumoperitoneum withdrawal (T2) all variables were similar in both groups. Postoperative pain assessed with numerical rating scale was similar in both groups at 3 and 24 h after the end of surgery.

CONCLUSIONS. In this pilot prospective randomized controlled trial, SSI based intraoperative analgesia seems to reduce sympathetic activation during maximum visceral noxious stimulation.

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Monitoring flow, pressure & cardiac performance: 0711–0723

0711

ACCURACY OF THE SUBXYPHO VERSUS APICAL WINDOWS TO EXPLORE CARDIAC FUNCTIONS IN ICU PATIENTS

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INTRODUCTION. Trans thoracic echocardiography (TTE) has become a major noninvasive device for the assessment of the hemodynamic status of critically ill patients. However numerous factors in ICU can interfere with the image quality obtained in the different windows (parasternal, apical and subxyphoid). In the absence of a correct apical window the echocardiographist sometimes try to use the subxyphoid window to record the information required.

OBJECTIVES. To compare the image quality of the parasternal, apical and subxyphoid windows and to explore the accuracy of the subxyphoid versus apical windows to analyze the cardiac function.

METHODS. All patients consecutively admitted in the medical ICU of Amiens University hospital during a 5 months period were included. Each patient underwent a TTE. Each window image quality was analyzed by 2 experienced echocardiographists according to this scale: A-Excellent, B-Good, C-Acceptable, D-Poor and E-Absence. Patients with a subxyphoid and an apical window quality ≥C were used to analyse the accuracy of the subxyphoid window to analyze the different parameters. Left ventricular ejection fraction (LVEF), Ao VTI, E/A, E/Ea, RVEDD/LVEDD and RVEDS/LVEDS were recorded in apical and subxyphoid windows. Pearson's correlation coefficients were determined and Blant–Altman plots and analyses were constructed. Inter and intraobserver variability were performed.

RESULTS. One hundred and seven patients were included with a mean age of 63 $\pm$ 16 years old, a BMI of 28 $\pm$ 8 kg/m^2, 48 (45%) mechanically ventilated and 36 (34%) receiving catecholamines. The mean number of adequate (≥C) acoustic windows was 2.2 $\pm$ 0.9. No image was obtained in 8 (7%) patients. The number of patients with an apical window quality <C and a subxyphoid window ≥C was only 5 (5%). However, 25 (23%) patients presented an apical window quality inferior to the subxyphoid window. Sixty five patients presented an apical and subxyphoid windows ≥C. In this subgroup of patients, respectively apical versus subxyphoid LVEF (54 $\pm$ 16 vs. 55 $\pm$ 14; p = 0.9), E/A (1.2 $\pm$ 0.9 vs. 1.1 $\pm$ 0.5; p = 0.3), RVEDD/LVEDD (0.65 $\pm$ 0.15 vs. 0.62 $\pm$ 0.19; p = 0.07) and RVEDS/LVEDS (0.5 $\pm$ 0.19 vs. 0.49 $\pm$ 0.18; p = 0.2) were not different. Aortic VTI (18 $\pm$ 5 vs. 16 $\pm$ 5; p = 0.001) and E/Ea (9.6 $\pm$ 4.6 vs. 7.6 $\pm$ 4; p = 0.001) were significantly increased in apical compared to subxyphoid windows. A strong positive correlation between the two windows was seen for LVEF (r = 0.83; p = 0.001), Ao VTI (r = 0.85; p = 0.001), E/A (r = 0.9; p = 0.001), E/Ea (r = 0.85; p = 0.001), RVEDD/LVEDD (r = 0.81; p = 0.001) and RVEDS/LVEDS (r = 0.86; p = 0.001).

CONCLUSIONS. Inoperative apical window associated to a subxyphoid correct window appears to be an occasional situation. The use of subxyphoid window instead of apical appears to be accurate for LVEF, E/A and ratios of right on left ventricles sizes but not for Ao VTI and E/Ea.

0712

MEASUREMENT OF LEFT VENTRICULAR VOLUMES USING REAL-TIME THREE-DIMENSIONAL TRANSESOPHAGEAL ECHOCARDIOGRAPHY IN ICU PATIENTS. PRELIMINARY RESULTS

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INTRODUCTION. Real-time transesophageal echocardiography (RT3D TEE) is a recent imaging modality which allows the measurement of left ventricular (LV) volumes. Its feasibility in ventilated patients in the intensive care unit is not yet known.

OBJECTIVES. To test the hypothesis that bidimensional (2D) TEE underestimates LV volumes when compared to RT3D TEE, to evaluate the feasibility of RT3D TEE in ventilated ICU patients in the ICU and to assess the influence of analysis softwares on values of LV volumes.

METHODS. During a two-month period, patients without cardiac history admitted in the ICU for neurological disorder requiring a mechanical ventilation were studied. A 2D TEE performed by an experienced intensivist ruled out any cardiac abnormality and 3 loops of RT3D TEE were recorded during an end-expiratory apnea to avoid excessive cardiac translation. Measurements were performed off-line using an Xcelera® workstation (Philips) on 3 non consecutive cardiac cycles and averaged. LV end-diastolic volume (EDV) and end-systolic volume (ESV) were measured: with 2D TEE using biplane Simpson's rule, with RT3D TEE using the QLAB® software with two distinct applications (3DQ and 3DQ advanced). LV ejection fraction (EF) and stroke volume (SV) were calculated from LV volumes obtained with 2D TEE and RT3D TEE. LVSV was also measured using the Doppler method applied at the level of the aortic ring. Values (median with 95th percentiles) provided by the different approaches (volumes and Doppler) were compared using non parametric tests.

RESULTS. In this pilot study, 10 patients were prospectively studied [age 44 years (38–52); SAPSII 30 (24–37); BMI 24 kg/m^2 (21–29)]. 2D TEE underestimated LV volumes when compared to RT3D TEE [EDV 94 ml (79–157) vs. 135 ml (112–149): p = 0.09 and ESV: 49 ml (38–52) vs. 63 ml (52–69)]. 2D TEE tended also to underestimate LVSV when compared to RT3D TEE [49 ml (43–78) vs. 70 ml (58–82): p = 0.35]. LVEF was similar when calculated with 2D TEE and RT3D TEE volumes [57% (51–63) vs. 54% (50–57)]. LVSV measured using RT3D TEE was similar to that measured by the Doppler method applied at the level of the aortic ring [70 ml (63–95)]. Measurements performed using the 3DQ advanced software provided results which values were intermediate between 2D TEE and 3DQ TEE [EDV: 123 ml (95–133); ESV: 50 ml (42–58)].

CONCLUSIONS. RT3D TEE appears as a promising technique which provides a more accurate measurement of LV volumes when compared to conventional 2D TEE. This new technique is feasible in ventilated patients in the ICU but requires the respect of a learning curve for the acquisition and analysis of results.

GRANT ACKNOWLEDGMENT. Philips Healthcare US and France provided the upper-end system and workstation but had no role in the study.

0713

VALIDATION OF A NEW PULSE CONTOUR METHOD FOR CONTINUOUS CARDIAC OUTPUT MONITORING IN CRITICALLY ILL PATIENTS

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INTRODUCTION. A new pulse contour method (VolumeView-CCO, Edwards Lifesciences) has been developed to monitor continuously cardiac output (CO) from a femoral arterial pressure curve. This new method uses the systolic area under the curve and shapes variables (such as kurtosis and skewness) to compute stroke volume from the arterial pressure curve.

OBJECTIVES. Our goal was to compare the performance of this new method to the PiCCO pulse contour method, using transpulmonary thermodilution as the reference technique.

METHODS. 72 critically ill patients monitored with a central venous catheter and a thermistor-tipped femoral arterial catheter were studied. The femoral catheter was connected to the EV1000 monitor (Edwards) and used to measure CO by transpulmonary thermodilution (COref) and the new VolumeView-CCO software (CCOvv) during up to 72 h. Transpulmonary thermodilution and arterial pressure curves were re-injected (real time procedure) into a $PiCCO_2$ monitor (Pulsion) to get PiCCO pulse contour CO values (CCOpi). Both pulse contour methods were calibrated each time transpulmonary thermodilution measurements were performed but CCOvv and CCOpi were recorded over a 5 min period just before measuring COref (i.e. just before recalibration–baseline values being excluded from the analysis). 338 triple measurements were available for comparison. Accuracy (bias), precision (SD) and percentage errors were calculated (1). The ability of pulse contour methods to track changes in COref was assessed by calculating the degree of concordance (when directional changes of CO of at least 15% were observed), as recently proposed by Critchley (2).

RESULTS. COref ranged from 2.7 to 18.6 l/min, CCOpi ranged from 2.5 to 16.2 l/min, and CCOvv ranged from 2.5 to 15.3 l/min. Mean COref, CCOpi and CCOvv were similar (6.8 ± 2.4, 6.8 ± 2.5, 6.7 ± 2.3 l/min, respectively). Other results are summarized in the table. Bias and concordance were comparable for both methods while precision was better for the new Volume View method ($p < 0.001$).

	Bias	SD (l/min)	% error (%)	Concordance (%)
CCOev	−0.07	1.00	29	81
CCOpi	+0.03	1.24	37	77

CONCLUSION. In critically ill patients, the new VolumeView pulse contour method is as accurate (same bias) and more precise (lower %error) than the PiCCO pulse contour method. The ability to track changes in CO is comparable to the PiCCO method.

0714

PROGNOSTIC VALUE OF CARDIAC POWER INDEX DURING SEPTIC SHOCK

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INTRODUCTION. Cardiac power is an index of cardiac contractility calculated from the simultaneous measure of mean arterial pressure (MAP) and cardiac output (CI): CPI = MAP X CI X 0.0022. In patients with cardiogenic shock, CPI is the strongest independent hemodynamic index of in-hospital mortality [1]. We believe that CPI/SVRi (systemic vascular resistance index) could also be a strong indicator of cardiovascular coupling. Different devices such as PiCCO system directly provide its value.

OBJECTIVES. The potential interest of CPI for prognostic assessment in septic shock patients has not been established.

METHODS. We conducted a prospective, monocentric and observational study in septic shock patients monitored by a $PiCCO_2$ device (Pulsion Medical Systems, Munich, Germany). After hemodynamic stabilization at 65–75 mmHg of MAP, CPI was recorded at inclusion and day 1. CPI was also calculated before and after a norepinephrine (NE) response test (NE infusion rate increased for a MAP variation of 15 mmHg). When CI was < to 2.5 l/min/m^2, a response test to dobutamine (5 µg/kg/min) was also performed.

RESULTS. A total of 28 septic shock patients are included with a sex ratio M/F 3/1, and a 25% mortality rate. IGSII score is 51 ± 15 in survivors vs. 76 ± 19 in non-survivors ($p = 0.09$) with a SOFA score at 12.3 ± 3.3 versus 13.4 ± 3.8 ($p = 0.54$). There is no difference in CI between survivors and non-survivors at D0 (2.9 ± 0.9 vs. 3.7 ± 1.5 l/min/m^2, $p = 0.20$). Lactate is 2.7 ± 2.1 versus 4.8 ± 4.1 mmol/l ($p = 0.05$). The norepinephrine dose at D0 is 0.54 ± 0.42 in survivors versus 1.02 ± 0.66 µg/kg/min in non-survivors ($p = 0.08$). Delta CPI D0/D1 is predictive of the outcome (0.13 ± 0.2 vs. −0.05 ± 0.08 W/m^2, $p = 0.01$) whereas CPI at D0 is not (0.49 ± 0.15 vs. 0.57 ± 0.27 W/m^2). During norepinephrine test, CPI increased more in survivor than in non-survivors (0.7 ± 0.21, n = 17 vs. 0.54 ± 0.30 W/m^2, n = 5, $p = 0.05$). The same result is found with the dobutamine test (0.5 ± 0.07, n = 7 vs. 0.39 ± 0.04 W/m^2, n = 3). Finally, CPI/SVRi, a cardiovascular coupling index, is not different between survivors and non-survivors (0.0031 ± 0.00015 vs. 0.0040 ± 0.00026, $p = 0.48$).

CONCLUSIONS. Static value of CPI at admission is not a prognostic factor of survival in septic shock. The ability to increase CPI during catecholamine stimulation appears to be a good tool to appreciate cardiac power reserve. Thus, the response to dynamic tests using CPI variation is promising for the prognostic assessment.

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0715

TISSUE DOPPLER AS NON INVASIVE METHOD FOR PREDICTION OF LEFT VENTRICULAR END DIASTOLIC PRESSURE (LVEDP)

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INTRODUCTION. The left ventricular end diastolic pressure (LVEDP) is an important parameter which reflects volume status in critically ill patients. Noninvasive assessment by Doppler echocardiography provides a safe and reproducible investigation comparable with invasive pressure monitoring.

OBJECTIVES. This study was designed to evaluate the role of tissue Doppler imaging (TDI) variables in the assessment of LVEDP.

METHODS. Patients scheduled for cardiac catheterization were studied with Doppler echocardiography immediately before the procedure. Early and late mitral inflow velocity (E, A wave respectively) and peak diastolic velocity from medial and lateral mitral annulus (Ea medial, Ea lateral) were obtained. Invasive measurement of LVEDP was obtained with a fluid filled pigtail catheter. The results were blinded to the interpreter.

RESULTS. There were 50 patients [mean age 53.6+9.7 years, mean ejection fraction (EF) 57.7 ± 11.9%]. Significant coronary lesions were found in 84% of this group. The correlation between LVEDP and E, Ea medial or Ea lateral were significant ($r = 0.20$, $p = 0.0001$: $r = -0.7$, $p < 0.0001$ and $r = -0.4$, $p = 0.01$, respectively). The ratio of E/Ea medial had the strongest correlation with LVEDP ($r = 0.8$, $p < 0.0001$). E/Eamedial >10 accurately predicted LVEDP >15 mmHg with 77% sensitivity and 88.7% specificity. In patients with EF >50%, the correlation between E/Eamedial and LVEDP was still significant ($r = 0.7$, $p < 0.0001$).

CONCLUSION. E/Ea medial correlates well with LVEDP and can be used to estimate LVEDP in coronary artery disease patients even in patients with normal LVEF.

0716

THE MICROCIRCULATORY RESPONSE TO CONTROLLED, ADEQUATELY COMPENSATED, CENTRAL HYPOVOLEMIA IN A LOWER BODY NEGATIVE PRESSURE MODEL

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INTRODUCTION. Hypovolemia is a common clinical complication occurring in operating rooms, emergency rooms, and intensive care units. The hypovolemia-associated reduction in stroke volume (SV) is physiologically countered by compensatory mechanisms such as increased heart rate (HR) and peripheral (micro)vascular tone to prevent the consequent decrease in blood pressure and organ perfusion. The peripheral microcirculation therefore plays a critical role in the response to hypovolemia. However, the exact response of the microcirculation with respect to (down)regulating microvascular density and perfusion and the consequent effects on peripheral tissue oxygenation and oxygen consumption for compensation of hypovolemia remains elusive.

OBJECTIVES. In the present study we tested the hypothesis that controlled, adequately compensated, central hypovolemia in subjects with intact autoregulation would be associated with decreased peripheral microcirculatory diffusion and convection properties and, consequently, decreased tissue oxygen carrying capacity and tissue oxygenation. Furthermore, we evaluated the impact of hypovolemia-induced microcirculatory alterations on resting tissue oxygen consumption.

METHODS. Twenty-four subjects were subjected to a progressive lower body negative pressure (LBNP) protocol of which 14 completed the protocol. At baseline and at LBNP = −60 mmHg, sidestream dark field (SDF) images of the sublingual microcirculation were acquired to measure microvascular density and perfusion; thenar and forearm tissue hemoglobin content (THI) and tissue oxygenation (StO_2) were recorded using near-infrared spectroscopy (NIRS); and a vascular occlusion test (VOT) was performed to assess resting tissue oxygen consumption rate. SDF images were analyzed for total vessel density (TVD), perfused vessel density (PVD), the microvascular flow index (MFI), and flow heterogeneity (MFIhetero).

RESULTS. Application of LBNP resulted in: 1. a significantly decreased microvascular density (TVD and PVD) and perfusion (MFI and MFIhetero); 2. a significantly decreased THI and StO_2; and 3. an unaltered resting tissue oxygen consumption rate.

CONCLUSIONS. Using SDF imaging in combination with NIRS, we demonstrate that controlled, adequately compensated, central hypovolemia in subjects with intact autoregulation is associated with decreased microcirculatory diffusion (TVD and PVD) and convection (MFI and MFIhetero) properties and, consequently, decreased tissue oxygen carrying capacity (THI) and tissue oxygenation (StO_2). Furthermore, using a VOT we found that resting tissue oxygen consumption was maintained under conditions of adequately compensated central hypovolemia.

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0717

NITRIC OXIDE METABOLISM AND HYPOXIC VASODILATION

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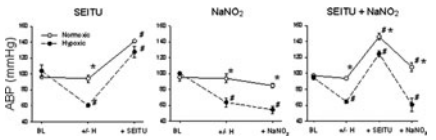
INTRODUCTION. When arterial O_2 content is reduced, reflex increases in blood flow occur in an attempt to restore local O_2 supply. This "hypoxic vasodilation" involves excess levels of nitric oxide (NO). However, controversy persists as to whether this is due to increased NO production by NO synthase, increased NO generation from nitrite (by nitrite reductase), or through decreased NO metabolism by mitochondria.

OBJECTIVES. To confirm that vasodilation is a NO-mediated response to tissue hypoxia, and to clarify mechanisms underlying this reflex.

METHODS. Under isoflurane anaesthesia, spontaneously-breathing fluid-resuscitated male Wistar rats (250–350 g) underwent intravascular cannulation for blood pressure (ABP) monitoring, blood gas analysis, and fluid/drug administration. Tissue PO_2 (tPO_2) was determined using a luminescence probe placed in thigh muscle. Animals were allowed to stabilize for 30′ after surgery and were then randomized to receive either room air or a hypoxic mixture (FiO_2 0.125). In separate experiments both groups received, alone or in combination, a 10′ continuous infusion of the non-selective NOS-inhibitor SEITU (1.5 mg/kg/min), the nitrite-donor $NaNO_2$ (0.25 mg/kg/min), or vehicle. Data shown as mean ± SD. Statistics were performed using 2-way repeated-measurement ANOVA and post-hoc Tukey's test.

RESULTS. Hypoxia significantly reduced PaO_2 from a baseline level of 10.8 ± 1.1 to 6.2 ± 2.8 kPa ($p < 0.001$); tPO_2 dropped from 6.1 ± 0.8 to 3.0 ± 0.4 kPa ($p < 0.001$). None of the interventions modified PaO_2 or tPO_2 levels.



[Time course of haemodynamic profile]
*$p < 0.05$ comparing normoxia and hypoxia. #$p < 0.05$ compared to baseline. BL = baseline, H = hypoxia.

CONCLUSIONS. Hypoxic vasodilation is, at least in part, an NO-mediated process: hypoxia reduced ABP and tPO_2, blunted the hypertensive effect of SEITU and accentuated the hypotensive effect of nitrite. We argue that, in hypoxia, NO derives only partially from NOS synthesis. Further insights into NO metabolism in hypoxia may help to better understanding mechanisms underlying haemodynamic adaptations.

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0718

THE DIAGNOSTIC ROLE OF CENTRAL VENOUS OXYGEN SATURATION ($SCVO_2$) AND CENTRAL VENOUS-TO-ARTERIAL CARBON DIOXIDE DIFFERENCE (DCO_2) IN HYPOVOLEMIA

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INTRODUCTION. Without invasive hemodynamic monitoring hypovolemia is hard to diagnose [1]. Recently besides the value of $ScvO_2$ the venous-to-arterial carbon dioxide difference (dCO_2) has also been shown to be increased (>5 mmHg) in certain critically ill conditions [2–4]. However, to our best knowledge no study has investigated the value of dCO_2 in non-bleeding-induced hypovolemia model and its correlation with macro- and micro-hemodynamic parameters yet.

OBJECTIVES. The aim of this study was to investigate the value of dCO_2 in indicating hypovolemia in a non-bleeding-induced hypovolemia model.

METHODS. Anesthetized, mechanically ventilated vietnamese mini-pigs (n = 11) underwent forced diuresis (furosemide: 5 mg/kg bolus + 5 mg/kg/h). In every 20 min (T_0–T_5), over a 120 min period, invasive hemodynamic measurements (PiCCO: global end-diastolic volume index, GEDI; oxygen delivery index, DO_2I); blood gas analysis and orthogonal polarization spectral imaging (OPS: red blood cell velocity, RBCV; capillary perfusion rate, CPR) were performed. Data are presented as median [interquartile range], and analysed with ANOVA, Pearson correlation, and linear regression.

RESULTS. The value of GEDI decreased significantly from T_0 to T_5 [368 (107), 238 (59) mL/m^2, $p < 0.001$, respectively]. In the meantime DO_2I; and both, RBCV and CPR were significantly reduced [T_0 = 365 (47), T_5 = 286 (107) mL/min/m^2, $p = 0.002$; T_0 = 865 (246), T_5 = 345 (311) µm/s, $p < 0.001$; T_0 = 89 (8), T_5 = 39 (5) %, $p < 0.001$, respectively]. The value of $ScvO_2$ significantly declined: T_0 = 79 (11), T_5 = 64 (21) %, $p = 0.004$, as dCO_2 on the contrary increased significantly: T_0 = 3 (5), T_5 = 8 (4) mmHg, $p = 0.006$. Linear regression revealed the order of parameters best indicating the change in GEDI, which were: heart rate, $ScvO_2$, dCO_2, VO_2/DO_2 ($p < 0.05$).

CONCLUSIONS. To our best knowledge this is the first animal study on a non-bleeding-induced hypovolemia model showing that $ScvO_2$ and dCO_2 may be used as indicators of decreasing preload in hypovolemia, which was accompanied by significant changes in macro- and micro-hemodynamics.

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0719

TRANSPULMONARY THERMODILUTION (TPTD) WITH FEMORAL INDICATOR INJECTION: COMPARISON TO MEASUREMENTS WITH JUGULAR INJECTION AND EVALUATION OF A CORRECTION FORMULA IN A DATA BASE WITH 1575 TPTDS IN 77 PATIENTS

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INTRODUCTION. Usually TPTD for measurement of cardiac index (CI), global end-diastolic volume index (GEDVI) and extra-vascular lung water index (EVLWI) is performed by indicator injection via the *jugular or subclavian* vein. If superior vena cava access is not feasible, *femoral* access can be used. However, two recent studies demonstrated significant overestimation of GEDI due to the additional volume of V. cava inferior participating in the indicator dilution in case of *femoral* injection. One of these studies provided a correction formula for $GEDI_{fem}$ based on data from 48 TPTDs in 24 patients [1]. Re-evaluation of this formula based on *paired* data is restricted to a small number of patients equipped with both jugular and femoral venous access. Large data bases including both patients with jugular and femoral venous access also provide the possibility to compare *unpaired* hemodynamic data derived from jugular and femoral access.

OBJECTIVES. Therefore, it was the aim of our study to evaluate the impact of the site of indicator bolus injection on GEDI in a large data base.

METHODS. Analysis of a prospectively collected database including 1575 TPTDs in 77 patients. Comparison of $GEDI_{fem}$ and $GEDI_{fem\ corrected}$ (derived from the above-mentioned formula) to $GEDI_{jug}$ (Wilcoxon-test for unpaired samples; SPSS 18.0). Prediction of "SVI <40 ml" by $GEDI_{fem}$ and $GEDI_{fem\ corrected}$ in the subgroup of patients with femoral access.

RESULTS. Patients with femoral and jugular access were not significantly different regarding APACHE-II (24 ± 7 vs. 24 ± 7; p = 0.638) and hemodynamic parameters not derived from TPTD such as CVP (16 ± 8 vs. 16 ± 6 mmHg, p = 0.864), heart rate (92 ± 19 vs. 96 ± 19/min; p = 0.065), and SVV (14.7 ± 7.4 vs. 14.6 ± 7.7%; p = 0.901). Furthermore, TPTD-derived CI (4.2 ± 1.5 vs. 4.2 ± 1.4 L/min*m^2; p = 0.647); SVI (45.1 ± 14.5 vs. 45.6 ± 16.3 ml; p = 0.838) and ELWI (11.0 ± 4.8 vs. 11.2 ± 4.1 ml/kg; p = 0.322) were not significantly different between femoral and jugular measurements. By contrast, GEDI was significantly higher in measurements with TPTD via femoral access compared to jugular access (960 ± 253 vs. 818 ± 194 ml/m^2; $p < 0.001$). Mean bias of 141.7 ± 22.8 ml/m^2 was markedly reduced by 53% to −66.0 ± 22.5 ml/m^2 by using the formula (1). Multiple regression analysis regarding GEDI including age, gender, APACHE-II, TISS, SAPS, CVP, and CI demonstrated that femoral TPTD was independently associated with GEDI. Regarding the prediction of "SVI <40 ml" $GEDI_{fem\ corrected}$ provided a larger AUC than $GEDI_{fem}$ (0.77 vs. 0.74).

CONCLUSIONS. 1. Despite a lower a priori probability to detect a significant impact of the venous access for TPTD compared to studies with simultaneous jugular and femoral access, our data demonstrate that GEDI is significantly and independently related to the localisation of TPTD indicator injection. 2. Use of a correction formula (1) in patients with femoral access markedly reduces the bias.

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0720

EXTREME HYPEROXIA DURING THE FIRST 24 H IS ASSOCIATED WITH AN INCREASED MORTALITY IN INTENSIVE CARE

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INTRODUCTION. Oxygen is administered to critically ill patients to avoid hypoxia. However the optimal range is poorly defined. The adverse effect of extreme hyperoxia has recently been recognised in a number of conditions [1;2].

OBJECTIVES. This study aimed to look at the effect of extreme hyperoxia during the first 24 h of admission to a general Intensive Care Unit (ICU).

METHODS. This study is a retrospective analysis of all the adult patients (>17 years old) admitted to the Intensive Care Unit of Queen Margaret's Hospital, Dunfermline between 01/06/1995 and 21/2/2011. Patients were identified from the Unit's Ward Watcher database which is part of the Scottish Intensive Care Society's national database. Demographic and physiology data from the first 24 h are available from this source and patients are followed to hospital outcome for the admission. As this study was interested in the effects of unnecessary hyperoxia the arterial partial pressure of oxygen (PaO_2) measured on the highest FiO_2 oxygen level in the first 24 h of admission was recorded. In accordance with previous clinical and laboratory studies hyperoxaemia was defined as $PaO_2 > 39.4$ kPa (300 mmHg) [1]. The primary outcome was hospital mortality. Unadjusted mortality was compared by the χ^2 test. Odds ratios were calculated to determine independent predictors of outcome using logistic regression analysis.

RESULTS. 6,274 patients were identified by the original search. Adequate data for analysis (complete APACHE II scoring, PaO_2 levels and hospital outcome) were available for 3,340. The mean highest PaO_2 was 22.38kPa [Standard Deviation (SD) 13.96]. The mean PaO_2/FiO_2 ratio was 36 (SD21.9). 348 (10.4%) patients had a PaO_2 greater than 39.4 kPa. The mean PaO_2/FiO_2 for the hyperoxic group was 67.3 (SD 32.3) suggesting that these patients did not have significant lung injury. The mortality for hyperoxic patients was 150/348 (43.1%) while the mortality for non-hyperoxic patients was 888/2,992 (29.7%). Unadjusted odds ratio for death associated with hyperoxia was 1.795 [95% Confidence Interval (CI) 1.432–2.251]. Multivariate Logistic regression analysis was performed to determine whether the effect of hyperoxia persisted when other potential variables (age and APACHE II score) were adjusted for. The odds ratio associated with hyperoxia was 1.87 (95% CI 1.424–2.455).

CONCLUSIONS. In an unselected group of ICU patients extreme hyperoxia during the first 24 h of admission is associated with an increase in mortality. In light of this finding and other reports [1–3] we feel that there is need for a prospective trial to identify the optimal target PaO_2 range to be achieved in critically ill patients.

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GRANT ACKNOWLEDGMENT. No external funding.

0721

ASSESSMENT OF AGREEMENT AND CONCORDANCE BETWEEN SVO_2 AND $SCVO_2$ MONITORED CONTINUOUSLY IN PATIENTS UNDERGOING LIVER TRANSPLANTATION

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BACKGROUND. Inadequate tissues oxygenation in patients undergoing liver transplantation (LT) may lead to poor outcome. Mixed venous O_2 saturation (SvO_2) is a standard bedside monitor of global tissues oxygenation. Pulmonary artery catheters (PAC) with capability of continuous monitoring of SvO_2 are available. However, less invasive central venous O_2 saturation ($ScvO_2$) showed good agreement with SvO_2 in some groups of patients [1]. $ScvO_2$ has also been used as a marker for goal-directed therapy in critically ill, and high-risk surgical patients demonstrating improved outcomes [2,3]. However, the agreement between SvO_2 and $ScvO_2$ has not been validated in patients undergoing LT.

OBJECTIVES. The current study investigates the agreement and concordance between SvO_2 and $ScvO_2$ monitored continuously in patients undergoing liver transplantation.

METHODS. After obtaining the IEB approval we prospectively studied a cohort of 27 patients undergoing liver transplantation. SvO_2 and $ScvO_2$ were recorded continuously during LT and up to 48 h postoperatively in the intensive care unit (ICU) using PAC CCOmbo^{TM} (744HF75), Presep^{TM} Oximetry CVP (3816HS) catheters and Vigilance-1^{TM} monitors (Edwards Life Sciences, Irvine, CA, USA). Multi-DAQ software (Edwards Lifesciences, Irvine, CA, USA) was used for data acquisition, recording and further off line analysis. The optical modules (OM2 of Vigilance^{TM}) were calibrated in vitro prior to insertion of PAC CCOmbo^{TM}, and Presep^{TM} CVP catheters. In vivo re-calibrations were performed at ICU admission, and each 12 h thereafter using Co-Oximeter NOVA CCX® (Biomedical Corporation, Waltham, MA, USA). Bland and Altman [4] analysis for bias and precision, the %-error [5] and the Four-Quadrant Plot [6] regression analysis of concordance between SvO_2 and $ScvO_2$ were performed.

RESULTS. Median duration of SvO_2 and $ScvO_2$ recordings was 19 (range 10–48) h. A total of 9,156 comparative sets of SvO_2 and $ScvO_2$ measurements were obtained. The bias, precision and % of error were 2.3, 6.1, and 15.2%, respectively. The trend analysis showed concordance of 0.92 between the changes of SvO_2 and $ScvO_2$ of 0.92 with the exclusion zones of 3%.

CONCLUSIONS. Continuous recording of SvO_2 and $ScvO_2$ values showed clinically acceptable bias and precision between the two parameters. Furthermore, there was excellent concordance between the changes of SvO_2 and ScvO2. $ScvO_2$ may be considered as a less invasive substitute of SvO_2 in patients undergoing liver transplantation.

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GRANT ACKNOWLEDGMENT. The study supported by the grant of Edwards Lifesciences.

0722

CONSEQUENCES OF ARTERIAL PCO_2 FLUCTUATION ON ARTERIOVENOUS CO_2 GRADIENT

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INTRODUCTION. The arteriovenous difference in CO_2 tension (ΔCO_2) has been proposed to assess the adequacy of tissular perfusion in shock states [1]. But due to its metabolic effects, CO_2 can act directly on microvascular regulation.

OBJECTIVES. We hypothesized that $PaCO_2$ variations for a same patient can modify ΔCO_2.

METHODS. After approval by the local ethic committee, 10 patients (66 ± 11 years, SAPS II = 35.3 ± 6), admitted to the ICU after a cardiac surgery, were included. They were all monitored with a Swan–Ganz catheter for their surgery. Tidal volume was 8 ml/kg during all the experiment. The respiratory rate (RR) was set at 10, 13 or 16 breaths/min defining three times of measurement. The RR adjustment order was randomized for each patient. After 30 min of stabilization, blood gases (arterial and venous), cardiac index, mean arterial pressure were collected. Venous samples were taken from the central venous catheter. Alveolar ventilation (AV) was also calculated. The three measurements for each patient were performed within 2 h. Time points were compared with repeated measures ANOVA and Scheffe's post-hoc test.

RESULTS. The linear relationship between AV and $PaCO_2$ ($r^2 = 0.99$) indicates a steady state in alveolar gas exchange. ΔCO_2 increases significantly with the decrease of $PaCO_2$ while mean arterial pressure, cardiac index, and temperature were nearly kept constant in this lapse of time. All patients had normal ΔCO_2 (defined as $\Delta CO_2 \leq 6$ mmHg) at RR10 instead of 20% at RR16. We also recorded a significant decrease of SvO_2 with $PaCO_2$ modifications.

[Data at the different times of experiment]

	Respiratory rate 10	Respiratory rate 13	Respiratory rate 16
$PaCO_2$ (mmHg)	45.5 ± 9.9	39.7 ± 7.9 §	35.9 ± 7.9 †‡
ΔCO_2 (mmHg)	4.2 ± 1.8	6.6 ± 2.8	7.6 ± 1.8 †
$ScvO_2$ (%)	77.9 ± 4.1	74.7 ± 7.4	72.6 ± 7.1†
Cardiac index (L/m^2)	2.37 ± 0.5	2.36 ± 0.6	2.36 ± 0.6
Mean arterial pressure (mmHg)	71.7 ± 13.3	68 ± 14.5	71.4 ± 13.2
Temperature (°C)	36.9 ± 0.9	36.9 ± 0.9	36.8 ± 0.9
$\Delta CO_2 \leq 6$ mmHg, n (%)	10 (100)	4 (40)	2 (20)
pH	7.29 ± 0.06	7.32 ± 0.06 §	7.35 ± 0.07 †‡

§ : p< 0.05 (FR 10 vs. 13), † : p< 0.05 pour (FR 10 vs. 16), ‡: p< 0.05 (FR 13 vs. 16)

CONCLUSIONS. Despite the small sample size, we showed that $PaCO_2$ variations might modify ΔCO_2 in postoperative hemodynamically stable patients. These results could be explained by direct CO_2 effect on microcirculation. Indeed, decreasing $PaCO_2$, microvascular tone probably increase, leading to a heterogeneous microcirculation and thus an increase of the ΔCO_2. This hypothesis needs to be confirmed. Another explanation can be acid–base abnormalities. Indeed they may affect blood capacity of transporting CO_2 and may worsen tissue hypercarbia [2].

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0723

OUTCOME OF ELDERLY PATIENTS WITH CIRCULATORY FAILURE

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INTRODUCTION. The proportion of elderly patients admitted to the ICU is increasing. Mortality is known to increase with age [1] but survival after circulatory shock is not well defined.

METHODS. Retrospective analysis of a large randomized trial comparing the influence of dopamine and norepinephrine on outcome in the ICU [2]. Patients were separated into young (Y, <75 years), old (O, ≥75 years) and very old (VO, ≥85 years). Data are expressed as mean ± SD. Differences between data are compared using Chi-square test for dichotomic data and ANOVA for continuous variables. Differences are considered significant at $p < 0.05$.

RESULTS. Of the 1,679 patients included in the initial trial, 494 (30%) were older than 75 years, including 84 older than 85 years. Older patients presented more frequently with cardiogenic and septic shock than younger patients. There were minor differences in APACHE II score calculated without age (Y: 17 ± 9, O: 18 ± 9, VO: 19 ± 9, p = 0.047) while SOFA scores were similar (Y: 9, 3 ± 3.5, O: 9. 3 ± 3. 4, VO: 9.0 ± 2.8, p = NS).Overall 28 days survival was 56% for Y, 40% for O and 33% for VO (differences $p < 0.001$). At 12 months, survival dropped to 34% in Y, 21% in O and 2% in VO ($p < 0.001$). Ageing was associated with an increase in mortality in both cardiogenic (Y: 44%, O: 26% and VO 15% $p < 0.001$) and septic shock (Y: 55%, O: 34% VO: 31% $p < 0.001$), Using multivariate analysis, age remained associated with a worse outcome.

CONCLUSIONS. This large database of patients in shock treated by noradrenaline or dopamine indicates ageing is independently associated with an increase in mortality. At 1 year, only 2% of patients older than 85 years were still alive.

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Diaphragmical function, neurally adjusted ventilatory assist & weaning: 0724–0734

0724

DEFLATING TRACHEAL CUFF SHORTENS WEANING TIME. A RANDOMIZED CONTROLLED TRIAL

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INTRODUCTION. Deflating the tracheal cuff improves ventilatory parameters, as peak flow and forced vital capacity.

OBJECTIVES. Our objective was to determine whether deflating the tracheal cuff during disconnections from mechanical ventilation (MV) shortens weaning time in tracheostomized ICU patients.

METHODS. Single center randomized controlled trial stratified by tracheostomy (TRQ) indication. Based on the drink test, high risk aspiration patients were excluded. A fixed weaning protocol was used, and patients were considered successfully weaned after 24-h MV disconnection. High flow conditioned oxygen was used in all patients. Primary end-point was weaning time and secondary end-points were pneumonia or tracheobronchitis after randomization, and swallowing function. Statistical analysis included linear regression multivariate analysis (log transformed).

RESULTS. Of 195 eligible patients, 181 patients were finally included (94 patients in the deflated cuff group and 87 in the inflated cuff group). The median time to complete weaning in the deflated group was significantly shorter than in the inflated group [12 (9–15) vs. 5 (4–7) days; $p < 0.01$]. The multivariate analysis detected interval from TRQ to first disconnection from MV (0.034, 95% CI .016/.052; $p < 0.01$); and deflated tracheal cuff (−0.83, 95% CI −1.09/−0.57; $p < 0.01$) as independently related to weaning time. The composite secondary end-point of respiratory infection (pneumonia or tracheobronchitis) after randomization was significantly lower in the deflated group (20 vs. 36%; p = 0.02), whereas swallowing function recovery was better in the deflated group (56 vs. 37%; p = 0.02).

CONCLUSIONS. Under the conditions of our protocol, deflating the tracheal cuff shortens weaning time and reduces respiratory infections in tracheostomized ICU patients. Clinicaltrial.gov identifier: NCT00956540.

GRANT ACKNOWLEDGMENT. FISCAM Grant PI-2009/71.

0725

INFLUENCE OF COMPLIANCE TO RESPIRATORY WEANING CONSENSUS CONFERENCE CRITERIA ON RESPIRATORY OUTCOME WITHIN 48 H AFTER PLANNED EXTUBATION

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INTRODUCTION. A two-step assessment (readiness to wean (RW) followed by spontaneous breathing trial (SBT)) of predefined criteria is recommended before planned extubation (PE)[1].

OBJECTIVES. We aimed to evaluate if compliance to all guideline criteria was associated with better respiratory outcome within 48 h after PE.

METHODS. The data (extracted from our clinical information system) of 458 consecutive patients who underwent PE after ≥48 h of invasive ventilation in our medico-surgical ICU were analyzed. We evaluated compliance with guidelines [1] regarding respiratory rate, tidal volume, PaO_2, FiO_2, PEEP, $PaCO_2$, pH, heart rate, systolic arterial pressure and arrhythmia during RW and SBT assessment (RW and SBT within 2 h). A patient was classified as RW+ if all RW criteria were fulfilled and RW− if at least 1 criterion was violated. The same approach was used to define SBT+ and SBT− patients. During the 48 h following PE, we assessed the occurrence of post-PE respiratory failure (PRF) (defined as the presence of at least 1 consensus criterion of respiratory failure [1]), reintubation (after NIV failure or because of immediate intubation criteria) and cumulative duration of post-PE ventilation (PPEV = Post-PE invasive + non-invasive ventilation). ICU mortality was recorded. Comparisons for various outcomes were performed by Chi-square and t tests.

RESULTS. All consensus criteria were fulfilled in 77.3% of the patients during RW and in 68.1% of the patients during SBT.

[Compliance to weaning criteria and outcome]

N = 458	PRF (%)	Reintubation (%)	PPEV (min)	ICU mortality (%)
All patients	53.5	10.0	542 ± 664	6.1
RW+	50.0	9.3	490 ± 626	5.4
RW−	65.4*	12.5	718 ± 757**	8.7
SBT+	52.6	8.0	498 ± 594	6.7
SBT−	55.5	14.4***	637 ± 788****	4.8

Occurrence of PRF only was not associated with increased ICU mortality: 4.2 versus 7.8%, p = 0.11. By contrast, ICU mortality was significantly increased in patients requiring reintubation: 21.7 versus 4.4%. p < 0.001; * p = 0.006 RW+ versus RW−; ** p = 0.003 RW+ versus RW−; *** p = 0.035 SBT+ versus SBT−; **** p = 0.030 SBT+ versus SBT−

CONCLUSIONS. In our ICU, compliance to all criteria of the two-step published approach of respiratory weaning was not optimal but reintubation rate was comparable to published data. Compliance with consensus conference guidelines was associated with lower reintubation rate and shorter PPEV but not with ICU mortality. As mortality was increased by reintubation, more sensitive and specific criteria to predict the risk of reintubation are probably needed.

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0726

RELEVANCE OF THE CLASSIFICATION PROPOSED BY THE INTERNATIONAL CONSENSUS ON WEANING OF MECHANICAL VENTILATION FOR DAILY PRACTICE IN MEDICAL ICU

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INTRODUCTION. A 3-level classification was proposed as a standard quotation of weaning difficulties by the 2007 international consensus conference on weaning of mechanical ventilation [1]. Relevance of this classification for clinical practice remains to be established in medical ICUs.

METHODS. One-year cohort study including patients requiring mechanical ventilation in a 18-bed medical ICU. Patients tracheotomised before admission or enduring readmission were excluded. Clinical data including SAPS2 score, cause for and duration of mechanical ventilation, and outcome were collected. Weaning, performed according to a formal protocol, was quoted according to the 3-level scale of the international consensus conference (group 1 (simple weaning): successful extubation after the first attempt; group 2 (difficult weaning): successful extubation after the 2nd or the 3rd spontaneous breathing trial (SBT) within 7 days; group 3 (prolonged weaning): failure of at least 3 SBTs or duration of weaning >7 days since the first SBT).

RESULTS. Among the 346 included patients, 187 did not start weaning: 174 (50.3%) died before being ready to wean, 3 (0.9%) were transferred in another unit and 10 (2.9%) experienced successful unplanned extubation. Among the 159 remaining patients who started weaning, 98 (61.6%) were categorized in group 1, 27 (17.0%) in group 2 and 34 (21.4%) in group 3. Age and SAPS2 were similar in the 3 groups. The prevalence of COPD was significantly higher in group 3. Reasons for intubation differed, with higher incidence of coma in group 1 and higher incidence of acute respiratory failure in group 3. Duration of ventilation increased across the 3 groups [group 1: median 4 days, interquartile range (2–8); group 2 : 8 (5–11); group 3: 13 (10–26), p < 0.0001]. Group 3 patients had a higher ICU mortality (29.4%) than group 1 and group 2 patients (9.2 and 7.7% respectively, p 0.07).

CONCLUSIONS. Difficult or prolonged weaning occurred in nearly 40% of medical ICU patients. The classification allowed discriminating patients with different outcomes. Indeed, difficult weaning was associated with increased ventilation duration but not with mortality while prolonged weaning was associated with increased mortality. These findings support the use of this classification to quote the difficulty to wean medical ICUs patients of mechanical ventilation.

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0727

EFFECTIVENESS OF A 2 HOUR SPONTANEOUS BREATHING T PIECE TRIAL (SBT) ON EXTUBATION FAILURE

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INTRODUCTION. Extubation failure is an important quality indicator and is independently associated with mortality and an increase in length of stay in mechanically ventilated patients.

OBJECTIVES. To assess the effectiveness of a 2 h spontaneous breathing trial (T piece) as a part of a standardised weaning protocol on extubation failure, mortality and length of stay.

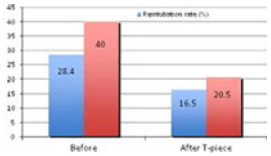
METHODS. This retrospective analysis was conducted in an 7 bedded Intensive Care Unit (ICU) of a busy District General Hospital in Scotland over a 2 years period. A consecutive sample of 289 patients, 144 patients prior to the introduction of a routine T piece trial and 145 subsequent to the introduction were studied. Inclusion criteria were all patients over the age of 18 years who had been mechanically ventilated for >48 h. Exclusion criteria were patients with tracheostomies and patients who were receiving end of life care. Extubation failure was defined as need for reintubation within 24 h. Data on age, APACHE scores, mortality and length of stay (LOS) were obtained from the WARDWATCHER database. Statistical analysis was performed using the SPSP software.

RESULTS. In total, 289 patients were studied. The age distribution and APACHE scores were identical. There was a statistically significant reduction in extubation failure after the introduction of a standardised SBT. (28 vs. 16.5%; p 0.017). There was a statistically non significant trend for a reduction in ICU LOS. There was no statistically significant difference in mortality. The absolute risk reduction was 0.119 (CI 0.023–0.207) and relative risk reduction was 0.419(CI 0.09–0.029), giving a number needed to treat (NNT) of 8.38.

[Effect of T piece trial]

	Pre T piece	Post T Piece	
Number analysed	144	145	
Age	55.4 CI ± 2.24	54.6 CI ± 2.26	p 0.84
APACHE II	22.6 CI ± 1.2	21.2 CI ± 1.13	p 0.1
Extubation failure	43 (28.4%)	24 (16.5%)	p 0.017
Mortality	38 (26.4%)	28 (15.3%)	p 0.163
ICU LOS (All)	9.33 CI ± 1.33	7.6 CI ± 1.06	p 0.053
ICU LOS (not reintubated)	6.99 CI ± 0.78	6.8 CI ± 0.55	p 0.47
ICU LOS (reintubated)	15.2 CI ± 3.3	12.2 CI ± 3.1	p 0.3

CONCLUSIONS. The inclusion of a T piece SBT in a standardised weaning protocol is associated with a reduction in extubation failure. However the positive effect of this intervention is not reflected in either a reduction of mortality or length of stay.



[extubation failure]

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0728

EVIDENCE FOR SEPSIS-INDUCED DIAPHRAGM DYSFUNCTION IN CRITICALLY-ILL PATIENTS

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RATIONAL. In severe infections, sepsis-induced diaphragm dysfunction contributes to the pathogenesis of acute respiratory failure, which eventually requires mechanical ventilation and worsens the prognosis. Although sepsis induced diaphragm dysfunction is a well demonstrated phenomenon in animal models of sepsis, to date, very few data are available in humans.

AIMS OF THE STUDY. 1. To evaluate to what extend sepsis is associated with a diaphragm dysfunction in humans; 2. To identify risk factors of sepsis-induced diaphragm dysfunction; 3. To assess its impact on the outcome.

PATIENTS AND METHODS. In 2 ICUs, diaphragm function was assessed in intubated and mechanically ventilated patients through the measure of tracheal pressure (Ptrach) at airway opening in response to bilateral anterior magnetic stimulation of the phrenic nerves within the first 12 h following intubation.

RESULTS. Over a 6 months period, 98 patients [age 62 ± 13 (mean ± SD) years, 67% males, BMI 26 ± 16 kg/m^2] were admitted for a medical (76%) or a surgical (24%) reason. SAPS2 was 55 ± 18 and SOFA on admisson was 8 ± 5. 52% of them had a sepsis. Ptrach was 8 ± 5 cmH_2O and was lower in patients with than in patients without a sepsis (8.7 ± 4.9 vs. 11.9 ± 6.1; p < 0.05). Diaphragm dysfunction at day 1 (defined as Ptrach <10 cmH_2O) was observed in 59% of the 98 studied patients. Factors significantly associated (p < 0.05) with a diaphragm dysfunction at day 1, were: a sepsis (63 vs. 36% in patients without diaphragm dysfunction) on ICU admission or at intubation, an older age (64 ± 14 vs. 57 ± 18 years), a higher severity of illness at admission as assessed with SAPS2 (58 ± 19 vs. 49 ± 18), a higher organ dysfunction level as assessed with the SOFA (8.9 ± 3.6 vs. 7.3 ± 4.0), and a marked acidosis (pH = 7.36 ± 0.11 vs. 7.42 ± 0.08). In addition, survivors had a higher Ptrach (10.9 ± 6.1 cmH_2O) than patients who died within the ICU (8.4 ± 4.0 cmH_2O, p < 0.05).

CONCLUSION. Diaphragm dysfunction occurs frequently in critically ill intubated patients admitted in ICU and is related to sepsis. A more severe diaphragm dysfunction is a surrogate of the severity of the associated illness and seems to be associated with a poor outcome.

0729

NEURALLY ADJUSTED VENTILATORY ASSIST IMPROVES PATIENT-VENTILATOR INTERACTION IN POST-EXTUBATION PROPHYLACTIC NON INVASIVE VENTILATION

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INTRODUCTION. Patient-ventilator asynchrony is a frequent issue in non invasive mechanical ventilation (NIV) and leaks at the patient-mask interface play a major role in its pathogenesis. NIV algorithms alleviate the deleterious impact of leaks and improve patient–ventilator interaction. Neurally adusted ventilatory assist (NAVA), a neurally triggered mode that avoids interferences between leaks and the usual pneumatic trigger, could further improve patient-ventilator interaction in NIV patients.

OBJECTIVES. To evaluate the feasibility of NAVA in patients receiving a prophylactic post-extubation NIV and to compare the respective impact of PSV and NAVA with and without NIV algorithm on patient-ventilator interaction.

METHODS. Prospective study conducted in 16 beds adult critical care unit (ICU) in a tertiary university hospital. Over a 2 months period, were included 17 adult medical ICU patients extubated for less than 2 h and in whom a prophylactic post-extubation NIV was indicated. Patients were randomly mechanically ventilated for 10 min with: PSV without NIV algorithm (PSV-NIV−), PSV with NIV algorithm (PSV-NIV+), NAVA without NIV algorithm (NAVA-NIV-) and NAVA with NIV algorithm (NAVA-NIV+). Breathing pattern descriptors, diaphragm electrical activity, leaks volume, inspiratory trigger delay (Td_{insp}), inspiratory time in excess (Ti_{excess}) and the five main asynchronies were quantified. Asynchrony index (AI) and asynchrony index influenced by leaks (AI_{leaks}) were computed.

RESULTS. Peak inspiratory pressure and diaphragm electrical activity were similar in the four conditions. With both PSV and NAVA, NIV algorithm significantly reduced the level of leak ($p < 0.01$). Td_{insp} was not affected by NIV algorithm but was shorter in NAVA than in PSV ($p < 0.01$). Ti_{excess} was shorter in NAVA and PSV-NIV+ than in PSV-NIV- ($p < 0.05$). The prevalence of double triggering was significantly lower in PSV-NIV+ than in NAVA-NIV+. As compared to PSV, NAVA significantly reduced the prevalence of premature cycling and late cycling while NIV algorithm did not influenced premature cycling. AI was not affected by NIV algorithm but was significantly lower in NAVA than in PSV ($p < 0.05$). AI_{leaks} was quasi null with NAVA and significantly lower than in PSV ($p < 0.05$).

CONCLUSIONS. NAVA is feasible in patients receiving a post-extubation prophylactic NIV. NAVA and NIV improve patient-ventilator synchrony in different manners. NAVA-NIV+ offers the best patient-ventilator interaction. Clinical studies are required to assess the potential clinical benefit of NAVA in patients receiving NIV.

0730

LONG TERM PHYSIOLOGIC EFFECTS OF NEURALLY ADJUSTED VENTILATORY ASSIST (NAVA) VS. PRESSURE REGULATED VOLUME CONTROL (PRVC) IN PREMATURE INFANTS

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INTRODUCTION. Recent studies demonstrated that NAVA can be safely applied in children [1] and in premature infants [2]. In all these studies, however, NAVA was applied for short period of time.

OBJECTIVES. To evaluate the effects of 12 h of NAVA on gas exchange and breathing pattern as compared to those obtained with PRVC, which is the mode commonly used in the clinical practice of the neonatal intensive care unit of our University Hospital.

METHODS. Eight consecutive premature infants intubated and mechanically ventilated for acute respiratory failure, capable to trigger the ventilator were eligible. Both modes were delivered with a Servo I ventilator (Maquet, Sölna, Sweden) equipped with both NAVA and the dedicated pediatric software. PRVC with automode was set as follows: 6–8 ml/kg of tidal volume (V_T); a minimum respiratory rate (RR) 35 breath per minute was further increased to maintain $PaCO_2$ ≤45 mmHg; positive end expiratory pressure (PEEP) between 4 and 6 cmH_2O; fraction of inspired oxygen (FiO_2) was adjusted to maintain SpO_2 between 89 and 95%. The NAVA level was adjusted to match peak airway pressures as previously done [2]. Arterial blood gases (ABGs) were sampled 1 ($PRVC_1$), 6 ($PRVC_6$) and 12 ($PRVC_{12}$) hours after enrollment; the same timeline was adopted with NAVA ($NAVA_1$, $NAVA_6$, $NAVA_{12}$). Flow, airway pressure (Paw) and electrical activity of the diaphragm (EAdi) were continuously recorded throughout the 24 h study period with a dedicated software. V_T, ventilator rate of cycling (RR_{mech}), and patient's spontaneous respiratory rate (RR_{neu}) were calculated. Patient-ventilator synchrony was appraised calculating RR mechanical to neural ratio ($MNR = RR_{mech}/RR_{neu}$).

RESULTS. Gestational age was 31.5 (28.9–34.0) weeks [mean ($CI_{min95\%} - CI_{max95\%}$)], birth weight was 1,684.7 g (1,153.3–2,144.2). There was no significant difference in ABGs between the 2 modes. However, there was a trend toward a higher PaO_2/FiO_2 with NAVA, as opposed to PRVC ($p = 0.059$). V_T resulted higher during PRVC (13.3ml/kg ± 5.7) than during NAVA (7.8 ml/kg ± 2.5) ($p < 0.05$). The percentage of breaths with a V_T >8 ml/kg was 81% in PRVC and 36% in NAVA ($p < 0.05$). RR_{mech} showed no differences between PRVC and NAVA (48 bpm ± 15.7 vs. 55.9 bpm ± 4.3, respectively) while RR_{neu} resulted lower in PRVC than in NAVA (12.6 bpm ± 9.8 vs. 54.1 bpm ± 3.4). MNR was 8.7 ± 7.1 in PRVC and 1.04 ± 0.02 in NAVA ($p < 0.05$).

CONCLUSIONS. Long term NAVA improved patient-ventilator interaction in premature infants as compared to PRVC.

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GRANT ACKNOWLEDGMENT. Maquet Critical Care provides all the material necessary for the study.

0731

IS DIAPHRAGM ELECTRICAL ACTIVITY A RELIABLE PREDICTOR OF WEANING SUCCESS?

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INTRODUCTION. To be optimal, weaning from mechanical ventilation requires to identify as early as possible the patients that could be successfully separated from the ventilator. This identification is mostly based on the tolerance of the spontaneous ventilation trial (SVT). In order to predict as early as possible the future success or failure of SVT, various indices have been developed. The most efficient and easy to use seems to be the rapid swallow breathing index. Electrical activity of the diaphragm (EAdi) may provide better indices to predict weaning success or failure.

OBJECTIVES. To evaluate to what extend indices derived from EAdi could reliably predict the future success or failure of the SVT.

METHODS. Prospective study conducted in a16 beds adult medical intensive care unit in a tertiary university hospital. Over a 2 months period, 37 patients (mean age 56 ± 31 years) previously mechanically ventilated with NAVA (Neurally Adjusted Ventilatory Assist) underwent 52 SVT. SVT lasted 30 min and were performed in pressure support ventilation with a pressure support level of 7 cmH_2O and zero end expiratory pressure. The pressure, flow and EAdi were continuously recorded over 30 min. Respiratory rate (RR), tidal volume (VT), maximum EAdi ($EAdi_{max}$) and inspiratory area under the EAdi curve ($EAdi_{auc}$) were calculated at 3, 10, 20 and 30 min. The rapid shallow breathing index (RR/VT), $EAdi_{max}$/VT and $EAdi_{auc}$/VT were eventually computed.

RESULTS. 33 records were obtained from successful SVT ("success") and 19 from unsuccessful SVT ("failure"). In both group, RR/VT, $EAdi_{max}$/VT and $EAdi_{auc}$/VT were not different at 3, 10, 20 and 30 min (one-way ANOVA, Table 1). We found that RR/VT [success: 68 (48–94) and failure: 113 (99–150)], $EAdi_{max}$/VT [success: 28 (18–68) and failure: 77 (34–98)] and $EAdi_{auc}$/VT [success: 11 (8–24) and failure: 26 (17-37)] discriminated significantly success and failure groups at 3 min [median IQR (25–75), $p < 0.01$). We also calculated sensibility, specificity and area under ROC curve (AUC) (Fig. 1).

CONCLUSIONS. EAdi-derived indices are reliable to predict weaning success or failure but are not more accurate than the rapid shallow breathing index.

		3 min	10 min	20 min	30 min	Sensibility	Specificity	AUC
RR/VT	Success	71 [20-120]	68 [36-119]	68 [33-123]	70 [36-126]	Cut off 100		
	Failure	109 [81-203]	123 [85-230]	138 [81-251]	134 [88-249]	68%	78%	0.83
$EAdi_{max}$/VT	Success	27 [9-47]	27 [9-45]	27 [10-45]	32 [11-53]	Cut off 50		
	Failure	77 [50-113]	70 [26-111]	70 [9-131]	79 [34-134]	68%	73%	0.72
$EAdi_{auc}$/VT	Success	11 [3-20]	11 [3-19]	12 [4-19]	12 [4-20]	Cut off 22		
	Failure	26 [8-44]	24 [5-42]	25 [8-45]	26 [8-47]	68%	76%	0.71

Fig. 1 All data are expressed in median IQR [25–75]

0732

DIAPHRAGMATIC EMG MONITORING DURING COMMON INTERVENTIONS IN CRITICALLY ILL ADULT PATIENTS WITH VENTILATORY OR OXYGENATION FAILURE ON THE ICU

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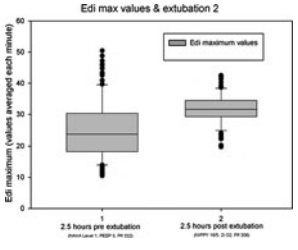
INTRODUCTION. Neurally Adjusted Ventilatory Assist (NAVA) is an innovative ventilatory support mode which delivers pressure which is proportional to inspiratory diaphragmatic electrical activity (Edi). We have previously described novel data [1] in which we show that measurement of neural signal is associated with decrease in ventilator days. Here, we describe in more detail the neural signalling profile of 3 patients during a spontaneous breathing trial (SBT)/extubation event.

OBJECTIVES. To observe Edi changes during spontaneous breathing trias and extubations.

METHODS. From December 2010, continuous Edi data was audited from sequential patients who received NAVA catheters. Specific SBT/extubation events were observed in detail with peak Edi signal for each breath averaged over each minute and recorded directly from Maquet Servo-i ventilators on to memory cards. The 2.5 h periods pre and post extubation (300 data points) were compared. This study took place in Kings College Hospital General Critical Care Unit; a 32 bed general intensive care unit within a large London teaching hospital.

RESULTS. Patient 1 peak Edi rose from 20.1 (±6.7) to 30.5 (±6.5) (Fig. 1) and although not immediately failing intubation, re-intubation occurred within 48 h. Patient 2 median peak Edi fell from 19.5 (±6.2) to 15.6 (±5.1) when extubated to no support and extubation was successful. In patient 3, we show the reduction in neural demand related to extubation and successful application of non-invasive ventilation with median Edi falling from 12.4 (±3.7) to 10.6 (±2.6).



[Extubation to NIV]

CONCLUSION. It is clear from our preliminary data that neural signalling during an SBT or extubation is complex and dependent on clinical presentation, though we do believe that in addition to accelerating weaning time, monitoring of Edi may provide useful predictive data during a SBT and after extubation. We now plan to look at different populations and hope to combine EDI with PaO_2/FiO_2 ratios, rapid shallow breathing index and non-invasive cardiac output monitoring to enhance current predictors of extubation success.

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GRANT ACKNOWLEDGMENT. Supported in part by Maquet Critical Care AB, Solna, Sweden.

0733

EFFECT OF VARIOUS NEURALLY ADJUSTED VENTILATORY ASSIST (NAVA) GAINS ON THE RELATIONSHIP BETWEEN DIAPHRAGMATIC ACTIVITY (EADI MAX) AND TIDAL VOLUME

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INTRODUCTION. Neurally Adjusted Ventilatory Assist (NAVA) is an assisted ventilatory mode in which the ventilator is driven by the electrical activity of the diaphragm (Eadi). NAVA improves patient-ventilator synchrony [1] but little is known about how to set the NAVA gain i.e., how to choose the ratio between Eadi and delivered pressure. The aim of the present study was to assess the relationship between Eadi and tidal volume (Vt) at various NAVA gain settings and to evaluate whether modifying the gain influenced this relationship in non-invasively ventilated (NIV) patients.

METHODS. Prospective interventional study comparing 3 values of NAVA gain during NIV (20 min each). NAVA100 was set by the clinician according to the manufacturer's recommendations. In NAVA50 and NAVA150 the gain was set as −50% and +50% of NAVA100 gain respectively. Vt and maximal Eadi value (Eadi max) were recorded. The ratio Vt/Eadi was then assessed for each breath. 5–95% range (range 90) of Vt/Eadi was calculated for each patient at each NAVA gain setting. Vt/Eadi ratio has the advantage to give an objective assessment Vt/Eadi max relationship independently from the nature of this relationship. A smaller Range90 indicates a better matching of Vt to Eadi max.

RESULTS. 12 patients were included, 5 had obstructive pulmonary disease and 2 mixed obstructive and restrictive disease. For NAVA100, the median [IQR] Range 90 was 32 [19–87]. For NAVA150 Range 90 was 37 [20–95] and for NAVA50 Range 90 was 33 [16–92]. That means that globally NAVA100 allowed a better match between Eadi max and Vt than NAVA50 and 150. However, by patient, NAVA100 had the lowest Range 90 value for only 4 patients (33%), NAVA150 for 2 (17%) and NAVA50 for 6 (50%) patients, indicating that NAVA100 was not the best NAVA gain for minimizing Range 90 in every patients.
Comparing the lowest Range 90 value to the next lowest for each patient, showed that 3 patients had differences of less than 10% (one each for NAVA50, NAVA100 and NAVA150). The remainder had differences from 17 to 24%, indicating that most patients (9/12 or 75%) had a clear better match between Eadi and Vt for one specific NAVA gain.

CONCLUSIONS. Different NAVA gains yielded markedly different ability to match Vt to Eadi max. This approach could be a new way to determine optimal NAVA gain for each patient but require further investigations.

REFERENCE. Piquilloud L, et al. Intensive Care Med 2011;37:263–71.

0734

OUTCOMES OF WEANING FROM MECHANICAL VENTILATION

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INTRODUCTION. A recent International Consensus Conference [1], proposed a new classification of weaning. Only one study [2] has evaluated the clinical implication of this classification in a multidisciplinary intensive care unit (ICU).

OBJECTIVES. The aim of our study is to describe weaning process and outcomes in a general intensive care unit according this classification.

METHODS. We studied all patients admitted in general ICU that required endotraqueal intubation in a 5 months prospective study. We categorized the patients according to the Consensus classification in: simple, difficult and prolonged weaning. The weaning was conducted according to our usual practice starting from volume assist controlled ventilation (ACV) and switching later to pressure support ventilation (PSV); then we performed a spontaneous breathing trial and decide extubation according to clinical tolerance and arterial blood gases. Statistical analysis: ANOVA and chi-square were used when appropriate. The data are presented in mean, standard deviation and percentage.

RESULTS. We studied 130 patients; 27 (21%) of them died before starting weaning; 5 (4%) lost data and 3 (2%) patients had an unplanned voluntary extubation. Ninety five (73%) patients were thus categorized. Mean age was 63 ± 15 years, SAPS II was 49 ± 18, total duration of mechanical ventilation was 10 ± 10 days, the mean number of spontaneous breathing trial per patient was 2 ± 3 and the mean ICU length of stay was 14 ± 11 days. The main findings in each weaning group are detailed in the table. We observed a group of 27/95 (28%) patients that halted the process of weaning and needed to return to ACV; this group had a reintubation rate of 10/21 (48%), a tracheotomy rate of 9/27 (33%) and mortality rate of 5/27 (19%).

VARIABLE	Simple Weaning n = 58 (61%)	Difficult Weaning n = 21 (22%)	Prolonged Weaning n = 16 (17%)	p
Age (years)	63 ± 15	64 ± 12	67 ± 10	0.43
SAPS II	49 ± 20	51 ± 18	44 ± 16	0.50
TMV (days)	6 ± 5	10 ± 8	21 ± 17	<0.001[b, c]
ICU length of stay (days)	10 ± 7	17 ± 13	24 ± 15	<0.001[a, b]
REIOT rate	4 (7%)	4 (19%)	8 (73%)	<0.001[b, c]
Tracheotomy rate	2 (3%)	2 (10%)	8 (50%)	<0.001[b, c]
ICU mortality	2 (3%)	1 (5%)	6 (38%)	<0.001[b, c]
Halted weaning process	13 (22%)	4 (19%)	10 (63%)	<0.004 [b, c]

SAPS II simplified acute physiology score, *TMV* total mechanical ventilation, *ICU* intensive care unit, *REIOT* reintubation. [a]Statistical significance between simple and difficult weaning; [b]Statistical significance between simple and prolonged weaning; [c]Statistical significance between difficult and prolonged weaning

CONCLUSIONS. Simple and difficult weaning groups have similar outcomes except for length of stay in ICU. Prolonged weaning entails poor outcomes in terms of reintubation, tracheotomy and mortality rates, similar to the outcomes in patients in whom weaning was halted.

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Non-invasive ventilation & airways humidification: 0735–0746

0735

BODY TEMPERATURE AFFECTS HUMIDIFIER EFFICIENCY

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INTRODUCTION. It is becoming increasingly common to see patients in Intensive Care with abnormal body temperatures ranging from 32 to 42°C. Respiratory humidifiers typically condition breathing air to 100% at 37°C but this may not be suitable for all patients.

OBJECTIVES. The objective of this study is to measure how body temperature affects the ability of various humidifiers to supply optimally conditioned air.

METHOD. We evaluated the performance of three humidifiers: a Heated Humidifier ("HH"; Fisher & Paykel MR 850) with a single heated wire circuit, a Heat Moisture Exchanger Filter ("HMEF"; DAR Hygrobac) and a Hydrator M5 (Inspired Medical Technologies) on a laboratory test-rig. The rig consisted of an ISO 9360 artificial lung which was set to various temperatures between 32 and 42°C to represent a range of patient body temperatures. The humidity of delivered air was measured for each type of humidifier and observations of rainout were made. 12 humidity readings were taken over a 2 h period.

RESULTS. The HH accurately delivered 100% humidity at 37°C, but did not respond to differing needs of patients at other temperatures. For a body temperature of 42°C, the relative humidity was only 75%. Conversely, for a body temperature of 32°C, the relative humidity was 127%. Assuming a tidal volume of 0.5 l at 15 breaths per minute, around 101 g of water would be expected to rainout inside the lungs over a 24 h period. This raises a concern of over-humidification [1]. The HMEF delivered 83% humidity at 37°C. In contrast to the HH, the performance did track patient temperature, with a near-constant 83% at 32°C and 82% at 42°C. It is worthy of note that at 42°C, the HMEF actually delivered a higher level of moisture than the HH. Many institutions do not use HMEFs after the first 48 h because of concerns that they deliver insufficient moisture. The Hydrator delivered 95% humidity at 37°C. The performance did track patient temperature. We measured 94% at 32°C and 96% at 42°C.
Rainout from the HH formed in the breathing circuit on both limbs within 5 h. The HMEF and Hydrator did not exhibit rainout in either limb.

CONCLUSIONS. HHs are intended to operate at 37°C and do not supply optimally humidified air to patients with higher or lower body temperatures. There is a risk of over-humidification in hypothermic patients and under-humidification in febrile patients. HMEFs deliver a more constant relative humidity across the temperature range, but such level may be too low for long-term care. The Hydrator delivers a near-constant relative humidity to all patient temperatures, and at a higher level than HMEFs.

REFERENCE. Thiyagarajan et al. World Fed J Crit Care 2004;1(1):23.

GRANT ACKNOWLEDGMENT. This work was commissioned by the Management Board of SBRI East and funded by NHS East of England, EEDA, ERDF and the Technology Strategy Board. The views expressed in the publication are those of the author(s) and not necessarily that of the funding partners.

0736

THE USE OF NONINVASIVE VENTILATION POST EXTUBATION: A META ANALYSIS

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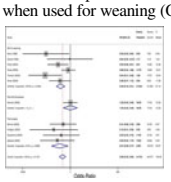
INTRODUCTION. Noninvasive ventilation (NIV) is a supportive therapy that improves mortality in acute respiratory failure (RF) [1]. It may also be used in patients recently extubated in Intensive Care Units (ICU) [2], postoperatively [3] and to aid weaning from mechanical ventilation (MV) [4] by reducing the morbidity and mortality associated with a further spell of MV.

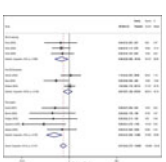
OBJECTIVES. To analyse the available evidence on use of NIV in 3 areas: in weaning, reduction of reintubation rates post extubation on ICU and reduction of atelectasis and respiratory failure following major surgery.

METHODS. 14 relevant RCTs were identified by 3 reviewers following a detailed search of identified medical databases. Meta analysis of summary statistics relating to predetermined end points (ICU and hospital length of stay, ICU and hospital mortality, reintubation, pneumonia) was performed.

RESULTS. NIV reduced ICU and hospital length of stay across all subgroups of patients. ICU length of stay was most markedly reduced when NIV was used for weaning (2.8 days) and post extubation (3.0 days). Across all subgroups NIV reduced reintubation rates (OR 0.57, 95% CI 0.42–0.77) and incidence of pneumonia (OR 0.38, 95% CI 0.25–0.58). There was insufficient evidence to suggest that NIV improves hospital survival except when used post operatively (OR 4.54, 95% CI 1.35–15.31) or ICU survival except when used for weaning (OR 2.19, 0.95% CI 1.14–2.43).



[Odds ratio for pneumonia]



[Odds ratio for reintubation]

CONCLUSIONS. Meta analysis of NIV use across a heterogenous group of patients who have recently been extubated suggests NIV may be useful in reducing ICU and hospital length of stay, pneumonia and reintubation rates.

REFERENCES. 1. Brochard L, et al. NEJM 1995;333:817–222. 2. Ferrer M, et al. Am J Resp Crit Care Med 2006;173:164–703. 3. Squadrone V, et al. JAMA 2005;293:589–954. 4. Burns KEA, et al. BMJ 2009;338:1574

GRANT ACKNOWLEDGMENT. AG was awarded a non-monetry scholarship by the National Institute for Health and Clinical Excellence (NICE) for this work.

0737

HEATED AND HUMIDIFIED HIGH FLOW OXYGEN THERAPY REDUCES DISCOMFORT DURING HYPOXEMIC RESPIRATORY FAILURE

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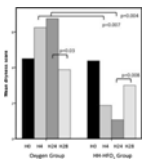
INTRODUCTION. Oxygen supply is one of the first line therapy for acute respiratory failure. However, there is no recommendation concerning heating, humidification on delivery techniques in spontaneous breathing patients. Breathing high flow dry and cold oxygen could provoke dryness of the upper airway mucosa and then result in discomfort and pain.

OBJECTIVES. To compare the effects of standard oxygen therapy without humidification and heated humidified high flow oxygen therapy (HH-HFO_2) on nasal airway calibre and the comfort in hypoxemic patients with acute respiratory failure.

METHODS. A prospective randomized cross over trial was conducted from December 2009 to December 2010 in hypoxemic patients hospitalized in a medical Intensive Care Unit (ICU). Nasal airway calibre was measured by acoustic rhinometry at inclusion, H4, H24 and 4 h after cross over (H28). Discomfort, particularly dryness of the nose, mouth and throat was auto-evaluated using a 0–10 numerical rating scale with the 2 devices and blindly evaluated by an ENT. The preference between the two systems was evaluated at the end of the protocol.

RESULTS. Thirty patients completed the protocol and were included into the main analysis. The median oxygen flow at inclusion was 9 and 12 l/min in standard oxygen group and in HH-HFO_2 group, respectively ($p = 0.21$). The acoustic rhinometric measurements did not show any difference between the 2 groups throughout the protocol. The dryness score was significantly lower as soon as the 4th h in the HH-HFO_2 group (2 vs. 7, $p = 0.007$) and after 24 h (1 vs. 7, $p = 0.004$). After cross over, dryness increased early when switching over standard oxygen therapy, and decreased when changing for HH-HFO_2 therapy ($p = 0.008$) (see figure). Eighteen patients ($n = 10$ in the HH-HFO_2 group and $n = 8$ in the Oxygen group) received a blind evaluation by the ENT, which confirmed the dryness of the nasal mucosa after 24 h of oxygen ($p = 0.05$). The HH-HFO_2 device was mainly preferred ($p = 0.01$).



[Intensity of dryness score]

CONCLUSIONS. Upper airway calibre does not differ when delivering heated and humidified high flow oxygen. However, HH-HFO_2 system improves clinical tolerance of oxygen therapy in patients with acute respiratory failure, requiring high oxygen concentration. It rapidly reduces dryness of the upper airway mucosa and decreases discomfort for most patients despite the noise induced by the device.

REFERENCE. Fontanari P. J Appl Physiol 1996.

0738

NON-INVASIVE VENTILATION IN PATIENTS WITH PNEUMONIA: EFFECTS ON OUTCOME

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INTRODUCTION. In spite of the increasing use of non-invasive ventilation (NIV), there are still some concerns regarding its use in the hypoxemic respiratory failure, especially in patients with pneumonia in whom high rates of failure are described [1]. Also, failure of NIV may be associated with worse outcome [2].

OBJECTIVES. To determine the effect of NIV as first ventilatory support (VS) compared with invasive mechanical ventilation (IMV) on the outcome of patients admitted in ICU with pneumonia.

METHODS. This is a retrospective study with patients admitted in our ICU with pneumonia and need for VS from 2002 to 2010. Patients with "do not intubate orders" were excluded. Comorbidities, demographic variables and variables associated with severity of pneumonia were recorded. Patients were compared according to the first VS applied, NIV (group 1 + 2) or IMV (group 3). Also, patients with failed NIV (group 2) were compared with group 3. χ^2 test and Mann–Whitney-U test were used. Propensity-adjusted logistic regression models were used to analyze mortality. Data are expressed as percentages or mean ± SD, unless specified.

RESULTS. 180 out of 289 patients with pneumonia needed VS. There were no significant differences between groups in PaO_2/FiO_2 (group 1, 162 ± 64; group 2, 128 ± 65; and group 3, 159 ± 105 mmHg) or age (71 ± 11, 67 ± 15 and 65 ± 15 years, respectively). Main results of univariate analysis were:

TABLE 1

	Group 1 NIV (n = 34)	Group 2 NIV + IMV (n = 30)	Group 3 IMV (n = 116)	p 1 + 2 versus 3	p 2 versus 3
COPD, n (%)	22 (65)	9 (30)	35 (30)	0.02	0.99
Immunosuppression, n (%)	3 (9)	5 (17)	34 (29)	0.01	0.16
SOFA score (points)	3.9 ± 2.2	6.6 ± 3.1	7.5 ± 3.4	<0.001	0.22
$PaCO_{2\ (mmHg)}$	57 ± 19	55 ± 21	45 ± 19	0.001	0.03
Positive respiratory culture, n (%)	6 (18)	8 (27)	65 (56)	<0.001	0.004
Hours from admission to IMV, median (IQR)	–	26 (18–71)	17 (11–28)	–	0.003
Days on IMV, median IQR	–	8 (4–23)	6 (3–13)	–	0.31
Hospital length of stay, median (IQR) (d)	15 (10–18)	28 (14–41)	20 (12–38)	0.29	0.25
Hospital mortality, n (%)	2 (6)	14 (47)	46 (40)	0.048	0.49

In the multivariate analysis, the first VS applied was not associated with hospital mortality (OR 0.63, 95% CI 0.2–1.9). The AUC of the propensity score model was 0.87 (95% CI 0.82–0.93). When only intubated patients were analyzed, hospital mortality was associated with failure of NIV (OR 3.6; 95% CI 1.1–11.6) together with previous renal insufficiency (OR 2.0; 95% CI 0.5–7.5), plasmatic albumin levels on admission (OR 0.23; 95% CI 0.1–0.4), alcoholism (OR 0.3; (95% CI 0.1–0.8) and pleural effusion (OR 0.4; 95% CI 0.1–0.8). The AUC of the propensity score model was 0.86 (95% CI 0.79–0.93).

CONCLUSIONS. In our patients with pneumonia, the first VS applied is not associated with mortality in the multivariate analysis. Failure of NIV is associated with an increased hospital mortality compared to IMV as first VS.

REFERENCES. 1. Antonelli M, et al. ICM 2001;27:1718. 2. Esteban A, et al. AJCCM 2008;177:170.

GRANT ACKNOWLEDGMENT. No grant is received.

0739

HYGROMETRY OF GAS DELIVERED WITH HIGH FLOW OXYGEN HUMIDIFIERS: A BENCH STUDY

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INTRODUCTION. The high flow oxygen therapy is increasingly prominent in health care. However, an adequate humidification is necessary to improve patient tolerance to this therapy. Few data is available in literature about this subject.

METHODS. We have tested on a bench the hygrometric performance of different high flow oxygen therapy systems (OptiFlow, Fisher & Paykel, Hydrate OMNI, Hydrate inc., Vapotherm, Vapotherm). We have used psychometric method to measure hygrometry.
For each condition, we made 3 hygrometric measurements at different moments of the day. The measurements were taken proximal to the simulated patient's interface. We have tested the incidence of different flow rates (10, 20–30–40 and 60 l/min) at two ambient temperature levels: normal temperature (22–24°C) and high temperature (28–30°C).

RESULTS. At normal temperature (22–24°C), the Fisher and Paykel Optiflow system (with or without compensation algorithm) provided the highest absolute humidity (39.3 vs. 35.9 vs. 32.0 for F&P, Hydrate and Vapotherm, $p = 0.0009$), regardless of the used flow rate (hygrometric performance >37 mgH_2O/L). At high temperature (28–30°C), the Vapotherm–Vapotherm system provided the highest absolute humidity at lower flow rates (10 and 20 l/min) (31.8 vs. 32.2 vs. 37.2, for F&P, Hydrate and Vapotherm, $p = 0.001$). However, at high flows, performances were significantly reduced with the Vapotherm device (37.2 vs. 31.8 for 10–20 L/min and 30–40 L/min, $p = 0.027$). The main results are presented on the following figure.

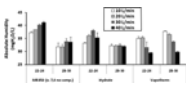

Fig. 1 The main results for absolute humidity

CONCLUSION. Even though the majority of systems tested deliver at least 30 mgH_2O/L, no recommended hygrometric levels for this therapy exist in literature yet. At high temperature (28–30°C), the majority of the systems showed a decrease in their hygrometric performance (except Vapotherm). The flow rate influence is moderated regarding the humidification performance (except for Vapotherm). The new technology Hydrate performed reasonably well within the tested conditions.

0740

BENCH EVALUATION OF HELMET NIV WITH A STANDARD OR A DOUBLE TUBE CIRCUIT

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INTRODUCTION. During Helmet NIV, the helmet is generally connected to the ventilator through a double tube circuit (one inspiratory line and one expiratory line). In clinical practice the helmet is sometimes connected to the ventilator through a standard circuit, connecting the Y piece only to one side of the helmet.

OBJECTIVES. The aim of this bench study was to compare Helmet NIV with both circuits in terms of performance and patient-ventilator interaction.

METHODS. A mannequin, connected to a test lung, set at two different respiratory rates (RR, 20 and 30 breaths/min), was ventilated in PSV mode through a helmet with two different settings ($Time_{press}/Tr_{exp}$ 50%/25%, Default setting and $Time_{press}/Tr_{exp}$ 80%/60%, Fast setting) randomly applied. The helmet was connected to the ventilator sequentially with the double and the standard circuit. The performance was analyzed measuring: Trigger pressure drop, Inspiratory Pressure–Time Product (PTPt), Pressure–Time Product at 300 and 500 ms (PTP300 and PTP500). Patient–ventilator interaction was evaluated measuring: Inspiratory trigger delay, Expiratory trigger delay, Pressurization Time, Time of Assistance.

RESULTS. Results are showed in Figs. 1, 2 and Table 1.

CONCLUSIONS. Compared to the standard circuit, the double circuit showed a significantly better patient-ventilator interaction, with shorter inspiratory and expiratory delays and a longer time of assistance, and a significantly higher performance.

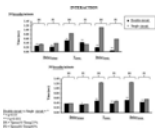

Fig. 1

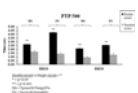

Fig. 2

TABLE 1

	RR20 Double tube	RR20 Single tube	RR30 Double tube	RR30 Single tube
Timeass (s) DS	0.30 ± 0.01**	0.29 ± 0.01	0.08 ± 0.01**	0.05 ± 0.01
Timeass (s) FS	0.42 ± 0.01**	0.24 ± 0.01	0.10 ± 0.02*	0.08 ± 0.01
PTPt (cmH_2O/s) DS	0.13 ± 0.01**	0.07 ± 0.01	0.26 ± 0.02	0.13 ± 0.01
PTPt (cmH_2O/s) FS	0.10 ± 0.01	0.11	0.23 ± 0.03**	0.11 ± 0.01**
PTP300 DS	0.16 ± 0.02	0.16 ± 0.08	0.03 ± 0.02**	0.07 ± 0.02
PTP300 FS	0.70 ± 0.03**	0.04 ± 0.02	0.04 ± 0.01	0.06 ± 0.02
PTP500 index DS	28%	29%	23%	17%
PTP500 index FS	41%**	25%	26%	21%

0741

NON INVASIVE MECHANICAL VENTILATION IN THE OLDER PATIENT IN THE INTENSIVE CARE UNIT

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INTRODUCTION. Non Invasive Mechanical Ventilation (NIMV) tolerance and success is associated with younger age, dental arcade integrity, APACHE II score <29 and respiratory rate <30.

OBJECTIVES. To determine factors associated with NIMV success in the elderly.

METHODS. Retrospective study of patients with NIVM in the ICU from July 2010–February 2011. Demographics, gasometric parameters, before and after (30 min) NIMV; length of stay (LOS), days under MV, mortality, necessity of invasive MV, type of mask and reason for NIMV were obtained.

RESULTS. 91 patients were included, 36 were male (39.6%); mean age: 71 ± 16 years, APACHE II score: 12 ± 6. Main cause for NIMV was Acute Respiratory Failure (ARF) in 62 (68.2%), increased Work of Breathing (WOB) in 12 (13.2%) and as weaning maneuver immediately after extubation in 17 (18.7%). Of 62 patients with ARF, 35 (38.5%) had hypoxemia and 27 (29.7%) hypercapnea. Most frequent type of mask was oronasal (ON) (n = 69, 76%); 21 (23%) had total Facial Mask (FM) and 1 had nasal mask. MV modes: Bipap 72 (79%), CPAP 19 (21%). Gasometric parameters are shown on Table 1.

TABLE 1

	Before NIMV	After NIMV	p
PaO_2	86.71 ± 43.8	102.71 ± 43.8	0.04
$PaCO_2$	47.31 ± 18.4	43.31 ± 13.5	NS
Respiratory rate (RR)	25.71 ± 5.1	23.61 ± 4.7	0.003
SpO_2	86.71 ± 3.4	96.51 ± 3.4	0.0001

Table 2 shows differences when divided by cause of NIMV.

TABLE 2

	Before	After	*p*
PaO_2			
Hypoxemia	57.6 ± 7	90 ± 47	0.02
Hypercapnea	81 ± 32	108 ± 45	0.02
WOB	92 ± 41	124 ± 50	0.06
Weaning	113 ± 62	91 ± 23	NS
$PaCO_2$			
Hypoxemia	34 ± 5	33 ± 5	NS
Hypercapnea	66 ± 17	55 ± 13	0.02
WOB	40 ± 13	38 ± 8	NS
Weaning	41 ± 14	41 ± 12	NS
RR			
Hypoxemia	26 ± 4	23 ± 5	0.02
Hypercapnea	24 ± 5	23 ± 4	NS
WOB	29 ± 4	24 ± 4	0.0001
Weaning	23 ± 5	23 ± 6	NS
SpO_2			
Hypoxemia	89 ± 8	96+4	0.0001
Hypercapnea	93 ± 5	96 ± 3	0.0007
WOB	93 ± 5	97 ± 4	0.0008
Weaning	95 ± 5	97 ± 3	NS

By type of mask: ON mask showed significant improvement in PaO_2 from 87 ± 44 to 108 ± 48 (p = 0.02) and SpO_2 from 93 ± 5 to 97 ± 3 (p = 0.0001); $PaCO_2$ and RR did not change. Patients with FM were older than patients with ON: 77 ± 10 versus 69 ± 18, respectively (p = 0.05); APACHE II score was higher too in FM 14 ± 6 versus 11 ± 6 in ON (p = 0.04). There were no difference in LOS, days under MV and mortality according to type of mask. NIVM as weaning technique increased LOS by 10 days versus other reasons (p = 0.01)

CONCLUSIONS. Although ON mask showed best improvement of hypoxemia, total FM was more frequently used in sicker and older patients. These patients should not be excluded from benefits of NIMV.

REFERENCE. Carolyn MD Ambrosio. Non invasive ventilation in the older patient who has acute respiratory failure. Clin Chest Med 2007;28:739–800.

0742

NON-INVASIVE VENTILATION IN ADULT RESPIRATORY DISTRESS SYNDROME. THERE AREA DIFFERENCES IN PROGNOSIS OF PULMONARY AND EXTRAPULMONARY ETIOLOGY?

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INTRODUCTION. The use of non-invasive ventilation (NIV) is controversial in severe forms of acute hypoxemic respiratory failure. Despite this, some authors advocate an initial attempt to prevent endotracheal intubation.

OBJECTIVES. To analyze the success and survival of patients with adult respiratory distress syndrome treated with NIV, differentiating from the pulmonary (ARDS-p) and extrapulmonary (ARDS-ep) etiology.

METHODS. Prospective observational, single center, study of all patients admitted to ICU with a diagnosis of ARDS and treated with NIV. Indication for NIV was dypsnea, respiratory rate (RR)> 30 bpm, PaO_2/FiO_2 <200, or accessory respiratory muscle activity. Primary study goal was success of NPPV (defined as a response to therapy, avoiding endotracheal intubation, and surviving during the stay in ICU and at least 24 h on medical ward) among patients with lung injury primarily pulmonary or extrapulmonary origin. The variables are expressed as mean ± standard deviation and percentage. Comparison between variables was performed using Pearson χ^2 test and Student's T test.

RESULTS. During the study period, 353 patients have been admitted initially with ARDS and have been treated with NIV. The mean age was 53 ± 20, 210 (59.5%) males, and 80.3% of infectious etiology. ARDS were 161 pulmonary origin, and 192 extra-pulmonary causes. 95.2% were treated with BiPAP mode and the rest with CPAP mode. 39 patients showed history of chronic respiratory disease (11%). The success of NIV was achieved in 84 patients (24.4%). The comparison between the main clinical and evolutionary variables of the 2 groups analyzed are shown in Table 1.

TABLE 1 COMPARISON BETWEEN ARDS-P AND ARDS-EP

	ARDS-p	ARDS-ep	p-value
SAPS II	47 ± 16	49 ± 14	0.404
Maximum SOFA index (NIV)	7.9 ± 4.1	8.7 ± 4.1	0.073
PaO_2/FiO_2 at NIV start	118 ± 39	127 ± 36	0.013
PaO_2/FiO_2 1 h NIV	141 ± 45	144 ± 44	0.579
RR at NIV start	40 ± 17	40 ± 23	0.943
RR at 1 h NIV	38 ± 21	38 ± 23	0.793
Duration of NIV (h)	39.5 ± 37.9	39.2 ± 31.3	0.309
NIV success	45 (28%)	41 (21.4%)	0.150
ICU death	74 (46%)	102 (53.1%)	0.180

CONCLUSIONS. The application of NIV as the initial treatment of respiratory failure due to ARDS has a high failure rate. The differentiation between pulmonary and extrapulmonary origin shows no difference in the success of the technique or the prognosis.

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0743

RISK FACTORS FOR RE-INTUBATION AFTER CARDIOPULMONARY BYPASS: ROLE OF NON-INVASIVE VENTILATION

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INTRODUCTION. Post-operative pulmonary complications may lead to re-intubation in patients recovering from cardiac surgery [1, 2]

OBJECTIVES. In order to design a randomized clinical trial we assessed (a) re-intubation rate (b) efficacy of non-invasive ventilation (NIV) to prevent re-intubation in patients recovering from cardiac surgery.

METHODS. Multicenter retrospective observational study (January–June 2010) in seven Italian Intensive Care Units (ICU). An institutional Ethic Committee approved the research protocol. All patients undergoing cardiopulmonary bypass (CPB) were included; exclusion criteria were: (a) age <18 years old, (b) solid organ transplantations, (c) mechanical ventilation before surgery or extracorporeal membrane oxygenation support or other mechanical assist devices. The following data were collected: age, gender, type of cardiac disease and intervention, European System for Cardiac Operative Risk (euro) SCORE [3], duration CPB and of cross clamping, PaO_2/FiO_2 ratio before and after extubation and at ICU discharge, use of NIV after extubation and occurrence of re-intubation within 1 week.

RESULTS. 964 patients were included. Re-intubation rate was 5.4%. Univariate analysis identified that re-intubated patients were older, had a higher euroSCORE, had more frequently aortic disease, and longer CPB, cross clamping time and needed NIV more frequently ($p < 0.01$). Multivariate analysis showed that the length of CPB and euroSCORE were associated with an increased risk of re-intubation [OR 1.009 (CI 1.003–1.014); OR 1.268 (CI 1.124–1.430)], while the use of NIV was associated with a reduced the risk of re-intubation [OR 0.196 (CI 0.099–0.387)], $p < 0.001$.

CONCLUSIONS. These preliminary retrospective data suggest the protective role of NIV after CPB and confirm the necessity of a RCT on the use of NIV in patients recovering from cardiac surgery.

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0744

THE IMPLICATIONS OF HOSPITAL LOCATION ON THE IMPLEMENTATION OF NON-INVASIVE VENTILATION

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INTRODUCTION. East Surrey Hospital is a district general hospital in Surrey, England serving a population of 420,000. In reference to guidelines published by the British Thoracic Society (BTS) [1], we assessed our non-invasive ventilation (NIV) service. The BTS recommends use of NIV on an ICU, HDU or respiratory ward. NIV is provided in many other locations in our hospital.

OBJECTIVES. 1. To determine whether the location that NIV is delivered in affects the duration of therapy. 2. To assess whether there is a relationship between location of therapy and patient outcome.

METHODS. Data was collected using our electronic database. Referrals for NIV from 1/10/10 to 31/12/10 were examined. Record was made of the location, duration and outcome of treatment. All cases receiving NIV in this period were included. Those referred for NIV later deemed not suitable for treatment were excluded.

RESULTS. A total of 69 patients were referred, 66 of whom received NIV. 28 patients were treated in a BTS recommended area. In this group the mortality rate was 39.3% and the median duration of treatment was 5 h (Interquartile range 2.5–15.5). 38 patients were treated in other locations. In this group the mortality rate was 47.4% and the median duration of treatment was 16.8 h (IQR 10–50.8). The difference in mortality rates between the groups was not statistically significant (p value 0.85). The difference in duration of NIV was statistically significant (p = 0.02). In 12 patients deeemed suitable for NIV as the upper limit of ventilatory support, the mortality was 83.3% when compared to other patients, p = 0.01. 44 patients who were suitable for invasive ventilation and were managed solely with NIV the mortality was 36.4% and in the 10 patients who proceeded to invasive ventilation the mortality was 40%.

CONCLUSIONS. 42% of patients received NIV in an area recommended by BTS guidelines. Patient mortality did not appear to be affected by the location of treatment, however once the decision not to intubate is made there is a significant difference in survival. However, NIV was used for a significantly shorter period of time when used in recommended areas. This may in part be explained by progression to invasive ventilation but is likely to reflect prompter decision making by staff more experienced in the use of NIV.

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0745

ASSESSMENT OF THE USE OF NON INVASIVE CONTINUOUS POSITIVE AIRWAY PRESSURE ASSOCIATED WITH NEBULIZATION IN PRE-HOSPITAL MANAGEMENT

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INTRODUCTION. These lasts few years, Non Invasive Ventilation (NIV) has grown up for Chronic Obstruction Pulmonary Disease (COPD), and Acute Pulmonary Edema (APE) through the use of Continuous Positive Airway Pressure (CPAP). Recently, several studies have reported the use of NIV coupled with nebulized bronchodilators to optimize the management of acute asthma patients in emergency departments and intensive care units. This has indicated an improvement in gas exchanges, decreased lung resistances and decreased work of breathing.

OBJECTIVES. The purpose of this study is to assess the workable in pre-hospital management, to target patients for its use, to compare clinical data before and after achievement of CPAP with nebulization.

METHODS. We have conducted a retrospective, descriptive and observational study. We have collected all files (EMA, Dispatching center) for each patient who had received CPAP NIV associated to nebulisation, for pulmonary bronchospasm (excluded Acute Pulmonary Edema), and supported by emergency medical service. Several data were analyzed: age, sex, history, severity signs, cardiac and respiratory rate, blood pressure, pulse oxymetry, intubation, nebulization of beta-2 agonists, anticholinergics, intravenous corticosteroids, arterial blood gases.

RESULTS. Over an 18 months period, 21 patients were enrolled: 8 patients were ventilated with CPAP nebulisation for a Severe Acute Asthma (38%), and 13 patients for a COPD exacerbation (62%). The mean age for asthma patients was 48 years, and 68 for COPD. Regarding to the history: 67% were under long-term corticosteroid, 48% were smokers, 29% received antibiotics, all patients presented a clinical bronchospasm, and severity criteria for respiratory distress. 67% of patients were hypoxic (SpO_2 <92%). All patients have received salbutamol inhalation, associated in 71.4% of cases with inhaled anticholinergic agent. Intravenous glucocorticoid drug was dispensed in 71.4% of cases and intravenous salbutamol in 23.8% of cases. None of asthma patients were intubated, 5 COPD patients (24.8%) patients were intubated. 12 patients were admitted in intensive care units (1 with asthma and 11 with COPD). Comparison of clinical parameters between pre-hospital care and emergency room shows a significant difference ($p < 0.05$) for respiratory rate (35.9 ± 7.48 vs. 24.95 ± 8.25) and pulse oxymetry (81.8 ± 15.8 vs. 96.4 ± 3.54).

CONCLUSIONS. First, it is interesting to note that the recommendations of management of acute severe asthma are not always followed. NIV through CPAP associated with nebulizations appears to provide benefit by reducing respiratory work (decreased respiratory rate) and improving alveolar ventilation (increased SpO_2) in patients with asthma. However in COPD patients, no improvement of symptoms has been observed. Nevertheless, we cannot know which of CPAP or drug inhalation have improved asthma patients.

0746

EFFECTIVENESS OF NONINVASIVE MECHANICAL VENTILATION (NIV) IN THE TREATMENT OF ACUTE RESPIRATORY FAILURE

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INTRODUCTION. Noninvasive Mechanical Ventilation (NIV) has been demonstrated to be of benefit in preventing endotracheal intubation and reducing mortality in specific patients in the setting of acute exacerbations of Chronic Obstructive Pulmonary Disease (COPD). In addition, data indicating favorable outcome with the use of NIV are present in weaning failure and in some patients with acute hypoxemic respiratory failure.

OBJECTIVES. To determine the efficacy of NIV in the treatment of Acute Respiratory Failure (ARF) and to identify factors associated with success or failure.

METHODS. Between March 1st 2010 and March 31th 2011 we conducted a prospective and analytical study of all patients (>18 years) who received NIV in the Intensive Care Unit-ICU of Santa Luzia Hospital, Brasilia, Brazil. Were analyzed: age, APACHE II score, Length of Stay in ICU and Length of Stay in Hospital and indications to NIV, Glasgow Coma Scale (GCS), arterial blood gases and mortality. We excluded 24 patients who had failed to collect data. Statistical analysis was performed normality test, independent samples *t* test, paired-samples *t* test, Mann–Whitney, Wilcoxon, Qui-square an logystic regression.

RESULTS. NIV was used in 89 patients (104 episodes of applying NIV), and in 62 (59.6%) was avoided intubation (success). There was no statistical difference between success and failure groups in relation to APACHE II score, age, Length of Stay in Hospital, pH pre-NIV, $PaCO_2$ pre-NIV and $PaCO_2$ post-NIV, PaO_2 post-NIV. Patients who had failure of NIV had a longer ICU stay (19.6 ± 16.0 vs. 24.3 ± 16.8 days, $p = 0.05$), lower neurologic status (GCS 14.3 ± 1.5 vs. 13.6 ± 2.5, $p = 0.05$) and higher mortality (29 vs. 78.6%, $p < 0.001$). Comparing the values of arterial blood gases analysis before and after application of NIV was not significant difference. The failure rate of NIV was 71.4%, 07 patients with non-COPD hypercapnic respiratory failure, 45.1%, 51 patients with hypoxemic respiratory failure, 38.5%, 13 patients with cardiogenic pulmonary edema, 33.3%, 12 patients with postextubation respiratory failure, 27.3%, 11 patients with an exacerbation of COPD.

CONCLUSIONS. The application of NIV was effective in the treatment of ARF in most cases. Patients with lower GCS had higher failure. None of the other variables was associated with the success or failure. The length of stay and mortality in ICU was higher in the failure group, especially in patients with non-COPD hypercapnic respiratory failure.

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Acute lung injury monitoring: 0747–0760

0747

ASSESSMENT OF INTERLEUKIN-18 VALUES IN SEPTIC ACUTE LUNG INJURY/ ACUTE RESPIRATORY DISTRESS SYNDROME PATIENTS

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INTRODUCTION. Our previous reports have described elevation of the serum levels of interleukin 18 (IL-18) in patients with sepsis, and also a significant correlation between the severity of the sepsis and the serum IL-18 level1), that the serum IL-18 data from patients with hepatic failure may reflect the severity of the hepatic failure 2), and that the serum IL-18 level in patients with septic multiple organ dysfunction syndrome reliably reflected the severity of the syndrome 3).

OBJECTIVES. This paper deals with a further study conducted by us on IL-18 in patients with septic acute lung injury (ALI)/acute respiratory distress syndrome (ARDS).

METHODS. The subjects studied were 38 patients seen during the 4-year period between April 2004 and March 2008, from whom blood samples could be drawn within about 6 h of the onset of septic AIL/ARDS. The average PaO_2/FIO_2 (P/F) ratio was 170, with a mean P/F ratio of 246 ± 31 in the patients with ALI and mean P/F ratio of 135 ± 64 in the patients with ARDS. There were 3 patients (7.9%) in the 30-day mortality group, 6 patients (15.8%) in the 60-day mortality group, and 7 patients (18.4%) in the 90-day mortality group. The serum levels of tumor necrosis factor-a (TNF-a) and IL-18 were determined by enzyme-linked immunosorbent assay (ELISA).

RESULTS. There was no significance each factors between the 30-day mortality group and the surviving group. The 60-day mortality groups exhibited significantly elevated APACHE II scores, SOFA scores, serum levels of TNF-a and IL-18 at the onset of the ALI/ARDS, as compared with the values in the survivor group. Both the mortality groups exhibited significantly elevated APACHE II scores, SOFA scores, serum levels of TNF-a and IL-18 at the onset of the ALI/ARDS, as compared with the values in the survivor group. The serum levels of TNF-a and IL-18 and the P/F ratio were all significantly higher in the ARDS group relative to that in the ALI group. The P/F ratio was found to show a significant, inverse correlation with the serum TNF-a and IL-18 levels ($r = -0.6486$, $p < 0.0001$; $r = -0.5716$, $p = 0.0002$).Furthermore, there was a significant correlation between the serum levels of TNF-a and IL-18 ($r = 0.8040$, $p < 0.0001$). The serum IL-18 level was significantly correlated with the APACHE II as well as the SOFA scores ($r = 0.7661$, $p < 0.0001$; $r = 0.7990$, $p < 0.0001$).

CONCLUSIONS. The present study demonstrated a significant correlation between the APACHE II as well as the SOFA scores and the serum IL-18 level These results suggest that the serum IL-18 level may have a bearing on the severity of sepsis. The data also demonstrated a strong correlation between the serum levels of IL-18 and those of the inflammatory cytokine TNF-a, suggesting that TNF-a may stimulate the production of IL-18. Hence, IL-18 appears to be involved in the development of ALI/ARDS, and the results show that the greater the degree of respiratory insufficiency, the higher the serum IL-18 level.

0748

IMAGING VENTILATOR INDUCED LUNG INJURY WITH PET

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INTRODUCTION. Ventilation with high tidal volumes (VT) may harm the lung in acute lung injury (ALI) by increasing lung inflammation and permeability of the alveolar-capillary membrane. Positron emission tomography (PET) is a powerful tool with potential to detect neutrophils activation within the lung [1].

OBJECTIVES. To test whether PET could detect ventilator-induced lung injury (VILI) in its earliest phase.

METHODS. In 32 pigs, ALI was performed by tracheal instillation of HCl followed by 2 h of mechanical ventilation during which 14 animals were studied in supine position (SP) with low ($n = 9$) or high PEEP ($n = 8$), and 9 in prone position (PP) with low PEEP, while plateau pressure was kept below 30 cmH_2O by adjusting VT. Low or high PEEP was selected from individual expiratory P–V curve. The remaining 6 animals were ventilated with high VT, adjusted to maintain trans-pulmonary pressure (PTP) above 35 cmH_2O (VILI-HCl). Twelve additional piglets served as controls: 6 were studied using normal ventilatory settings (control group) and 6 with high VT, adjusted to maintain PTP above 35 cmH_2O (VILI). At end of experiment, lung inflammation was assessed with PET as lung uptake of FDG normalized by tissue fraction (Ki/FT), and by cytokines concentration in the BAL fluid.

RESULTS. KI/FT in the whole lung was significantly lower in the control and VILI groups than to each other group (Fig. 1). No significant difference in FDG uptake was observed between HCl-injured groups, whether or not lung protective ventilation was applied. Cytokines in BAL were not statistically different between HCl injured groups (Fig. 2), but significantly different from control. IL1 and TNFα were significantly higher in the VILI group, as compared to control.

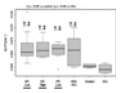

Fig. 1

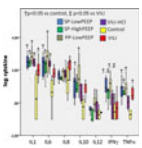

Fig. 2

CONCLUSIONS. PET imaging with FDG may be inadequate to assess VILI, at least during its earliest phase. A PET radiotracer directed towards alveolar macrophages may be more appropriate.

REFERENCE. Musch G. Anesthesiology 2007;106:723–35.

0749

OPEN LUNG BIOPSY IN PATIENTS WITH ACUTE RESPIRATORY FAILURE AND BILATERAL PULMONARY INFILTRATES

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INTRODUCTION. A clinical syndrome of acute respiratory distress syndrome (ARDS) may be the result of a wide spectrum of diseases and causes. Identification of the etiology of ARDS has important implications for treatment and prognosis. While noninvasive testing is sufficient for causal diagnosis in most cases, open lung biopsy (OLB) may provide essential information where the results of noninvasive diagnostics are inconclusive.

OBJECTIVES. To describe the results of OLB performed in patients with a clinical diagnosis of ARDS.

METHODS. We reviewed all cases of open lung biopsy, performed between 2002 and 2009 in patients admitted for acute respiratory failure and bilateral pulmonary infiltrates to the Intensive Care Unit (ICU) of Ghent University Hospital. Pathological results were classified as specific or non-specific. In case of a non-specific result, the contribution of the OLB to clinical decision making was evaluated by a panel of three ICU physicians. We noted complications following OLB.

RESULTS. A total of 60 OLB were reviewed. Patients were male in 60%, had a mean age of 63 years (±14) and were immunocompromized in 40%. All patients underwent computed tomography and 85% were subjected to broncho-alveolar lavage prior to OLB. Pathological diagnosis of OLB was specific in 39 (65%): interstitial lung disease in 24, neoplastic disease in 4, pulmonary infectious disease in 9, a combination of interstitial lung disease and infection in 1 and a combination of neoplastic disease and infection in 1 patient. A non-specific diagnosis was found in 21 cases (35%): ARDS in the acute phase in 3, ARDS in the fibroproliferative phase in 14, bronchiolitis obliterans organizing pneumonia in 3, pulmonary emboli in 1. A non-specific diagnosis was judged as contributive to patient management in 14 cases as it led to the initiation of new therapy/stopping or modification of empiric therapy in 13 and a withdrawal of ventilatory support in 1. Complications of OLB were life-threatening in 1 patient (tension pneumothorax), were major in 12 (bleeding > 1L, persisting air leak, desaturation, extensive subcutaneous emphysema) and minor in 14 (bleeding < 1L, transient air leak, wound infection, limited subcutaneous emphysema, atelectasis).

CONCLUSIONS. In our experience, in a selected group of patients with ARDS of unknown origin, OLB offered a specific diagnosis in 65% and was contributive to patient management in the majority of cases.

0750

IS END-INSPIRATORY LUNG VOLUME A PREDICTING FACTOR OF POTENTIALLY RECRUITABLE LUNG IN ALI/ARDS PATIENTS?

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INTRODUCTION. Acute Lung Injury (ALI) and Acute Respiratory Distress Syndrome (ARDS) are clinical syndromes associated with collapse of lung units, pulmonary infiltrates and hypoxemia. In ALI/ARDS patients the effects of positive end-expiratory pressure (PEEP) probably depends on the percentage of potentially recruitable lung (PRL), i.e., the proportion of total lung weight, measured at PEEP of 5 cmH_2O, accounted for non aerated lung tissue in which aeration was restored during a recruitment maneuver [1]. The quantitative spiral CT scan is presently the gold standard to assess PRL, even if it needs mobilization and movement of critically ill patients to CT room and it is a laborious and time consuming technique (needing dedicated software and manually drawing each lung image).

OBJECTIVES. Aim of this study was to evaluate if the gas volume delivered during a recruitment maneuver could predict the percentage of PRL computed by CT scan.

METHODS. Patients with ALI/ARDS underwent a spiral CT scan at 5 and 45 cmH_2O of airway pressure for clinical reasons. The percentage of PRL was computed by a dedicated software analysis of CT lung images manually outlined, while gas volume delivered during a recruitment maneuver was obtained both by a dedicated software analysis of CT lung images manually outlined and by bedside measurements: in fact, it corresponds to end-inspiratory lung volume (EILV) at inspiratory plateau pressure of 45 cmH_2O.

RESULTS. One hundred and seven patients (69 males, age 57 ± 17 years, BMI 26 ± 5 kg/m^2, PaO_2/FiO_2 192 ± 71, PEEP 11 ± 3 cmH_2O) were enrolled. The mean percentage of PRL and the mean EILV computed by software analysis were 12.9 ± 10.9% and 2,882 ± 1,113 mL, respectively. No significant correlation between PRL and EILV was found ($p = 0.001$, $r^2 = 0.09$) (Fig. 1).

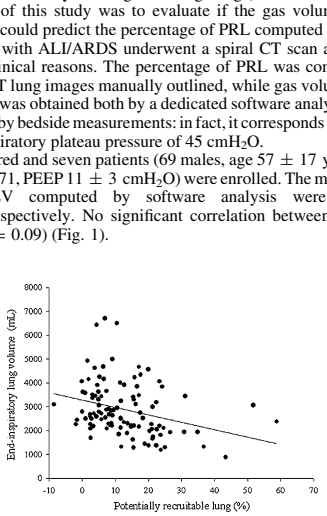

Fig. 1 Correlation between PRL and EILV in ARDS patients

CONCLUSIONS. EILV cannot be used to predict PRL, basing on analysis of available data. This may be due to overdistension induced by recruitment maneuver in lung regions already open at a PEEP value of 5 cmH_2O. Another hypothesis is that the recruitment maneuver can open lung regions without a change in lung mechanical properties, such as static compliance.

REFERENCE. Gattinoni L, et al. N Engl J Med 2006;354:1775–1786.

0751

BOHR'S DEAD-SPACE TO MONITOR OVERDISTENSION DURING A PEEP TRIAL

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INTRODUCTION. Selecting PEEP during lung protective ventilation in ARDS patients remains a difficult clinical task. High PEEP may induce overdistension whereas low levels promote lung collapse and tidal recruitment. We have recently described the non-invasive measurement of Bohr's dead space (VD_{Bohr}) using volumetric capnography (VCap). As it measures true dead space without being contaminated by shunt effects it might become a useful clinical tool to detect overdistension and thus help select PEEP.

OBJECTIVES. To describe the behaviour of VD_{Bohr} and its ability to detect overdistension during a PEEP titration trial in a porcine model of ARDS.

METHODS. A two-hit lung injury model combining repeated saline lung lavages (to obtain a PaO_2/FiO_2 <200 mmHg) with 3 h of injurious ventilation [ZEEP + delta pressure (DP) of 35cmH_2O] was performed in 8 pigs. After baseline measurements a 2 min recruitment manoeuvre (PEEP 30 + DP 25cmH_2O) was performed followed by a 2 cmH_2O stepwise PEEP reduction from 26 to 6 cmH_2O where each level was maintained for 5 min. Volume controlled ventilation (Vt 6 ml/kg), RR 30 and $FiO_2$1 was applied during the entire protocol. At each PEEP, shunt, dynamic compliance (Cdyn) and VCap were measured. Maximal compliance corresponded to the onset of lung collapse (arrows in Fig. 1). VD_{Bohr} was computed as $(PACO_2 - P\bar{E}CO_2)/PACO_2$. Both, mean alveolar ($PACO_2$) and mixed expired ($P\bar{E}CO_2$) CO_2 were calculated directly from the volumetric capnogram. Airway dead-space (VD_{aw}) was calculated using a mathematical approach identifying the midpoint of phase II as the inflection point of the whole capnogram where its curvature changes sign and alveolar dead space (VD_{alv}) by subtracting VD_{aw} from VD_{Bohr}.

RESULTS. According to changes in VD_{Bohr} animals could be divided into two clusters with distinct behaviours: Group1 (n = 3): A biphasic response suggested overdistension to occur at high and at low levels of PEEP. Group2 (n = 5): a progressive monotonous decrease (Fig. 1). When analyzing the three final PEEP steps group 1 showed a higher shunt and lower compliance (48 ± 9 vs. 33 ± 2%, $p = 0.01$; 12.9 ± 4.4 vs. 17.2 ± 4.8 ml/cmH_2O, $p = 0.093$, respectively). VD_{alv} progressively increased in both groups whereas VD_{aw} decreased in both groups but increased again at low levels of PEEP only in group1.

CONCLUSIONS. VD_{Bohr} measured by volumetric capnography provides a non-invasive breath-by-breath means of monitoring overdistension and may help in selecting PEEP.

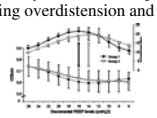

Fig. 1 VDBohr and Cdyn during decremental PEEP levels

0752

ACUTE COR PULMONALE AND PATENT FORAMEN OVALE IN EARLY ARDS: A TRANSESOPHAGEAL ECHOCARDIOGRAPHIC STUDY

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INTRODUCTION. Acute increase in right ventricular (RV) afterload secondary to acute respiratory distress syndrome (ARDS) may result in acute cor pulmonale (ACP) and patent foramen ovale (PFO).

OBJECTIVES. To prospectively determine the incidence of ACP and PFO in ventilated patients admitted to the ICU for ARDS using transesophageal echocardiography (TEE) and to evaluate their potential prognostic value.

METHODS. This multicenter descriptive study which plans to enroll 200 patients over a 2-year period. Patients were eligible if: >18 years old, presenting with ARDS (acute onset, bilateral infiltrates on chest radiography, $PaO_2/FiO_2 \leq 200$ with FiO_2 1 and PEEP ≥5 cmH_2O, absence of elevated left ventricular pressure based on E/E' <8) with diagnostic criteria fulfilled since less than 48 h. TEE was performed by highly trained intensivists and digitally recorded for off-line analysis. TEE studies were reviewed independently by two intensivists with expertise in echocardiography and no access to patients' charts and identity. ACP was diagnosed based on the association of a dilated RV and paradoxical septal motion in the transgastric short-axis view; PFO was detected by a positive contrast study in the bicaval view. A logistic regression was performed to identify potential factors associated with 28-day mortality.

RESULTS. Since November 2009, 134 patients were studied (men 67%; mean age 54 ± 15 years; SAPSII 44 ± 17; SOFA 7.5 ± 3.5; PaO_2/FiO_2 117 ± 43; V_T 410 ± 70 mL; PEEP 11 ± 3 cmH_2O; plateau pressure 25.5 ± 4.3 cmH_2O; $PaCO_2$ 47 ± 11). Sixty-two patients (49%) received a vasopressor support for an associated circulatory failure. Etiology of ARDS was bacterial pneumonia (33%), H1N1 (27%), septic shock (8%), aspiration (8%) and others (24%). Day 28 mortality was 21%. ACP was observed in 28/134 patients (20.9%; 95% CI 14.4–28.8), and a PFO was noted in 18/134 patients (13.4%; 95% CI 8.2–20.4). In no case the right-to-left interatrial shunt was massive. In only 3/18 patients (17%) the shunt was continuous throughout the respiratory cycle. Right atrial opacification by the contrast study was deemed subtotal due to the presence of a large Eustachian valve in 10 patients (7%). Age, PaO_2/FiO_2 and ACP were associated with the presence of a PFO ($p = 0.02$), $PaCO_2$ being not quite significant ($p = 0.09$). Factors associated with 28-day mortality were: SAPS2 ($p = 0.01$; OR 1.04; 95% CI 1.01–1.06), mean arterial pressure ($p = 0.05$; OR 0.97; 95% CI 0.94–1.0), V_T ($p = 0.01$; OR 1.01; 95% CI 1.0–1.02), and plateau pressure ($p = 0.01$; OR 1.15; 95% CI 1.04–1.27) at inclusion. CPA and PFO were not predictive of death ($p = 0.73$ and 0.86, respectively).

CONCLUSIONS. In this population of ARDS patients submitted to protective ventilation, the incidence of ACP was similar to that previously reported, but PFO was usually not associated with major intracardiac shunt. Factors associated with death remain to be confirmed in the entire cohort of patients.

GRANT ACKNOWLEDGMENT. Prix SRLF.

0753

THE USE OF AN OESOPHAGEAL BALLOON TO MEASURE PLEURAL PRESSURE: EFFECTS OF DIFFERENT INFLATION VOLUMES

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INTRODUCTION. Oesophageal pressure is widely used as a surrogate for pleural pressure to obtain transpulmonary pressure, lung and chest wall mechanics.

OBJECTIVES. To evaluate in an in vitro model the accuracy of pleural pressure (Ppl) measurement by means of an oesophageal balloon.

METHODS. A nasogastric tube (Nutrivent, Sidam s.r.l., Mirandola (MO), Italia) provided by a latex balloon (10 cm length, 10 ml maximal volume) connected by a 3-way stopcock to a pressure transducer (Transtar, Medex medical Ltd, GB) and to a 10 ml syringe, was inserted in a pleural-oesophageal mechanical simulator. This consisted of a rigid and transparent plastic cylinder, provided by inlet and outlet sealed ports for the nasogastric tube and an additional port connected by a 3-way stopcock to a 100 ml syringe and to a second pressure transducer. The pressure inside the cylinder (the "pleural" pressure) was set to the desired values by inflating or suctioning different air volumes through the additional port. A latex elastic tube (the "oesophagus") was placed inside the cylinder between the inlet and the outlet port; its inner diameter was slightly greater than that of the nasogastric tube, whereas the elastic properties were similar to those of the in vivo human oesophagus. In order to mimic tidal changes of Ppl, we applied a 10 cmH_2O pressure increase (ΔPpl) to 5 different basal "pleural" pressure inside the cylinder: −5, 0, +5, +10 and +15 cmH_2O. Once inserted in the oesophagus, the balloon was inflated with 7 different volumes (0, 0.5, 1, 2, 3, 4 and 6 ml) at each basal pleural pressure. We evaluated the transmission to the oesophageal balloon of both the absolute pleural pressure (Poes vs. Ppl) and of the applied change in pleural pressure (ΔPoes vs. ΔPpl).

RESULTS. Figures 1 and 2 show, in all basal pleural pressures tested, mean values ± SD of the difference between Poes-Pl and ΔPoes-ΔPpl, as a function of the balloon inflation volume. Figures 3 and 4 show, in 3 different conditions (basal Ppl −5, 0 and +15 cmH_2O) the difference between Poes-Pl and ΔPoes-ΔPpl, as a function of the ballon inflation volume.

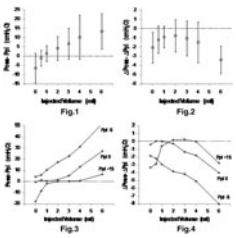

Fig. 1

CONCLUSIONS. The accuracy of pleural pressure monitoring depends on the volume injected in the oesophageal pressure measuring system, particularly for absolute values. The optimal volume to be injected seems to be a function of the basal pleural pressure.

0754

ACCURACY OF A NEW VISUAL RADIOLOGICAL SCALE IN ASSESSING POTENTIALLY RECRUITABLE LUNG IN A HETEROGENEOUS POPULATION OF ARDS PATIENTS

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INTRODUCTION. In Acute Lung Injury (ALI) and Acute Respiratory Distress Syndrome (ARDS) patients, the potentially recruitable lung (PRL) is useful to set mechanical ventilation's parameters. We present two methods to assess PRL: a software analysis of quantitative spiral CT scan and a visual radiological scale analysis of CT.

OBJECTIVES. Aim of this study was to determine if the accuracy of the two proposed methods could be influenced by the amount of PRL.

METHODS. Each patient underwent a whole lung CT scan at 5 and 45 cmH_2O of airway pressure. For the software analysis, PRL was defined as the proportion of the non aerated lung tissue in which aeration was restored during a recruitment maneuver [1]; for the visual analysis, PRL was defined as the difference in non aerated tissue between 5 and 45 cmH_2O of airway pressure considering lung lobar volumes as percentage of TLC [2]. The enrolled patients were divided in two groups according to the median PRL. A Bland–Altman analysis was performed on both groups in order to determine the agreement between software and visual PRL.

RESULTS. Thirty ALI/ARDS patients were enrolled and divided in two groups according to the median PRL (median = 15.7%). There were no significant differences in characteristics between the two groups (Table 1).

TABLE 1 MAIN CLINICAL CHARACTERISTICS IN PRL GROUPS

	Low PRL group	High PRL group
Patients (n)	15	15
Age (years)	58 ± 18	60 ± 19
BMI (kg/m^2)	27.5 ± 7.2	25.6 ± 3.5
PEEP (cmH_2O)	10 ± 1	10 ± 1
PaO_2/FiO_2	182 ± 51	162 ± 61

The average PRL computed by software and by visual analysis were 9.0 ± 4.0 and 8.0 ± 4.0% in the low PRL group, and 20.8 ± 4.2 and 15.8 ± 5.3% in the high PRL group. Bland–Altman analysis showed a bias of 1.05 with a 95% CI (−5.96; 8.05) in low PRL group (Fig. 1A), whereas it showed a bias of 4.97 with a 95% CI (−3.61; 13.56) in high PRL group (Fig. 1B).

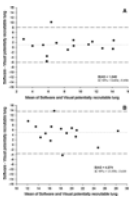

Fig. 1 Bland–Altman analysis in PRL groups

CONCLUSIONS. While in low PRL group the two analysis's methods revealed high accuracy, in high PRL group the Bland–Altman analysis showed that visual radiological analysis underestimated PRL of about 5%. Despite this underestimation, visual radiological analysis can be considered more useful, time sparing and reliable method than the software analysis to assess PRL in clinical practice.

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0755

PULMONARY EMBOLISM IN H1N1-INDUCED ACUTE RESPIRATORY FAILURE: THE ROLE OF BEDSIDE CHEST ULTRASONOGRAPHY

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INTRODUCTION. H1N1-induced acute respiratory failure is often refractory to treatment and associated with a high mortality. Autopsy studies have shown a high incidence of pulmonary embolism (PE) in fatal cases. PE is possibly often unrecognized in H1N1-induced ARDS, because of the risks and difficulties in transporting unstable patients for a CT or a lung scan.

OBJECTIVES. The aim of this study is to describe our experience with bedside lung ultrasonography and echocardiography in H1N1-induced acute respiratory failure.

METHODS. All patients with confirmed H1N1 influenza, admitted to the ICU from January till March 2011, were included in this study. Echocardiography and lung echography were performed on admission and at least once daily on the following days till patients' discharge or death. Information from ultrasonography was compared to chest X-ray and CT scan findings.

RESULTS. Seven patients with confirmed H1N1-induced acute respiratory failure were admitted to the ICU (two female and five male, age 15–75). All patients were intubated and mechanically ventilated. Three patients presented with pulmonary thromboembolism: two with right atrial thrombosis and one with deep vein thrombosis at multiple sites (both femoral veins, inferior vena cava, and right jugular vein) and massive lung hemorrhage. One underwent thrombolysis because of obstructive shock with acute core pulmonale, and all three received full anticoagulation. Only one of them was stable enough to undergo CT pulmonary angiography. Lung ultrasonography revealed multiple lesions consistent with distal thromboemboli in six of the seven patients: subpleural, triangular or rounded, hypoechoic lesions containing small central hyperechoic structures (indicating the presence of air in the affected bronchiole). Four of the seven patients have survived and all of them were discharged from the ICU.

CONCLUSIONS. Pulmonary thromboembolism may be often associated with H1N1-induced respiratory failure and its high mortality.
2. Bedside chest ultrasonography (combined heart and lung scans) could be valuable in diagnosing PE in critically ill patients with H1N1-induced acute respiratory failure.

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0756

EIT BASED ASSESSMENT OF REGIONAL VENTILATION DISTRIBUTION IN AN EXPERIMENTAL MODEL OF SEVERE ARDS

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INTRODUCTION. The concept of lung protective ventilation consists of limitation of inspiratory pressure (P_{insp}), reduction of tidal volume (V_T) and optimization of positive end-expiratory pressure (PEEP). The reduction of V_T may only partially be compensated for by increasing the respiratory rate because the alveolar ventilation might become to low and hence arterial partial pressure of carbon dioxide (P_aCO_2) may rise. PEEP may recruit atelectatic lung areas and thereby improve gas exchange and avoid end-expiratory lung collapse, which is known to be detrimental. On the other hand PEEP can lead to overinflation of the lung or of certain areas of the lung. It is not known how regional distribution of ventilation and end-expiratory lung volume (EELV) are affected by changes in tidal volume and PEEP in severe acute respiratory distress syndrome (ARDS).

OBJECTIVES. The aim of this study was to examine the effect of different PEEP levels on regional distribution of ventilation and end-expiratory lung volume (EELV) using low and high tidal volumes.

METHODS. 10 pigs (50 ± 5 kg, mean ± SD) were ventilated in a volume-controlled mode. Acute lung injury (ALI) was induced by repeated bronchoalveolar lavage. A pumpless arteriovenous extracorporeal membrane oxygenator (interventional lung assist (ILA), Novalung, Hechingen, Germany) was used to compensate for decreased alveolar ventilation with small tidal volumes. PEEP was set 2 cmH_2O above the lower inflection point of a static pressure–volume curve. The animals were ventilated with 10 ml/kg V_T and ILA clamped and with 5 ml/kg V_T and open ILA for 30-min long time intervals in each setting. Regional ventilation was recorded with electrical impedance tomography (EIT system GoeMF II, CareFusion, Hoechberg, Germany) and in combination with plateau pressures the regional compliance was calculated. Measurements were performed during baseline and after induction of lung injury. The distribution of regional ventilation, EELV and regional compliance were analysed.

RESULTS. Low V_T in the normal lung and ALI led to a shift of the ventilation towards the ventral regions of the lung. EELV decreased with ALI. With high PEEP levels ventilation of the dorsal parts of the lung and EELV increased again and the compliance increased in the dorsal regions and decreased ventrally. Increase of compliance indicates more ventilated lung with respective pressure and hence indicates lung recruitment. Conversely a decrease would indicate an overinflation of the lung.

CONCLUSIONS. High PEEP levels lead to a shift of the ventilation to the dorsal regions of the lung. Analysis of regional compliance suggests recruitment in the dorsal regions and overinflation in the ventral regions of the injured lung.

GRANT ACKNOWLEDGMENT. The study was partially supported by Novalung, Hechingen, Germany.

0757

MEASUREMENT OF PEEP RELATED CHANGES IN END-EXPIRATORY LUNG VOLUME BY ELECTRICAL IMPEDANCE TOMOGRAPHY IN EXPERIMENTAL LUNG INJURY

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INTRODUCTION. End-expiratory lung volume (EELV) can noninvasively be monitored by Electrical Impedance Tomography (EIT) at bedside [1]. However, EIT was shown to overestimate EELV in case of recruitment as a result of changes in PEEP [2].

OBJECTIVES. To analyze whether a stepwise repeated calibration of tidal impedance variation (ΔZ) and end-expiratory lung impedance (EELI) improves measurement of PEEP related changes in EELV by EIT.

METHODS. Experimental lung injury was induced by abdominal hypertension oleic acid injection in 7 anesthetized and ventilated pigs. PEEP was changed from 0 to 25 cmH_2O in steps of 5 cmH_2O in a randomized order. At each PEEP level Computed Tomography (CT) of the lung was performed during end-expiration. Additionally, ΔZ and EELI were calculated from EIT measurements. The ratio of ΔZ and tidal volume (ΔZ/VT) was calculated at every single PEEP level. PEEP related lung volume changes were estimated from EIT by dividing changes in EELI between different PEEP levels (ΔEELI) by ΔZ/VT of zero PEEP (one point calibration) [2] and by ΔZ/VT of the respective PEEP level (stepwise repeated calibration). ΔEELV was calculated from CT. Linear correlation and Bland-and-Altmann analyses were used to compare lung volume changes calculated from EIT and CT.

RESULTS. Correlation and aggreament of EIT and CT based measurement of PEEP related changes in EELV are given in Table 1.

TABLE 1

	One point calibration	Repeated stepwise calibration
r^2	0.78	0.84
Bias	124 ml	127 ml
SD	129 ml	127 ml

CONCLUSIONS. In our animal model, calculation of PEEP related changes in end-expiratory lung volume from EIT resulted in an overestimation when compared to CT. A stepwise repeated calibration of changes in end-expiratory lung impedance increases correlation but not agreement of EIT and CT based EELV measurement when compared to previously reported one point calibration [2].

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GRANT ACKNOWLEDGMENT. Departmental funding.

0758

AGREEMENT OF TWO METHODS FOR ASSESSING PRESSURE/TIME CURVE PROFILE (STRESS INDEX) IN ARDS

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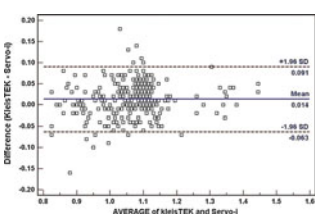
INTRODUCTION. Analysis of the shape of the airway pressure/time curve (Paw-t) during constant flow mechanical ventilation (Stress Index = SI) has been used to predict mechanical stress. The mathematical coefficient describing the shape of the Paw-t curve may therefore identify and quantify mechanical stress during ventilation. In experimental studies, the threshold values for *SI* that best discriminated lungs with and without morphological, histological signs and biological markers of Ventilator Induced Lung Injury ranged between 0.9 and 1.1. The implementation of a *SI* monitoring software on ventilator would allow an easier use and bedside access.

OBJECTIVES. We compared *Stress Index* values collected on the ventilator using a dedicated software with the values obtained using experimental device.

METHODS. The experimental device (KleisTEK Engineering, Bari, Italy) measures the flow with a pneumotacograph connected to a differential pressure transducer inserted between the Y piece of the ventilator circuit and the Endotracheal Tube (ET). The Paw is measured proximal to ET. All variables are collected and the mean portion of Paw-t curve was analyzed trough the algorithm of Levemberg-Marquardt. *SI* is represented by the b factor of the equation: Pao=a × t^(b) + c. Servo-i (Maquet) have been implemented by a real time *SI* analysis software using measurements of flow and Paw as performed by the ventilator.
Multiples measurements on different ventilation settings have been performed at the same time with the two devices (Servo-i and KleisTEK) on 10 ARDS patients. Data have been compared with the statistical analysis proposed by Bland & Altman in order to assess agreement between two *SI* measurement techniques.

RESULTS. The strength of the relation between two variables is r = 0.92 (CI 0.9–0.93; p < 0.0001). For Bland&Altman see Fig. 1



CONCLUSIONS. Statistical analysis show a good correlation and agreement in the measurements taken by the ventilator's software than those of the reference device.

GRANT ACKNOWLEDGMENT. PRN60ANRA04.

0759

RESPIRATORY RELATED CVP VARIATIONS, AN ALTERNATIVE TO ESOPHAGEAL PRESSURE FOR MONITORING LUNG MECHANICS?

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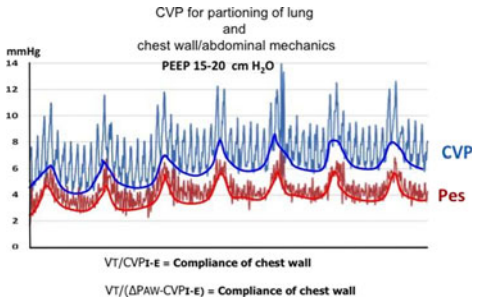
INTRODUCTION. Esophageal pressure (Pes) has been used as a surrogate for pleural pressure to estimate transpulmonary pressure and guide ventilation in ARDS [1]. Still it may be cumbersome to measure Pes and the reliability of the measurements has been questioned [2]. An alternative to Pes could be to measure respiratory related central venous pressure variations which are readily available in most ICU patients [3].

OBJECTIVES. To assess if CVP can be used as a substitute for Pes to estimate respiratory variations in pleural pressure.

METHODS. After ethical approval, 11 anesthetized pigs (32–42 kg) and six patients with acute respiratory failure were studied. CVP was measured using catheters in vena cava superior with the pressure receptor at the right atrium level. Pes was measured with an airfilled catheter in the esophagus, the position tested according to Baydur [4]. During controlled mechanical ventilation with tidal volume (Vt) 6 and 10 ml/kg in patients and pigs respectively, a PEEP-step manoeuvre was performed (0, 5,10,15 and 20 cmH_2O), 3–5 min at each step, Respiratory variations were also studied at different Vt. Pes and CVP were measured at endexpiration and endinspiration. Due to cardiac interference, CVP and Pes was calculated as the mean of systolic and diastolic values. Preview Graph



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RESULTS. Respiratory variations in CVP and Pes were similar during the PEEP steps both in pigs (3.9 ± 1.1 vs. 4.3 ± 1.4 cmH_2O, mean difference 0.4 ± 1.6; SD) and in patients (4.7 ± 2.5 vs. 4.1 ± 0.7 cmH_2O, mean diff 0.7 ± 2.0; SD). Increasing PEEP from 0 to 20 cmH_2O resulted in greater increases in absolute end expiratory values of CVP versus Pes (+8.0 ± 1.8 vs. +5.8 ± 1.1 cmH_2O, respectively, p < 0.01).

CONCLUSIONS. The study shows that measuring respiratory variations in CVP may be a possible alternative to Pes for determination of transpulmonary pressure as well as chest wall and lung elastance. The two measurements reflects pleural pressure changes in different regions. CVP reflects pleural pressure in ventral regions while Pes reflects middorsal regions.

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0760

FIO_2/PEEP (FPI): A SIMPLE INDEX FOR OPITIMIZING VENTILATOR SETTINGS

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INTRODUCTION. During mechanical ventilation oxygenation may be improved by increasing the fraction of inspired oxygen (FiO_2) or the positive end-expiratory pressure (PEEP). However, FiO_2 > 50% may cause hyperoxic damage, while high PEEP may lead to barotrauma [1]. Our aim was to describe our everyday's practice in setting FiO_2 and PEEP values.

METHODS. Prospective observational study in April 2010. We considered the physiological FiO_2/PEEP ratio (the 'FP-index', FPi) <7, as calculated from physiological values (21%/3 cmH_2O) and the ARDSnet trial's minimum settings (35%/5 cmH_2O) [2]. Patients were grouped according to their FPi values: Group-1: FPi <5; G-2: FPi = 5–7; G-3: FPi = 7–8; G-4: FPi > 8. Data were recorded on admission (T_0) and after 24 h (T_1). Data are presented as median (interquartile range) and analysed with Wilcoxon test.

RESULTS. 75 patients were enrolled. FPi in the total sample was: FPi_{T0} = 9(4); FPi_{T1} = 7(3), (p < 0.001). On admission 71% of the patients were in G-3 and G-4, and 51% remained so by T_1. In patients with FiO_2 > 50% (n = 51):FPi_{T0} = 10(9); FPi_{T1} = 7(4), (p < 0.001), and 77% were in G-3 and G-4 at T_0 and 44% at T_1. PaO_2 was normal throughout the observation: T_0 = 119(118), T_1 = 110(67) mmHg.

CONCLUSIONS. According to FPi values, patients were ventilated with higher than optimal FiO_2 and lower PEEP values in the first 24 h. Whether the simple FPi <7 target value may change our everyday routine to set ventilators better required further investigations.

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Hepatology & nutrition: 0761–0771

0761

THE OUTCOME OF CRITICALLY ILLNESS IN DECOMPENSATED LIVER CIRRHOSIS

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INTRODUCTION. The mortality of cirrhotic patients in the ICU varies between 50 and 100% probably depending on the severity of illness. Therefore, a proper triage of cirrhotic patients to the ICU is important. There is no consensus whether liver specific scores compared to APACHE II or SOFA scores are superior to predict outcome in these patients.
OBJECTIVES. The hypothesis was that increasing organ failure especially acute kidney injury (AKI) treated with CRRT correlates with increased mortality and that APACHE II and SOFA are better to predict mortality in decompensated liver cirrhosis compared to the Child–Pugh liver specific score.
METHODS. A single center cohort analysis in a closed 18 bed multidisciplinary ICU. From January 2007 to January 2010 87 adult patients (2.7% of all acute admitted adults) with liver cirrhosis were included. The department had no specific exclusion criteria.
RESULTS. The patients were severely ill with median sores: SAPS II 60, SOFA (day 1) 11, APACHE II 31, and Child–Pugh 12. From ROC curves AUC was 0.79 for SOFA day 1 and 0.81 for APACHE II compared to 0.59 for Child–Pugh. In decompensate liver cirrhosis the 90 days overall mortality was 82%. For patients receiving mechanical ventilation only the 90 days mortality was 76%. Further complicated with respiratory failure and need of pressure agents for shock the 90 days mortality increased to 89%. Patients in need of mechanical ventilation, pressure agents and CRRT because of AKI had a 90 days mortality of 93%.
CONCLUSIONS. SOFA and APACHE II were better to predict mortality than Child-Pugh. With MODS including AKI in decompensated liver cirrhosis the mortality is nearly 100%. To improve ICU outcome in these patients exclusion criteria have to be developed.

0762

SLOWER PUFA WASHOUT FROM MEMBRANES AFTER IV COMPARED ORAL HIGH DOSE FISH OIL (FO) ADMINISTRATION IN HEALTHY SUBJECTS

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RATIONALE: Time to n-3 PUFA membrane incorporation has been shown to be shorter than previously known: literature suggests that weeks are required by the enteral route, while only a few hours are required by IV. By the latter route, it is still uncertain if the n-3 PUFA found on platelet membranes are true incorporation or simple adsorption after infusion.
AIM. To determine time to incorporation and washout after 0.6 g/kg FO administered either orally (OR) or (IV).
METHODS. Eight Healthy volunteers (age 23.8 ± 1.1 years; BMI 22.8 ± 2.9; 4 female 4 males) received 2 treatments: (1) IV: A FO lipid emulsion (Omegaven®, Fresenius Kabi) was infused IV in 3 h at day 1 (D1). 2) OR: On D8 they received over 3 days the same 0.6 g/kg FO dose orally. Blood samples: (IV): at baseline (t0), t60, t120, t180, t240, t360 min, then D2, D3, D4, D5: OR at baseline (D8) then on D9, D10, D11, D12 and D15. Analysis: platelets' membrane fatty acid composition, plasma triglycerides (TG) The volunteers received diet guidelines during the trail. Statistics: mean ± SD, Wilcoxon signed-rank (level of significance $p < 0.05$).
RESULTS. After IV perfusion plasma TG peaked at t240 (13.6 ± 3.6 mmol/l), and reverted to baseline values by D2: after oral FO, plasma TG remained within normal ranges. Significant progressive membrane EPA enrichment was observed between t60, t120, t360 and D2 (delta max: 0.87 ± 0.34 mmol%). Washout time IV: EPA concentrations on D8 (7 days after FO perfusion) were still significantly higher than on t60. The EPA concentration equals the levels of 2 h FO perfusion (0.4 g/kg). After OR FO, the membranes were stepwise significantly enriched with EPA (peak D11: delta max: 0.79 ± 0.21 mmol%). Washout time OR: EPA levels at D15 (5 days after final OR administration) were above the OR baseline D8 and equals D9 (0.2 g/kg).
CONCLUSION. N-3 PUFA incorporation was confirmed after rapid IV infusion, with an unsuspected prolonged persistence beyond D8 (7 days after infusion), suggesting a true membrane incorporation. One day (0.2 kg) oral supplementation already increased membrane EPA content, while the total 0.6 g/kg oral dose kept TG within normal ranges. The administration mode (IV vs. OR) seems to have a influence on the EPA membranes washout.
DISCLOSURE OF INTEREST. F. Delodder: None Declared, C. Perrudet: None Declared, L. Liaudet: None Declared, G. Gagnon: None Declared, P. Schneiter: None Declared, L. Tappy: None Declared, M. Berger Grant/Research Support from: FreseniusKabi, BBraun, Aguettant, Consultant of: Baxter.

0763

EFFECT OF LCT-MCT LIPID EMULSIONS ON GAS EXCHANGE AND HEMODYNAMIC DATA IN A COHORT OF CRITICALLY ILL PATIENTS

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OBJECTIVES. To study the effect of LCT-MCT lipid emulsions on hemodynamic data and gas exchange in a cohort of critically ill patients.
METHODS. Cohort, prospective, observational studio in an adult medical-surgical ICU. The gas exchange and hemodynamic data were obtained retrospectively. Lung Injury Score, core temperature, Respiratory system compliance, PaO_2/FiO_2, mean blood pressure and the amount of lipid administered were assessed at the start of the infusion, at 24, 48, and 72 h in 72 adult patients. Data were analyzed using repeated measures models and corresponding standard errors. Statistical significance was set at $p < 0.05$. PASW statistical software (version 18.0, SPSS, Chicago, IL, USA) was used.
RESULTS. Forty patients received lipid emulsions and 32 were the control group. Lipids were administered at an infusion rate (median; interquartile range) of 0.38 mg/kg/min (0.162; 0.86). Higher mortality was observed in patients receiving lipids: 37.5 vs. 15.6%, $p = 0.039$. There was a statistically significant decrease of PaO_2/FiO_2 that varied linearly over the study period between the pO_2/FiO_2 of patients who receives either no lipid or with respect to "lung injury score", the core temperature, respiratory system "compliance" and having Mean arterial blood pressure less than 70 mmHg. The evolution of the PaO_2/FiO_2 is shown in Fig. 1.

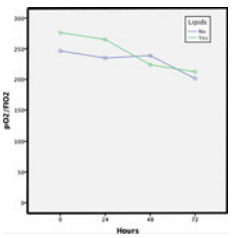

Fig. 1 Evolution PaO_2/FiO_2

There was no statistically significant differences ($p = 0.621$) compared to pO_2/FiO_2 in relation to the amount of lipids administered as shown in Fig. 2.

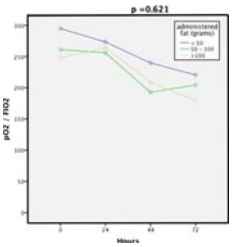

Fig. 2 pO_2/FiO_2 in relation amount of lipids
CONCLUSIONS. LCT-MCT lipid emulsions infused at a low rate of infusion in 24 h did not affect gas exchange or hemodynamic parameters in a cohort of critically ill patients. We only found a statistically significant linear variation of the ratio pO_2/FiO_2 over the study period in both groups.

0764

EFFECT OF AN EARLY, AGGRESSIVE FEEDING REGIMEN AND THE INSTITUTION OF A NUTRITIONAL SUPPORT TEAM ON CALORIC AND MACRONUTRIENT INTAKES AND DEFICIENCIES IN CRITICALLY ILL CHILDREN

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INTRODUCTION. Critically ill patients are at risk for inadequate feeding and subsequent increased morbidity. In pediatric critical care, reported effects of feeding protocols and/or nutritional support teams are contradictory.
OBJECTIVES. To measure the effect of a nutritional algorithm and the implementation of a nutritional support team on delivered amounts of calories and macronutrients during the first 10 days of admission on a tertiary pediatric intensive care unit.
METHODS. In the setting of a tertiary pediatric intensive care unit we performed a single center intervention study with historic controls during 2 separate 10-month periods. Patients with length of stay >3 days and mechanical ventilation were eligible for the study. The nutritional algorithm was based on early and aggressively incremental, nurse-driven enteral feeding. On indication, addition of parenteral nutrition was limited to 5 standardized, age-dependent ready-made solutions. Once a week and on demand, a nutritional support team, consisting of a pediatrician-intensivist, a nurse practitioner, and a clinical dietician, reviewed the nutritional regimen of all patients, and advised the attending clinicians. Endpoints of the study were delivered percentages of predefined goals for energy and macronutrients (fat, protein, carbohydrates) during the first 10 days of admission.
RESULTS. After implementation of the feeding protocol together with the institution of a nutritional support team, significantly higher amounts of enteral nutrition were delivered during the first 4 days of admission, compared to the control period. This resulted in higher achieved percentages of goals for calories and macronutrients, with subsequent decrease in cumulative protein and energy deficits.
CONCLUSIONS. The introduction of an early and aggressive nutrition protocol, and the institution of a dedicated nutritional support team, led to a significant better enteral feeding regimen during the first 4 days of admission on a tertiary pediatric intensive care unit, with a decrease in cumulative protein and energy deficits.
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0765

TOTAL PARENTERAL NUTRITION WITH GLUTAMINE SUPPLEMENTATION FOR SEPTIC PATIENTS WITH COLORECTAL LIVER METASTASIS RECEIVING CHEMOTHERAPY

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INTRODUCTION. Chemotherapy plays an important role in cancer treatment but may associate with several gastrointestinal complications, which can cause sepsis. Besides, malignant diseases and their treatment produce a system inflammatory response and metabolic stress, which is characterized by system deficiency of glutamine (Glu).

OBJECTIVES. It is assumed that the use of Glu supplementation for septic patients with colorectal liver metastasis receiving chemotherapy, can improve their condition.

METHODS. A prospective randomized study included 40 patients (pts) (M:F = 17:23, mean age 57) with colorectal liver metastasis receiving chemotherapy who developed several gastrointestinal toxicity (GIT) in the course of treatment. This GIT was complicated by the developing of sepsis. The pts were randomized into two groups. Pts of group1 (G1, n = 20) received standard (1 g/kg/day amino acids) total parenteral nutrition (TPN). Pts of group2 (G2, n = 20) additionally received i.v. Glu (0.3 g/kg/day Glu). TPN was given 10 days. The pts in groups were identical according to the severity of disease (APACHE II) and the standard of intensive care. Activity of AST, ALT, gamma-glutamyl transferase (GGT), concentration of total protein, albumin, total bilirubin, C-reactive protein, procalcitonin and clinical data were measured before the start of TPN and after the administration. The significance of differences was assessed by Student's t-test and Chi-square test.

RESULTS. There were no differences in the concentrations of total protein, albumin, total bilirubin, ALT, AST duration of hospitalization, 28-day survival. After Glu supplementation, GGT activity was significantly higher in the G1 compared the G2 (284.8 ± 66.4 U/l vs. 139.4 ± 76.4 U/l, $p < 0,05$). In G2 encephalopathy and acute pancreatitis was significantly less ($p = 0.013$).

CONCLUSIONS. Changes in enzyme levels indicate the cholestatic type of hepatobiliary deviations. Administration of glutamine for these patients has a positive effect on functional status of liver and clinical outcome in these patients.

0766

PROSPECTIVE AUDIT OF NASOGASTRIC PH AND CONFIRMATION OF CORRECT PLACEMENT OF NG TUBES IN CRITICAL CARE PATIENTS AT THE ROYAL GWENT CRITICAL CARE UNIT

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INTRODUCTION. Establishing enteral feed in critically ill patients is widely accepted l. However the National patient safety agency (NPSA) recognised that malplacement of nasogastric (NG) tubes is associated with significant morbidity and mortality [1].

OBJECTIVES. In our study we were assessing our ability to routinely obtain NG aspirates with pH < 5.5 to confirm that a NG feeding tube is correctly positioned in critically ill patients.

METHODS. The study was registered with the Aneurin Bevan Health Board, Newport, UK.This was a perspective audit carried out over a 2-week period at the Royal Gwent Critical care unit during september 2009. Data were collected whenever a patient needed an NG feeding tube and the aspirate pH tested daily. The results were analysed and new guidelines developed and the audit repeated in September 2010 for a further 2 weeks. The change in practice was to introduce a 4 h break in feeding regime from 0600 to 1000 everyday.

RESULTS. The first data collection over the 2-week period produced 55 data entries from 8 patients. Of these entries, 43 (78%) obtained an aspirate, 11 (20%) obtained no aspirate. From the patients in which an aspirate was obtained, 54% of aspirates had a pH < 5.5. Scrutiny of these results showed that the pH of 1.5 was obtained when feeding had been temporarily stopped but that 4 h after the feed was recommenced, the pH had risen to 4.5. In the case of two of the pH 4.5 aspirate entries feeding had stopped 1 h prior to testing. Over the 2 weeks 14 chest X-rays were requested. The 2nd cycle produced 46 data entries from 11 patients, in the 2-week period. Of these entries, 32 (69%) obtained an aspirate, 10 (22%), obtained no aspirate. From the patients in which an aspirate was obtained, 91% of aspirates had a pH of 5.5 or lower compared with 54% of aspirates in the first cycle. Six chest X-rays were requested during the 2 weeks to confirm tube position. The audit also demonstrated that some patients consistently have readings of 6 or above irrespective of their feeding regime or any acid inhibiting medication prescribed.This highlighted that alternative measures to pH need to be used to confirm tube position. The NPSA suggested documenting the external length of all NG tubes should be documented on their insertion so that if it is not possible to obtain a satisfactory aspirate then external length could be checked. This has been adopted as routine practice on our unit.

CONCLUSION. By introducing a 4 h feeding break between 0600 and 1000 it was possible to obtain NG aspirate in 91% with pH < 5.5 and reduced the need for confirmatory chest X-rays by 50% with no increase in adverse events or critical incidents. There was no loss of calorific intake during the second audit cycle as the daily regimes were modified for delivery over 20 h instead of 24.

REFERENCE. 1. National Patient safety Agency: Reducing harm caused by malplacement of nasogastric feeding tubes; Patient safety alert 05:Feb.05.

0767

ESOPHAGEAL VARICEAL BLEEDING (EVB): ADHERENCE TO TREATMENT RECOMMENDATIONS AND OUTCOME IN CLINICAL PRACTICE

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AIMS. Inappropriate adherence to practice guidelines might be responsible for high mortality rates in patients with EVB. It was the aim of this study to evaluate adherence to existing guidelines in these patients.

METHODS. Review of clinical records of all patients with cirrhosis admitted to a German university hospital due to variceal bleeding between 2004 and 2010 with regard to the following recommendations: 1. Volume support/blood transfusions 2. Antibiotic prophylaxis 3. Vasoactive pharmacologic therapy 4. Upper endoscopy within 12 (24) h 5. TIPS-placement in patients with uncontrolled bleeding 6. Temporary balloon tamponade in uncontrollable bleeding. Further endpoints: mortality, recurrent bleeding rate and associated complications.

RESULTS. 74 episodes of EVB; 67 patients (m41/f26, age 53 ± 14 years) with cirrhosis (39 alcoholic/16 viral/5 other/7 cryptogenic). Initial MELD was 17 ± 9 (normal ward (NW): 13 ± 6; ICU 20 ± 11). Days in hospital: median 7 (range 1–74; ICU 4, 1–28). Hypovolemic shock was present in n = 24 (32%) [NW 9/36 (25%); ICU 15/34 (44%); $p = 0.128$]. Hemoglobin (g/dl) was 7.9 ± 2.1. Transfusion (no. of RPC 6 ± 11 [NW 1 ± 2; ICU 11 ± 14; $p < 0.001$]) to maintain a hemoglobin of 8 g/dL was sufficient in 50/71 (70%) [NW 28/35 (80%); ICU 22/35 (63%); $p = 0.112$]. Antibiotic prophylaxis was performed in 51/69 (74%) patients [NW 17/35 (49%); ICU 34/34 (100%); $p < 0.001$]. Vasoactive treatment (terlipressin) was performed in 21/69 (30%) patients [NW 1/35 (3%); ICU 21/34 (62%); $p < 0.001$]. Endoscopic therapy in 68/74 (92%) of patients within first 24 h. Ligature was more frequently used than sclerotherapy [45/74 (71%) vs. 17/74 (23%); $p < 0.001$], a combination of both in 6/74 (8%). Total no. of endoscopies: 2 ± 1 [NW 1 ± 1; ICU 2 ± 1; $p < 0.001$]. Persistent or relapsing bleeding occurred in 12/74 Patients (16%) [NW 0/36 (0%); ICU 12/38 (32%); $p < 0.001$]. Balloon tamponade was used in 6/12 (50%) episodes. TIPS was performed in 2/4 (50%) patients with ongoing bleeding despite two trials of endoscopic therapy. In-hospital mortality was 17/74 (23%) [NW 2/36 (6%); ICU 15/38 (39%); $p = 0.003$]. Mortality due to ongoing bleeding was 9/74 (12%) [NW 0/35 (0%); ICU 9/38 (24%); $p = 0.002$]. There was significant association (Wilcoxon test) of INR ($p = 0.001$) and presence of HE ($p = 0.002$) with mortality. Furthermore initial creatinine ($p < 0.001$), ARF ($p < 0.001$), lowest diastolic (but not systolic) RR ($p = 0.01$), and overall no. of RPC ($p < 0.001$) were associated with mortality. On ICU also higher APACHE-II ($p = 0.003$) and SAPS-II ($p = 0.001$) scores predicted a negative outcome.

CONCLUSIONS. Despite an overall acceptable implementation of treatment recommendations in clinical practice the mortality in EVB patients remains high. The stage of underlying chronic liver disease has major impact on outcome in EVB-patients. Awareness for the impact of vasoactive therapy and antibiotic prophylaxis is significantly higher in an ICU setting.

0768

IMMUNONUTRITION FOR GASTROINTESTINAL CANCER PATIENTS: AN EFFECTIVE AND COST-SAVINGS INTERVENTION

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INTRODUCTION. Immunonutrition intervention has been demonstrated to be effective by relieving the burden of post-surgical infectious complications for gastrointestinal cancer patients [1].

OBJECTIVES. The aim of this study is to assess the associated economic impact of using immunonutrition to control for hospital-acquired infections, in routine hospital practice.

METHODS. Based on the meta-analysis results and US hospital costs data [2], the hospital cost savings due to the use of immunonutrition were computed by using decrease in length of stay as well as from reduction in each infectious complication, including anastomotic leak, wound infection, pneumonia, urinary tract infection, and sepsis.

RESULTS. Use of immunonutrition was associated with hospital savings of $6,963 per patient based on reduction in hospital length of stay, of $2,4797 based on reduction in overall infectious complications and ranged from $853 to $6,273 when considering reduction in each complication type. Among patients with infectious complications, the highest hospital savings occurred for patients receiving peri-operative immunonutrition; whereas when considering the overall patients' population, the highest savings occurred with the peri-operative regimen.

CONCLUSIONS. Use of immunonutrition for patients undergoing surgery for GI cancer is an effective and cost-saving intervention. Investing in immunonutrition for pre- or peri-operative use allows hospitals to make the highest savings by decreasing infectious complications.

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GRANT ACKNOWLEDGMENT. Analysis financially supported by & co-developed with Nestle HealthCare Nutrition.

0769

EVALUATION OF QUALITY NUTRITIONAL INDICATORS OBTAINED FROM THE ICU ELECTRONIC INFORMATION SYSTEM

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INTRODUCTION. Electronic information systems in the ICU allow access to structured nutritional and metabolic information of the critical ill patient at the bedside and provide automatic calculation of the caloric and protein requirements. They can also be a powerful tool for monitoring the quality nutritional indicators.

OBJECTIVES. To analyse the results of the quality nutritional indicators in a 12 beds general ICU between June and December 2010 and compare these results with the standard settled by our ICU based on current literature.

METHODS. We defined five quality indicators (Table 1), which are easily obtained from data collected in the nutritional flowsheet of the computerized system at the point of care (Picis CareSuite®). Two of the indicators are related to the energy balance (EB) as it has been shown that a negative EB is highly correlated to the occurrence of complications in the ICU. The EB is calculated daily by the system based on all enteral and parenteral nutrients administered. To obtain the indicators, the computerized system used the formulas depicted in Table 1.

RESULTS. During the study period 82 patients received artificial nutrition (43% parenteral, 22% enteral, 18% both) for a total of 827 days. A total of 8,081 determinations of blood glucose were obtained. Table 1 shows the results obtained for the selected indicators and its comparison with the standard. In two of them, the performance was below standard, which enabled us to establish a plan in order to improve the compliance with the standard in the next review process.**TABLE. 1**

Quality Indicator	Formula to obtain the quality indicator	Results obtained	Standard
Calorie and protein requirements prescribed within the first 24 hours of admission	No. of patients with artificial nutrition (AN) whose requirements are prescribed within the first 24 hours of admission / No. of patients with AN x100	60%	90%
Energy balance (EB) within the first 72 hours of admission	No. of measurements of EB with a value ≥ 50% within the first 72 hours of admission in patients with AN prescription / No. of measurements of EB within the first 72 hours of admission in patients with AN prescription x100	95%	70%
Energy balance 72 hours after admission	No. of measurements of EB with a value ≥ 80% 72 hours after admission in patients with AN prescription / No. of measurements of EB 72 hours after admission in patients with AN prescription x100	88%	80%
Maintaining appropriate levels of glycemia	No. of total blood glucose (BG) determinations between 80 – 150 mg/dl in patients with insulin infusion / No. of total BG determinations in patients with insulin infusion x100	67%	70%
Severe hipoglycemia	No. of total BG determinations ≤ 40mg/dl in patients with insulin infusion / No. of total BG determinations in patients with insulin infusion x100	0,023%	<0,05%

CONCLUSIONS. The quality indicators associated with the nutritional and metabolic support of critically ill patients can be easily obtained automatically from the electronic Information System in the ICU. In the analysis performed in our ICU, we comply with the standard in three of the five selected indicators. Periodic analysis of these indicators allows us a continuous quality improvement of the nutritional support and is a powerful tool to improve the calorie delivery and to maintain an appropriate glycemic control in the critical care patient.

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0770

TO FEED OR NOT TO FEED, THAT IS THE QUESTION...

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INTRODUCTION. Nasogastric feeding is used in up to 90% of critically ill patients. Unrecognised intra-bronchial placement is a potentially serious complication and can lead to infection, pneumothorax and occasionally death. The Cortrak system allows real-time visualisation of nasogastric tube transit using a transmitter stylet and an external electromagnetic sensing device. This system has been reported to have a 100% success rate for correct tube placement [1]. It avoids the need for traditionally used methods to confirm tube position such as pH testing or chest X-ray. Benefits include earlier feeding as tube position is confirmed at the time of placement, reduced radiation exposure and the availability of a printed record for review and training. To be deemed "competent" to use the Cortrak system, staff need to pass a multiple choice test, correctly interpret commonly encountered images and complete at least 2 supervised, successful tube insertions. We have used the Cortrak system to place over 250 tubes in our Unit but recently had a serious incident with unrecognised intra-bronchial placement using this system. We reviewed staff training and conducted a survey to determine inter-observer variation when reviewing images of tube position.

METHODS. A series of 18 Cortrak images were distributed to 10 trained nursing staff showing both correctly (intragastric) and incorrectly placed tubes (intra-bronchial, coiled in oesophagus). The participants were anonymously asked to identify tube position from the images and indicate whether they would commence feeding on the basis of the image. They were also asked about insertion technique, patient positioning and sensor placement.

RESULTS. 100% response rate was achieved. There was considerable variation in image interpretation. The most significant finding was that intra-bronchial insertion images were not recognised in 30% of cases and staff said they would be happy to feed the patient despite lung placement. When responders were unsure of the position they indicated they would test the pH and/or resite the tube. Most participants were aware of the correct patient positioning and electromagnetic sensor placement. However 70% of participants said that despite training they lacked confidence in the technique and suggested that alternative modes of position confirmation should still be used before feeding. This may be due to the fact staff were aware of the incident in our unit.

CONCLUSIONS. More rigorous training is required before this system can be used to confirm correct tube placement. "Competent" staff were not confident in using this technique. It is subject to observer error and is not, in our experience, a failsafe technique. "To feed or not to feed', when Cortrak is used in isolation, will remain the question!

REFERENCE. Cortrak Training Manual, Merck Serono, October 2009.

0771

SEVERE LACTIC ACIDOSIS AND A SEPSIS-LIKE SYNDROME IN THE ICU: BEWARE OF UNEXPECTED CAUSES

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INTRODUCTION. Hyperlactatemia is frequently encountered in critically ill patients and, especially when persisting following treatment, clearly associated with poor outcome [1]. Well-known causes of lactate acidosis in the icu are related to global or regional poor tissue perfusion or oxygenation, as well as impaired cellular oxygen uptake in, for example, septic shock.

OBJECTIVE. To enhance the awareness of less common causes of hyperlactatemia in the intensive care patient.

METHODS. We report a case of persistent hyperlactatemia, which, after a prolonged delay in diagnosis, turned out to be caused by disseminated malignancy.

CASE. A 61-year old female was admitted to the ICU with a presumed diagnosis of septic shock due to pyelonephritis. At admission, there was a severe lactic acidosis (considered type A), leucocytosis and high procalcitonin, compatible with the diagnosis of sepsis (Table 1). Despite antibiotic therapy, haemodynamic and respiratory support and renal replacement therapy, the patient's condition deteriorated. Because CT imaging showed a mass containing multiple cysts in the upper pole of the left kidney, percutaneous drainage was performed for focus control, which produced fluid with a purulent aspect. All cultures were negative. Because of progressive multi-organ failure and persistent hyperlactatemia, causes of type B lactic acidosis were considered. FDG-PET/CT scan was performed for further evaluation of the cystic lesion. Increased FDG uptake was seen throughout the skeleton and in the left upper kidney. Microscopic examination of bone marrow aspirate revealed epithelial cells. Patient died at the ICU ward after 16 days of admittance.

A disseminated poorly differentiated renal carcinoma with pleural and bone marrow localisation was confirmed at post-mortem research.

TABLE 1 LABORATORY RESULTS

Parameter	Unit	Day 1	Day 4	Day 10	Day 16
Lactate	mmol/l	7.2	11.9	9.3	NA
pH		7.25	7.22	7.42	7,44
Base excess	mmol/l	−15.4	−14.9	−4.4	−8.1
Bicarbonate	mmol/l	10	12	19	15
Anion gap	mmol/l	21.1	26.6	20.4	25.6
Procalcitonin	ng/ml	17.78	38.78	47.03	19.29
Leucocyte count	x10E9/l	24.8	26.6	19.0	23.0

DISCUSSION. Although the association of type B lactic acidosis with haematologic malignancy is well known, the association with solid tumours is rare [2] and disseminated renal carcinoma as a cause of type B lactic acidosis has never been reported so far.

CONCLUSION. Disseminated malignancy should be considered in cases of persistent hyperlactatemia when causes of type A lactic acidosis are excluded.

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Oral Sessions
Difficult ICU infections: Diagnosis & outcome: 0772–0776

0772

TOTAL CORTISOL AND ADRENOCORTICOTROPIC HORMONE (ACTH) IN IDENTIFYING SEVERE COMMUNITY-ACQUIRED PNEUMONIA (SCAP) CLINICAL OUTCOMES AND COMPLICATIONS

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INTRODUCTION. Elevated serum total cortisol (TC) levels in critically-ill patients revealed relationship with severity of critical illness as well as risk of death. We hypothesized that the evaluation of adrenal function could provide prognostic information in SCAP patients requiring intensive care unit (ICU) admission.

OBJECTIVES. The aim of the present study was to investigate TC and ACTH levels relationship with in-hospital outcomes (in-hospital mortality (IHM), length of in-hospital stay, duration of ICU stay), need for invasive mechanical ventilation (IMV) and vasopressor support (VS).

METHODS. 20 ICU patients with proven SCAP CURB-65 class 3, 4 were enrolled to the study. Control group included 16 comparable healthy volunteers. Serum basal TC and ACTH were measured within the first 24 h after admission and at day 8.

RESULTS. Increasing CAP severity was associated with increased TC values both on admission and 8th day ($r = 0.87$; $p = 0.011$ and $r = 0.88$; $p = 0.019$, respectively). Their levels at 1st and 8th days revealed statistical difference in CURB-65 class 3 and 4 patients ($p = 0.033$ and $p = 0.048$, respectively). TC on admission and 8th day values demonstrated statistically significant correlation with IHM ($r = 0.86$; $p = 0.011$ and $r = 0.88$; $p = 0.021$, respectively) and were higher in non-survivors then those in survivors (median) (1,377 vs. 865 nmol/l, $p = 0.033$, respectively) at 1st and 8th days (823 vs. 387 nmol/l, $p = 0.049$, respectively). TC levels correlated with need for VS ($r = 0.87$; $p = 0.012$ on admission and $r = 0.88$; $p = 0.021$ at 8th day, respectively) and showed higher concentrations in patients requiring VS compared with those with stable haemodynamics both at 1st (1,377 vs. 865 nmol/l, $p = 0.034$, respectively) and 8th days (823 vs. 387 nmol/l, $p = 0.049$, respectively). Duration of ICU stay correlated with TC values on admission ($r = 0.89$; $p = 0.019$).

Enhanced ACTH levels on ICU admission were associated with need for IMV ($r = 0.72$; $p = 0.047$), their values appeared to be higher in patients requiring IMV (33.5 vs. 11.4 ng/ml, respectively), but were not statistically different.

CONCLUSIONS. Elevated serum TC in SCAP is associated with disease severity and could be used for identifying severe CAP patients at high risk of mortality, prediction of duration of ICU stay and need for VS.

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GRANT ACKNOWLEDGMENT. We disclose any relationship with manufacturers or providers of any commercial products or services relevant to this research.

0773

DIAGNOSTIC METHODS USED IN HOSPITAL-ACQUIRED AND VENTILATOR-ASSOCIATED PNEUMONIA AT THE INTENSIVE CARE UNITS (ICU) OF LATIN AMERICA

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INTRODUCTION. Limited information is available regarding the epidemiology and diagnostic methods for Hospital-acquired Pneumonia (HAP) and Ventilator-associated Pneumonia (VAP) in Latin American Intensive Care Units (ICUs).

OBJECTIVES. Our aim was to characterize the epidemiology and diagnosis of HAP and VAP in Latin American ICUs.

METHODS. A multicenter prospective observational study was done in 17 Intensive Care Units (ICUs) from 4 Latin American countries (Argentina, Colombia, Peru, and Ecuador). We included consecutive ICU patients whom required >48 h of invasive mechanical ventilation and developed a clinical diagnosis of pneumonia (according to the ACCP criteria). The patients were stratified according to the pneumonia diagnosis in HAP or VAP. We performed descriptive statistics.

RESULTS. Out of 802 patients enrolled in the study, 99 developed pneumonia stratified in 63 (7.9%) with VAP and 33 (4.1%) had HAP. The mean age was 54.1 ± 14.2 years old for VAP and 54.45 ± 10.5 for HAP patients, respectively. VAP patients had a higher rate of clinical characteristics associated with pneumonia including: a) New or progressive radiographic infiltrates [98.4% (VAP) vs. 42.4% (HAP)]; b) Leukocytosis or Leukopenia [77.7% (VAP) vs. 33.3% (HAP)]; c) Fever [77.7% (VAP) vs. 27.2% (HAP)]; d) New purulent tracheal secretion [92% (VAP) vs. 39.4% (HAP)]. Septic shock was present in 57.6% of the patients with HAP and 38% with VAP. When comparing the different diagnostic methods for pneumonia, non-invasive techniques (47.1%) were more commonly used than invasive (10.9%) methodologies. Tracheal aspirate was performed in 55.5% of the patients that developed VAP and in 63.6% of the patients who developed HAP. In 82.8% of samples from patients with VAP the result was positive, preferring the quantitative method. Bronchoscopy was performed in 7 patients with VAP (11.1%) and in 3 patients with HAP (9%). Alveolar lavage (BAL) was performed in 100% of positive results in VAP cases and 33.3% in HAP ones. Blood cultures were the most frequent diagnostic method used in patients with VAP and HAP (74.6 and 78.8%, respectively), but were positive in 25.5% of the VAP patients and 11.5% of the HAP patients. The ICU mortality for VAP patients was 31.7% and for HAP was 33.3%, respectively.

CONCLUSIONS. We observed important differences in epidemiology, clinical characteristics and the use of diagnostic methods among Latin American ICUs regarding the diagnosis of HAP and VAP. Non-invasive diagnostic techniques are more frequently used in clinical practice. Further studies are needed to assess the association of health care utilization and clinical outcomes.

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0774

EPIDEMIOLOGY OF FAECAL PERITONITIS IN THE GENOSEPT COHORT

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INTRODUCTION. The GenOSept collaboration was set up by the European Critical Care Research Network (ECCRN) to determine the genetic basis of the host response to sepsis. While faecal peritonitis (FP) is a common reason for admission to the Intensive care unit (ICU) there is a lack of data on the clinical course and outcome. FP formed one cohort of the GenOSept collection and the high quality data available gives a unique and contemporary view of the clinical phenotype of patients admitted to Intensive care units (ICU) across Europe.

OBJECTIVES. To define the clinical phenotype and risk factors for outcome in the FP cohort of the GenOSept study.

METHODS. Data was extracted from the electronic case report forms of FP patients recruited to GenOSept. Patients were right censored at date of hospital discharge or at 6-month follow up. Study end point was 6-month mortality. Person time was calculated as days from date of ICU admission to date of death or censoring. Univariate Cox proportional hazards analyses, adjusted for age and sex, were used to determine factors significantly associated with 6-month mortality.

RESULTS. Between 29/09/2005 and 05/01/2011 data from 977 patients admitted from 102 centres across 14 countries was extracted. Mean age (±SD) of patients was 66.5 (±14.0) with 33% over 75 years of age; 530 (54.2%) were male. Comorbidities were present in 767 (78.5%) of patients, commonest of which were cardiovascular in 40%; respiratory in 25% and gastrointestinal in 23.6%. Median (IQR) length of ICU stay was 10 (5–21) days. ICU mortality was 20.9%, in hospital mortality was 28.8%, 28 days mortality was 19.1% and 6 months mortality was 31.6%. The ICU mortality rate (95% CI) was 1.23 per 100 person days (1.07–1.42). The commonest mode of death in hospital was failure of resolution of organ dysfunction in 15.9% of patients, followed by treatment limitation in 10.7% and recurrent sepsis in 10.5%;
77.8% of patients required vasoactive drugs, with 76.2% on ventilatory support and 11.8% needing renal replacement therapy (RRT). Factors significantly associated with a worse outcome at 6 months included acute renal failure (ARF) (HR = 2.44, CI 1.93–3.08; $p = 6.32 \times 10^{-14}$), need for RRT (HR = 2.09; CI 1.63–2.67; $p = 4.98 \times 10^{-9}$) and ventilatory support (HR = 1.93, CI 1.3–2.87; $p = 1.09 \times 10^{-3}$).

CONCLUSIONS. The GenOSept FP cohort was characterized by an elderly population, with high prevalence of cardiovascular and respiratory comorbidities. While only 20.9% of patients die from FP on the ICU there is an additional mortality of 10.7% at 6 months. Ventilatory support, ARF and requirement for RRT were the most significant risk factors for worse outcome. AT and GC: joint first authorship.

GRANT ACKNOWLEDGMENT. Written on behalf of the GenOSept partners and investigators. Funded by a grant from the European Commission. P. Hutton was funded by the UKCLRN. A.C. Gordon is funded by an NIHR Clinician Scientist award.

0775

CLINICAL VALUE OF SUPAR, A NEW BIOMARKER

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INTRODUCTION. The leading cause of mortality in critically ill patients is sepsis. The soluble urokinase-type plasminogen receptor (suPAR) is a new biomarker that is found in human body fluids and is involved in different steps of the immune response. High suPAR serum concentrations are associated with increased mortality in different populations of non-ICU patients. Its utility in critically ill patients has yet to be defined.

OBJECTIVES. To assess the value of suPAR levels in the diagnosis and prognosis of sepsis.

METHODS. All adult patients admitted to the ICU of Erasme University Hospital were prospectively screened over a 10-week period (10 December 2010 to 28 February 2011). Patients admitted for <6-h observation or during week-ends, and those who refused to participate were excluded. Sepsis, severe sepsis and septic shock were defined according to standard criteria. We also studied blood samples from 17 healthy volunteers. Serum suPAR was measured on ICU admission and then daily until ICU discharge (for a max. of 15 days) using an ELISA kit (ViroGates A/S Copenhagen, Denmark).

RESULTS. We studied 152 patients (92 men, 58 ± 18 years), with APACHE II and SOFA scores at admission of 16 (11–22) and 6 (3–9), respectively. Admissions were for medical conditions (n = 79, including 49 sepsis), trauma (n = 16, including 2 sepsis), elective surgery (n = 43) and emergency surgery (n = 14, including 4 sepsis). Sepsis was diagnosed at admission in 55 patients (36%); 15 of these had severe sepsis (10%) and 26 septic shock (17%). Overall mortality was 12.5%. SuPAR concentrations at admission were higher in patients than in healthy volunteers [5.5 (3.3–10.2) vs. 2.6 (2.2–3)] and were significantly correlated to C-reactive protein levels (R = 0.479), APACHE II (R = 0.532) and SOFA (R = 0.447) scores. suPAR levels were higher in septic patients than in non-septic patients [7.1 (4.2–9.3) vs. 3.7 (2.6–5.4) ng/mL, $p < 0.05$); the difference was significant in both medical and surgical subgroups. A value of suPAR of 5.5 ng/mL had 75% sensitivity and 72% specificity for diagnosing sepsis [area under the receiver operating characteristic curve (AUC) of 0.75, 95% CI 0.66–0.83]. A suPAR level of 6 ng/mL had 63% sensitivity and 60% specificity for prediction of ICU mortality, with an AUC of 0.71 (95% CI 0.60–0.81); the suPAR AUC for ICU mortality in septic patients was 0.68.

CONCLUSIONS. In ICU patients, suPAR serum concentrations are increased at ICU admission, likely reflecting the activation of the immune system. SuPAR is not very reliable to diagnose sepsis at ICU admission, but is a good severity index in septic and non-septic populations. Further studies are warranted to assess the value of serial suPAR levels in ICU patients.

0776

ENDOTRACHEAL TUBE BIOFILM: A HIDDEN RESERVOIR FOR MULTIDRUG RESISTANT PATHOGENS?

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INTRODUCTION. Increasing prevalence of multidrug-resistant (MDR) pathogens, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and extended-spectrum β-lactamase positive Enterobacteriaceae (ESBL), jeopardizes effective treatment of intensive care unit (ICU)-acquired infection. Surveillance cultures (SC) may help to limit horizontal spread of these pathogens by early identification of colonized patients and may guide the clinician in the choice of empiric antibiotic therapy. The biofilm which develops on the endotracheal tube (ET) may represent an additional site for colonization by MDR strains.

OBJECTIVES. We assessed the presence of pathogens in ET biofilm and correlated ET biofilm cultures with systematic SC, especially regarding MDR pathogens.

METHODS. The study was conducted in the 14-bed medical ICU of Ghent University Hospital during three separate 1-month periods between January 2009 and March 2011. In this period, MRSA and ESBL constituted 22 and 7% of hospital-wide *S. aureus* and Gram-negative isolates, respectively. Following extubation, the endoluminal biofilm was scraped off the distal part of the ET and underwent three cycles of vortexing and sonification. The suspension was inoculated on selective growth media to identify potential pathogens. Screening for MRSA and ESBL was done by inoculation on selective chromogenic agar and was confirmed by disk diffusion (oxacillin) (MRSA), and by double disk diffusion method (ceftazidime (cfz) and cefotaxime (cft) versus cfz-clavulanic acid and cft-clavulanic acid) (ESBL), respectively. For each patient, we compared ET biofilm microbial cultures with SC sampled prior to extubation and consisting of thrice weekly sampled tracheal aspirates, urinary specimens and throat swabs and once weekly collected rectal samples. To screen for MRSA and ESBL in SC, respectively MRSA ID chromogenic agar and Drigalski Lactose agar containing 4 mg of cfz per liter were used. MRSA and ESBL were confirmed by disk diffusion (cefoxitine), respectively double disk diffusion (cfz, and cft vs. amoxycillin–clavulanic acid and piperacillin–tazobactam).

RESULTS. ET biofilm contained pathogens in 36 out of 65 ET examined (55%), and contained pathogens distinct from SC in 21 ET (32%). From a total of 111 pathogens isolated in ET biofilm and SC, 27 (24%) were exclusively found on ET biofilm: 7 *Staphylococcus aureus,*17 Enterobacteriaceae and 3 *Pseudomonas aeruginosa*. In 6 out of 11 patients (55%) with positive MRSA cultures, MRSA was present in ET biofilm and was absent in SC. In 6 out of 15 patients (40%) with cultures growing ESBL, these strains were found in ET biofilm and were absent from SC.

CONCLUSIONS. In our ICU-patients, colonization of ET biofilm was distinct from that of other screened body sites. ET biofilm contained MDR pathogens that were missed by regular SC.

Diagnostics in severe sepsis: 0777–0781

0777

A FUNCTIONAL GENOMICS APPROACH TO THE IDENTIFICATION OF BIOMARKERS OF SURVIVAL IN SEVERE SEPSIS DUE TO COMMUNITY-ACQUIRED PNEUMONIA

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INTRODUCTION. Severe sepsis is still associated with a high mortality, the most common underlying aetiology being community-acquired pneumonia (CAP) [1]. Severe sepsis is known to be precipitated by a dysregulated immune response [2] but the pathophysiology of this condition, and in particular why some patients have a poor outcome, remains unclear. To date the clinical utility of biomarkers of illness severity and outcome has been limited. Consequently it has proved difficult to develop novel, targeted interventions for the most severely ill patients.
OBJECTIVES. To define early, functional genomic biomarkers of survival in severe sepsis due to CAP.
METHODS. Adult patients with severe sepsis due to CAP admitted to 20 UK intensive care units (ICUs) were recruited following ethics committee approval and informed consent. RNA was isolated from peripheral blood leukocytes on days 1, 3 and 5 after admission to ICU using a leukodepletion filter system (LeukoLock, Ambion). RNA integrity was assessed using an Agilent 2100 Bioanalyser. Gene expression profiling was performed using whole genome bead arrays (Illumina HT12 v4) to interrogate around 48,000 unique transcripts. Normalised expression, corrected for age and relative cell counts was used to estimate differential effects using linear models with empirical Bayesian estimation. Gene set enrichment analysis was used to interpret differential expression lists. A gene expression signature associated with survival was determined by penalised support vector machines and independently validated.
RESULTS. A training dataset of 134 samples from 78 patients was analysed. A four fold difference in expression (FDR < 0.01) was seen in 66, 99, and 100 genes between survivors and non-survivors on days 1, 3 and 5 of ICU admission respectively. Genes related to antigen presentation, apoptosis, phagocytosis, the classical complement system and caspase regulation were differentially regulated in non-survivors. A minimal gene set expression signature predictive of mortality was defined and validated in a further cohort of 30 patients (15 survivors, 15 non-survivors).
CONCLUSIONS. Gene expression profiling in severe sepsis reveals important early biomarkers of survival.
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GRANT ACKNOWLEDGMENT. Wellcome Trust, UK and "Young Investigator Award" Intensive Care Society, UK

0778

PLASMA HUMAN NEUTROPHIL LIPOCALIN (PHNL) IN ACUTE KIDNEY INJURY & SEPSIS

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INTRODUCTION. HNL, also known as Neutrophil Gelatinase-Associated Lipocalin (NGAL), is released by the kidney epithelium under stressful conditions and has emerged as an early marker of acute kidney injury (AKI). HNL is also secreted by neutrophils in response to bacterial infections and sepsis [1], the leading cause of AKI in the general intensive care unit (ICU) [2].
OBJECTIVES. To investigate the diagnostic value of pHNL for sepsis and AKI in a general ICU population.
METHODS. 76 patients were classified on ICU admission: No AKI and no sepsis (n = 26); No AKI and sepsis (n = 24); AKI and no sepsis (n = 7); AKI and sepsis (n = 19). pHNL was analyzed twice daily by a polyclonal radioimmunoassay (RIA)-method. Optimal cut-off values for the diagnosis of sepsis or AKI were identified from the receiver operating caracteristics (ROC) curves. The association of admission-pHNL with sepsis and AKI was investigated by logistic regression.
RESULTS. pHNL was higher in septic patients throughout the six study days (Fig. 1). The association between pHNL on admission and sepsis remained after adjusting for AKI whereas no association with AKI was found after adjusting for sepsis (Table 1).

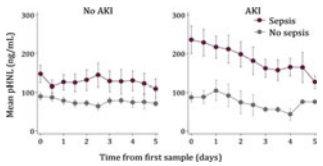

Fig. 1

TABLE 1 ASSOCIATION OF PHNL WITH SEPSIS AND AKI

pHNL	Sepsis	AKI
AuROC (95% CI)	0.78 (0.67–0.88)	0.71 (0.59–0.83)
Cut-off value (ng/mL)	105	118
Crude OR (95% CI)	6.89 (2.50–19.02)	3.67 (1.35–9.94)
Adjusted OR (95% CI)	5.97 (2.11–16.91)[a]	2.86 (0.98–8.36)[b]

AuROC area under the ROC-curve. [a]Adjusted for AKI; [b]Adjusted for sepsis

CONCLUSIONS. Plasma HNL is a diagnostic marker of sepsis independent of AKI status. Plasma HNL should be used with caution as a marker of AKI in the general ICU since sepsis alone increases the HNL concentration significantly.
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0779

MONOCYTE POLARIZATION IN INTENSIVE CARE : PROOF OF CONCEPT FROM A BIOINFORMATIC META-ANALYSIS OF PUBLIC TRANSCRIPTIONAL DATA

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INTRODUCTION. Macrophage polarization M1 (inflammatory) and M2 (regulatory) is the cornerstone of immune response control. In intensive care unit, the study of macrophage polarization may be a tool to discriminate inflammation due to infectious process or not. However, due to their tissue localization, easy access to macrophages is difficult in daily practice. Monocytes also exhibit a M1 and M2 polarization pattern [1]. Then, we derived M1 and M2 polarization signatures composed of a reduced number of genes (respectively 9 and 10 genes).
OBJECTIVES. In order to determine whether these signatures can help clinicians to study monocyte polarization, we analyzed public human transcriptional data.
METHODS. Bioinformatic analysis of public transcriptional data extracted from the Gene Expression Omnibus database. We selected all datasets composed of 1. at least ten samples; 2. human type of cells corresponding to macrophages, monocytes, peripheral blood mononuclear cells (PBMC) or whole blood; 3. samples stimulated with either interferon gamma (IFNg), interleukin 4 (IL4), lipopolysaccharide (LPS), various pathogens or a combination of these stimuli. All analyzed datasets are freely available with given IDs at http://www.ncbi.nlm.nih.gov/geo/. Statistical analysis was performed with the statistical suite R and Bioconductor libraries *made 4* and *limma*. Briefly, datasets were normalized using the quantile method. Expression values corresponding to the M1 and M2 signatures' genes were then extracted. These reduced datasets were analyzed by either a non supervised analysis (classification of "blinded" samples only from expression values) or a supervised analysis (evaluation of a significant difference of expression between a priori defined groups of samples).
RESULTS. First, we confirmed the validity of both signatures in a dataset composed of monocytes, monocytes derived macrophages, and in vitro M1 (with IFNg) and M2 (with IL4) polarized macrophages (GSE5097 & GSE16385). M1 polarization by IFNg of microglia cells (central nervous system cells related to macrophages) was also confirmed (GSE1432). Second, *Staphylococcus aureus* infected macrophages exhibited a M1 polarization (GSE13670). Third, a M1 polarization pattern was identified in PBMC samples from healthy subjects exposed to LPS in vivo (GSE3284).
CONCLUSIONS. This study validates two reduced monocyte polarization signatures. It also shows that monocyte polarization can be studied in PBMC samples by transcriptome analysis. This bioinformatic analysis validates the feasibility of monocyte polarization study from blood samples in critically ill patients. At the bedside, the evaluation of monocyte polarization may help to discriminate inflammatory response of infectious or non-infectious origin.
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0780

THE USEFULNESS OF C-REACTIVE PROTEIN (CRP) COMPARED TO PROCALCITONIN (PCT) TO REDUCE ANTIBIOTIC EXPOSURE IN CRITICALLY ILL PATIENTS WITH SEPSIS: A PILOT STUDY

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INTRODUCTION. Procalcitonin (PCT) have been successfuly used to guide antibiotic therapy in septic patients. Few data regarding the role of C-reactive protein (CRP) in this context are available in the literature.
OBJECTIVES. We sought to evaluate if CRP was as useful as PCT to guide antibiotic therapy in intensive care patients with sepsis.
METHODS. Pilot phase of a RCT (NCT00934011) conducted at a University Hospital, in Brazil. 40 patients were randomly assigned to one of the two groups: PCT group (n = 20) or CRP group (n = 20). Antibiotics were stopped based on standard care plus sequential biomarkers levels. Main endpoints were "duration of antibiotic therapy" for the first episode of infection, "total days under antibiotic therapy" and "antibiotic-free days per 1,000 days alive" during follow up. Secondary endpoint were "all-cause 28-day mortality" and "infection relapsing rate". Patients were followed up for 28 days, or until death.
RESULTS. The mean age was 60.2 (SD 17.7) years, and 23 (57.5%) patients were male. 25 of 40 (62.5%) patients had septic shock. Median (25–75% percentile) initial Apache II and SOFA score were 23 (14.2–30.7) points and 8 (4.2–10) points, respectively. Even though patients of PCT group presented higher values for these severity scores, this difference did not reach statistical significance. Median (25–75% percentile) CRP levels on inclusion were similar for patients of the PCT group (153.6; 71.6–324.9 mg/dL) and those of the CRP group (155.9; 47.9–294.7 mg/dL), p = 0.738. Differently, median (25–75% percentile) PCT levels on inclusion were significantly higher among patients of the PCT group, as compared to their counterparts (7.79; 1.95–27.67 vs. 1.85; 0.34–11.0 ng/dL; p = 0.048). The mean (±SD) duration of antibiotic therapy for the first episode of infection was 7.0 ± 4.4 days in the CRP group, as compared to 8.1 ± 3.9 days in the PCT group, p = 0.408. In the analysis adjusted for severity (SOFA score, Apache II or SAPS 3), the HR for duration of antibiotic therapy was 1.4 (95% CI 0.7–2.8). The mean (±SD) of total days under antibiotic therapy was higher in patients of the PCT group than in those of the CRP group (14.0 ± 6.0 vs. 11.7 ± 6.9 days, p = 0.272). Finally, the number (±SD) of antibiotic-free days per 1,000 days alive was similar among the two groups (313.2 ± 257 in the CRP group vs. 290.2 ± 265 in the PCT group; p = 0.783). Five (25%) patients died in the CRP group against 8 (40%) patients in the PCT group (p = 0.50). Relapsing infection was observed in one patients of the CRP group.
CONCLUSIONS. In this pilot study, we found that CRP might be as useful as PCT to guide antibiotic use in septic patients, with no harm. Results from the total sample of patients are expected to be available in December 2012.
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GRANT ACKNOWLEDGMENT. This study was partially supported by Fapemig.

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PROSPECTIVE COMPARISON OF BROAD-RANGE PCR ASSAY AND MICROBIOLOGICAL CULTURE TECHNIQUE FOR IDENTIFICATION OF PATHOGENS IN PATIENTS WITH SUSPECTED SEPSIS

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INTRODUCTION. Molecular amplification techniques are suggested to be a useful adjunct in early detection of blood-stream pathogens in patients with suspected sepsis [1, 2].

OBJECTIVES. To study the accuracy of broad-range polymerase chain reaction (PCR) assay compared to standard microbiological culture (MC) technique used for detection of pathogenic microorganisms in patients with suspected sepsis and to evaluate the time sparing effect of PCR to decision-making over antimicrobial therapy.

METHODS. Fifty-four patients with systemic inflammatory syndrome (SIRS) and suspected septic focus were included in this study according to eligibility criteria. Samples for identification of suspected septic pathogens were taken during febrile septic episodes (SE) and analyzed using both MC (incubation at 37 Grad C for max. 9 days) and half-automated multiplex PCR (PMS, Böblingen, Germany). PCR was able to detect nine pathogens and deliver the results of pathogen's identification within 6 h.

RESULTS. From 87 samples, taken during SE, both methods yielded negative results in 17 (20%) and positive in 40 (46%) of cases. In 27 samples (31%) PCR identified organisms not detected by MC. MC yielded positive results in 3 cases (3%) where PCR failed ($p < 0.001$; Chi-square test). PCR yielded the results, relevant for decision on appropriate antimicrobial therapy 60 h (mean; 95% CI 48–73) earlier than standard MC.

CONCLUSIONS. Multiplex-PCR assay was more accurate and rapid than standard culture technique in identification of pathogenic microorganisms in patients with suspected sepsis.

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0783

COMPARISON OF CAM-ICU AND ICDSC AGREEMENT TO THE DIAGNOSIS OF DELIRIUM IN CLINICAL AND SURGICAL PATIENTS ADMITTED TO THE ICU

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INTRODUCTION. Delirium is a prevalent and serious problem for patients admitted to intensive care units (ICU). Different characteristics between clinical and surgical patients could affect the agreement of delirium diagnosis tools between these patients.

OBJECTIVES. Compare the agreement between CAM-ICU and ICDSC to the diagnosis of delirium in medical and surgical patients admitted to the ICU.

METHODS. Adult surgical and clinical patients admitted to an ICU for more than 24 h between March 2009 and September 2010 were included. Delirium was evaluated twice a day by the ICDSC and CAM-ICU. Patients were followed until ICU discharge or for a maximum of 28 days.

RESULTS. 646 patients were enrolled in the study, grouped according admission type in the ICU: emergency/urgency surgery (78–12.1%), elective surgery (211–32.7%) and clinical admission (357–55.2%). In clinical patients it was found negative ICDSC and negative CAM-ICU in 247 (69.4%) patients, positive CAM-ICU but negative ICDSC in 15 (4.2%) patients, negative CAM-ICU but positive ICDSC was found in 36 (10.1%) patients and positivity in both scales ICDSC was observed in 58 (16.3%) patients, with a $k = 0.60$. The kappa to emergency/urgency surgical patients ($k = 0.36$) or for elective surgical patients were lower ($k = 0.40$) when compared to clinical ICU patients.

CONCLUSIONS. There was a large disagreement in delirium diagnosis between.

GRANT ACKNOWLEDGMENT. CNPq, UNESC.

Determinants for perioperative outcome: 0782–0786

0782

EFFECTS OF PROPHYLACTIC USE OF HALOPERIDOL IN CRITICALLY ILL PATIENTS WITH A HIGH RISK FOR DELIRIUM

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INTRODUCTION. Delirium occurs frequently in ICU patients and is associated with serious health problems and increased mortality. The effects of prophylactic treatment of delirium are not known. We evaluated our delirium prevention policy with haloperidol and compared the results with a non-treated historical and current control group.

METHODS. With the PRE-DELIRIC model, consisting of ten predictive variables with an AUC of ROC of 0.85, validated in 3,056 ICU patients, patients with a ≥50% delirium risk were identified. From August 2009 until present prophylactic treatment of ICU patients with ≥50% delirium risk became our policy. High-risk patients received 1 mg haloperidol 3/day. Patients with organ dysfunction or >80 years received 3 × 0.5 mg. Patients with QTc-time >500 ms were not treated. Primary outcome measures were: delirium incidence and duration of delirium (determined by CAM-ICU 3 times daily) and 28 days mortality. Results of prophylactic treatment were compared with a historical and a current non-treated ICU group.

RESULTS. In 8 months in total 86 patients received prophylactic haloperidol. These patients were comparable for PRE-DELIRIC score, APACHE-II and age with a historical control group of 303 patients (Table 1), and 56 eligible patients that were not treated during the implementation phase of our delirium prophylaxis policy. Delirium prophylaxis with haloperidol resulted in a significantly lower delirium incidence, and borderline significant reduction in crude 28 days mortality. Cox-regression analysis including adjusted for age, sepsis and APACHE resulted in an odds ratio of 0.76 (95% CI 0.60–0.97) in 28 days mortality. Delirium duration was not significantly different between groups (Table 1). Furthermore, prevention with haloperidol resulted in less re-admissions (16 vs. 6%). In 12 patients haloperidol was stopped for reasons of QTc prolongation ($n = 8$), severe renal dysfunction ($n = 1$) and a possible sedative effect ($n = 3$). No severe side effect were reported.

CONCLUSIONS. These preliminary results shows that prophylactic treatment of high risk patients with a low dose haloperidol is effective in reducing the delirium incidence, ICU re-admissions and reducing the 28 days mortality rate.

Table 1. Results of delirium prevention with low dose haloperidol in high-risk patients

TABLE 1 RESULTS OF DELIRIUM PREVENTION WITH LOW D

	Control group (N = 303)	Intervention group (N = 86)	P value
PRE-DELIRIC score	73 ± 22	74 ± 20	0.87
APACHE-score	20 ± 7	21 ± 10	0.74
Delirium incidence	224 (74%)	53 (62%)	0.02
Delirium duration in h (median, IQR)	72 [24–180]	102 [32–346]	0.40
Duration mechanical ventilation in h. (median, IQR)	116 [37–249]	74 [22–185]	0.10
Re-admission	49 (16%)	5 (6%)	0.008
Unplanned removal tubes/lines (%)	58 (19%)	13 (15%)	0.25
LOS-ICU (median, IQR)	7 [3–13]	5 [3–9]	0.56
28 days mortality (N)	38 (12.5%)	6 (6.3%)	0.06

0784

RESTRICTIVE STRATEGY OF INTRA-OPERATIVE FLUID MAINTANENCE DURING OPTIMISATION OF OXYGEN DELIVERY DECREASES MAJOR COMPLICATIONS AFTER HIGH-RISK SURGICAL PATIENTS

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INTRODUCTION. Fluid management for major surgical cases is critical. Both, persistent hypovolemia and fluid overload may be associated with complications.

OBJECTIVES. To evaluate the impact of two strategies of crystalloid administration along with optimization of oxygen delivery (DO_2) on the incidence of major complications in high-risk patients submitted to prolonged surgeries.

METHODS. Prospective, randomized, controlled study was performed in high-risk surgical patients submitted to major surgeries. The restrictive group received 4 ml/kg/h of lactated ringer as fluid maintenance and the conventional group received 12 ml/kg/h. A minimally invasive technique (LiDCO plus system) was used to continuously monitor stroke volume and IDO_2. Optimization of oxygen delivery was performed in both groups during surgery and for 8 h after admission in the ICU with fluid challenges guided by stroke volume variation and dobutamine aiming to keep the best achievable DO_2I.

RESULTS. A total of 88 patients was included, 43 patients in the conventional group and 45 patients in the restrictive group. Median age was 69 years. The conventional group received a significantly greater amount of lactated ringer (4,335 ± 1,546 mL) than the restrictive group (2,301 ± 1,064 ml) ($p < 0.001$). Despite similar temporal patterns of DO_2I, there was a 52% decrease in the rate of overall major postoperative complications in the restrictive group (Conventional group, 41.9%; Restrictive group, 20.0%; RR 0.48, 95% CI 0.24–0.94; $p = 0.046$).

CONCLUSIONS. A more restrictive strategy of fluid maintenance along with goal-directed therapy decreased major complications after prolonged surgeries in high-risk patients.

0785

DYNAMIC INDICES DO NOT PREDICT VOLUME RESPONSIVENESS IN DAILY CLINICAL PRACTICE

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INTRODUCTION. Dynamic indices, including pulse pressure, systolic pressure and stroke volume variation (PPV, SPV and SVV, see Fig. 1) are accurate predictors of fluid responsiveness under strict conditions, e.g., controlled mechanical ventilation using high tidal volumes and absence of cardiac arrhythmias. However, in daily clinical practice, these prerequisites are not always met.

OBJECTIVES. To evaluate the effect of regularly used ventilator settings, different calculation methods, and the presence of cardiac arrhythmias on the predictive value of dynamic indices in sedated, mechanically ventilated patients.

METHODS. We evaluated 47 fluid challenges in 29 cardiac surgery patients. Patients were divided in different groups based on tidal volume. Dynamic indices were calculated in four different ways: calculation over 30 s, breath-by-breath (with and without excluding arrhythmias) and with correction for tidal volume. Patients with a change in SVI >10% were identified as responders.

RESULTS. The predictive value was optimal in the group ventilated with tidal volumes >7 ml/kg with correction for tidal volume, calculated breath-by-breath and with exclusion of arrhythmias (AUC = 0.95, 0.93 and 0.90 for PPV, SPV and SVV, respectively). Including patients ventilated with lower tidal volumes, calculating dynamic indices over 30 s without excluding cardiac arrhythmias reduced the AUC to 0.51, 0.63 and 0.51 for PPV, SPV and SVV, respectively (see Fig. 2).

CONCLUSIONS. PPV, SPV and SVV are only reliable predictors of fluid responsiveness under strict conditions. In daily clinical practice low tidal volume, cardiac arrhythmias and the calculation method substantially reduce their predictive value.

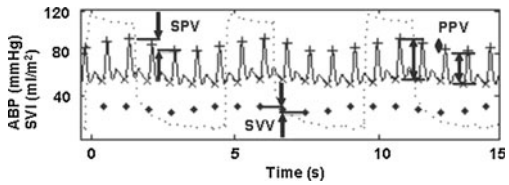

Fig. 1 Airway pressure, ABP (with marked systolic and diastolic pressure) and SVI with illustrated PPV, SPV and SVV. [example of the processed data]

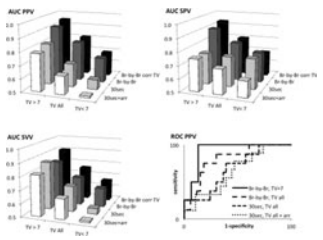

Fig. 2 Figure 2: part a, b and c: the areas under the ROC curve for all different groups. part d: four different ROC curves for PPV for characteristic groups. AVC of the dynamic indices over different groups

0786

EFFECTS OF SYNTHETIC COLLOIDS ON RENAL FUNCTION IN CARDIAC SURGICAL ICU PATIENTS

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INTRODUCTION. Synthetic colloids are commonly used in cardiac surgery as intravascular volume replacement therapy. A previous retrospective study showed a high incidence of acute kidney injury (AKI) after hydroxyethyl starch (HES) administration in cardiac surgical patients [1].

OBJECTIVES. We therefore investigated, the effect of the synthetic colloids HES and gelatin on renal function in a large cohort of patients with cardiac surgery and cardiopulmonary bypass.

METHODS. Before-after retrospective study in patients with cardiac surgery and cardiopulmonary bypass (n = 6,553). Fluid therapy was recorded during the surgical procedure and on the ICU. AKI was defined by RIFLE criteria [2] and/or a new need for renal replacement therapy (RRT).Between 2004 and 2006, standard colloid was mainly 6% HES 130/0.4 (n = 2,137). Between 2006 and 2008 standard colloid was changed to 4% gelatin (n = 2,325). From 2008 until 2010 patients received mainly crystalloids (n = 2,091) except for HES as standardized cardiac priming solution.

RESULTS. Age, SAPS2 and SOFA scores were significantly higher in the crystalloid group at baseline. RIFLE failure occurred more commonly in patients who received both HES (9.2%, p = 0.002) and gelatin (8.9%, p = 0.004) compared to patients who received only crystalloids (6.6%). The rate of RRT was 5.6% in the crystalloid group, 7.0% (p = 0.076) in the HES group and 7.4% (p = 0.019) in the gelatin group. Multivariable logistic regression analysis showed an increased risk for RRT in the ICU after use of HES (odds ratio 1.708, p = 0.004) or gelatin (odds ratio 2.229, p < 0.001). ICU and hospital lengths of stay tended to be longer in the HES than in the crystalloid group [median, interquartile range 3 (2–4) days vs. 2 (2–4) days, p = 0.043 and 13 (11–17) vs. 12 (10–17) days, p < 0.001, respectively).

CONCLUSIONS. In this cohort of patients with cardiac surgery, fluid therapy with synthetic colloids was associated with an increased risk for AKI and a higher need for RRT.

REFERENCES. 1. Rioux JP, et al. Crit Care Med 2009;37:1293-8. 2. Bagshaw SM, et al. Nephrol Dial Transplant 2008;23:1569–1574.

GRANT ACKNOWLEDGMENT. Supported, in part, by an unrestricted grant of the Thuringian Ministry of Cultural Affairs (Landesprogramm ProExzellenz; PE 108-2), the Foundation of Technology, Innovation, and Research Thuringia (STIFT), and the German Sepsis Society.

Education & training in the ICU: 0787–0791

0787

INTENSIVE CARE MEDICINE IN THE DEVELOPING WORLD - REAL-TIME, TRANSCONTINENTAL TEACHING OF TRAINEE PHYSICIANS IN SOMALILAND USING A DEDICATED SOCIAL NETWORKING PORTAL: A NOVEL APPLICATION OF TELE CRITICAL CARE

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INTRODUCTION. In 2007, Somaliland's new medical school produced the country's first ever group of graduating doctors. Whilst there had been doctors before the decades of civil war they had all been trained elsewhere. Somaliland's junior doctors are often solely responsible for the full range of clinical specialties, including critically ill patients, due to a paucity of senior supervising clinicians. Teaching and supervision of such doctors is essential to ensure the safest and most effective clinical practice. Whilst there is a willingness of volunteers from the developed world to support Somaliland's fledgling postgraduate medical education system, there are limited means to provide this help to junior doctors scattered over a wide geographical area. There have been multiple calls in the international literature for a dedicated global health learning system and for a coordinated effort to global medical education (1,2).

OBJECTIVES. We report the use of a dedicated web-based portal (www.medicineafrica.com), combining the concepts of clinical education and social networking, that has facilitated the successful delivery of live, case-based teaching on a range of critical care topics to Somaliland's undergraduates and interns.

METHODS. Trainees are able to upload clinical cases to be discussed with a UK-based tutor; tutors are then able to question trainees in real-time and highlight areas requiring attention, simulating the bedside teaching experience.

RESULTS. Between July 2008 and the April 2011 there were 5 courses and 143 tutorials encompassing 156 different medical cases. Intensive care topics include management and diagnosis of shock and treatment of cardiac arrest. Online feedback and in-country focus groups have shown that the teaching has been well received by students. Students have difficulties with reliable internet access and finding time in their schedules for education. Tutors have had to adapt sessions to deal with differences between resources in the UK and Somaliland including a lack of equipment and basic drugs.

CONCLUSIONS. MedicineAfrica.com will be used to continue to support postgraduate medical training in Somaliland, and is expanding to support new partnerships in Sierra Leone, Zimbabwe and Palestine. This application of remote intensive care medicine teaching can be used to deliver critical care education to healthcare professionals across many countries in the developing world.

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GRANT ACKNOWLEDGEMENTS: King's college charitable fund.

0788

LOGISTICS AND EDUCATIONAL ASPECTS OF THE INTRODUCTION OF ULTRAPORTABLE ECHOCARDIOGRAPHY (UPE) INTO A MEDICAL EMERGENCY (MET) SYSTEM

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INTRODUCTION. Ultraportable echocardiography recently emerged as a new modality for rapid point-of-care diagnosis and monitoring of basic haemodynamic abnormalities.

OBJECTIVES. To develop a systematic approach to the introduction of new technique (ultraportable hand-held echocardiography) into an established hospital MET.

METHODS. A prospective observational study of the logistical and educational process of the introduction of ultra-portable echocardiographic service into MET.

SETTING. Tertiary multidisciplinary trauma centre.Prior to the introduction of UPE, a comprehensive organisational plan of human resources, physical space and a dedicated archiving and reporting system was developed to ensure safe incorporation into in-hospital MET. Quality assurance (QA) procedures were introduced to detect sentinel events and preventable complications associated with the introduction of a new technology. QA activities were centred on systematic expert reviews of all emergency scans done during the MET calls with feedback to the leaders of MET. Educational efforts were directed to the advanced trainees in intensive care, who lead MET focused on robust basic skills in image acquisition with UPE scanners and correct interpretation of findings within pathophysiological groups of major haemodynamic syndromes. Individuals were tested on their proficiency level prior to practical application of UPE.

RESULTS. Acceptable individual proficiency levels were achieved within the allocated timeframe. Systematic QA became an essential tool in continuous education. There was gradual uptake of UPE by advance trainees during MET responses changing their diagnostic approach to patients with unstable haemodynamics.

CONCLUSIONS. 1. Structured approach to the introduction of hand-held UPE service as a part of in-hospital MET response is beneficial. 2. QA activities require an accessible archiving and reporting station. 3. Incorporating new UPE technology into individual diagnostic algorithm in the emergency setting is a challenge.

REFERENCE. Sicari R, et al. The use of pocket-size imaging devices: a position statement of the European Association of Echocardiography. Eur J Echo 2011;12:85–87.

0789

USE OF IN SITU SIMULATION TRAINING TO FACILITATE ORIENTATION IN A NEWLY OPENED INTENSIVE CARE UNIT

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INTRODUCTION. In our hospital we were in the process of moving into a new Intensive Care Unit (ICU) which provided a unique opportunity to investigate the use of simulation to facilitate staff orientation.

OBJECTIVES. To determine if in situ simulation can be used to facilitate orientation, improve confidence and identify training needs of staff in a new ICU.

METHODS. Following hospital approval to undertake the project, seven groups (each consisting of two ICU nurses and one ICU doctor) were randomly selected to participate. All candidates received a standard ICU orientation as per hospital protocol. Candidates signed consent and confidentiality agreements and were familiarised with the simulator (SimMan 3G, Laerdal Medical Limited, Kent). Each group worked through a simulated accidental extubation scenario and were debriefed. Three experienced facilitators watched the scenarios and rated the teams on their technical skills (validated using the modified Delphi technique) and their non-technical skills based on the Team Emergency Assessment Measure (TEAM) which has been validated in the literature [1]. Candidates completed a pre- and post-simulation questionnaire using a five point Likert scale (1 being "strongly disagree" and 5 being "strongly agree") to rate their agreement with statements regarding their confidence in working in the new ICU.

RESULTS. There was an increase in candidates' median Likert score from 3 pre-simulation, to 4 post-simulation for the statements "I feel confident that I will be able to quickly find the equipment I need in an emergency situation" and "I feel sufficiently orientated to work in the new critical care unit". All candidates agreed or strongly agreed that simulation training increased their confidence and facilitated staff orientation to the new ICU. There was no correlation between the individual groups' technical and non-technical skills scores. The simulation session highlighted training needs (Table 1).

TABLE 1 TRAINING NEEDS IDENTIFIED AND RESULTING ACTIONS

Simulation highlighted	Action
Nursing staff unaware of emergency buzzer, differing functions/contents of cardiac arrest and airway trolley	Targeted teaching session on the cardiac arrest and airway trolleys for nursing staff. Raised awareness of emergency buzzer
Doctors unable to use ICU equipment (infusion pumps, bed controls), unaware of location of emergency drugs box	Doctors standard orientation changed to include use of ICU equipment, familiarisation and location of emergency drugs box
Problems accessing head-end of bed in an emergency	Redesigning of the ICU workspace

CONCLUSIONS. We found that this in situ simulation session improved our staff's feelings of orientation and improved their confidence in working in the new ICU. The sessions proved to be a useful tool in identifying training needs of staff and identifying problems with the ICU workspace. No correlation between the technical and non-technical scores could be identified and non-technical skills did not appear to have an impact on time to re-intubation. In situ simulation may be a useful adjunct to traditional ICU orientation to improve staff confidence and in identifying training needs when working in a new ICU.

REFERENCE. Rating medical emergency teamwork performance: Development of the Team Emergency Assessment Measure (TEAM). Resuscitation 2010;81:446–452.

0790

DEVELOPMENT OF A CRITICAL CARE ECHOCARDIOGRAPHY TRAINING PROGRAM BASED ON A US/EUROPEAN FRAMEWORK

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INTRODUCTION. Echocardiography is an evolving skill for intensivists. However, training has traditionally been limited to cardiologists in the US. Currently there is neither a widely accepted training paradigm nor credentialing process for critical care practitioners [1]. Because of these uncertainties, US intensivists have few options for training and face skepticism from other specialists about their skills should they procure such formal instruction.

OBJECTIVES. To describe the development of a multidisciplinary, multi-institution critical care echocardiography training program for fellows in two large academic hospitals inspired by joint US/European guidelines. Also, to characterize barriers to echo instruction for non-cardiologists and to identify strategies to overcome them.

METHODS. We performed literature searches and semi-structured interviews with cardiologists, intensivists, and anesthesiologists to characterize training barriers. We also developed a conceptual model of critical care echocardiography training and created a simple learner-directed training program with web-based modules, supervised echo reading, and standardized patient exercises.

RESULTS. Initially, we identified no feasible options for echocardiography training in our university-based health system. Barriers included resistance from cardiologists, lack of non-cardiologist expertise, lack of institutional credentialing process, and time constraints of trainees/instructors. After 3 years, barriers were overcome allowing critical care echo training. A list of training topics included: Basics of echo, standardized views, systolic function, non-invasive hemodynamics and volume responsiveness assessment, PE and acute right heart failure, diastolic dysfunction, and myocardial infarction and its complications. Our training program addresses a number of key American College of Graduate Medical Education core competencies including medical knowledge, patient care, systems-based practice, professionalism, and practice-based learning and improvement.

CONCLUSIONS. Although there were numerous barriers to providing critical care echocardiography training in the US, we were able to develop and successfully initiate such a novel program. Further study is required to determine how to deliver this training most efficiently to physicians, what is the impact of this training on patient outcomes (blood stream infections, frequency of invasive central venous catheter use, and competence), and how sustainable are skill levels. Further research will also be needed to determine educational and clinical outcomes with real world utility: trainee confidence, clinical competence, and echo resources utilization.

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GRANT ACKNOWLEDGMENT. Duke University GME Innovation in Education grant 01-10-03.

0791

THE NEW-2-ICU COURSE; A NEW ERA IN MEDICAL EDUCATION ON THE ICU

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INTRODUCTION. Changes in postgraduate medical training, the constraints of the European Working Time Directive and the unique nature of work on the ICU, mean that junior doctors are now working on ICUs with less clinical experience than was previously the case. These doctors may be expected to manage serious or life threatening situations from very early on in their ICU placements and no formal education system currently exists to train them, representing an unmet educational need.

OBJECTIVES. To create the "New-2-ICU course", an evidence-based course for junior doctors designed to increase patient safety on the ICU.

METHODS. Delegates work though novel online pre-course material (video lecture podcasts, a displaced tracheostomy algorithm and checklists for areas such as sepsis) focused at their level of training. They then attend a 1 day multimodal simulation course, where they experience hands-on training in airway, ventilator and ultrasound guided central venous access skills, facilitated by advanced task trainer mannequins. Advanced human patient simulator sessions then focus on likely or life-threatening ICU scenarios such as leading a cardiac arrest, dealing with a displaced tracheostomy or managing a hypoxic patient on a ventilator. Delegates complete pre- and post-course questionnaires examining the level of supervision they feel they require to perform key tasks or skills.

RESULTS. Three courses have now been completed, training 59 junior doctors. The ability to work without direct supervision increased in all task and skill areas assessed. These were (increase in percentage of delegates who felt that they did not require direct supervision to perform the task following the course): ventilation using a Water's circuit (53%), reviewing the ventilated patient (52%), central line insertion (51%), managing tracheostomies (48%), managing the shocked patient (43%), use of ultrasound for vascular access (38%), inserting a laryngeal mask airway (33%) and ventilation with an Ambu bag and face mask (27%). Overall delegates were able to perform unsupervised a median of 2 of these tasks before the course and 7 tasks after the course. One delegate was faced with a displaced tracheostomy in the middle of the night in an obese, oxygen-dependent patient 1 month following the course and managed the patient as per the New-2-ICU displaced tracheostomy algorithm, with no adverse sequelae. Similar cases have led to death or serious morbidity [1].

CONCLUSIONS. The New-2-ICU course dramatically increases task ability, skills and knowledge in likely and life-threatening ICU scenarios amongst junior doctors. This has and will continue to lead to an increase in patient safety on the ICU.

REFERENCE. Report and findings of the fourth national audit project of the Royal College of Anaesthetists: Major complications of airway management in the UK. 2010. http://www.rcoa.ac.uk.

GRANT ACKNOWLEDGMENT. Grant received from Intersurgical for course set-up costs.

Factors predicting ICU patient outcome: 0792–0796

0792

LOW SERUM 25-HYDROXYVITAMIN D AT CRITICAL CARE INITIATION IS ASSOCIATED WITH INCREASED MORTALITY

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INTRODUCTION. Vitamin D has broad effects on immunity, inflammation, metabolism, and endothelial and mucosal functions. Our group previously studied 2,399 critically ill patients demonstrating that serum 25-hydroxyvitamin D (25(OH)D) <30 ng/mL measured up to 365 days prior to hospital admission was a strong predictor of all cause mortality [1].

OBJECTIVES. To explore the role of vitamin D deficiency at the time of critical care initiation in the outcome of critically ill patients, we performed a 10 year multicenter observational study of patients among whom 25-hydroxyvitamin D was measured near critical care initiation. The aim of this study was to determine the relationship between 25-hydroxyvitamin D deficiency at critical care initiation and subsequent mortality. We hypothesized that deficiency in 25-hydroxyvitamin D at critical care initiation would be associated with all cause mortality.

METHODS. The study was performed in two tertiary hospitals in Boston, Massachusetts, USA. Between 1998 and 2009 we studied 1,325 patients, age ≥18 years, in whom 25-hydroxyvitamin D was measured within 7 days before or 7 days after critical care initiation. 25-hydroxyvitamin D was categorized as deficiency (≤15 ng/mL), insufficiency (16–29 ng/mL) and sufficiency (≥30 ng/mL). Vital status was determined using the Social Security Administration Death Master File. Logistic regression examined death by days 30, 90 and 365 post-critical care initiation and in hospital mortality. Adjusted odds ratios were estimated by multivariable logistic regression models.

RESULTS. 50.4% were 25-hydroxyvitamin D deficient, 35.6% insufficient and 14.0% sufficient. 25-hydroxyvitamin D deficiency is predictive for all cause mortality. 30 days following critical care initiation, patients with 25-hydroxyvitamin D deficiency have an OR for mortality of 1.85 (95% CI, 1.15–2.98; P = 0.01) relative to patients with 25-hydroxyvitamin D sufficiency. 25-hydroxyvitamin D deficiency is a significant predictor of mortality at 30 days following critical care initiation following multivariable adjustment for age, gender, race, Deyo-Charlson index, sepsis, season, and surgical versus medical patient type (adjusted OR 1.94; 95% CI, 1.18–3.20; P = 0.01). Results were similarly significant at 90 and 365 days following critical care initiation and for in-hospital mortality. The potential benefit of vitamin D sufficiency appears to occur in the first 45 days following critical care initiation. The association between vitamin D and mortality was not modified by sepsis, race, or Neighbourhood Poverty rate, a proxy for socioeconomic status.

CONCLUSIONS. Deficiency of 25-hydroxyvitamin D at the time of critical care initiation is a robust predictor of all cause patient mortality in a critically ill patient population.

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GRANT ACKNOWLEDGMENT. NIH K08AI060881.

0793

DOES SOCIOECONOMIC DEPRIVATION INFLUENCE OUTCOME FROM CRITICAL CARE?

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INTRODUCTION. Socioeconomic deprivation (SED) influences outcomes from a wide range of medical conditions, and as a surrogate marker for unmeasured comorbidity and adverse lifestyle choices, SED might be assumed to influence outcomes from critical illness. However this has not been consistently established. Studies using the Carstairs score to measure SED have not shown an overall association whereas work using the Index of Multiple Deprivation (IMD) suggested a link between SED and outcome for surgical and non surgical ICU admissions. Our hospital serves a region with extremely deprived areas and also very affluent areas. This gives us a powerful opportunity to test the hypothesis whether SED influences outcome from critical illness.
OBJECTIVES. To establish whether or not SED (as measured by the IMD) influences outcome from critical illness within our ICU.
METHODS. All ICU admissions from April 2003 to September 2010 were analysed. SED was measured using the government-collected Index of Multiple Deprivation. This is a 7 domain assessment of SED that is acquired from a geographically defined population of roughly 1,500 persons. Each admission was assigned a IMD score based on home postcode. IMD score increases with increasing deprivation. ICU outcome was hospital death. A Cox proportional hazards model was constructed to examine the effect of IMD on outcome, including ICNARC sickness severity score and age.
RESULTS. 6,676 admissions were studied. The hazard ratio for death with each increasing point of IMD score (range 1–78) was 1.00373 ($p = 0.003$). The effect persisted when we looked at post-operative versus non operative admissions.
CONCLUSIONS. There is an association between deprivation and mortality within our ICU. This finding is important because current risk prediction models do not adjust for deprivation. Furthermore funding arrangements for critical care should take into account the socioeconomic status of each unit's catchment population.
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0794

IMPACT AND RISK FACTORS OF THROMBOCYTOPENIA IN THE CRITICALLY ILL

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INTRODUCTION. Thrombocytopenia in critically ill patients has been associated with increased morbidity and mortality. However, an independent association between thrombocytopenia and mortality remains controversial [1]. Many risk factors have been identified but studies using multivariate analysis are limited. In addition, the comparative impact of thrombocytopenia in different diagnostic categories has not been thoroughly evaluated.
OBJECTIVES. The objectives of this study were to evaluate the frequency and comparative impact of thrombocytopenia and identify independent risk factors.
METHODS. Data were extracted from the clinical data warehouse of a 687-bed academic center. The study included all hospitalized adults admitted to one of 3 intensive/coronary care unit (ICU–CCU) for more than 48 h between 1997 and 2007. For patients with multiple admissions, only the last admission was considered. Thrombocytopenia was classified into 2 categories according to the lowest platelet count measured during admission: moderate ($<100 \times 10^9$/L) and severe ($<50 \times 10^9$/L). Thrombocytopenia was further classified as present on day of admission and following ICU/CCU admission. Univariate and multivariate logistic regression were used to identify risk factors for ICU acquired thrombocytopenia and evaluate the Impact of thrombocytopenia on hospital mortality.
RESULTS. From the 15,047 patient cohort, 64 patients excluded because of missing data. Thrombocytopenia was present or developed on day of admission in 13.1% and developed thereafter in 7.7% of patients. Moderate and severe levels of thrombocytopenia were associated with mortality rates of 19.1 and 33.6%, respectively. In a logistic regression model adjusting for reason of admission, age, gender, associated illnesses, ICU/CCU unit, admission platelet counts, length of ICU stay, APACHE 2 and Charlson scores, admission (OR 1.6; 95% CI 1.4–1.9) and ICU acquired (OR 2.6; 95% CI 2.2–3.0) thrombocytopenia were associated with an independent risk of mortality. The greatest impact of thrombocytopenia on mortality was observed in the digestive (OR 3.97) and cancer (OR 5.26) admission categories. Major independent risk factors for ICU-acquired thrombocytopenia included disseminated intravascular coagulation, admission unit, hemodialysis, acute hepatitis and liver cirrhosis.
CONCLUSIONS. Thrombocytopenia is common in the ICU and associated with an independent risk of mortality. The impact on mortality varies according to admission category. Future studies are needed to evaluate strategies aiming at reducing its impact.
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0795

MORTALITY IN ELDERLY PATIENTS ADMITTED TO THE INTENSIVE CARE UNIT: A DANISH 1 YEAR COHORT STUDY

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INTRODUCTION. Patients in intensive care include both medical and surgical patients with differences in age, functional status, comorbidities, severity of illness and underlying disease. Several studies have shown increased in-hospital mortality with age [1, 2], but limited data exist on the association between age and long-term outcome.
OBJECTIVES. To assess 30-day and 1-year mortality in patients admitted to the ICU in Northern Denmark in relation to age controlling for level of morbidity.
METHODS. Through the Danish National Registry of Patients (DNRP) we identified a cohort of 34,246 patients admitted to an ICU in Northern Denmark from 2005–2008. We obtained information on surgical procedures performed within 7 days prior to ICU admission and comorbidity according to the Charlsons Comorbidity Index from DNRP. Information on time to death was obtained from the Civil Registration System. We used the Kaplan–Meier method to estimate survival and computed mortality rate ratios (MRRs) using a Cox proportional hazard model, stratified by type of admission (medical/surgical patients), comparing the mortality rates among patients aged 15–49, 50–64, 65–79, ≥80 years of age, adjusting for sex and comorbidity using Charlsons Comorbidity Index. We used the age group of 50–64 year old as the comparison cohort.
RESULTS. Of the 34,246 patients, 9,019 (26.3%) were aged 15–49, 9,023 (26.4%) were aged 50–64, 11,713 (34.2%) were aged 65–79 and 4,491 (13.1%) were aged ≥80 years. Table 1 presents 30-day and 1-year mortality and MRR by age group and type of admission. In medical patients 30-day mortality was 44.1% in patients aged ≥80 years compared with 18.7% in those aged 50-64 year [adjusted MRR = 2.63 (95% CI, 2.36–2.94)]. In surgical patients, 30-day mortality was 31.8% in patients aged ≥80 years [adjusted MRR = 3.96 (95% CI, 3.55–4.41)]. The 1-year MRRs for patients aged ≥80 years were 2.59 (95%CI, 2.37–2.84) and 3.11 (95% CI, 2.86–3.37) for medical and surgical patients, respectively.

Table 1 30-day, 1-year mortality and MRR

Age group (years)/ medical patients	30-day mortality (%)	Adjusted MRR (95% CI)	1-year mortality (%)	Adjusted MMR (95% CI)
15–49	5.3	0.30 (0.26–0.36)	7.9	0.30 (0.26–0.34)
50–64	18.7	1 (ref.)	28.6	1 (ref.)
65–79	30.8	1.64 (1.48–1.82)	45.6	1.62 (1.50–1.77)
≥80	44.1	2.63 (2.36–2.94)	61.3	2.59 (2.37–2.84)
Age group(years)/surgical patients				
15–49	4.4	0.55 (0.46–0.64)	7.6	0.47 (0.42–0.53)
50–64	8.8	1 (ref.)	18.3	1 (ref.)
64–79	13.6	1.52 (1.37–1.68)	25.9	1.41 (1.31–1.51)
≥80	31.8	3.96 (3.55–4.41)	46.9	3.11 (2.86–3.37)

CONCLUSIONS. High age is a prognostic factor for 30-day and 1-year mortality after admission to an ICU.
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0796

PROGNOSIS OF ELDERLY PATIENTS MECHANICALLY VENTILATED IN THE ICU

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OBJECTIVE. To evaluate the prognosis of patients ≥75 years undergoing mechanical ventilation in the ICU.
MATERIALS AND METHODS. Retrospective analysis of a database of 1,661 mechanically ventilated patients from a multicenter research of 13 ICU over a period of 2 years. Exclusion criteria: Patients ≤18 years old. Patients who were considered a limitation of therapeutic effort to ICU admission. The following variables were recorded: Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) in the first 24 h of ventilation. Age, sex, reason for mechanical ventilation, length of mechanical ventilation, need of tracheotomy, early reintubation (within 48 h of extubation), late reintubation (more than 48 h of extubation), noninvasive ventilation failure, comorbidity (Charlson Index), functional ability (Barthel Index), length of stay in-hospital prior to the current admission to the ICU, ICU mortality and hospital mortality.
RESULTS. Men: 1,127 patients (67.9%). Age: 62.1 ± 16.2 years. APACHE II: 20.3 ± 7.5. Total SOFA: 8.4 ± 3.5. Four hundred twenty three patients (25.4%) were ≥75 years. Differences between groups according to age are shown in Table 1.

DIFFERENCES BETWEEN GROUPS ACCORDING TO AGE

	Age ≥ 75 years ($n = 423$)	Age < 75 years ($n = 1.238$)	p
Age	78.8 ± 3.3	56.4 ± 14.9	0.000
Men	272 (64.3%)	855 (69.1%)	
SOFA	8.8 ± 3.4	8.3 ± 3.5	0.01
APACHE II	22.3 ± 7.3	19.6 ± 7.5	0.000
Charlson Index	2.5 ± 1.8	1.8 ± 2	0.000
Barthel Index	90.1 ± 15.6	93.4 ± 14.3	0.000
Early reintubation	39 (9.2%)	105 (8.5%)	0.6
Late reintubation	14 (3.3%)	56 (4.5%)	0.4
Length of MV	8 (2–100)	8 (2–165)	0.8*
Tracheotomy	103 (24.3%)	343 (27.7%)	0.1
UCI mortality	142 (33.6%)	321 (25.9%)	0.002
Ward mortality	35 (8.3%)	73 (5.9%)	0.08

CONCLUSION. Our results show higher intra-ICU mortality in patients ≥75 years compared to younger people. The lack of data concerning post-discharge survival and quality of life did not allow to draw firm conclusions. Due to the forecast in the Spanish population pyramid (Fig. 1) within the next 40 years it is necessary to develop well-designed studies to assess the admission trends, survival, quality of life at discharge as well as cost/utility analysis in this population to provide a response to the predictable increasing demand for ICUs resources in the coming years.

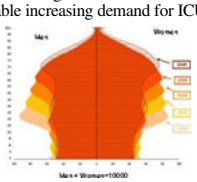

Fig. 1 Population pyramid in Spain 2009–2049

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Oral Sessions
Epithelial & endothelial dysfunction in experimental lung injury: 0797–0801

0797

THE P55 TNF RECEPTOR PROMOTES ALVEOLAR EPITHELIAL DYSFUNCTION IN EXPERIMENTAL ACUTE LUNG INJURY

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INTRODUCTION. Tumour Necrosis Factor (TNF) is released early into the alveolar space in response to lung injury. TNF mediates its effects by signalling through two cell surface receptors—p55 and p75. We previously showed through genetic [1, 2] and pharmacological [3] approaches that TNF signalling specifically through the p55 TNF receptor promotes pulmonary oedema formation in models of acute lung injury (ALI) induced by mechanical stretch and acid aspiration.
OBJECTIVES. In this study we investigated the mechanisms through which the p55 TNF receptor mediates pulmonary oedema development during the early phase of lung injury after acid aspiration.
METHODS. Hydrochloric acid was instilled into the lungs of anaesthetised, ventilated, wild-type (WT) C57Bl6 mice or mice lacking either the p55 (p55KO) or p75 (p75KO) TNF receptor. Mice were terminated at 90 min after acid instillation, when respiratory mechanics showed clear injury in WT animals. Epithelial cell function was assessed through in situ measurement of alveolar fluid clearance. Additionally, levels of soluble Receptor for Advanced Glycation End-products (RAGE), a specific marker of type 1 alveolar epithelial cell injury, was determined in lavage fluid (BALF).
RESULTS. Acid-induced deterioration in respiratory system elastance was significantly attenuated in p55KO animals. The p55KO animals also showed improved alveolar epithelial function, with reduced BALF soluble RAGE levels and higher alveolar fluid clearance rates compared to WT injured animals. In contrast, p75KO animals showed no attenuation, and even tended to show worse injury parameters at this time point.

Table 1

	WT uninjured	WT acid	P55KO acid	P75KO acid
Change in respiratory system elastance (%)	29.7 ± 8.9	107.2 ± 29.9**	73.5 ± 10.7*	121.1 ± 5.5
BALF RAGE (ng/ml)	2.7 ± 2.1	83.3 ± 37.8**	42.9 ± 23.5*	90.6 ± 25.5
Alveolar fluid clearance (%/30 min)	10.95 ± 0.97	5.62 ± 2.29**	8.09 ± 1.33*	6.24 ± 2.25

One-way ANOVA with Bonferroni test; N = 5–8; **P < 0.01 versus WT uninjured; *P < 0.05 versus WT acid
CONCLUSIONS. This study provides the first mechanistic insight into the critical role of the p55 TNF receptor in inducing early alveolar epithelial cell dysfunction and contributing to the development of pulmonary oedema in acute lung injury. The p55 receptor seems to mediate epithelial injury independent of the p75 receptor, supporting the rationale for specific p55 receptor blockade in ALI induced by predominantly epithelial insults.
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GRANT ACKNOWLEDGMENT. Supported by the Wellcome Trust.

0798

ROLE OF THE ACTIVATED PROTEIN C IN THE CONTROL OF PULMONARY ENDOTHELIAL DYSFUNCTION ASSESSED BY A CELLULAR MODEL MECHANICALLY STRESSED BY MAGNETIC STIMULATION

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INTRODUCTION. The endothelium plays a major role in the pathophysiology of pulmonary edema. A few models have shown the interest of administrating activated protein C (APC) to protect the lungs against injury induced by mechanical stress.
OBJECTIVES. Using an in vitro cellular model, we presently study the effect of endothelial stimulations on cytoskeleton (CSK) remodeling and cell mechanical response.
METHODS. Primary cultures of human pulmonary microvascular endothelial cells (HPMEC) were subjected to cyclic mechanical stress by a CSK-specific technique of magnetostimulation which uses RGD-coated ferromagnetic beads (4.5 μm in diameter) in presence of various doses of APC and inhibitors of the activation of myosin. Measurements of cellular stiffness were performed by Magnetic Twisting Cytometry using the same beads. An evaluation of the structural and functional reorganization of the cytoskeleton was performed by confocal microscopy, after staining of actin and activated myosin. The production of IL-8 was also measured by ELISA.
RESULTS. APC limits the increase in cell stiffness assessed from the deep cytoskeleton elastic modulus E2 at doses of APC (X =) 0.5, 1 and 5 mg/ml along with a marked reorganization of the actin cytoskeleton and a decrease in myosin activation. However, at 10 mg/ml, the cell stiffness is still significantly increased. The production of IL-8 is dose-dependent.

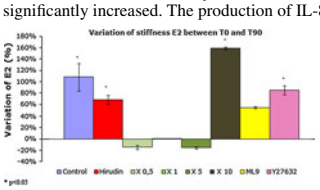

Fig. 1 Variations of E2 stiffness between T0 and T90

CONCLUSIONS. Endothelial stimulation by ferromagnetic beads allows the study of cytoskeleton remodeling under the influence of drugs already known to interact with the endothelium. APC inhibits activation pathways of myosin, resulting in deep modifications of the cytoskeleton structure. For these specific effects which exclude the action of thrombin, APC leads to a dose-dependent increase of IL-8 secretion. Thus, APC could play a major role in the reorganization of the cytoskeleton of endothelial cells during lung mechanical stress in a dose-dependent manner. Its contributions to endothelial permeability and apoptosis remain to be elucidated.
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0799

THE ROLE OF ADENOSINE RECEPTOR A2B IN ENDOTOXIN-INDUCED NEUTROPHIL TRAFFICKING INTO THE DIFFERENT LUNG COMPARTMENTS

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INTRODUCTION. Excessive transmigration of polymorphonuclear neutrophil granulocytes (PMNs) into the different compartments of the lung is a central pathomechanism in the early phase of acute pulmonary inflammation. Adenosine receptor A2B (A2BAR) is a critical mediator of cell migration; however, its role in pulmonary inflammation has not been studied systematically. Here, we sought to characterize the role of A2BAR in a murine model of lung inflammation.
METHODS. Wildtype- and A2BAR deficient mice ($A2B^{-/-}$) inhaled LPS for 30 min. After 24 h, PMNs were detected in all lung compartments (intravascular–interstitial–alveolar), using a flow cytometry-based technique. Chimeric mice were generated to evaluate the role of A2BAR on hematopoietic and non-hematopoietic cells. Chemokines were measured in the BAL (ELISA), microvascular leakage was determined using the Evans blue extravasation technique. The effect of a pharmacological A2BAR-agonist (BAY 60-6583) was evaluated in vivo and in vitro.
RESULTS. $A2B^{-/-}$ mice showed significantly higher PMN counts in the lung interstitium and in the BAL than wildtype mice ($p < 0.05$). This effect remained after reconstitution of wildtype mice with bone marrow of $A2B^{-/-}$ mice, suggesting a particular role of A2BAR on leukocytes. LPS-induced microvascular permeability was significantly higher in $A2B^{-/-}$ and in chimeric mice that expressed A2BAR on non-hematopoietic cells only ($p < 0.05$). Pretreatment with a specific A2BAR agonist reduced the accumulation of PMNs in interstitium and BAL ($p < 0.05$) and prevented LPS-induced increase in microvascular permeability ($p < 0.05$). The A2BAR agonist was also effective in reducing migration of human PMNs across a layer of pulmonary endothelial or epithelial cells. A2BAR-dependent effects on PMN trafficking were not associated with altered release of chemokines into the alveolar space. Pretreatment of pulmonary endothelial cells-, but not epithelial cells-, also decreased transmigration of PMNs in vitro.
CONCLUSIONS. Our results identified A2BAR as a critical mediator for LPS-induced migration of PMNs and alveolo-capillary leakage. Particularly, A2BAR on hematopoietic cells appears pivotal in our model. Pharmacologic activation of A2BAR attenuated PMN infiltration and microvascular leakage and might represent a potentially therapeutic approach.

0800

NON-ENZYMATIC NITRIC OXIDE PRODUCTION IN HYPOXIC LUNG REGIONS

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INTRODUCTION. Nitric Oxide (NO) can be generated non-enzymatically by direct reduction of nitrite during acidotic and ischemic conditions. Whether it will exert biological effects remains to be shown.
OBJECTIVES. We hypothesized that non-enzymatic production of NO from nitrite can occur in hypoxic lung regions, and contribute to the modulation of hypoxic pulmonary vasoconstriction (HPV).
METHODS. Eighteen healthy anaesthetized pigs were separately ventilated with hypoxic gas (fraction of inspired oxygen [F_IO_2] 0.05) to the left lower lobe (LLL) and hyperoxic gas (F_IO_2 0.8) to the rest of the lung. Six pigs received increasing concentrations (600–2,000 mg/kg/min) of sodiumnitrite ($NaNO_2$) infusion ($NaNO_2$ group), six pigs received the non-specific NO synthase (NOS) inhibitor N^w-nitro-L-arginine methyl ester (L-NAME) and $NaNO_2$ infusions (600–2,000 mg/kg/min) (L-NAME+HCl group) and six pigs received buffered Ringer's solution (Control group). NO concentration in exhaled air (ENO), NOS activity in lung tissue, and regional pulmonary blood flow were measured.
RESULTS. Infusion of $NaNO_2$ 600 mg/kg/min i.v. without NOS-blockade increased ENO_{LLL} (2.3 [0.6] (mean [SD]) to 3.7 [0.7] ppm, $p < 0.01$), and ENO_{HL} (1.9 [0.7] to 3.1 [0.8], $p < 0.05$), and decreased mean systemic artery pressure (MaP) (76 [12] to 59 [6] mmHg, $p < 0.01$), while no changes ($p > 0.07$) were observed in NOS activity, mean pulmonary artery pressure (MPaP), or the relative perfusion of the LLL (Q_{LLL}/Q_T). Not until ENO_{LLL} had increased by over 100% during infusion of $NaNO_2$ 2,000 mg/kg/min, was HPV attenuated, with a dramatic decrease in MPaP and increase in Q_{LLL}/Q_T. Both ENO_{LLL} and ENO_{HL} were strongly correlated ($r = 0.97$ and 0.91, respectively) to the infusion concentration of $NaNO_2$ during NOS inhibition, but ENO_{LLL} was consistently higher than ENO_{HL} ($p < 0.001$).
CONCLUSIONS. Infusion of $NaNO_2$, with and without NOS-inhibition, increases ENO in a concentration-dependent manner, and more from hypoxic than from hyperoxic lung regions, indicating that NO can be produced non-enzymatically, predominantly in hypoxic lung regions, where it contributes to the modulation of HPV.
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GRANT ACKNOWLEDGMENT. The Swedish Medical Research Council (No 5315), the Swedish Heart Lung Foundation, Stockholm, Sweden, AGA AB Medical Research Fund, Lidingö, Sweden, The Laerdal Foundation, Stavanger, Norway, and "Förenade Liv", Mutual Group Life Insurance Company, Stockholm, Sweden.

0801

EFFECT OF HYPERGLYCEMIA ON INFLAMMATORY RESPONSES IN EXPERIMENTAL ARDS INDUCED BY LUNG LAVAGE

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INTRODUCTION. It is known that hyperglycemia enhances inflammatory responses in sepsis or acute lung injury induced by endotoxemia [1], however the effects of hyperglycemia on inflammatory responses in acute lung injury caused by a direct insult to the lung have not been defined.

OBJECTIVES. The purpose of present study is to investigate the effects of hyperglycemia on ongoing inflammatory responses in lung injury induced by whole lung lavage.

METHODS. Nineteen Japanese white rabbits were randomly assigned to three groups; [normal control (n = 5), acute lung injury with normoglycemia (NG: n = 7), and acute lung injury with hyperglycemia (HG: n = 7) groups]. The animals were anesthetized intramuscular ketamine and pentobarbital. Mechanical ventilation was initiated after tracheostomy (TV = 10 ml/kg, RR = 25/min, I:E ratio = 1:2, and F_IO_2 = 1.0). The normal control animals were sacrificed without inducing lung injury. Lung injury was induced by whole lung lavage using warmed (38°C) normal saline and after stabilization, each animal received low tidal volume ventilation (LTV: 6 ml/kg) with 10 cmH_2O PEEP. HG group received 1.3 ml/kg of 50% glucose solution followed by 1.3 ml/kg/h intravenously. Arterial blood was sampled for measurement of blood gas and blood glucose during experimental course. Four hours after establishment of hyperglycemia and ventilatory treatment, the lungs and heart were excised en bloc. Bronchoalveolar lavage fluid (BALF) was obtained for the left lung. BALF HMGB-1 levels were measured using ELISA. mRNA expression of Interleukin-8 (IL-8) and Toll like receptor 4(TLR-4) in the lung tissue and BALF cells were examined by RT-PCR. All data are presented as mean ± standard deviation (SD). The Mann–Whitney test was used for comparisons between all groups. P values less than 0.05 were considered significant.

RESULTS. PaO_2 decreased after the induction of lung injury, but the values were significantly elevated by application of LTV+PEEP. In the HG group, the blood glucose levels were kept between 400–450 mg/dl during the experiment. Gene expression of IL-8 and TLR-4 of both NG and HG groups in the BALF cells and the lung tissue specimens increased significantly after the end of experiment, but the levels were higher in the HG group compared to the NG group. The BALF HMGB-1 levels at the end of experiment also increased in both groups and those of HG group were significantly higher than those of NG group (162.8 ± 111.4 vs. 60.9 ± 32 ng/ml).

CONCLUSIONS. The results suggest that hyperglycemia may exacerbate the pulmonary inflammatory responses in acute lung injury.

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Future perspectives for ICU infections: 0802–0806

0802

EFFECT OF BUNDLE COMPLIANCE ON REDUCING VENTILATOR ASSOCIATED PNEUMONIA IN A MIXED MEDICAL-SURGICAL ICU

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INTRODUCTION. Ventilator-associated pneumonia (VAP) remains a significant problem in the hospital setting, with very high morbidity, mortality, and cost.

OBJECTIVES. The aim of the study was to identify the effect of the introduction of the Ventilator Care Bundle on VAP rate on our 10-bedded Critical Care Unit over a 3-year period.

METHODS. Retrospective audit on the rate of VAP for a 6 months period in 2008 before the implementation of the ventilator care bundle provided baseline data on patients who were ventilated for more than 48 h. Prospective rolling audit was carried out after the VAP bundle was introduced in clinical practice in 2008. The ventilator care bundle consisted 30° head-elevation, daily sedation break if $FiO_2 < 0.6$ and PEEP < 10, thromboprophylaxis with low-molecular weight heparin and gastric ulcer prophylaxis with proton-pump inhibitor. Robust educational program was rolled out during the implementation phase for medical and nursing staff. Compliance data was collected based on the information recorded in our clinical information system (CIS, Carevue, Philips). Monthly compliance data was presented at the audit meetings and also posted on the noticeboard. VAP diagnosis was made according to the HELICS criteria.

We collected data on average ventilation time, VAP rate, time of onset of VAP and outcome of VAP. For statistical analysis Chi-square test and Wilcoxon test were used.

RESULTS. Our main results are summarised in Table 1.

Table 1

Year (quarter)	Ventilator days	Ventilated patients (n)	Bundle compliance (%)	Confirmed VAP (n)	Infection rates/1,000 ventilated days/year
2008 before implementation	589	73	68	8	13.5
2009 (Q1)	200	44	92	1	
2009 (Q2)	247	42	94	0	
2009 (Q3)	186	43	98	1	
2009 (Q4)	216	39	100	2	4.7*
2010 (Q1)	265	40	98	0	
2010 (Q2)	329	50	100	0	
2010 (Q3)	270	39	100	1	
2010 (Q4)	319	51	100	1	1.7*

We have seen a significant increase in the compliance with the bundle and it resulted a significant and sustained reduction in VAP rate (*p < 0.05). Time of developing VAP increased progressively from 8 ± 3 days to 16 ± 3 days over the study period. Mortality of VAP was 37, 25 and 0%.

CONCLUSIONS. Our data shows that implementation of care bundles can significantly and sustainably reduce VAP on the ICU without extra expenditure. Despite 100% compliance with the bundle over a sustained period we could not eliminate VAP completely. However, we noticed an increased length of ventilator time before the development of VAP. Real-time display of bundle compliance at the bedside by CIS can help to reinforce this message. Our plans are to implement chlorhexidine mouthwash for all ventilated patients to try to eliminate VAP completely.

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0803

ANTI-BACTERIAL EFFICACY OF INHALED SQUALAMINE IN A RAT MODEL OF *PSEUDOMONAS AERUGINOSA* CHRONIC PNEUMONIA

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INTRODUCTION. Squalamine is an amphiphil steroid extracted from shark with antibacterial activity against Gram+ and Gram− bacteria including on multi-drug resistant strains. It could be an interesting alternative to classic antibiotics for lung decontamination of patients colonized with *Pseudomonas aeruginosa*, especially in regard of the actual increase of bacterial drug resistance. The aim of this work was to study the anti-bacterial effectiveness of inhaled squalamine compared to colimycine and to a placebo in a model of chronic pneumonia with *Pseudomonas aeruginosa* in rats.

METHODS. Model of chronic infection. Sprague–Dawley rats underwent oro-tracheal intubation after sevoflurane anesthesia and received 150 µl of a solution of agar beads containing 10^8 colonies forming units (CFU)/ml of *P. aeruginosa* aerosols administration. After infection, a series of 24 animals (3 groups of 8) were treated twice daily by aerosolized squalamine (2.85 mg), colimycine (160 mg) or saline serum 0.9% (control group) from the day after the infection (D1) to D6 (6 days of treatment). Doses of drugs were determined according to MIC and to the calculated fraction of drug reaching lower airways. Size of aerosolized particles was measured. On day 7, all animals were sacrificed and lungs removed. The right lung was crushed and cultured to determine bacterial load. The left lung was preserved for histological study.

RESULTS. Mean size of particles aerosolized was 2.8 µm for squalamine and 2.2 µm for colistine. Aerosols were well tolerated and no mortality was observed. Aerosols of squalamine allowed a significant reduction in mean pulmonary bacterial load compared to the control group (1.6×10^3 vs. 1.8×10^5 CFU/lung; $p < 0.01$) after a 6 days treatment of twice daily aerosols. These results were also found with aerosolized colimycine compared to the control group (mean bacterial count of 3.2×10^3 vs. 1.8×10^5 CFU/lung; $p < 0.01$). Mean lung weight was significantly lower in animals of squalamine group compared to control group (mean weight of right lung 0.836 g vs. 1.26 g; p = 0.02).

CONCLUSIONS. Treatment with twice daily aerosols of squalamine allows a significant reduction in pulmonary bacterial load after 6 days of treatment in a model of chronic pneumonia with *Pseudomonas aeruginosa* in rats comparable to colimycine efficacy. Aerosols were well tolerated and did not cause mortality. There is an anti-bacterial activity of squalamine in vivo.

0804

ROLE OF MANNOSE-BINDING LECTIN POLYMORPHISMS IN THE SUSCEPTIBILITY TO AND SEVERITY OF PNEUMOCOCCAL COMMUNITY-ACQUIRED PNEUMONIA

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INTRODUCTION. Mannose binding lectin (MBL) is a serum opsonin, and activates the lectin pathway of complement. MBL deficiency (O/O plus XA/O genotypes) is a common primary immunodeficiency whose clinical penetrance remains controversial.

OBJECTIVES. Analyzed the significance of MBL deficiency (A/0 + 0/0 genotypes) and low MBL genotypes (XA/Y0 + Y0/Y0 genotypes) in the susceptibility to and severity of pneumococcal CAP (P-CAP).

METHODS. Case–control study: haplotypes and genotypes were analyzed in 1398 white Spanish patients with CAP (348 patients with P-CAP) and 1591 healthy controls from five Hospitals in Spain. Analysis of severity: prospective study according to MBL genotypes.

RESULTS. No effect of MBL genotypes on CAP susceptibility was observed. No effect of MBL deficiency on P-CAP susceptibility was found, but P-CAP patients had significantly higher frequencies of YA/YA (high MBL producer) genotypes than controls (OR = 1.32, 95% CI 1.03–1.69; p = 0.022). P-CAP patients with MBL deficiency had a higher Pneumonia Severity Index (PSI IV–V) at admission (OR 2.28, 95% CI 1.09–5.07; p = 0.019). In addition, MBL deficiency predisposed P-CAP patients to both septic shock (OR = 2.19, 95% CI 1.03–4.47; p = 0.02) and multi-organ disfunction syndrome (MODS) (OR 2.28, 95% CI 1.09–5.07; p = 0.026). Likewise, patients with low producer genotypes have a higher risk of developing acute renal failure (OR = 1.62, 95% CI 1.00–2.63; p = 0.037) or MODS (OR = 2.13, 95% CI 1.23–3.71; p = 0.0039).

CONCLUSIONS. Our large study does not support a role of MBL deficiency in the susceptibility to CAP or P-CAP. However, we provide evidence that MBL deficiency and low producer genotypes predispose to the development of the most severe forms of sepsis in patients with P-CAP.

GRANT ACKNOWLEDGMENT. "Fondo de Investigaciones Sanitarias" (Ministerio de Sanidad, FIS 02/1620), "Sociedad Española de Neumología y Cirugía Torácica" (SEPAR 2002) and RedRespira-ISCiii-RTIC-03/11 (Instituto de Salud Carlos III, Ministerio de Sanidad).

0805

INCREASED SPUTUM GLUCOSE CONCENTRATION: A RISK FACTOR FOR STAPHYLOCOCCUS AUREUS IN PATIENTS WITH TRAUMATIC BRAIN INJURY

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INTRODUCTION. Patients after traumatic brain injury (TBI) are vulnerable to early onset ventilator acquired pneumonia (EOVAP) and recent data shows that *Staphylococcus aureus (S aureus)* is an important pathogen [1]. Previously we have shown in a general critical care population that patients with high concentrations of glucose in airway surface liquid (ASL) are prone to *S aureus* infection [2]. Normally the concentration of glucose in ASL is <0.5 mmol/L. Hyperglycaemia and inflammation are risk factors for increased ASL glucose concentrations [3].
OBJECTIVES. The aim of this study was to prospectively measure ASL glucose in ventilated critically ill patients, with and without, traumatic brain injury (TBI) and to observe the development of airway pathogens.
METHODS. Patients admitted with TBI were included if they were expected to require intubation and ventilation for >48 h and were compared with critically ill patients admitted to the general intensive care unit (GICU). Assent from relatives in accordance with the local ethics requirements was obtained. Patients were sampled daily for blood and sputum filtrate glucose concentrations, sputum microbiology and serum biochemical and haematological variables. Clinical pulmonary infection scores (CPIS) were calculated.
RESULTS. TBI patients were younger (40 vs. 71, $p = 0.0018$) but did not differ in severity of illness (SOFA: 7 (5–9) vs. 9 (7–14.5), $p = 0.145$). ASL glucose concentration was significantly higher in TBI patients (Table 1). Blood glucose did not differ at any time. Patients with TBI had more *S. aureus* in sputum (Table 1). The CPIS was higher in patients with *S aureus* on day 2 than GICU patients (6 vs. 2.5, $p = 0.045$).

Table 1

Variable	Day	TBI	GICU	p
Number		16	9	
Blood glucose (mmol/L) [Med (IQR)]	1	7.3 (6.4–8.1)	6.3 (6.1–7.9)	p = 0.294
ASL glucose (mmol/L) [Med (IQR)]	1	2.1 (1.0–2.8)	0.5 (0.3–1.0)	p = 0.002
	2	2.5 (1.2–4.1)	0.3 (0.1–1.7)	p = 0.039
	3	1.7 (0.7–2.4)	0.9 (0.1–2.2)	p = 0.233
Patients with *S. aureus* (n)	1	4	0	
	2	7	0	p = 0.022
	3	6	0	

CONCLUSIONS. Ventilated patients with TBI injury are more likely to have EOVAP caused by *S. aureus* than critically ill patients without TBI. It is associated with significantly increased ASL glucose concentration. Serum glucose concentrations are not increased. The exact mechanism remains to be elucidated.
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GRANT ACKNOWLEDGMENT. This work is funded by the BJA and RCoA.

0806

CENTER- AND PATIENT-BASED DETERMINANTS OF DAY28 MORTALITY OF HOSPITAL-ACQUIRED BLOODSTREAM INFECTIONS IN INTENSIVE CARE UNITS: THE EUROBACT STUDY

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INTRODUCTION. While several studies have investigated patient specific determinants of outcome from hospital-acquired bloodstream infection (HA-BSI), it is not well defined how organisational characteristics may influence the risk for death.
OBJECTIVES. To evaluate patient, institutional, and country based determinants on the risk for death from HA-BSI among patients admitted to intensive care units (ICU).
METHODS. A prospective, multi-centred cohort study was conducted. A multilevel logistic mixed model was developed to assess factors associated with all-cause day-28 mortality.
RESULTS. A total of 1,156 patients were included from 162 ICUs in 24 countries. The majority of the participating ICUs employed a closed model (113; 70%), were in public hospitals (145; 90%), and were mixed medical-surgical units (107; 66%; and 30; 19% were medical, 16; 10% were surgical, 3; 2% were cardiac, and 6 were other). Study ICUs were university-based in 74 (46%), university-affiliated in 30 (19%), and community-based in 58 (36%). The overall 28-day all cause fatality rate was 413/1,156 (36%). No country-based variables (ie Gross Domestic Product, national expenditures on health, physician and nurse density) were significantly associated with outcome. At the center-level, ICUs with higher average mortality (adjusted off ratio (OR) 1.03 per percent; 95% confidence interval (CI) 1.01–1.05) and higher average bed occupancy (OR 1.54 >40 admissions/bed/year; 95% CI 1.05–2.27) were significantly associated with increased mortality risk; whether ICUs were closed or open units, private or public, university or community-based, or whether there was availability of an infection control team, antibiotic committee, and an attending an infectious diseases specialist were not significantly associated with outcome. Medical patients (OR 1.36; 95% CI 1.02–1.81) and those with severe sepsis (OR 1.82; 95% CI 1.06–3.13) or septic shock (OR 3.52; 95% CI 2.08–5.98), higher SAPS II scores (OR 1.02 per point; 95% CI 1.02–1.04), and respiratory (OR 1.88; 95% CI 1.19–2.97), hepatic (2.30; 95% CI 1.18–4.47), and immune (OR 2.08; 95% CI 1.40–3.10) co-morbid illnesses were at increased risk for death while a urinary tract focus of infection was associated with lower risk (OR 0.53; 95% CI 0.30–0.92). Failure of source control (OR 5.21; 95% CI 1.95–13.96) and inadequate antibiotic therapy (OR 1.85; 95% CI 1.30–2.64) increased the risk for death.
CONCLUSIONS. This study identified patient and institutional based determinants of outcome for HA-BSI. Further research is needed to assess whether improvements in therapy and ICU capacity may improve patient outcomes.
GRANT ACKNOWLEDGMENT. The study was endorsed by the ECCRN. Funding, University Joseph Fourier, Albert Michallon university hospital 38000 Grenoble France.

AKI: Epidemiology & treatment: 0807–0811

0807

MULTICENTER PROSPECTIVE OBSERVATIONAL STUDY ON SAFETY AND EFFICACY OF REGIONAL CITRATE ANTICOAGULATION IN CVVHD IN PRESENCE OF LIVER FAILURE: THE LIVER CITRATE ANTICOAGULATION THRESHOLD STUDY (L-CAT)

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INTRODUCTION. Regional citrate anticoagulation in continuous venovenous hemodialysis (citrate-CVVHD) has become a widely used technique in the intensive care units (ICU), which decreases risk of bleeding and increases filter patency. However, concern exists about safety of citrate in liver failure patients.
OBJECTIVES. The aim of our study was to evaluate safety and efficacy of regional citrate anticoagulation in ICU patients with normal and impaired liver function.
METHODS. 133 consecutive adult ICU patients were prospectively observed for 72 h of citrate-CVVHD. Patients were stratified into 3 groups according to their serum bilirubin (mg/dL) (normal ≤ 2, n = 47, mild >2–≤ 7, n = 44, severe >7, n = 42). Citrate-CVVHD was performed with variable treatment dose using the multiFiltrate device (Fresenius Medical Care, Germany). End-points for safety were: severe acidosis or alkalosis (pH ≤ 7.2; ≥ 7.55) and severe hypo- or hypercalcemia (≤ 0.9; ≥ 1.5 mmol/L) of any cause. End-point for efficacy was filter lifetime.
RESULTS. Main types of ICU admission were: 56% medical and 38% post-surgery. Liver failure was predominantly due to ischemia (39%) or multiple organ dysfunction syndrome (27%). The frequency of safety end-points of any cause did not differ between the 3 patient strata: severe alkalosis (normal 2%, mild 0%, severe 5%; $p = 0.41$); severe acidosis (normal 13%, mild 16%, severe 14%; $p = 0.95$); severe hypocalcemia (normal 8%, mild 16%, severe 12%; $p = 0.57$); severe hypercalcemia (0% in all strata). Only in 3 patients an increased ratio of total to ionized calcium (≥ 2.5) was detected (2%). Overall filter lifetime was 49% after 72 h, however after censoring for discontinuation due to non-clotting causes (e.g. renal recovery, death) 96% of all filters were running after 72 h.
CONCLUSIONS. Our data demonstrate that citrate-CVVHD can be safely used in patients with liver dysfunction. Furthermore, it yields excellent filter patency and avoids bleeding, thus can be recommended also in patients with liver dysfunction.
GRANT ACKNOWLEDGMENT. Presenting author receives grants from Fresenius Medical Care, Germany.

0808

THE EPIDEMIOLOGY OF ACUTE KIDNEY INJURY - PRELIMINARY RESULTS OF THE MULTICENTER INTERNATIONAL AKI-EPI STUDY

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INTRODUCTION. Since the development of the RIFLE consensus definition for Acute Kidney Injury (AKI) several studies reported on the epidemiology of AKI. Limitations of these studies include retrospective design, single center setting, use of creatinine criteria only. Therefore, the Acute Kidney Injury Network (AKIN) formulated prospective epidemiologic data as one of the top priorities in AKI research.
OBJECTIVES. To evaluate the epidemiology of ICU patients classified according to the RIFLE classification for AKI, based on an interim analysis of the Acute Kidney Injury-Epidemiologic Prospective Investigation (AKI-EPI) study.
METHODS. Data were recorded on 10 or more consecutive admitted ICU patients per unit, during the study period May 2009–December 2010.
RESULTS. This analysis includes 1,670 patients from 107 units from 34 different countries. Of these, 924 patients (55.3%) had an episode of AKI defined by the RIFLE classification. Creatinine criteria (Cr) only identified 669 AKI patients (72.4%). Urine output criteria (UO) only identified 601 AKI patients (65.0%). In addition to Cr and UO criteria, renal replacement therapy identified 10 patients extra (1.1%). Use of the AKIN modification, that includes patients with an absolute increase of Cr ≥ 0.3 mg/dL, resulted in 58 patients extra. Of patients classified as no-AKI according to UO criteria, 29.3% had AKI according to Cr criteria. Of no-AKI according to Cr, 24.5% had AKI according to UO. AKI patients were older (66 years, interquartile range (IQR): 55, 75 vs. 60, IQR: 48, 71, $p < 0.001$), and a greater proportion had female gender (38.3 vs. 33.2 vs. 38.3%, $p = 0.032$). Maximum severity of AKI was Risk in 196 patients (11.7%), Injury in 168 (10.1%), and Failure in 560 (33.5%). There was a stepwise increase of hospital mortality according to RIFLE class (no-AKI 6.7%, R 16.1%, I 23.6%, and F 37.2%). When classified according to Cr or UO criteria only, there was less discrimination in mortality between RIFLE classes (mortality Cr only: no-AKI 10.4%, R 26.6%, I 38.2% and F 36.6%, and for UO criteria only: 12.3, 22.1, 17.2, 39.9%). The 58 patients, who were classified as AKI by the 0.3 mg/dL AKIN criterion, but not by RIFLE, had a mortality of 3.6%.
CONCLUSIONS. In this large prospective multicenter international ICU study, AKI classified according to the RIFLE classification occurred in more than half of ICU patients. When isolated Cr or UO criteria were used, one quarter to one third of AKI patients were missed. Cr criteria and UO criteria were complimentary in identification of AKI patients. AKI was associated with a stepwise increase of mortality. This relation was less clear in patients who were classified to Cr or UO criteria only. The AKIN modification identified only a small number of patients not identified by RIFLE, and these patients had a low mortality.

0809

URINE HEPCIDIN IS AN EARLY PREDICTOR OF PROTECTION FROM CARDIOPULMONARY BYPASS-ASSOCIATED ACUTE KIDNEY INJURY - AN OBSERVATIONAL COHORT STUDY

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INTRODUCTION. Conventional markers of acute kidney injury (AKI) lack diagnostic accuracy and are expressed only late after cardiac surgery with cardiopulmonary bypass (CPB). Recently, interest has focused on hepcidin, a regulator of iron homeostasis, as a unique renal biomarker.

OBJECTIVES. We aimed to (1) assess the predictive value of early postoperative urine hepcidin and plasma hepcidin for protection from AKI (2) investigate the role of chronic kidney disease on the predictive value of hepcidin and (3) explore whether changes in urine hepcidin reflect changes in plasma hepcidin.

METHODS. We studied 100 adult patients in the control arm of a randomized controlled trial (clinicaltrials.gov NCT00672334) that were identified to be at increased risk of AKI after cardiac surgery with CPB. AKI was defined according to the RIFLE classification. Samples of plasma and urine were obtained simultaneously (1) before CPB (2) 6 h after the start of CPB and (3) at 24 h after CPB. Plasma and urine hepcidin 25-isoforms were quantified by competitive enzyme-linked immunoassay.

RESULTS. At 6 and 24 h after CPB, AKI-free patients (N = 91) had largely increased and were 3–7 times higher urine hepcidin concentrations compared to patients with subsequent AKI (N = 9) in whom postoperative urine hepcidin remained at preoperative levels ($P = 0.004$, $P = 0.002$). Furthermore, higher urine hepcidin and, even more so, urine hepcidin adjusted to urine creatinine at 6 h after CPB discriminated patients who did not develop AKI [AUC-ROC 0.80 (95% CI 0.71–0.87); 0.88 (95% CI 0.78–0.97)] or did not need renal replacement therapy initiation [AUC 0.81 (95% CI 0.72–0.88); 0.88 (95% CI 0.70-0.99)] from those who did. At 6 h, urine hepcidin adjusted to urine creatinine was an independent predictor of protection from AKI ($P = 0.011$). Plasma hepcidin did not predict protection from AKI. The study findings remained essentially unchanged after excluding patients with preoperative chronic kidney disease.

CONCLUSIONS. Our findings suggest that urine hepcidin is an early predictive biomarker of protection from AKI after CPB thereby contributing to early patients risk stratification.

GRANT ACKNOWLEDGMENT/COMPETING INTEREST: Dr. Westerman is a shareholder, President and CEO of Intrinsic LifeSciences, developer and distributor of an ELISA assay for hepcidin. Dr. Westerman has received consulting fees and grant support from Centocor-Ortho Research and Development. Dr. Prowle and Prof. Bellomo are named in a US preliminary patent application in conjunction with Dr. Westerman. Prof. Bellomo has received consulting fees from Gambro, Biosite, Abbott Diagnostics, and Philips Medical Systems, and grant support from Fresenius Kabi, Bard, Pfizer, and Gambro. Dr. Haase received lecture fees from Abbott Diagnostics and Biosite/Alere.

0810

MANAGEMENT OF RENAL REPLACEMENT THERAPY: AN INTERNATIONAL SURVEY AMONG INTENSIVISTS

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INTRODUCTION. Despite informations obtained from large randomized controlled trials addressing the question of management of renal replacement therapy (RRT) in critically ill patients, optimal choice of the technique, dose-intensity and timing remain matter of debate. Few studies have evaluated current practices and believes of intensivists regarding RRT.

OBJECTIVES. The goal of this study was to evaluate practices and believes regarding the management of RRT in ICU patients with an acute kidney injury among an international panel of intensivsits.

METHODS. Online questionnaire sent to every ESICM members through the monthly newsletters in July and August 2010. This study was endorsed by the ESICM through the ECCRN. The questionnaire included questions regarding characteristics of responders, choice of technique, timing and settings of RRT in the respondent practice. Results are expressed in n (%) or median (interquartile range).

RESULTS. The respondents (n = 273) had a 12 (7–20) years experience in an ICU, most of them were head of ICU (n = 185, 67%). Respondents were from 50 countries most of them working in France (n = 51, 18.9%), United Kingdom (n = 30, 11.1%) and Germany (n = 24, 8.4%). Half of them worked in a mixed (medical-surgical) ICU (n = 130, 47.8%). In most of the ICUs, the intensivists were in charge of the prescription of RRT (n = 228, 83.8%). Preferred RRT modality was continuous renal replacement therapy (CRRT) techniques (88%), while only 10% preferred intermittent hemodialysis (IHD). Main reasons justifying this choice being greater hemodynamic stability (n = 110, 42%), better fluid balance control (n = 108, 41%) and possibility of cytokines removal (n = 87, 33.3%). Regarding RRT dose-intensity, when using IHD, only 45 respondents (16.5%) preferred longer dialysis duration (>4 h) and only 64 (23.4%) daily dialysis (>4 times a week). When using continuous RRT, only 44% of respondents prescribed ultrafiltration rate of higher than 25 ml/kg/h. However, when treating septic patients higher rates of ultrafiltration rates were used with 27% of respondents prescribing ultrafiltration rate higher than 45 ml/kg/h. Finally, 20% of intensivists used diuretics before initiating RRT only in case of fluid overload.

CONCLUSIONS. CRRT remains the preferred technique of RRT for most intensivists. Despite recent publications suggesting that increasing intensity of RRT does not improve outcome, a large proportion of intensivists declare prescribing ultra filtration rate above 25 ml/kg/h, especially during sepsis. The limited number of respondents to this questionnaire and the large number of countries limits however the external validity of our results. A cross sectional cohort survey regarding management of RRT in ICU would be valuable in order gain insights into current practices of RRT and would help to better define areas for future investigations.

0811

CONTINUOUS VENOVENOUS HAEMODIALYSIS WITH REGIONAL CITRATE ANTICOAGULATION IN LIVER FAILURE

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INTRODUCTION. Liver failure is often accompanied by an impaired kidney function. In case of dialysis treatment citrate for the local anticoagulation is an option to reduce the risk of bleeding. However there is both little data above citrate anticoagulation in patients with liver failure and predictors for its feasibility.

OBJECTIVES. We prospectively evaluated the feasibility as well as the predictive capability of parameters of liver function including the plasma disappearance rate of indocyanine green (ICG-PDR) regarding citrate accumulation in patients with impaired liver function under continuous haemodialysis (CVVHD) with citrate anticoagulation.

METHODS. Prospective study in a medical intensive care unit of a university hospital. 28 CVVHD with citrate anticoagulation in 18 patients (maximum of 2 CVVHD per patient) with impaired liver function (mean MELD score 34). Use of the multiFiltrate of Fresenius Medical Care. Application of calcium and citrate according to standard protocol. Duration of CVVHD in all patients for at least 24 h, in 20 cases for 72 h. Time period from October 2009 to April 2011.

RESULTS. Citrate levels significantly increased in the serum of all patients. In parallel a decrease of the ionised calcium after 30 min after start of the CVVHD and an increase of the total/ionised calcium ratio after 4, 12, 24 and 72 h ($p < 0{,}001$ for all comparisons) was detected. Total/ionised calcium ratio exceeded the critical level of >2.5 [1] in 5 out of 28 cases resulting in treatment stop after 24 h instead of 72 h. In ROC analysis the baseline values of the ICG-PDR and the Quick were predictive for exceeding the critical threshold of total/ionised calcium ratio >2.5 at time point 12 and 24 h of treatment (12 h: AUC 0.856 for ICG-PDR and 0.891 for Quick. 24 h: AUC 0.761 for ICG-PDR and 0.992 for Quick). Total/ionised calcium ratio of <2.5 after 24 h was predicted by baseline Quick (AUC 0.992), GOT (AUC 0.811), ICG-PDR (AUC 0.761) whereas MELD (AUC 0.754) and baseline bilirubin (AUC 0.652) had limited predictive capability. Concerning the metabolic side effects during citrate CVVHD mean blood pH showed an increase of 7.28–7.33 after 24 h and to 7.37 after 72 h of treatment. Mean ionised calcium could be hold stable in a normal range between 1.18 mmol/l at start, 1.17 mmol/l after 24 h and 1.14 mmol/l after 72 h with a correctable lowest ionised calcium of 1.07 mmol/l after 4 h of treatment.

CONCLUSION. In difference to Quick, pTT or INR the ICG-PDR might be a valuable parameter of predicting the threshold of total/ionised calcium ratio >2.5 not influenced by the substitution of coagulation factors. Using these indicators an appropriate metabolic control in CVVHD with citrate anticoagulation can be achieved despite a strongly impaired liver function.

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Quality of care & ICU readmission: 0812–0816

0812

READMISSION TO THE ICU: A DEAD END?

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INTRODUCTION. Readmission to the ICU during the same hospitalization is not beneficial for patients' survival.

OBJECTIVES. To evaluate hospital mortality in patients readmitted to the ICU.

METHODS. A retrospective cohort analysis of readmitted patients documented in the Dutch national ICU registry (National Intensive Care Evaluation, NICE) in which 81 ICUs participate, mixed medical-surgical ICUs in university hospitals, teaching- and non-teaching hospitals. Data was analysed using PASW Statistics 18.02.

RESULTS. From 2008 to 2010 a total number of 154,014 patients were admitted to the ICUs and 11.579 (7.5%) were readmitted, fairly consistent with literature. Hospital mortality increased from 24.2% at first readmission n = 9,382 (6.1%) to 34.9% at the fourth readmission n = 83 (0.05%). Surprisingly, hospital mortality declines at the fifth or more readmission. Further research is needed to explain this.

CONCLUSIONS. Readmission in this Dutch cohort of ICU patients is associated with higher hospital mortality.

REFERENCES. 1. Rosenberg AL, et al. Chest. 2000;118:492–502.

Table 1 ICU readmission and hospital mortality

	Number of patients	%	Hospital mortality	% Hospital mortality
No readmission	142,435	92.5	18,256	12.82
First readmission	9,382	6.09	2,274	24.24
2nd readmission	1,421	0.92	420	29.56
3rd readmission	268	0.17	82	31.72
4th readmission	83	0.05	29	34.94
5th readmission	19	0.01	5	26.32
6th or more readmission	18	0.01	2	11.11
Not recorded	388	0.3	64	16.49

0813

RESIDUAL ORGAN DYSFUNCTION AND OUTCOMES IN PATIENTS DISCHARGED FROM INTENSIVE CARE UNIT

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INTRODUCTION. Hospital mortality in the post intensive care unit (ICU) period is associated with the presence and severity of organ failure at ICU discharge [1].

OBJECTIVES. We hypothesized that the presence and the number of residual organ dysfunctions could be determinant of post-ICU outcomes in patients without any organ failure at ICU discharge.

METHODS. Patients discharged in the period of 2003 to 2008 from the Emergency Department ICU of Hospital das Clinicas at University of São Paulo after at least 72 h of ICU stay were retrieved from our prospectively collected database. Residual organ dysfunction was defined as a SOFA score less or equal to 2 and organ failure was defined as a SOFA score of 3 points or more for each domain. Only patients with SOFA score less or equal to 2 at discharge in any system of the SOFA domains were analyzed. Chi-square test and Mann–Whitney tests to univariate analysis were used when appropriate. A multivariate analysis was performed using a binary logistic model taking in-hospital death as a dependent variable and APACHE II and each system of SOFA score at discharge as independent variables.

RESULTS. Our database comprised of 694 patients and 126 patients were not included in the analysis due to the presence of SOFA >3 in any domain at discharge. Thus, we analyzed 568 patients (82%). The mean age was 49 ± 19 y/o, median APACHE II score was 14 (10–20), median admission SOFA 4 (2–6) and the most important causes of admission were respiratory failure (34%) and shock (16%). Post-ICU mortality was 17% (94), unplanned ICU readmission was 17% (95) and among these 95 patients that were readmitted, 47 (50%) died in the ICU. The median of ICU LOS was 7 (4–12) and post-ICU LOS was 12 (6–26) days. At discharge, the median of SOFA was 1 (1–2). The risk to in-hospital mortality for each additional residual organ dysfunction is OR 2.10 (95% CI 1.64–2.69, P < 0.001). On the univariate analysis, APACHE II, residual dysfunction of neurological, cardiovascular, respiratory, renal and hematological domains were significantly associated with death after ICU discharge. On the multivariate analysis, APACHE II OR 1.06 (95% CI 1.03–1.10, P < 0.001), neurological OR 2.24 (95% CI 1.30–3.85, P = 0.004), cardiovascular OR 3.35 (95% CI 1.51–7.45, P = 0.003), respiratory OR 2.00 (95% CI 1.21–3.38, P = 0.008) and renal OR 1.80 (95% CI 1.03–3.15, P = 0.038) components were associated with in-hospital death. Furthermore, the number of residual dysfunctions is associated with unplanned readmission OR 1.41 (95% CI 1.12–1.77, P = 0.004).

CONCLUSIONS. Cumulative residual organ dysfunctions were independently associated with post-ICU death and unplanned readmission. Patients with residual organ dysfunction at ICU discharge may need special attention at a monitored environment such as a step-down unit after ICU period until further improvement of organ dysfunction.

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0814

REGIONALISATION OF QUALITY MEASUREMENT IN ICU: A NOVEL APPROACH TO PANEL-BASED DEVELOPMENT AND MULTICENTRE IMPLEMENTATION OF QUALITY MEASURES ACROSS A UK CRITICAL CARE NETWORK

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INTRODUCTION. Intensive care quality measurement is elusive, with no universally agreed set of measures. Internationally implemented ICU quality measures have ranged from a single proposed indicator [1] to a list of 20 [2], indicating that a gold standard has yet to be found. Regionalised development and implementation of quality measures may offer effective benchmarking, with improved local engagement and a novel approach to selection of workable measures.

OBJECTIVES. We describe the successful development and implementation of regionalised quality measures across 13 public hospitals in the North West London Critical Care Network (NWLCCN).

METHODS. A multiprofessional expert panel was convened of 14 doctors, nurses and physiotherapists from 8 organisations in the Network. Healthcare commissioner involvement was sought and obtained. Initial input was a long-list of 55 evidence-based measures generated at a consensus conference hosted by a sister Network [3], sorted by structure, process, and outcome. Shortlisting was performed by an iterative, modified Delphi process, applying a priori scoring criteria (validity, measurability, reproducibility, verifiability, resilience, discriminatory power, and lack of perverse incentives). Numerical sorting and face-to-face meetings were used to refine the shortlist, with the greatest weighting given to measurability. Formal written definitions were generated for each shortlisted measure, and those measures which proved difficult to define were rejected. The measures were adjusted for polarity, linearity, and scale.

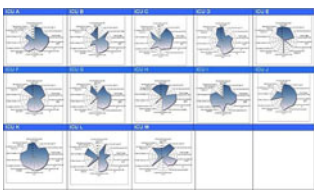

Fig. 1 Quarter-year regional dataset, Oct–Dec 2010

RESULTS. A final list of 14 measures was developed and collected quarterly. Measures are analysed and returned to units in radar chart form (Fig. 1). More fill shading = better score on each axis. The quality measures are now embedded in the local healthcare commissioning system, with contractual obligations to collect data.

CONCLUSIONS. A viable set of quality measures was produced by a multiprofessional expert panel using an innovative structured selection process, and is now in established regional use.

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0815

DAILY MULTIDISCIPLINARY ROUNDS INCREASE 28-DAY ICU-FREE DAYS

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INTRODUCTION. Daily multidisciplinary rounds (DMR) can be helpful to improve communication, share common goals and result in better patients outcome [1].

OBJECTIVES. To evaluate the impact of the institution of DMR in clinical outcomes in a mixed ICU of a private hospital.

METHODS. DMR were instituted in our mixed tertiary 16-bed ICU in October 2010. Using our patient's data bank, we retrieved admission clinical and demographic data and outcome information in 2 different admission periods: 1 year before (period 1) and 1 year after institutions of DMR (period 2). Four independent multivariate analysis were performed with the 28-day ICU-free days, 90-day hospital-free days, ICU mortality and hospital mortality as dependent variables. The independent variables were: period, age, SAPS 3 score, Charlson Comorbidity Index (CCI) and type of admission (clinical vs. surgical).

RESULTS. From October 2008 to October 2010, 1,600 patients were admitted in our ICU. The mean age was 64.1 (±19.0) years, the mean SAPS 3 49.3 (±17.5), the ICU mortality was 15% and the hospital mortality was 25%. There was 656 patients admitted in period 1 and 944 in period 2 (after MDR). There was no gender age or type of admission difference between the 2 periods. However, there were significant differences in the SAPS 3 and CCI between the 2 periods, there were also significant differences in 28-day ICU-free days and 90-day hospital-free days (Table 1).

Table 1 Patient characteristics in the 2 periods of the st

Parameter	Period 1 (n = 656)	Period 2 (n = 944)	P value
Age, years	64.6 ± 18.6	63.8 ± 19.3	0.40
Male gender (%)	328 (50)	475 (50)	0.83
CCI	3.0 ± 3.0	1.7 ± 2.1	<0.01
SAPS 3	53.4 ± 19.8	46.5 ± 15.3	<0.01
Admission type (clinical/surgical)	514/132	759/185	0.68
28-day ICU-free days	18.0 ± 11.1	21.8 ± 8.50	<0.01
90-day hospital-free days	49.6 ± 37.8	58.6 ± 34.6	<0.01

In the multivariate linear analysis, period 2 was associated with an increase in 28-day ICU-free days (Table 2).

Table 2 Univariate and multivariate linear analysis

Parameter	Beta univariate	P value	Beta multivariate	P value
Age	−0.68 (−0.93 to −0.43)	<0.01	0.09 (0.07–0.12)	<0.01
Admission type	5.20 (4.01 to 6.38)	<0.01	−2.17 (−3.27 to −1.08)	<0.01
CCI	−1.05 (−1.23 to −0.87)	<0.01	0.20 (0.02 to 0.37)	0.02
SAPS 3	−0.32 (−3.50 to −0.305)	<0.01	−0.41 (−0.44 to −0.37)	<0.01
Period (reference to 1)	3.85 (2.89 to 4.81)	<0.01	1.23 (0.42 to 2.04)	<0.01

Other variables (age, CCI, SAPS 3 and type of admission) were also associated with this outcome. The period was not associated with the other outcomes. ICU mortality was only independently associated with SAPS 3 and hospital mortality was independently associated with SAPS 3 and CCI.

CONCLUSIONS. The institution of multidisciplinary rounds was independently associated with an increase in the 28-day ICU-free days, without any significant effect in other hospital outcomes.

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0816

A SERVICE QUALITY IMPROVEMENT PROJECT REVIEWING CRITICAL CARE READMISSIONS WITHIN 48 HOURS IN A TEACHING HOSPITAL MIXED MEDICAL / SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Readmission to critical care within (<) 48 h is associated with significantly increased morbidity and mortality [1, 2]. It is recognised as one measure of the quality of critical care performance. Identifying reasons for readmission is key to implementing change to minimise readmission rates.

OBJECTIVES. To determine the critical care readmission rate <48 h.
To identify reasons for readmission <48 h through root cause analysis.

METHODS. We retrospectively reviewed patient data form our casemix critical care information system on all patients discharged alive over 20 months from 1/1/2009 to 1/10/2010. The data reviewed included: age, diagnosis, ICU length of stay (LOS), duration of individual organ support, discharge destination, timing of discharge ('out of hours' i.e. 1700 hours, 0800 hours week days or during weekend). We then reviewed the casenotes of all patients readmitted <48 h and, through root cause analysis, identified 'themes' contributing to readmission.

RESULTS. Of 1,990 patients discharged alive, 123 (6.2%) were readmitted. 28 (1.4%) were readmitted <48 h. The most common reasons for readmission were: respiratory failure, return to theatre and sepsis. Patients, readmitted <48 h, ICU LOS was on average less (3.06 vs. 4.01 days). Of all readmissions, those readmitted <48 h had stayed on average 2.5 days less than all readmissions (4.1 vs. 6.7 days). The readmission rate <48 h for post-operative renal / pancreas transplant or peritonectomy patients was higher [7/121 (5.7%) vs. 35/1642 (2.2%)]. Nearly three times as many patients, readmitted <48 h, had been discharged 'out of hours' [449/1990 (22.1%) vs. 18/28 (64.3%)]. Issues identified: inadequate discharge summaries, inadequate communication with receiving team, 'Early Warning Score' policy not adhered to (e.g. timing of arterial blood gas, charting of fluid balance, delay in critical care referral).

CONCLUSIONS. Our ICU readmission rate <48 h of 1.4% is below the national average of 1.8% (ICNARC Case Mix Programme) [3]. Reasons were multi-faceted and those identified through root cause analysis included: 'out of hours' discharge, >24 h advanced respiratory support, <36 h basic respiratory support (particularly post extubation), >6 h advanced cardiovascular support, >4 days basic cardiovascular support, >3 days renal replacement therapy, and <3 days critical care stay, type of surgery (transplant (renal/pancreas), peritonectomy). These findings were presented locally and incorporated into recommendations for identifying 'high risk for readmission' patients and improving the quality of critical care discharge and follow-up.

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Poster Sessions
Extracorporeal lung assist methods: 0817–824

0817

NON-TOXIC ALVEOLAR OXYGEN CONCENTRATION WITHOUT HYPOXEMIA DURING APNEIC VENTILATION. AN EXPERIMENTAL STUDY

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INTRODUCTION. Since mechanical ventilation may induce lung injury, oxygenation without tidal breathing, i.e. apneic oxygenation in combination with extracorporeal carbon dioxide removal, might be an option in the treatment of acute respiratory failure. However, ventilation with 100% O_2, which is potentially toxic, is considered a prerequisite to ensure acceptable oxygenation. Thus, it has been shown that ventilation with lower O_2 concentrations, hypoxemia will develop within minutes due to nitrogen (N_2) accumulation/concentration in the alveolar compartment caused by continuous absorption of O_2 (but not of N_2) from the lungs.

OBJECTIVES. We hypothesised that trapping N_2 in the lungs before the start of apneic oxygenation would keep the alveolar O_2 at a non-toxic level and still maintain normoxemia. The aim was to test whether a predicted N_2 concentration would agree with a measured concentration at the end of an apneic period.

METHODS. Seven anesthetized, muscle relaxed, endotracheally intubated pigs (22–27 kg) were ventilated in a randomised order with an inspired fraction of O_2 0.6 and 0.8 at two positive end-expiratory pressure levels (5 and 10 cmH_2O) before being connected to continuous positive airway pressure using 100 percent O_2 for apneic oxygenation. N_2 was measured before the start of and at the end of the 10 min apneic period. The predicted N_2 concentration was calculated from the initial N_2 concentration, the end-expiratory lung volume and the anatomical dead space.

RESULTS. The measured and predicted N_2 concentrations were 46.9 ± 4.3 and 48.2 ± 2.5% at an F_iO_2 of 0.6 and a PEEP of 5 cmH_2O with similar agreements at F_iO_2 0.8 and PEEP of 10 cmH_2O. The accuracy and precision as assessed by the mean difference between measured and predicted N_2 levels and as standard deviation of the difference were −0.5 and 2%, respectively.

CONCLUSIONS. This study indicates that it is possible to predict and keep alveolar N_2 concentration at a desired level and thus, alveolar O_2 concentration at a non-toxic level during apneic oxygenation.

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0817

LONG-TERM SURVIVAL AFTER ECMO TREATMENT

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INTRODUCTION. ECMO treatment, is used in patients (neonatal, paediatric and adult) with severe respiratory or circulatory failure where the acute risk of dying is very high. Respiratory indications for ECMO treatment are OI >40 (for neonatal), P/F ration less then 80 and Murray score >3 (for paediatric and adult).

Long term survival for these patients have been investigated in some selected groups but especially the adult group is lacking long term follow up data.

OBJECTIVES. To create a ten-year consecutive cohort of patients (neonatal, paediatric and adult) treated at the Karolinska University Hospital ECMO centre. In total 253 patients, and make a five-year follow up analysing the long-term mortality in the patients treated for respiratory indication.

METHODS. A cohort of all patients treated in the ECMO centre between 1995 and 2005 was formed.

Patients from abroad were excluded since they could not be followed (n = 27). Patients registered as ECPR-ECMO was excluded (n = 9).

The Swedish mortality registry was contacted and mortality data on the remaining 217 patients in the cohort was obtained. The patients in the cohort were followed for at least 5 years, the longest follow up time extending to 15 years.

RESULTS. Median IO (oxygenation index) for the neonatal group was 59. Median P/F ratio for the paediatric group was 55 and for the adult group 52. Of the patients in the cohort 77% survived to decanulation and 61% were still alive 5 years post ECMO treatment. No death was recorded in the cohort after a follow up time of 3 years or longer.

CONCLUSIONS. In this group of ECMO treated patients, no continuous long time deaths were observed after 3 years of follow up. The long-term survival needs to be analysed to conclude what causes there are to death in the cohort after ECMO treatment.

0819

EXTRACORPOREAL LIFE SUPPORT FOR ACUTE RESPIRATORY DISTRESS SYNDROME: USING A MOBILE ECMO SYSTEM AND LOW-DOSE ANTICOAGULATION

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INTRODUCTION. Extracorporeal life support represents a rescue therapy for severe hypoxemia and hypercapnia. During the recent years advances in ECMO technologies have been achieved. Here we report 2 years of experience in ECMO therapy using a new mobile ECMO system and low-dose anticoagulation.

METHODS. We performed a retrospective analysis of all patients treated with ECMO at the surgical ICU of University Medical Center Mannheim from August 2008 until July 2010. Our ward is a 16-bed ICU that is specialized for advanced ventilator support and ECMO therapy. Instable patients were connected to ECMO in the referral hospital by our team consisting of two intensivists, assistance by a cardiac surgeon or a perfusionist was not required. Using a miniaturized heparin-coated ECMO system we aimed a target-aPTT of 50 s.

RESULTS. 26 adult patients were treated with ECMO between August 2008 and July 2010. The patients had a mean age of 41 years, mean APACHE II sore was 27.5 and mean SAPS II score was 70.7 at admission to ECMO-center. Conventional ventilation was used for mean 3.1 days until ECMO was started, mean PaO_2/FiO_2 ratio before ECMO was 67 mmHg. At the time of takeover the patients required invasive mechanical ventilation with a mean level of PEEP of 15.9 mbar and a mean peak inspiratory pressure of 35.2 mbar.

Community acquired pneumonia was the most frequent reason for ARDS, ten patients showed a bacterial infection, six suffered from 2009 H1N1 influenza A. Hospital acquired pneumonia caused ARDS in seven patients. In each case one patient developed acute respiratory failure after polytrauma, Wegener granulomatosis and near drowning.

Twelve patients (46.2%) were transported by our team, in seven patients (26.9%) connection to ECMO was performed in the referral hospital and transport took place under ECMO conditions, ECMO duration was in average 12.4 days.

Median aPTT was 54.75 s, parameters indicating haemolysis were only moderately elevated. In two patients a clotting within the ECMO circuit could be recorded, one time the oxygenator had to be changed on day five, in another patient we replaced it on day 34. We recorded a need of 0.88 red blood cell concentrates, 0.45 units of fresh frozen plasma and 0.21 platelet concentrates per day on ECMO.

Survival rate on day 28 was 57.7%, non-surviving patients were older (mean age 43.2 vs. 39.4 years), had a greater severity of illness demonstrated by APACHE II (29.9 vs. 25.7) and SAPS II score (74.6 vs. 66.8) and more ventilator days before starting ECMO (3.4 vs. 2.9 days).

CONCLUSIONS. It seems that an early consideration of ECMO therapy, if conventional ventilation fails, might be associated with a better outcome. New technologies allow low levels of aPTT and a safe and quick connection to veno-venous bypass that can be performed by trained intensivists before transfer to ECMO-center, assistance by a cardiac surgeon or a perfusionist is dispensable.

0820

COMBINATION OF PUMPLESS EXTRACORPOREAL LUNG ASSIST WITH NON INVASIVE VENTILATION MIGHT AVOID ENDOTRACHEAL INTUBATION IN PATIENTS WITH EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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INTRODUCTION. 17–30% of patients with exacerbation of chronic obstructive pulmonary disease (COPD) die if invasive mechanical ventilation (IMV) is necessary. However, the majority of patients surviving such a treatment episode would chose to receive the same treatment again [1]. Non invasive mechanical ventilation (NIV) via face mask or helmet is known to effectively avoid IMV in many patients with exacerbation of COPD and hypercapnic respiratory failure and was also shown to result in a long term survival benefit [2]. Therefore, NIV is the treatment of choice in COPD patients presenting with hypercapnic respiratory failure.

OBJECTIVES. Arteriovenous extracorporeal lung assist (av-ECLA) is highly effective in eliminating carbon dioxide (CO_2) [3]. In patients presenting with decompensated respiratory acidosis that is refractory to NIV, av-ECLA might thereby be able to avoid tracheal intubation and IMV.

METHODS. In three patients with exacerbation of COPD and hypercapnic respiratory failure that did not respond to NIV, av-ECLA was initiated: Using local anesthesia the femoral artery and vein were cannulated with 15 and 19 F cannulas respectively and the artificial lung was interposed. NIV was continued with reduced airway pressures throughout av-ECLA-therapy.

RESULTS. With membrane-lung blood flows ranging from 1.2 to 1.5 l/min and oxygen sweep gas flows through the membrane lung of 4 to 10 l/min the $paCO_2$ was adjusted to values between 50 and 65 mmHg resulting in a pH of >7.3. NIV was continued during av-ECLA treatment and airway pressures were titrated to avoid tachypnea and maintain oxygenation at a paO_2 between 50 and 60 mmHg. Duration of av-ECLA treatment ranged from 2 days in one case to 7 and 8 days respectively. In two patients endotracheal intubation was avoided and the patients were discharged home. In one patient after 7 days of av-ECLA/NIV, endotracheal intubation was performed due to recurrent pneumonia and worsening oxygenation requiring a higher level of positive endexpiratory pressure. Tracheostomy was performed 2 days later and the patient was subsequently transferred to a nursing home providing longterm respiratory care.

CONCLUSIONS. In patients with exacerbation of COPD av-ECLA combined with NIV might be a therapeutic option aiming to avoid the IMV related morbidity and mortality.

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0821

EXTRACORPOREAL MEMBRANE OXYGENATION FOR REFRACTORY RESPIRATORY FAILURE IN NEONATES WITH MECONIUM ASPIRATION SYNDROME

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INTRODUCTION. Meconium aspiration syndrome (MAS) of the newborn can result in life threatening respiratory failure with the need for mechanical ventilation. In some patients the situation does not improve with conventional treatment and in these cases extracorporeal gas exchange can be lifesaving. Four randomised trials have shown a strong benefit of ECMO compared to conventional ventilation when primary outcome measure was death before discharge home for severe but reversible respiratory failure of different origin in newborn infants. The UK trial showed higher survival and less disability in patients treated with ECMO compared to conventional treatment at 1 year, and at four and 7 years.

OBJECTIVES. To describe the short term results of the ECMO Centre Karolinska with ECMO in newborns with MAS.

METHODS. Retrospective analysis of our database of all newborns treated with ECMO for refractory respiratory failure due to MAS. Due to the nature of this study no approval from the institutional review board was needed.

RESULTS. Between April 1989 and December 2010, 85 neonates (>39 weeks estimated gestational age) with severe respiratory failure due to MAS were treated with ECMO at the ECMO Centre Karolinska. Mean Oxygenation Index (OI) for decision making was 67 (min–max 12–160). 22 patients were cannulated for veno-arterial and 63 for veno-venous ECMO. The mean duration on ECMO was 3.7 days (0.7–12 days). All patients survived to discharge from our ECMO unit.

CONCLUSIONS. Our results indicate that patients treated with ECMO because of refractory respiratory failure due to MAS can have an excellent short term prognosis. This is supported by randomised trials where newborns treated with ECMO due to refractory respiratory failure from different origins including MAS had a significantly better survival compared to conventional critical care treatment.

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0822

OUTCOME DATA FROM A NEW EXTRACORPOREAL MEMBRANE OXYGENATION UNIT

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INTRODUCTION. In the 2010–2011 UK H1N1 influenza season the most severe cases were referred for extracorporeal membrane oxygenation (ECMO) at the Glenfield Hopital, Leicester, UK. At the University Hospital of South Manchester we opened a satellite unit for the first time, with 4 ECMO beds.

OBJECTIVES. How sick were our patients before they arrived? How many patients survived to hospital discharge? How long did they spend on ECMO and on ICU? What was the complication rate?

METHODS. A retrospective case note review and telephone follow-up.

RESULTS. We performed veno-venous ECMO via internal jugular and femoral catheters and instigated resting lung ventilation (peak pressure 25 cmH_2O, rate 10/min, PEEP 10 cmH_2O). Eleven patients were admitted: 8 men and 3 women, median age 41 years, median weight 86 kg.

The median Murray score was 3.75.

Severity of respiratory failure prior to ECMO

Parameter	Median	IQR
PaO_2/FiO_2 (mmHg)	56	47–66
Compliance (mL/cmH_2O)	23	18–31
Hours ventilated*	41	30–79
Peak pressure (cmH_2O)	37	34–39

10 (91%) of our 11 patients survived to hospital discharge. Two went to inpatient rehabilitation. The patient who died had ECMO withdrawn after 40 days and died the next day from respiratory failure.

Duration of therapy

ECMO (h)	284	224–380
Ventilated days	37	30–43
Critical care days	44	34–45
Hospital days	45	40–70

Complications

Complication	Number of patients
Additional femoral line	5
ECMO restarted	4
Cannula migration	3
Pulmonary bleeding	2
Tracheostomy bleeding	2
Second oxygenator	1
GI bleed	1

CONCLUSIONS. 1. All of our patients had severe respiratory failure and high inspiratory pressures. 2. We believe that these patients would not have survived without ECMO and resting ventilation. 3. Our survival rate was high, especially for a new unit, but we had small numbers. 4. We had no fatal complications. This is because perfusionists, in addition to specialist nurses, managed the circuits. 5. We performed veno-venous ECMO that has lower complication rates. 6. We had experience from ventricular assist devices in our transplant unit. 7. The maximum number of days ventilated prior to ECMO was 6. The median was 1.5 days. This shorter duration of high inspiratory pressures and high FiO_2 reduces lung injury. 8. We believe that resting lung ventilation allows for lung recovery, and that this is facilitated by ECMO. 9. ECMO treatment requires a prolonged critical care and hospital stay. 10. ECMO is labour intensive and required elective cardiac surgery to be cancelled to provide perfusionists to run the circuits.

0823

EXPERIENCE OF EXTRACORPOREAL MEMBRANE OXYGENATION AS A BRIDGE TO DEFINITIVE AIRWAY SECURITY

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INTRODUCTION. Extracorporeal membrane oxygenation (ECMO) has been used for cardiac and respiratory failure for over 30 years. Advances in critical care management along with increased clinical experience with ECMO have improved survival rates for various incentive care unit (ICU) conditions including refractory acute respiratory distress syndrome (ARDS) or cardiac failure. Recently, however, ECMO has emerged as a useful means of short-term support in the short-term management of hypoxic patients for nontraditional indications such as upper airway surgery, pulmonary embolism, and malignant airway obstruction. There were few reports for airway security in ECMO.

OBJECTIVES. To review our experience of using veno-venous ECMO as a bridge to support a patient with severe airway obstruction.

METHODS. A total of 54 ECMO were performed in the Asan Medical Center from November 2009 to March 2011. Ten patients (18.5%) used veno-venous ECMO as a bridge to support a patient with severe airway obstruction and their clinical courses were reviewed.

RESULTS. Of the ten patients, six were male; their median age was 63 years (range 43–82). All patients had severe airway obstruction because of tumor progression. The cause of using ECMO for airway security were insertion of tracheal stent for 5 patients, malignant mass removal with rigid bronchoscope for 3 patients, removal of tracheal stent due to stent rupture for 1 patient, and emergent intubation for 1 patient. A mean ECMO time was 12.4, 10.6 h, respectively. One hemorrhagic complication was developed and he was expired due to massive bleeding after removal of malignant mass. Weaning from ECMO therapy was success in 9 patients, and all patients are alive and well.

CONCLUSIONS. Airway protection itself or insertion of tracheal stent or removal of endobronchial mass with airway protection is a potentially life-saving procedure used in diverse clinical situations. However, problems with airway protection may cause serious complications which may be life-threatening. Although these conditions are uncommon indications for ECMO, ECMO could be a potential option for such life-threatening conditions.

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0824

FUNCTIONAL ASSESSMENT OF OXYGEN TRANSFER AT THE MEMBRANE LEVEL DURING ECMO AND THE UNRELIABILITY OF POST-MEMBRANE PAO2 AS A QUANTITATIVE PARAMETER OF THE PROCESS

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INTRODUCTION. Reversal of life-threatening refractory hypoxemia with extracorporeal membrane oxygenation (ECMO) represents a new opportunity for life. During ECMO, patient survival is dependent on oxygen transfer at the membrane level, which is a major determinant of the systemic oxygen content, thus influencing oxygen transport and delivery at tissue level. Qualitative evaluation of this process for membrane performance assessment is recommended and is usually done by serial measurements of post-membrane PaO_2 (pM-O_2).

OBJECTIVES. We assumed that measurement of pM-O_2 would be an oversimplification of the oxygen transfer process assessment at the extracorporeal membrane. Alternatively, we hypothesized that a more complex functional characterization of the oxygen transfer capabilities of the membrane, taking into account patient oxygen profile, hemoglobin and hemodynamic variables, would define a more trustworthy model on which to rely for membrane quantitative assessment.

METHODS. We performed ECMO in our patients using the Quadrox PLS Oxygenator System (Maquet). Intrinsic functional characteristics of the Quadrox were provided by the manufacturer; additionally, we defined an algorithm to assess the in vivo functional membrane behavior, replicating not only those intrinsic membrane characteristics but also the influence of patient oxygen profile, hemoglobin and hemodynamic variables. Results obtained from this model, translating the in vivo functional performance of the membrane, were compared to the values expected exclusively from the characteristics of the Quadrox PLS.

RESULTS. During treatment of our ECMO patients, we were able to monitor the oxygen transfer at the membrane level, cardiac output and the O_2 profile of the patient, and so to estimate the oxygen transfer profile of the membrane performing in vivo. In all of them, a graphic correlation between the O_2 intrinsic transfer profile of the membrane (what was expected to occur) and the real oxygen transfer occurring in each moment (what was really happening) allowed us to interpret deviations in light of hemodynamic, hemoglobin or oxygen peripheral extraction interferences on the process. In all of these circumstances, the absolute value of pM-O_2 appeared as a flawed parameter on which to rely for in vivo functional assessment of the membrane.

CONCLUSIONS. pM-O_2 is a simple parameter that reflects the efficacy of the extracorporeal membrane oxygenation process, mainly in steady-state circumstances. However, this parameter becomes unreliable to quantify or qualitatively assess oxygen transfer if hemoglobin, hemodynamics or oxygen metabolism are not simultaneously monitored.

GRANT ACKNOWLEDGMENT. No grant and no conflict of interests to declare.

Approaching the myocardial ischaemic patient: 0825–0838

0825

MORTALITY AMONG INTENSIVE CARE PATIENTS WITH PRE-EXISTING ATRIAL FIBRILLATION: A DANISH COHORT STUDY

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INTRODUCTION. The lifetime risk of suffering at least one episode of atrial fibrillation (AF) exceeds 20% [1]. In the general population, presence of AF is associated with a twofold increase in all-cause mortality [2]. Ten percent of ICU-patients may have pre -existing chronic or intermittent AF [3]. The impact of pre-existing AF on the prognosis of ICU patients is unknown.

OBJECTIVES. To investigate mortality within 30 days and 1 year after ICU admission among patients with and without a history of AF.

METHODS. All patients admitted to the ICUs in northern Denmark (population = 1.8 million) in the period 2005–2007 were identified through the Danish National Registry of Patients. Patients with a hospital diagnosis of AF within 5 years prior to admission were included in the analysis. Kaplan–Meier methods were used to estimate 30-day and 1-year mortality. Cox regression analyses were used to compute hazard ratios adjusted for age, gender, and co-morbidity.

RESULTS. Among the 28,172 ICU patients included, 2,267 (8.1%) had been diagnosed with AF within 5 years before admission. Compared to patients without a history of AF, patients with AF were more likely to be older (median age 74 vs. 62 years), to have congestive heart failure (31.5 vs. 4.9%), to have a history of myocardial infarction (12.6 vs. 5.9%), and to be treated with mechanical ventilation (50.1 vs. 40.3%).

Patients with AF had a 30-day mortality of 25.1% (95%CI 23.4–26.9%) compared to 14.9% (95% CI 14.4–15.3%) in patients without AF. The crude hazard ratio (HR) for 30 day mortality was 1.79 (95% CI 1.63–1.95). HR adjusted for gender and age was 1.14 (95% CI 1.04–1.24), HR adjusted for gender, age and co-morbidity was 1.04 (95% CI 0.95–1.14). Patients with AF who required treatment with mechanical ventilation had an adjusted HR for 30 day mortality of 1.03 (95% CI 0.92–1.15), patients with AF without need of ventilator therapy had an adjusted HR 0.99 (95% CI 0.86–1.16).

One-year mortality was 39.8% (95% CI 37.7–41.8%) for patients with AF versus 24.4% (95% CI 23.9–24.9%) for patients without. The crude HR for one-year mortality was 1.80 (95% CI 1.68–1.93). HR adjusted for gender and age was 1.14 (95% CI 1.07–1.23). HR adjusted for gender, age and co-morbidity was 1.00 (95% CI 0.94–1.08). Patients with AF requiring treatment with mechanical ventilation had an adjusted HR for 1 year mortality of 1.03 (95% CI 0.93–1.13), while patients not needing this therapy had an adjusted HR of 0.96 (95% CI 0.87–1.07).

CONCLUSIONS. Patients with a history of AF prior to ICU admission have a substantially higher mortality following hospitalisation in an ICU than patients without previous episodes of AF. However, the increased mortality seems to be related to higher age and greater comorbidity rather than to AF itself.

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0826

ACUTE HOSPITAL-ACQUIRED ANEMIA IN PATIENTS WITH ACUTE CORONARY SYNDROMES

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INTRODUCTION. Anemia (A) is common among patients (P) with acute coronary syndromes (ACS) and is associated with poor outcomes. Less is known about acute, hospital-acquired anemia (HAA).

OBJECTIVES. Our purpose was to determine the incidence, correlates and prognostic implications of HAA in P with ACS.

METHODS. From a population of 519 P consecutively admitted for ACS to a Coronary Unit, we studied 348 P (71% male, age 65 ± 14 years) with normal hemoglobin (Hb) at admission. HAA was defined according to criteria proposed by Beutler and Waalen. Mortality (M) was assessed at follow-up (FU) (7.5 ± 5.1 months). Uni and multivariate analysis was performed using SPSS 17.0.

RESULTS. HAA occurred in 151 P (43.4%). Hb declined by a mean of 2.1 ± 1.4 g/dL. 27 P (17.9%) developed moderate-severe A (Hb < 11g/dL). The factors associated with HAA were: female gender ($p = 0.008$), older ages ($p < 0.001$), diabetes mellitus ($p = 0.017$), chronic renal disease ($p < 0.001$), STEMI ($p = 0.022$), acute heart failure (HF) ($p = 0.003$); lower Hb (14 ± 1.0 vs. 15 ± 1.2; $p < 0.001$), haematocrit (42 ± 3.4 vs. 45 ± 3.9; $p < 0.001$) and glomerular filtration rate ($p < 0.001$). P with HAA had higher GRACE Score ($p < 0.001$), CRUSADE Bleeding Score (32 ± 15 vs. 24 ± 12; $p < 0.001$) and Outpatient Bleeding Risk (1.6 ± 0.6 vs. 1.4 ± 0.7; $p = 0.001$). There were no differences in the incidence of coronariography, angioplasty or use of antiplatelet agents (including Gp IIb/IIIa inhibitors, 32 vs. 29%). P with HAA more often had a femoral access (45 vs. 28%) or were submitted to crossover ($p = 0.002$), a larger catheter sheath ($p = 0.014$) and longer treatment with enoxaparine ($p = 0.006$). P with HAA had longer hospital stay ($p < 0.001$); higher incidence of cardiorenal syndrome ($p = 0.002$) and left ventricular dysfunction ($p = 0.011$). No differences were found in documented bleeding (7.9% in P with HAA; $p = 0.126$). 3.3% of P with HAA were transfused ($p = 0.01$). 112 P (80%) were discharged with A criteria. Mortality was parallel to A severity ($p = 0.003$): mild (5.6%) vs moderate (9.1%) versus severe (40%). In FU there was higher M in P with HAA ($p = 0.003$). After adjustment for GRACE score, P with moderate-severe A had higher M in FU ($p = 0.048$; HR 3.426).

CONCLUSIONS. Nearly half of ACS P developed HAA in the absence of documented bleeding. Bleeding scores correctly predicted these P. HAA was only partially explained by the use of drugs with bleeding potential. The vascular access for coronariography was crucial. We confirmed that HAA is associated with worse prognosis, being an independent predictor of mortality even after adjustment for Grace Score and therefore is an important target for prevention efforts.

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0827

PROGNOSTIC EVALUATION OF ACUTE ST-ELEVATION MYOCARDIAL INFARCTION COMPLICATED BY VENTRICULAR FIBRILLATION

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INTRODUCTION. Acute ST-elevation myocardial infarction (STEMI) complicated by primary ventricular fibrillation (VF) is associated with greater hospital mortality [1].

OBJECTIVES. To analyze severity, use of coronary reperfusion therapy (CRT) and death rates in patients with STEMI and recovery from VF prior to CRT.

METHODS. We undertook a prospective cohort study in all patients with STEMI admitted between January 2004 and January 2007 (n = 668) to the intensive care unit (ICU) of a hospital without 24-h availability of percutaneous coronary intervention (PCI). Analysis was made of the characteristics of the patients who experienced recovery from VF prior to the administration of reperfusion therapy. Data were collected on ICU mortality, severity according to the TIMI risk score, the Killip class on admission, the maximum Killip class, the location of the infarction and the type of CRT. Data were expressed as mean ± standard deviation. Was used the Student's *t* for comparisons of two means. A *p* value of <0.05 was considered statistically significant.

RESULTS. Of the 668 patients with STEMI, 30 (4.49%) had recovered from VF before the administration of CRT, including one patient in shock and another with dilated cardiomyopathy. Mechanical ventilation was necessary in 50% of these cases. Three of the patients (10%) who recovered from VF died (1 cardiogenic shock and 2 severe anoxic encephalopathy), compared with 10.5% of the others (p ns). Comparison of the characteristics of the patients who recovered from VF versus the rest showed the following: their age was 58.77 ± 11.59 versus 63.15 ± 13.27 years (p ns); the location of the infarct was anteroseptal in 53.3 versus 42.5% (p ns); the TIMI score was 3.33 ± 2.17 versus 3.6 ± 2.43 (p ns); their Killip class on admission was I:80%, II:16.7%, III:0%, and IV:3.3% versus I:81.5%, II:12.5%, III:3%, IV:3.1% (p ns); their maximum Killip class was I:60%, II:26.7%, III:6.7%; IV:6.7% vs. I:66.8%, II:16%, III:6.9%, IV:10% (p ns); and fibrinolysis was given to 19 (63.3%) versus 472 (74%) (p ns). In the patients with recovery from VF, primary PCI was performed in 23.3% versus just 8.5% of the others ($p = 0.006$); primary or facilitated PCI (pharmacological agent plus invasive strategy) in 43.3 versus 16.6% ($p < 0.001$); and rescue PCI in 16.7 versus 18.8% of the others (p ns).

CONCLUSIONS. No significant differences were found between the patients who recovered from VF and the others in age or severity, though they were more often treated with early coronary intervention procedures than the others. Patients with STEMI who recover from VF experience a similar ICU mortality to those who do not have VF when they are preferentially treated with early invasive coronary reperfusion therapy

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0828

LOCAL INTRA-ARTERIAL THROMBOLYSIS IMPROVES RIGHT VENTRICULAR DYSFUNCTION IN HEMODYNAMICALLY STABLE PULMONARY EMBOLISM

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OBJECTIVE. Management of pulmonary embolism (PE) with right ventricular (RV) dysfunction and hemodynamic stability is controversial. The objective of this study is to determine the efficacy of local intra-arterial thrombolysis (LT) in these cases and to evaluate its effect on RV function and its systemic repercussions.

METHODS. Prospective study (January 2008 to present). Inclusion criteria: 1. Hemodynamic stability defined as systolic arterial pressure (SAP) >90 mmHg; 2. PE confirmed by helical CTA; 3. RV dysfunction defined by at least one of the following echocardiographic (ECO) findings: subjective alteration of RV contractility, RV diameter in the four chamber view >40 mm, tricuspid annular plane systolic excursion (TAPSE) <15 mm and/or systolic pulmonary artery pressure >30 mmHg.

Pulmonary angiography (ANG) was done with measurement of pulmonary artery pressures (PAP). LT with uroquinase (UK) (bolus of 100.000–200.000 UI followed by a 100.000 UI/h infusion) plus unfractioned heparin infusion. ICU monitoring. Control ANG and ECO follow ups where done in all patients. *Statistical method*: Paired *t* test. Results are shown as means difference between initial and final values with a confidence interval (CI) of 95%. The Wilcoxon signed-rank test was used when the null hypothesis was rejected.

RESULTS. Thirty nine patients. Twenty three males. Age 61 ± 18 years. Main symptom: dyspnea (85%). On arrival: SAP 127 ± 23 mmHg, heart rate (HR) 105 ± 22 bpm, hemoglobin (Hb) 14 ± 2 g/dl, platelets 209 × 10^3±71 cells/mm^3, Troponin I 0.45 ng/ml (median; range: <0.05–31) and nt ProBNP 3.515 pg/ml (median; range 25–23.181). ECO: severe dysfunction 28%, moderate 53%, mild 11% and normal 8%; RV diameter 45 ± 7 mm; TAPSE 15 ± 4 mm. ANG: systolic PAP: 52 ± 15 mmHg; diastolic PAP 24 ± 9 mmHg and mean PAP 34 ± 10 mmHg. Mean time of LT 55 ± 15 h. Decrease in mean HR after LT: 27 bpm [CI95 (20–33), $p < 0{,}001$]. No significant decrease in Hb levels. Platelet count mean dropped by 73 × 10^3 cells/mm^3 [CI95 (60–86 × 10^3), $p < 0{,}001$] as did nt-ProBNP (median 1.062 pg/ml; range 20–13.396; $p < 0.001$). Lowest fibrinogen levels during LT: 252 ± 94 mg/dl. Control ANG: 82% radiologically improved. Mean reduction of PAP: systolic PAP 16 mmHg [CI 95 (12–20), $p < 0.001$]; diastolic PAP 9 mmHg [CI 95 (6–12), $p < 0.001$] and mean PAP 10 mmHg [CI 95 (7–12), $p < 0.001$]. Control ECO (1–7 days after LT): 18% presented mild RV dysfunction, the rest of them had normal contractility ($p < 0.001$); mean reduction of RV diameter: 9 mm [CI 95 (7–11), $p < 0.001$]; mean TAPSE raise: 8 mm [CI 95 (5–10), $p < 0.001$]. All patients survived. LT was stopped in one case due to hematuria.

CONCLUSIONS. Fibrinogen levels during LT remained in normal values. There was a drop in platelet count that could be related to heparin infusion. No change in the value of Hb was noted. LT didn't cause major systemic complications. LT in this group of patients improved RV dysfunction and contributed to the rapid resolution of the thrombus.

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GENDER DIFFERENCES IN THE IN-HOSPITAL MANAGEMENT OF PATIENTS ADMITTED FOR NON-ST-SEGMENT-ELEVATION ACUTE CORONARY SYNDROME

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INTRODUCTION. There is controversy about the existence of gender bias in the diagnosis and treatment of non-ST-segment-elevation acute coronary syndrome (NSTEACS).
OBTECTIVES. Our aim was to compare the data of in-hospital management of NSTE ACS in relation to gender of the patient.
MATERIALS AND METHODS. We analyzed the clinical, epidemiological, treatment and diagnostic characteristics in 715 patients admitted to our hospital for NSTEACS, from January 2004 to December 2005.
RESULTS. 31.9% (228 patients) were women, with an older age compared to men (70.5 ± 9.9 years vs. 64.2 ± 11.3 years, p = 0.0001), more hypertensive (70.2 vs. 59.8%, p = 0.004) and diabetes (49.6 vs. 35.9%, p = 0.0001). We found more prevalence of atrial fibrillation (11.8 vs. 7%, p = 0.023) and anemia (34.8 vs. 23.1%, p = 0.001) in women. Men had a higher percentage of previous coronary revascularization procedure (23.4 vs. 14.9%, p = 0.005). Women had greater comorbidity (Comorbility Charlson Index 2.64 ± 2.3 vs. 2.20 ± 1.9, p = 0.0001) and higher percentage of TIMI risk score ≥3 (71.5 vs. 56.6%, p = 0.0001). There were no significant differences in the percentages of unstable angina or non-Q-wave myocardial infarction in relation to gender (73.7 vs. 73.3%, p = 0.49 and 25.9 vs. 25.7%, p = 0.51) nor measurement of left ventricular systolic function (84.6 vs. 85.2%, p = 0.9). Women underwent less treadmill test (11.1 vs. 19.4%, p = 0.03), cardiac catheterization (66.2 vs. 74.5%, p = 0.01) and angioplasty stent implantation (53 vs. 62.5%, p = 0.028). Women had a higher percentage of absence of significant coronary arteries stenosis (24.7 vs. 9.7%, p = 0.0001) and 3-vessel disease (41.3 vs. 27.4%, p = 0.001). At discharge, women received less prescription of clopidogrel (40.8 vs. 55.9%, p = 0.0001) and beta-blockers (73.2 vs. 80%, p = 0.03) and more ACE inhibitors or ARBs (72.8 vs. 54.3%, p = 0.0001). After multivariate analysis, female gender was not an independent predictor for cardiac catheterization (mOR 0.79; 95% CI, 0.53–1.19; p = 0.26), although it predicted lower use of coronary angioplasty (mOR 0.58, 95% CI, 0.38–0.9; p = 0.01).
CONCLUSIONS. In our series, we found differences in diagnosis and treatment of patients with non-ST-segment-elevation acute coronary syndrome in relation to gender. These differences disappeared when the analysis included factors that might justify them.

0830

ACUTE AND LONG-TERM EFFECTIVENESS OF ELECTRICAL CARDIOVERSION IN PATIENTS WITH PERSISTENT ATRIAL FIBRILLATION

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INTRODUCTION. Atrial fibrillation (AF) is the most frequent sustained arrhythmia. The first step in a rhythm control strategy is generally electrical cardioversion (ECV). Long-term maintenance of sinus rhythm after a successful ECV is difficult, mainly because of a high recurrence rate of AF. Our objective was to evaluate the effectiveness of ECV in patients with persistent atrial fibrillation (PAF) after monitoring for 12 months. We also analyzed the clinical and echocardiographic factors which predict the acute and first year success of ECV.
METHODS. This prospective study included 105 patients (p) with PAF that consecutively underwent ECV in our Cardiology Department between January 2008 and January 2009. ECV was performed under general anesthesia with 20 mg of intravenous etomidate. Unless contraindicated, patients continued to receive rate-control medication after ECV to prevent a high heart rate in the event of recurrence of AF. Ambulatory monitoring to determine relapses was performed at 6 and 12 months.
RESULTS. We analyzed 105 p with a mean age of 60 ± 10 years old. They were predominantly male (75%), 61% had known hypertension and 16% suffered from diabetes mellitus. Structural cardiopathy was observed in 66% of the p (ischemic heart disease in 23%, valve disease in 32% and dilated cardiomyopathy in 11%). Total arrhythmia duration was indefinite in 84%, <3 months in 11%, and >3 months in 5%. Before CVE, heart rate was controlled by drugs to lower the rest heart rate to <100 beats/min. The specific medication depended on the physician's preference as well as on concomitant heart disease; 70% took amiodarone, 12% ACE inhibitors, 14% verapamil or diltiazem, 10% beta-blockers, 5% digitalis. The CVE was effective in 65% of the p; the acute success was related to the male gender (p < 0.05), the size of the left atrium (p < 0.05) and the need for a single electric shock (p = 0.001).
During follow-up, at 6 months, 21% had a relapse of AF; it was related to the number of electric shocks (p = 0.028). At 18 months, 32% remained in sinus rhythm. It was associated with taking amiodarone and with the shorter length of arrhythmia (p < 0.05). Patients with relapses more often had reduced LVEF (15%), increased LVEDD (10%), history of prior CVE (33%), interrupt of pharmacological treatment (15%). The NYHA functional class was I in 50% II in 47% (higher rate of recurrence) and III 8%. No complications were described in the medium or long term, (0% of thromboembolic events).
CONCLUSIONS. Electrical cardioversion is a safe and effective treatment in the short-term, despite frequent recurrences. Patient age and the size of left atrium were predictors of acute success. Long-term success of cardioversion was associated with the shorter length of arrhythmia and the taking of class III antiarrhythmic drugs.
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0831

IDENTIFYING MYOCARDIAL DAMAGE FROM ROUTINELY RECORDED DATA IN THE INTENSIVE CARE UNIT (ICU)

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INTRODUCTION. The physiological effect of myocardial damage depends on both the severity of the myocardial injury and the part of the heart which is damaged. To diagnose suspected myocardial damage, ICU clinicians often use a combination of the patient's physiological data, an electrocardiogram (ECG), and cardiac biomarkers (e.g. troponin) as it is not often possible to elicit the classical history of chest pain. However, critically ill patients often don't display the ECG changes related with myocardial damage, and cardiac biomarkers are not always routinely taken. It is hypothesized that using only routinely recorded physiological data to detect myocardial damage is a hard task, resulting in disagreement between clinicians, and potentially under treatment of patients.
OBJECTIVES. To determine if ICU consultants, using only routinely recorded data, disagree when identifying patient myocardial damage.
METHODS. In the ICU at Glasgow Royal Infirmary, patient troponin levels are measured every 72 h or when a patient has suffered a suspected myocardial event. 4 ICU consultants were interviewed individually and asked to detect myocardial damage from the same 8 datasets. Each patient dataset contained hourly physiological parameters, fluid and drug infusions, LiDCO readings, and troponin values for the complete patient stay. 4 of the 8 datasets were known to contain myocardial damage (indicated by troponin readings >0.04 g/l).The remaining 4 datasets contained no myocardial damage. For each dataset the consultant was asked to determine whether the patient had suffered myocardial damage. Note that although the troponin values were known these values were not shown to the consultants.
RESULTS.

Consultants' detection of myocardial damage

	Dataset 1	Dataset 2	Dataset 3	Dataset 4	Dataset 5	Dataset 6	Dataset 7	Dataset 8	Total correct
Myocardial damage (as confirmed by raised troponin levels)	Yes	Yes	No	No	No	Yes	Yes	No	
Consultant 1 (75%)	Yes	Yes	No	Yes	Yes	Yes	Yes	No	6 out of 8
Consultant 2 (37.5%)	No	Yes	No	Yes	Yes	Yes	No	Yes	3 out of 8
Consultant 3 (37.5%)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	3 out of 8
Consultant 4 (62.5%)	No	Yes	No	Yes	Yes	Yes	Yes	No	5 out of 8

Details of individual consultants' performance]

	Consultant 1	Consultant 2	Consultant 3	Consultant 4	Consultant average
True positive (Sensitivity)	4 out of 4 (100%)	2 out of 4 (50%)	3 out of 4 (75%)	3 out of 4 (75%)	75% (12/16)
False negative	0 out of 4 (50%)	2 out of 4 (50%)	1 out of 4 (25%)	1 out of 4 (25%)	25% (4/16)
True negative (specificity)	2 out of 4 (50%)	1 out of 4 (25%)	0 out of 4 (0%)	2 out of 4 (50%)	31.25% (5/16)
False positive	2 out of 4 (50%)	3 out of 4 (75%)	4 out of 4 (100%)	2 out of 4 (50%)	68.75% (11/16)

CONCLUSIONS. Detecting myocardial damage from routinely recorded data is a difficult task and disagreement was indeed observed between the consultants (Fleiss' Kappa = 0.384). The number of false negatives (25%) in the study suggests that patient treatment may benefit from frequently recorded troponin levels. Bearing in mind, experienced ICU consultants were examining the datasets for myocardial damage; it is anticipated that if clinicians of wider experience levels are observed in a natural setting, the detection of patient myocardial damage would be significantly lower. The work presented is a pilot study and the results will be investigated further in a larger study.

0832

ACCURACY OF A NON-INVASIVE DEVICE (NEXFIN HD™) FOR CONTINUOUS MONITORING OF ARTERIAL PRESSURE AND CARDIAC OUTPUT IN CRITICALLY ILL SEPTIC PATIENTS. A COMPARISON WITH DOPPLER-ECHOCARDIOGRAPHY

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INTRODUCTION. Arterial pressure and cardiac output (CO) continuous monitoring is of crucial importance for adequate management of critically ill septic patients. The NEXFIN HD monitor is able to continuously and non-invasively monitor arterial pressure by using a finger cuff and a photoelectric plethysmograph. While continuously measuring arterial waveform, the monitor calculates CO.
OBJECTIVES. The aim of the study was to compare invasive arterial pressure measured by an arterial catheter and by the Nexfin HD™ in critically ill septic patients. CO output and CO variations (D CO) after a passive leg-raising manoeuvre (PLR) measured by Doppler echocardiography were also compared with Nexfin HD's non-invasive measurements.
METHODS. After approval by the local ethics committee, critically ill septic patients sedated, mechanically ventilated and with a radial arterial line in place were prospectively included. Patients with poor echogenicity, with known heart valve disease were excluded. Invasive measurement of mean arterial pressure (MAP) and CO measured by Doppler echocardiography were performed. Simultaneously, non-invasive arterial pressure and CO calculated by the Nexfin HD™ monitor were recorded. A PLR was then performed and all hemodynamic data were recorded again after a 2 min interval. The PLR-induced CO variation (DCO) measured by both methods was recorded. Data were presented as median (IQR) or as number and proportion. The r' Spearman coefficient of correlation was used to compare MAP and CO measured by both methods. The Bland and Altman method was also used to compare MAP and CO measurements.
RESULTS. During the study period, from the 18 patients were included. Among them, 15 were in septic shock and 3 in severe sepsis. The median MAP measured invasively was 78 (71.5–90.0) mmHg versus 87.5 (73.5–93.5) mmHg measured by the Nexfin HD™. The median CO measured by Doppler echocardiography was 5.9 (4.2–6.6) l/min versus 6.3 (5.0–7.8) l/min measured by the Nexfin HD™. The median D CO measured by Doppler echocardiography was 0.04 (−0.01/0.17) l/min versus −0.02 (−0.23/0.12) l/min measured by the Nexfin HD™. Comparison between invasive and non invasive arterial pressure found a correlation of r' = 0.78, p < 0.0001, a bias of −6.1 mmHg and limits of agreement of (−28.3/16.2) mmHg. The comparison between CO measured by Doppler echocardiography and by the Nexfin HD™ found a correlation of r' = 0.58, p = 0.0002, a bias of −0.9 l/min, limits of agreement of (−4.6/2.8) l/min and a percentage of error of 62%. Comparison of D CO found a r' = 0.65, p = 0.003 a bias of 0.12 l/min and limits of agreement of (−0.26/0.49) l/min.
CONCLUSIONS. In this study, despite good correlations, the Nexfin HD™'s non-invasive evaluation of mean arterial pressure, cardiac output and CO variations of critically ill septic patients shows a lack of precision. Further studies are necessary to validate this device.

0833

INFLUENCE OF ALVEOLAR PRESSURE VARIATIONS ON THE PULSE PRESSURE VARIATIONS

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INTRODUCTION. Pulse pressure variation is a promising volume responsiveness predictor for critically ill patients under mechanical ventilation. The alveolar pressure variation has fundamental effect on pulse pressure variation and may complicate its interpretation. How to correct pulse pressure variations according to alveolar pressure variation remains unsettled.

OBJECTIVES. To investigate the influence of alveolar pressure variations on the pulse pressure variations.

METHODS. Six anesthetized piglets underwent five stages of intravascular volume status change. Each stage comprised of four cycles of alveolar pressure variations manipulation by adjusting the pressure control level of mechanical ventilation. Five different alveolar pressure variations were applied in randomized order for each cycle. Pulse pressure variation are recorded and calculated from lower abdominal aorta for different alveolar pressure variations.

RESULTS. The pulse pressure variation is positively and linearly correlated to the alveolar pressure variation. The pulse pressure variation responded rapidly to change in alveolar pressure variation and attained stabilization within 30 s.

Table 1

Correlations between the pulse pressure variation values calculated from different time after alveolar pressure variation change

Time after alveolar pressure change	Mean ± SD*	Time after alveolar pressure change			
		30 s	60 s	90 s	120 s
30 s	26.24 ± 14.00	1	0.971	0.975	0.949
60 s	26.20 ± 13.96	0.971	1	0.970	0.945
90 s	26.44 ± 14.05	0.975	0.970	1	0.962
120 s	26.47 ± 13.82	0.949	0.945	0.962	1

The mean r-square for 116 cycles of alveolar pressure manipulation was 0.84 ± 0.21. The slopes of the trend lines for pulse pressure variations over alveolar pressure variations are larger during stages of hypovolemia and smaller during stages of hypervolemia.

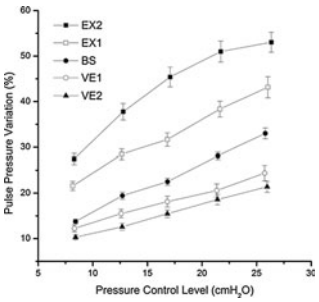

Fig. 1

CONCLUSIONS. The pulse pressure variation is positively and linearly correlated to the alveolar pressure variation. The pulse pressure variation responds rapidly to the changes in alveolar pressure variation. These characteristics could be helpful in interpreting volume responsiveness for patients ventilated in small tidal volume.

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GRANT ACKNOWLEDGMENT. The present study is supported by Buddhist Tzu Chi General Hospital, Taipei Branch, Taiwan [TCRD-TPE-99-15].

0834

CARDIAC OUTPUT MEASUREMENT USING THE NEXFIN™ MONITOR AND THE PICCO$_2$ SYSTEM IN CARDIAC SURGERY PATIENTS

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INTRODUCTION. Cardiac output (CO) can be determined on a completely non-invasive basis using the *Nexfin™* system (BMEYE B.V., Amsterdam, The Netherlands). It uses photoelectric plethysmography combined with an intermittently inflated finger cuff, the so-called volume-clamp technique. The technique is based on the Modelflow algorithm that relies on a three-element Windkessel model. So far, only limited validation data is available.

OBJECTIVES. The aim of this study was to evaluate CO assessed by the *Nexfin™* system (nCCO) in patients after cardiac surgery and an established pulse wave analysis technique, the *PiCCO$_2$* system (pCCO, Pulsion Medical Systems, Munich, Germany), as compared to intermittent thermodilution (itCO).

METHODS. With ethics committee approval and written informed consent, patients after cardiac surgery were enrolled. In all patients a PiCCO femoral artery catheter was inserted after induction of anaesthesia and upon ICU arrival the PiCCO$_2$ system was recalibrated. The study period was initiated after application of the *Nexfin* finger cuff and start of the *Nexfin™* System. Continuous CO was assessed by both systems and intermittent thermodilution (average of triplicate measurements) was performed at 6 predefined measurement points during the ICU stay. Absolute CO measurements were compared using Bland-Altman analysis adjusted for repeated measurements and %error [1], concordance was calculated in order to compare CO trends [2].

RESULTS. 132 matched sets of data from 22 patients (age = 67 ± 9 years, Euroscore = 2.8 ± 1.8, left ventricular ejection fraction = 63 ± 4%) were available for statistical analysis. Ranges of CO values were 2.1–10.0 l/min for nCCO, 1.7–10.2 l/min for pCCO, and 3.8–11.6 l/min for itCO. Results for bias, limits of agreement, %error and concordance are summarized in Table 1.

Table 1

	Bias (l/min)	LOA (l/min)	%error	Concordance (%)
nCCO versus itCO	−0.8	2.9	49.1	78
pCCO versus itCO	−0.8	2.5	42.4	74
nCCO versus pCCO	0.0	2.8	47.9	77

CONCLUSIONS. Performance of the *Nexfin™* and the *PiCCO$_2$* systems was comparable in patients after cardiac surgery. Both continuous CO monitoring devices underestimated CO assessed by intermittent thermodilution and did not meet proposed criteria [1, 2] regarding %error or concordance.

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0835

TRANSPULMONARY THERMODILUTION MEASUREMENTS ARE NOT AFFECTED BY CONTINUOUS VENO-VENOUS HEMOFILTRATION AT HIGH BLOOD PUMP FLOW

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INTRODUCTION. Transpulmonary thermodilution (TD) relies on the analysis of blood temperature variation observed into the femoral artery after the injection of a cold bolus in the superior vena cava territory. In case of renal replacement therapy, some thermal interactions might occur, resulting in measurements errors.

OBJECTIVES. To assess the validity of transpulmonary TD measurement of cardiac index (CI) in case of use of continuous veno-venous hemofiltration (CVVHF).

METHODS. Thirty patients were prospectively included once they met the following criteria: (1) monitoring by the PiCCO2 device (Pulsion Medical Systems), (2) CVVHF (Aquarius, Edwards LifeScience) using a femoral catheter, (3) hemodynamic stability. The blood pump flow was either set at 250 mL/min ("low flow" group) or 350 mL/min ("high flow" group) and a filtration flow of 6,000 mL/h was used (88 ± 28 mL/kg).

At inclusion, a first set of data was collected (CVVHF running) with a first thermodilution (TD1). The blood pump was then turned off and the continuous CI derived from pulse contour analysis was recorded (PC1). Then, a second thermodilution was performed (TD2) before resuming the blood pump. The CI was thus compared between TD1 (CI_{TD1}), PC1 (CI_{PC1}) and TD2 (CI_{TD2}). Differences between CI_{TD1} and CI_{PC1} were interpreted as due to the potential effect of stopping the blood pump (since the pulse contour-derived measurement of CI is independent from temperature analysis). Differences between CI_{TD1} and CI_{TD2} were interpreted as related either to the thermal influence of CVVHF and/or stopping the blood pump.

RESULTS. Sixty recordings were performed in thirty patients (age 66 ± 13, SAPSII 68 ± 19, 80% under mechanical ventilation). Meantime of blood pump stop was 323 ± 75 s, without any adverse effect. Considering the whole population, CI_{PC1} (3.51 ± 0.97 L/min/m^2) was not different from CI_{TD1} (3.49 ± 0.98 L/min/m^2, mean difference: 0.9 ± 5.5%, p = 0.34).

The CI_{TD2} (3.50 ± 1.00 L/min/m^2) was not different from CI_{TD1} (mean difference: 0.7 ± 8.2%, p = 0.63) and from CI_{PC1} (mean difference: 0.0 ± 9.2%, p = 0.92).

When studying CI changes in the "high flow" group (29 measurements), we still observed no significant difference between successive CI measurements (CI_{TD1}: 3.86 ± 0.79, CI_{PC1}: 3.87 ± 0.78, CI_{TD2}: 3.92 ± 0.80 L/min/m^2).

CONCLUSIONS. The measurement of CI by transpulmonary thermodilution is not affected by CVVHF using a femoral access. These conclusions remain valid when a high blood pump flow (350 mL/min) is used.

0836

CLINICAL PROFILE OF COMPLICATIONS WITH THE USE OF VASCULAR CLOSURE DEVICE ANGIOSEAL FOR FEMORAL PERCUTANEOUS CATHETERIZATION

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OBJECTIVES. Our objective was to determine the prevalence of vascular complications with the use of vascular closure device AngioSeal after cardiac catheterization via femoral artery. We studied the overall prevalence of any vascular complication in this population, the epidemiological and clinical predictors of bleeding, the complication rate and the way of presentation.

METHODS. Between 2006 and 2010 we studied 1,613 patients in whom, after catheterization via femoral artery, it was used an AngioSeal percutaneous closure system. We studied the predictors of complications, the clinical profile of patients and its manifestations.

RESULTS. The study included 1,613 patients with a mean age of 69.47 years. 57% were female, 52% had diabetes mellitus and 15% chronic renal failure. 74 patients (4.6%) in this serie had a complication related to AngioSeal. The procedure that was performed was coronary angioplasty with drugs eluting stents or bare metal stents in 1032 patients (64%), diagnostic catheterization in 420 patients (26%), and valve interventions in 161 patients (10%). From the 74 complications, the most frequent was haematoma in 60 patients (81%), and most of them were small: 73% <5 cm (44 patients). 57% of all haematomas appeared or worsened late (>24 h), presenting as a syndrome of acute bleeding (26 patients), coinciding with the primo-mobilization. The symptoms are acute groin pain, swelling and hypotensive box vagal or hemorrhage. 22 patients (29.7%) required transfusion for signs and/or hemoglobin <9 mg/dl. 18 patients developed pseudoaneurysms, 12 of them were resolved with compression, 6 with embolization with surgery. 3 patients (4%) developed arterial ischemia resolved with endarterectomy. Independent predictors of bleeding were coronary intervention (63%), dual antiplatelet therapy (76%), fibrinolysis (28%), previous oral anticoagulation (26%) and prior anemia (6%).

CONCLUSIONS. Vascular complications resulting from the use of AngioSeal are rare, and many of them, have a presentation of acute bleeding possibly due to late inadequate apposition between collagen and vascular anchor. Coronary intervention and dual antiplatelet therapy are the most important independent predictors of bleeding associated with the use of this device.

0837

IS BEDSIDE CLINICAL EXAMINATION OF CAPILLARY REFILL TIME REPRODUCIBLE IN CRITICALLY ILL PATIENTS BETWEEN DIFFERENT OBSERVERS? AN INTER-RATER VARIABILITY STUDY

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INTRODUCTION. Capillary refill time (CRT), determined by applying pressure on a finger and measuring the time until the return of a normal colour, is a generally accepted method of assessing the circulatory status of a patient. Studies have showed that the physical examination by measuring CRT identify patients at high risk of complications from acute circulatory [1–3]. However, the interpretation of CRT is subjective and there is lack of evidence validating this simple tool to evaluate clinical status of critically ill patients. Therefore, the current study sought to validate its reproducibility between observers.

OBJECTIVES. Examine prospectively the inter-observer reproducibility of bedside clinical examination of CRT critically ill patients.

METHODS. We enrolled consecutive patients who had undergone initial resuscitation and stabilization within 24 h of ICU admission (MAP > 65 mmHg and no change in vasopressor infusion rate for 2 h). The first measurement was performed at admission and every 24 h thereafter until day 3. CRT was measured by applying firm pressure to the distal phalanx of the index finger for 15 s, and a chronometer recorded the time of returning to normal colour. A CRT > 5 s was defined as the upper limit of normality. To address the reliability of the subjective assessment of CRT, Cohen's kappa statistic (k) was used as a measure of agreement, which represents the chance corrected proportional agreement. The measure was calculated for 3 different observers. Results are given in kappa values (k); 95% confidence intervals were calculated from the standard error of k.

RESULTS. Forty eight consecutive critically ill patients were assessed independently by each of the three observers. Table 2 shows correlation of CRT between the 3 observers. Table 1 shows the level of agreement for all measurements by the study team. Overall agreement for CRT was substantial.

Inter-observer agreement between three observers

	Day 1	Day 2	Day 3
Observers: 1 versus 2	0.80 (0.62; 0.97)	0.77 (0.53; 1.0)	0.79 (0.51; 1.0)
Observers: 1 versus 3	0.85 (0.75; 0.95)	0.89 (0.57; 0.95)	0.70 (0.45; 0.93)
Observers: 2 versus 3	0.95 (0.85; 1.0)	0.77 (0.53; 1.0)	0.70 (0.45; 0.93)

CONCLUSIONS. We found a substantial inter-rate agreement of CRT measurement in critically ill patient. This study provides reasonable evidence of the reproducibility of CRT, in particular, for a delayed capillary refill >5 s.

Correlation between observers

Day 1		Correlations[a]		
		CRT1	CRT2	CRT3
CRT1	Pearson correlation	1	0.954**	0.943**1
	Sig (2-tailed)		0.000	0.000
	N	48	48	46
CRT2	Pearson correlation	0.954**	1	0.982**
	Sig. (2-tailed)	0.000		0.000
	N	48	48	46
CRT3	Pearson correlation	0.943**	0.982**	1
	Sig. (2-tailed)	0.000	0.000	
	N	46	46	46

Day 2		Correlations[a]		
		CRT1	CRT2	CRT3
CRT1	Pearson correlation	1	0.988*	0.988*
	Sig (2-tailed)		0.000	0.000
	N	37	37	37
CRT2	Pearson correlation	0.988*	1	0.982**
	Sig (2 tailed)	0.000		0.000
	N	37	37	37
CRT3	Pearson correlation	0.988**	0.982**	1
	Sig. (2-tailed)	0.000	0.000	
	N	37	37	37

Day 3		Correlations[a]		
		CRT1	CRT2	CRT3
CRT1	Pearson correlation	1	0.988**	0.981**
	Sig. (2-tailed)		0.000	0.000
	N	30	29	29
CRT2	Pearson correlation	0.988**	1	0.975**
	Sig. (2-tailed)	0.000		0.000
	N	29	29	29
CRT3	Pearson correlation	0.981**	0.975**	1
	Sig. (2-tailed)	0.000	0.000	
	N	29	29	29

** Correlation is significant at tHe 0 01 level (2-tailed)

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0838

NITRATES/NITRITES AND NITRIC OXIDE PRODUCTION ARE REDUCED BY HYPOTHERMIA IN ACUTE MYOCARDIAL INFARCTION

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INTRODUCTION. Protective effect of therapeutic hypothermia in cardiac arrest survivors has been repeatedly shown. Clinical data on therapeutic hypothermia in acute myocardial infarction (AMI) are, however, still insufficient; the effect of hypothermia on oxidative stress and nitric oxide (NO) production in patients with AMI is not known.

METHODS. Ten patients after out-of-hospital cardiac arrest due to AMI were included into the hypothermia group; all were treated with mild hypothermia using endovascular system Thermodard XP. Target core temperature 33°C was maintained for 24 h, re-warming rate was set at 0.15°C per hour, followed by normothermia of 36.8°C. Ten patients with AMI, non-complicated by cardiac arrest were assigned to the control group. Blood samples for measurements of nitrotyrosine and nitrates/nitrites were taken at admission and then every 6 h for 54 h.

RESULTS. The levels of nitrotyrosine were significantly lower in the hypothermia group in all measurements ($P < 0.001$). Nitrates/nitrites levels were comparable in both groups in the first 24 h, during re-warming the levels gradually increased in the hypothermia group, reaching significant difference between groups in the normothermia period ($P < 0.05$).

CONCLUSIONS. Our results provide indirect evidence that hypothermia may attenuate oxidative stress and presumably also NO production in AMI not only in experimental but also in clinical settings.

ICU discharge: 0839–0850

0839

HOSPITAL COMPLICATIONS OF CRITICALLY ILL PATIENTS AFTER INTENSIVE CARE UNIT (ICU) DISCHARGE

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INTRODUCTION. Intensivists are frequently unaware of long-term outcome of patients discharged from ICU. Complications for discharged ICU patients are common in the ward and may lead to ICU readmission and/or death.

OBJECTIVES. To assess the hospital complications of ICU discharged patients and their relationship with ICU readmission and hospital mortality.

METHODS. Prospective, descriptive study in a medical-surgical ICU of a tertiary referral hospital during a 24 months period. We analysed epidemiological data, previous health state, diagnosis on admission, hospital complications and its relationship with ICU readmission and mortality after ICU discharge. *Statistical analysis*: Quantitative variables were shown as percentage and mean ± standard deviation (SD). Chi square and Fisher exact test were employed to test qualitative variables; ANOVA test and Bonferroni "post hoc" test was used for quantitative variables. A p value <0.05 was considered statistically significant. We conducted an univariate logistic regression and a multivariate analysis to assess the effect of the non-homogeneous variables.

RESULTS. Six hundred and nine patients were discharged from ICU and followed during hospital stay. Mean age was 52.95 ± 16.75 years old. Three hundred and fifty-four patients (58.13%) were male. Mean APACHE II at ICU admission was 16.94 ± 7.6. Main diagnosis on admission were: acute respiratory failure (29.23%), gastrointestinal illness (27.75%, including postoperative control of transplantation), central nervous system illness (26.27%), septic shock (10.51%), hemodynamic disorder (2.46%) and miscellaneous group (4.1%). Mean length of ICU stay was 10.04 ± 13.01 days. Mean length of hospital stay was 38.80 ± 40.37 days. Two hundred and seventy-six patients (45.32%) had complications during their hospital stay after ICU discharge: infectious (22.82%), respiratory (11.66%), neurological (11.49%), hemodynamic (6.9%), and graft complications (5.75%). After multivariate analysis, tracheostomy was the only independent risk factor for hospital complications (OR 1.71, CI 95% 1.02–2.89, $p = 0.042$). Thirty-two patients (5.25%) were readmitted to ICU. Hemodynamic (OR 9.5, CI 95% 3.64–24.78, $p < 0.001$), respiratory (OR 3.43, CI 95% 1.14–8.36, $p = 0.0065$), infectious (OR 6.15, CI 95% 2.52–15.03, $p < 0.001$) and graft (OR 12.41, CI 95% 4.35–35.37, $p < 0.001$) hospital complications were associated with ICU readmission. Fifty-one patients (8.37%) died during hospital stay. Hemodynamic (OR 12.44, CI 95% 5.15–30.03, $p < 0.001$), respiratory (OR 19.02, CI 95% 9.28–38.98, $p < 0.001$) and graft (OR 3.94, CI 95% 1.3–11.89, $p = 0.014$) hospital complications were associated with hospital mortality.

CONCLUSIONS. Hospital complications are common among critically ill patients discharged from ICU. We identified some hospital complication associated with readmission to the ICU and hospital mortality. Only tracheostomy was associated with ward complications in our study.

0840

THE TRANSITION TO ELECTRONIC DISCHARGE DOCUMENTATION IN A UK TEACHING HOSPITAL INTENSIVE CARE UNIT

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INTRODUCTION. The transition from paper to electronic documentation was undertaken in our unit in June 2008, with full implementation of technical infrastructure to support this project. It is now used throughout our facility, with all patients having an electronic medical discharge summary completed by the critical care physicians. This is a topic less well described in the literature [1], in particular the utility of electronic discharge notes to those involved in critical care referral pathways. Barriers to electronic notes include inappropriate copying and pasting and perceived difficulty in locating the note of interest [2].

OBJECTIVES. (1) To gather baseline data from those involved in critical care referrals, relating to the existence of electronic discharge notes. (2) To establish the utility of these records in subsequent decision making, including the suitability for re-referral of patients discharged from critical care.

METHODS. Anonymised online questionnaires with 11 binary responses, were sent to medical and surgical registrars working in the hospital. This cohort represented the majority of clinicians referring patients to critical care, and were thus felt to be an appropriate group to survey.

RESULTS. 35 clinicians were identified, of which 77% responded (100% of surgeons and 62% of physicians). 30% were unaware of an electronic discharge summary.

Of those who were aware, 84% reviewed the summary on arrival onto the general ward and 16% only if the patient was re-referred to critical care. 53% felt the information was always useful, however 47% thought the information relating to critical care management was not clear from the electronic notes. If a patient discharged from critical care subsequently deteriorated on the ward, 79% would review the discharge note and 32% would specifically look for comments relating to limits of re-escalation. Only 58% of clinicians who had reviewed the electronic notes felt they were better then handwritten notes, and that the hospital should switch over from paper documentation.

CONCLUSIONS. A significant proportion of clinicians involved in referring patients to critical care, were unaware of the existence of the electronic discharge notes. Improved education and awareness is needed, as well as means of highlighting this record within the medical notes. Many respondents did not find the discharge information useful, we should find ways of presenting aspects of critical care stay in a more succinct and focussed way. In addition, there appears to be an observed reticence towards electronic notes amongst clinicians not yet directly utilising them.

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0841

SIMPLIFIED THERAPEUTIC INTERVENTION SCORING SYSTEM (TISS-28): OUTCOME PREDICTOR AT DISCHARGE FROM INTENSIVE CARE UNIT?

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INTRODUCTION. The best time to transfer the patients from critical care units to conventional hospitalization areas is not always easy. Early discharge can increase the risk of worsening during the convalescence period. The simplified therapeutic intervention scoring system (TISS-28) could be used to determine the optimal moment for discharge from critical care.

OBJECTIVES. This study evaluated the Simplified Therapeutic Intervention Scoring System (TISS-28) as a tool to better asses the real situation of patients when their discharge from ICU to conventional medical areas is being planned.

METHODS. This is a prospective single centre study of patients discharged from medical intensive care unit between April and December 2010. Epidemiological data, comorbidity, cause of admission and severity scores at admission were collected, as well as different variables regarding clinical condition of patients at discharge, including TISS-28. Univariable analysis was made using Chi-square and Student's *t* test. We used multiple logistic regression model to assess the association between the independent variable and mortality, after adjustment for possible confusing factors (we consider confusion if the estimate of the coefficient changes over a 10%).

RESULTS. Four hundred patients were studied. 63% were male. Their mean age was 57 ± 18 years and 40% had comorbidities. Severity scores were APACHE II 15 ± 7, SOFA 4.5 ± 2.7. The most common cause of ICU admission was infectious (19%), neurological (17%) and respiratory diseases (15%). The mean value of TISS-28 at discharge was 11 ± 5. Mean stay was 4 days in ICU (1–191) and 18 days in hospital. Hospital mortality was 5.8%. In univariate analysis the variables related to mortality were: age, severity scores and organ dysfunction at admission, and cardiac arrhythmias, anticoagulation treatment, renal replacement therapy and TISS-28 at discharge.

Table 1

	Alive/dead	OR	CI 95%	Significance
Age	55 versus 65	1.04	1.01–1.07	0.02
APACHE II	15 versus 20	1.10	1.01–1.19	0.01
SOFA	4.7 versus 7.0	1.27	1.07–1.52	0.00
TISS-28	10 versus 15	1.16	1.06–1.26	0.00
Organ dysfunction <2 versus ≥2	3.9 versus 22.7%	7.18	2.06–25.11	0.00
Anticoagulation	3.7 versus 11.9%	3.56	1.17–10.82	0.02
Cardiac arrhythmias	3.6 versus 15.8%	5.03	1.74–14.51	0.00
Renal replacement	3.1 versus 30.8%	14.02	3.63–54.20	0.00

In the multivariable analysis, TISS-28 value, adjusted by all the previously described variables, was an independent factor associated to mortality: OR 1.27, IC 1.07–1.48, p = 0.004.

CONCLUSIONS. In our study, the Simplified Therapeutic Intervention Scoring System was independently associated to hospital mortality and could be used to determine the optimal moment to discharge patients from critical care units.

0842

EARLY READMISSION TO THE ICU: A RECURRENT PROBLEM

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INTRODUCTION. Early readmission to the ICU has been associated with increased in-hospital mortality. Therefore, identifying patients at risk for readmission within 72 h after ICU discharge is important. The aim of this study is to determine the incidence, clinical characteristics, causes and outcome of patients readmitted within 72 h (early readmission) in order to create a protocol to minimize the risk of early readmission.

METHODS. A retrospective analysis of prospectively collected data from the MediScore database over a period of 19 months at the 40 bed ICU of our university hospital. Measurements were conducted on demographic, diagnostic, physiological and outcome data. A multivariate analysis was used to identify predicting variables of readmission within 72 h.

RESULTS. 3,528 patients were evaluated. 270 patients (7.7%) were readmitted. Early readmission—within 72 h—occurred in 108 patients (3%). These patients were mostly re-admitted with respiratory failure (41%), followed by cardiovascular failure (25%), medical (eg. sepsis) (22%) and gastro-intestinal (11%) causes. Mortality rates were higher in the readmitted group then in the non-readmitted group, respectively 9 and 2.4%. Readmitted patients had a hospital length of stay twice as long as non-readmitted patients (17.5 vs. 35.8 days, p < 0.001).

Age, Apache II and Saps II score and first, mean and maximum TISS score were significantly higher in the whole group of readmitted patients. Early readmitted patients had higher Saps II and Apache II scores and were older. After a multivariate analysis of the significant variables, maximum TISS score and age appeared to be relevant indicators for early readmission. Furthermore, the TISS score on the day before discharge was associated with early readmission.

CONCLUSION. We identified several variables associated with early readmission. However, after multivariate analyses, it was not possible to create a strong predictive model for the readmission risk. More research is needed to create a definitive model predicting early ICU readmission.

0843

READMISSION RATE AND HOSPITAL MORTALITY IN APACHE IV SUBGROUPS

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INTRODUCTION. Unplanned readmission to the ICU is associated with increased in-hospital mortality.

OBJECTIVES. To determine the hospital mortality in four major APACHE IV diagnosis subgroups of patients readmitted to the ICU.

METHODS. A retrospective cohort analysis of readmitted patients documented in the Dutch national ICU registry (National Intensive Care Evaluation, NICE) in which 81 ICUs participate, mixed medical-surgical ICUs in university hospitals, teaching- and non-teaching hospitals. Data was analysed using PASW Statistics 18.02.

RESULTS. From 2008 to 2010 a total of 154,014 patients were admitted to the ICUs and 11,579 (7.5%) were readmitted. Since 2008 the NICE has implemented the Acute Physiology and Chronic Health Evaluation (APACHE) IV prognostic model.

To create order in the numerous APACHE IV diagnoses, from the top 20 APACHE IV diagnoses four major APACHE IV diagnosis subgroups were formed: cardiac surgery, infectious, surgery and medical to show trends in readmission to the ICU and hospital mortality. Of these subgroups cardiac surgery patients had a very low readmittance rate (1.23%) compared to the readmittance rate of the whole group (7.5%). Patients with infectious disease were readmitted more often (12.02%). Hospital mortality was impressive in both the Infectious (28.64%) and Medical (31.55%) subgroups compared to the low hospital mortality for cardiac surgery patients (1.14%). However, if elective surgical patients (cardiac and non-cardiac) are readmitted to the ICU chances of survival go down immediately.

CONCLUSIONS. Readmission to the ICU in these APACHE IV subgroups is especially deleterious for patients after elective surgery, as measured by hospital mortality.

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Readmission and hospital mortality

	Number of patients			Hospital mortality			
	No readmission	Readmission		No readmission		Readmission	
APACHE IV diagnosis subgroup	Number	Number	%	Number	%	Number	%
I. Cardiac surgery	21,212	265	1.23	242	1.14	21	7.92
II. Infectious	10,730	1,466	12.02	3,027	28.21	466	31.79
III. Surgery	20,236	1,356	6.28	1,462	7.22	257	18.95
IV. Medical	11,852	1,065	8.24	3,704	31.25	371	34.84

0844

SWIFT SCORE PREDICT ICU-READMISSION IN SOUTH AMERICA?

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INTRODUCTION. Unplanned readmission of hospitalized patients to an intensive care unit (ICU) is associated with a worse outcome, but our ability to identify who is likely to deteriorate after ICU dismissal is limited. The Stability and Workload Index for Transfer (SWIFT) score based on ICU length of stay, admission source, and day of discharge need for neurologic and respiratory support predicts ICU readmission with acceptable accuracy in Europe and North America.

OBJECTIVES. To evaluate the applicability of the SWIFT score in our ICU, the readmission incidence and identify another risk factors to readmission.

METHODS. Retrospective cohort including all patients hospitalized (n = 1,277) in the period of April/2008 to December/2009 who had been discharged from the ICU. Were analyzed the demographic data, severity scores in admission, reason for hospitalization, need for supports invasive ventilatory, hemodynamic, and dialysis and the length of stay in the ICU. On the day of discharge from the ICU were evaluated the severity scores (SOFA, Glasgow Coma Scale), of physical dependence (modified Rankin Scale) and need of assistance (TISS). We applied the SWIFT score in our ICU.

RESULTS. During this study, 126 (9.3%) patients were readmitted to the medical ICU. Patients who were readmitted were older than non-readmitted (72 ± 17 vs. 66 ± 17, <0.001) and more severely ill (APACHE II 18 ± 9 vs. 13 ± 7, <0.001) (SOFA at admission 4 ± 3 vs. 2 ± 2, <0.001) respectively. By multivariate logistic regression major predictors of readmission were: age, APACHE II, SOFA at admission, inotropic use, mechanical ventilation days, time of ICU and Glasgow Coma Score, SOFA and TISS at discharge of ICU. A cutoff SWIFT score of 15 yielded a positive likelihood ratio of 2.26 (95% CI, 0.61–0.69), specificity 0.81, and sensitivity 0.43.

CONCLUSIONS. A simple score based on ICU length of stay, admission source, and day of discharge need for neurologic and respiratory support predicts readmission with acceptable accuracy in South America ICU.

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0845

A HIGH POST ICU MORTALITY IN ELDERLY PATIENTS ADMITTED TO THE ICU WITH ABDOMINAL SEPSIS

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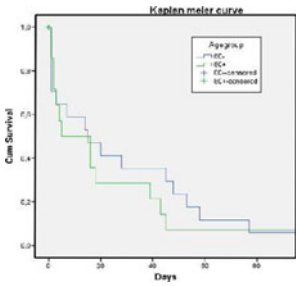
INTRODUCTION. The number of patients aged eighty years or older (80+) admitted to the intensive care unit (ICU) is increasing [1, 2]. Higher age is a risk factor of mortality in patients admitted to an ICU with severe sepsis or shock [3]. Evidence regarding mortality, especially long-term mortality in elderly patients with abdominal sepsis is lacking.
We therefore analysed the mortality of elderly patients (80+) compared to younger patients (80−), with abdominal septic shock admitted to our ICU.
METHODS. Retrospective cohort study of patients admitted to the ICU of the Flevoziekenhuis, Almere, between 2008 and 2010. Diagnose, treatment, Apache IV and SAPS II scores were collected from our database (Mediscore) and discharge letters. Patient death is registered in our hospital information system which is linked to the population register.
RESULTS. A total of 77 patients were admitted to the ICU with an abdominal septic shock. 7 Patients were excluded, 6 because not all data was available and one patient was transferred to another hospital. 70 Patients were included, 19 patients were 80 years or older.
The SAPS and Apache score underestimates the mortality risk in elderly (80+) patients and overestimates the mortality risk in younger (80−) patients.

Table 1

	Age (mean)	Sex (%) male/ female	Apache IV score/ mortality risk (mean)	SAPS II score/ mortality risk (mean)	Mortality ICU	Mortality hospital	Mortality <12 months
80− (N = 51)	61.25	53% M 47% F	Score: 80.2 MR: 0.40	Score:50.9 MR: 0.48	20%	29%	33%
80+ (N = 19)	84.26	47% M 53% F	Score: 85 MR: 0.48	Score: 52.8 MR: 0.49	42%	63%	74%
P value	–	–	0.476 0.122	0.606 0.822	0.057	0.009	0.002



Kaplan–Meier

CONCLUSIONS. Elderly (80+) patients with abdominal septic shock have a high post ICU mortality. The mortality risk based on the SAPS and Apache scores underestimates their mortality rate.
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0846

CRITICAL CARE FOLLOW-UP ON THE WARDS: MONEY WELL SPENT?

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INTRODUCTION. Appropriate timing in identifying the need for and providing higher level care improves survival. In our hospital we identified a need for critical care input on the wards so initiated an outreach team in 2004 which was well established by 2005.
OBJECTIVES. To establish if critical care outreach altered hospital mortality rates for all ITU patients.
METHODS. Prospective data was collected on elective and emergency admissions to a multidisciplinary adult ICU between 2001 and 2010 and entered into a computerised database. This included whether the case was elective or emergency, APACHE II score on admission, length of ICU stay, ICU and hospital outcomes, standardised mortality rates (SMR) and readmission rates. Data of all ICU admissions were analysed annually.
RESULTS. During the study period there was a fall in hospital mortality from 31% in 2001 to 20.4% in 2010 and SMR from 0.99 in 2001 to 0.68 in 2010. The annual mean length of stay during this time period ranged from 3.4 to 4.8 days and the annual mean age from 60.4 to 64.2 years. An increasing trend in readmission rates was noticed from 3% in 2001 to a peak of 10% in 2007.
CONCLUSIONS. The introduction of a critical care outreach service was associated with a decrease in all cause hospital mortality for all intensive care patients. It is noted that the rate of re-admission to Intensive Care increased during this time period and we believe this could be associated with the introduction of critical care outreach, timely interventions and improved hospital mortality rates.

0847

THE EPIDEMIOLOGY AND OUTCOMES OF CHRONIC CRITICAL ILLNESS: A MULTICENTRIC STUDY IN SOUTH OF BRAZIL

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INTRODUCTION. Chronic critical illness (CCI) has been recognized as a new paradigm in the intensive care unit (ICU) and its definition is variable and unclear. One criterion could be patients who require continued care in an ICU setting for weeks to months.
OBJECTIVES. Our goal was to describe the epidemiology, clinical profiles and outcomes of CCI patients.
METHODS. Prospective multicentre cohort study in 4 ICUs in Brazil, including all consecutive patients older than 15 years admitted from March 2007 to July 2010. We defined CCI as patients who required continued care in ICU for ≥21 days. Data collected included characteristics at admission, ventilator support and outcomes of patients from their admission to death or hospital discharge.
RESULTS. We included 4,896 patients. The incidence of CCI was 9.7% (n = 476). Table 1 summarizes the differences between CCI patients and non chronic population. There was no difference between groups in age, gender and body mass index (BMI). The CCI patients presented more neuromuscular weakness, 90 (2.2%) versus 131 (30.8%), p < 0.001; and tracheostomy, 111 (2.5) versus 210 (44.1), p = <0.001, respectively.
CONCLUSIONS. CCI patients are sicker at admission (higher APACHE II score, SOFA score and lower Coma Glasgow Score). The ICU mortality and hospital mortality are higher than non CCI patients. To move forward at a pace that matches the incidence of this condition, the definition of CCI needs consensus.
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Epidemiology and outcomes

	<20 days of ICU stay n = 4,420	≥21 days of ICU stay n = 476	p
SOFA (admission)	2.9 ± 3.1	4.6 ± 3.1	<0.001
APACHE II	15.8 ± 7.9	19.7 ± 6.9	<0.001
COMA GLASGOW SCORE	13.1 ± 3.3	12.0 ± 3.8	<0.001
TISS (24 h)	19.0 ± 8.2	24.8 ± 8.3	<0.001
MECHANICAL VENTILATION (%)	1,545 (35)	410 (86.1)	<0.001
MECHANICAL VENTILATION (days)	2.4 ± 3.9	20.1 ± 28.7	<0.001
HOSPITAL STAY (days)	13.9 ± 17.6	60.4 ± 54.0	<0.001
ICU MORTALITY (%)	717 (16.2)	161 (33.8)	<0.001
HOSPITAL MORTALITY (%)	1,058 (24)	227 (47.8)	<0.001

0848

ANALYSIS OF READMITTED PATIENTS AFTER INTENSIVE CARE DISCHARGE

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INTRODUCTION. Readmission to the ICU during the same hospitalization is frequent and associated with significant morbidity and mortality.
OBJECTIVES. To describe the incidence, characteristics of patients readmitted to the ICU and to analyze the relationship between readmission to the ICU and the final mortality–morbidity of patients.
METHODS. Observational, prospective, single center, conducted over a period of 14 years. Readmission is defined as the patient once discharged, back to ICU before being discharged home. Inclusion criteria: patients admitted to the ICU who were discharged alive from the hospital ward. Exclusion criteria: to be discharged to the ward in another hospital center or directly home. The variables are expressed as mean ± standard deviation and percentage. Comparison between variables was performed using Pearson χ^2 test, McNemar test, and Student's test for independent and related data.
RESULTS. During the study period 15,111 patients were admitted to the ICU, 1,917 of them died in ICU and 260 patients were transferred to another hospital. The study population was 12,934 patients who have been discharged from a medical ward of the same hospital, of which, 730 had been readmitted, presenting 794 readmissions (6.1%), 675 patients have had one readmission, 48 have been two, 5 have been three and two patients 4 readmissions. The 93.6% of readmissions were urgent and 53% due to a complication of the inicitial disease that motivated the admission. Patients who required readmission show greater severity (SAPS II 40 ± 18 vs. 30 ± 15), increased need of mechanical ventilation (33.8 vs. 16.2%) and non-invasive ventilation (25.9 vs. 17.2%) as well as tracheostomy (7.2 vs. 3.3%), hemodiafiltration (3.5 vs. 0.5%), nosocomial infection (15.4 vs. 5.2%) and hospital stay (37 ± 40 vs. 16 ± 16 days) (all p value <0.001). The hospital mortality of readmitted patients was 30.7%, of non-readmitted was 17.8%, and the mortality of patients discharged from the medical ward and not readmitted was 4.3% (all p value <0.001). Among readmitted patients, during the readmission and compared with the previous admission, they have more severe disease (SAPS II 33 ± 14 vs. 40 ± 18 and SOFA maximum 3.5 ± 3.6 vs. 6.2 ± 5.6), increased need for mechanical ventilation (33.6 vs. 22.4%) and noninvasive ventilation (26.1 vs. 18.8%), greater need to perform tracheostomy (7.1 vs. 3.9%), hemodiafiltration (3.4 vs. 0.4%), higher rate of nosocomial infection (15.2 vs. 7.8%) and longer stay in ICU (5.2 ± 9.3 vs. 7.7 ± 15.9 days) (all p value <0.001).
CONCLUSIONS. The ICU readmissions are frequent, presenting greater severity of the disease process during readmission with greater need of organ support and increased morbidity and mortality.
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0849

INTENSIVE CARE UNIT DISCHARGE TIMING AUDIT

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INTRODUCTION. Night time discharge rates have increased, and are felt more likely to be premature. They are associated with higher readmission rates and increased mortality [1–3]. NICE produced guidelines in 2007 recommending that transfer from critical care areas to the general ward between 22:00 and 07:00 should be avoided and documented as an adverse event if it occurs [4].

OBJECTIVES. To assess the rates of night time discharges in our hospital, and their association with readmissions to ICU during the same hospital stay and mortality post ICU survival.

METHODS. The audit was carried out in a district general hospital with a 7 bed ICU. Capacity increased to 8 beds between the initial and repeat audit. Data recorded for ICNARC was collated for 6 months, April to September 2008. Exclusion criteria were death during ICU stay or transfer outside the Trust. A re-audit was completed for the same 6 months in 2009 following presentation of the initial audit findings and recommendations to the department. Night time was defined as 22:00 to 07:00 in line with the NICE guidelines.

RESULTS. Initial audit revealed 12.4% of discharges occurred at night time, and were associated with increased readmission rates. Only 1.5% of all discharges were to the ward at night time. The other night time discharges were to Recovery Ward, which is used as a step down facility in our hospital. Five out of the seven night time discharges readmitted were readmitted directly from the Recovery Ward to ICU. The re-audit showed improvement, with night time discharges down to 5.1%. Overall readmission rate was also reduced from 10.3 to 4.1%. Overall mortality post ICU survival was 9.4% and 9.6% in the initial and repeat audits respectively. Mortality was unaffected by discharge time in both the initial and repeat audits.

CONCLUSIONS. Our audit showed increased readmissions to ICU associated with night time discharges, consistent with previous findings. In contrast with published work we found no association with increased mortality and propose this is a result of the routine use of Recovery Ward as a step down unit for discharges out of hours.

From this audit we recommend low rates of night time discharges. In addition, if discharges do need to occur at night time the use of a step down facility, such as the Recovery Ward, may help reduce potential for harm associated with premature discharges.

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0850

ICU HANDOVER: INFORMATION OVERLOAD OR UNDERLOAD?

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INTRODUCTION. Clinical handover is a fundamental part of clinical practice, defined as a process of transferring authority and responsibility for providing care of patients from departing care giver to a named recipient [1, 2]. Failure to adequately exchange essential information can have disastrous consequences for the patient.

OBJECTIVES. To review the process of handover in a university teaching hospital intensive care unit, highlight areas of deficiency and improve current practice.

METHODS. A prospective observational study was undertaken over a 14 day period to examine the quality and content of clinical handover by night shift doctor to the day medical team. Key data expected to be handed over included patient details, diagnosis and treatment domains and communication with relatives [3]. Additional data collected also included duration of handover, personnel present and frequency of interruptions.

RESULTS. 98 sets of patient data were collected during the study period. All handovers were supervised by a consultant intensivist. Clinical information handed over verbally covered reason for admission in 74.4% of cases, working diagnosis in 80% and current management plan in 80%. However information on patient co-morbidities (medical 56%, mobility/dependency 4%) and resuscitation status (2%) were poorly covered. Only 32% of patient handover covered significant clinical changes in the last shift and 30% of patients had a proposed management plan for the forthcoming day discussed. 58% of handover commenced on time and finished before or on time. Of the allocated 30 min, the time taken to complete handover varied from 10 to 40 min with average time of 25 min. There were total of 27 interruptions over 14 days of audited period. Reasons for interruption included telephone calls and requests from visiting teams and nurses.

CONCLUSIONS. Our study identified that there was inadequate verbal transfer of information between shifts. This could be attributed to poor communication skills, lack of confidence, unfamiliarity with the patients' condition, inability to recognise salient clinical features and difficulty in concentration due to frequent interruptions or fatigue. The senior clinician should ensure all aspects of patient care are discussed at handover time by asking appropriate questions and ensuring that the handover is free from interruptions. It should be an educational experience for the trainee with appropriate feedback rather than an informal conversation at the end of the shift [2].

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Sepsis research: From bench to bedside: 0851–0865

0851

THE PROTECTIVE EFFECT OF A1-ANTITRYPSIN ON LIPOPOLYSACCHARIDE-INDUCED SEPSIS IN MICE

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INTRODUCTION. Sepsis caused predominantly by an overwhelming systemic inflammatory response to an infection, frequently results in acute lung injury (ALI), multiple organ failure and even death. Neutrophil elastase (NE) which is derived from neutrophil is regarded as one of the important mediators of host responses to inflammation or infection. α1-antitrypsin (α1-AT), a proteinase inhibitor, is known to have protective effect in ALI. We therefore assessed the effects of α1-AT as a potential anti-inflammatory mediator, on endotoxin-induced sepsis in mice.

METHODS. To demonstrate the effect of α1-AT in sepsis model, we administered 20 mg/kg lipopolysaccharide (LPS) in 500 μl PBS intraperitoneally (LPS only). Another group received 500 μg α1-AT in 500 μl PBS intraperitoneally at 3 h before intraperitoneal LPS challenge (α1-AT+LPS); negative control group animals (control) received 500 μl PBS intraperitoneally. Groups of mice were sacrificed at 3 and 24 h after LPS challenge respectively. We measured the degree of inflammatory response related with sepsis by core body temperature, elastase activity and polymorphonuclear cells (PMNs) in bronchioalveolar lavage (BAL) fluid, myeloperoxidase (MPO) activity in lung and liver, tumor necrosis factor-α (TNF-α) and interleukin 1β (IL-1β) concentration in serum in each group. The extent of organ injury was assessed by histologic examination using hematoxylin-eosin staining.

RESULTS. Mice pretreated with α1-AT showed recovery of core body temperature (35.0 ± 0.10°C vs. 34.75 ± 0.05°C, $p = 0.01$), decreases in elastase activity (0.0526 ± 0.0032 vs. 0.0765 ± 0.002, $p < 0.0001$), decreases in total cells and PMNs ($1.63 \pm 0.06 \times 10^6$ cells vs. $1.89 \pm 0.06 \times 10^6$ cells, $p = 0.013$) in BAL fluid, decreases in MPO activity in the lung, (8.016 ± 0.75 U/g vs. 12.6 ± 6.89 U/g, $p = 0.014$) and liver tissue (8.74 ± 2.03 U/g vs. 15.16 ± 3.96 U/g, $p = 0.019$), decreases of TNF-a and IL-1β concentrations in serum (TNF-α: 35.89 ± 3.87 pg/ml vs. 164.72 ± 34.24 pg/ml, $p < 0.0001$, IL-1b: 134.21 ± 54.10 pg/ml vs. 585.41 ± 68.54 pg/ml, $p < 0.0001$). Histologically, pretreated mice showed attenuated PMNs infiltration and alveolar edema.

CONCLUSIONS. α1-AT pretreatment significantly attenuated an inflammatory response and tissue injury in endotoxin-induced sepsis in mice.

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0852

SYSTEMIC AND ORGAN-SPECIFIC BIOLOGICAL EFFECTS OF GRADED METABOLIC AND HYPERCAPNIC ACIDOSIS IN HEALTHY PIGS

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INTRODUCTION. Both protective and detrimental effects of acidosis have been reported under different acute pathological conditions. Moreover, little is known about dose-dependent and organ-specific responses to different types of acidosis. To separate the effects of acidosis from the effects of an underlying disease in clinical setting, we performed a complex physiological study in healthy animals.

OBJECTIVES. To evaluate systemic and organ-specific biological effects of graded metabolic (MAC) and hypercapnic (HCA) acidosis in several vital organs in a porcine model.

METHODS. In 24 instrumented anesthetized pigs, systemic and regional (renal, carotic and liver) haemodynamics, oxygen exchange, energy metabolism (lactate/pyruvate, ketone body ratios), ileal and renal microcirculation, systemic inflammation (TNFα, IL-6), nitrosative/oxidative stress (NOx, GSH/GSSG) were assessed. Animals were randomized into three groups: 1. MAC, induced by HCl infusion ($n = 8$), 2. HCA, induced by increasing inspired fraction of CO2 ($n = 8$), 3. Control group ($n = 8$). Data were collected at baseline (T0), at pH 7.25 (T1) and at pH 7.1 (T2) (always after 60 min of steady state).

RESULTS. Neither moderate nor severe MAC affected systemic, regional, microvascular haemodynamics, oxygen consumption and cytolosolic/mitochondrial redox state. By contrast, HCA significantly reduced systemic vascular resistance. HCA-mediated increase in cardiac output was preferentially redistributed to carotic and hepato-splanchnic region, without affecting renal perfusion. HCA increased renal cortex PO_2 and renal oxygen consumption, while liver oxygen consumption remained unchanged. Ketone body ratio decreased in severe HCA in renal and hepatic vein. Both types of acidosis increased plasma IL-6, without enhancing oxidative/nitrosative stress.

CONCLUSIONS. In healthy animals acute moderate to severe MAC has no appreciable effects on tissue microvascular perfusion and energetics. Progressive HCA evoked different responses in oxygen consumption of kidney compared with liver and gut, suggesting that organ systems do not respond uniformly to HCA. HCA-mediated augmentation of tissue perfusion could be outweighed by increased inflammatory response and altered tissue energetics. The effects of HCA do not appear to be a function of pH only.

GRANT ACKNOWLEDGMENT. Research project MSM 0021620819 (Replacement of and support to some vital organs).

0853

THE ET-RECEPTOR-ANTAGONIST TEZOSENTAN ATTENUATES PULMONARY EDEMA AND REDUCES LEVELS OF THE NEUTROPHIL-DERIVED PERMEABILITY-PROMOTING PROTEIN HBP IN EXPERIMENTAL SEPSIS: A NOVEL POTENTIAL LINK BETWEEN ET-1 AND EDEMA FORMATION?

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INTRODUCTION. In severe sepsis, uncontrolled capillary leakage is of key importance. Extravasation of plasma causes hypovolemic shock and formation of edema. Edema impairs the microcirculation causing hypoxia and organ dysfunction. Plasma levels of the endogenous peptide endothelin-1 (ET-1) correlate with mortality in septic patients. Moreover, ET-receptor antagonism has been shown to attenuate pulmonary edema in experimental sepsis, but the mechanisms are obscure. As the protein heparin-binding protein (HBP, also known as CAP37 and azurocidin), which is released by neutrophils upon septic stimulation, increases capillary permeability we investigated the effects of ET-antagonism and ET-1 on plasma levels of HBP in a porcine model.

METHODS. 8 pigs were anesthetized, catheterized and mechanically ventilated. Hemodynamic, blood gas-exchange parameters and plasma levels of HBP (p-HBP) were monitored. Extra vascular lung water ($EVLW_{STID}$) was measured with single thermal indicator dilution technique (PiCCO, Pulsion) and gravimetrically ($EVLW_{Grav}$) at the end of the protocol. After baseline measurements and 2 h of endotoxic shock (*E. coli*, 250 ng/kg/h) the animals were randomized to receive either IV tezosentan (TZ, ET-receptor antagonist, n = 5) or vehicle (n = 3). The animals were studied for a total of 5 h, after which they were sacrificed. In a separate experiment one anesthetized, catheterized and mechanically ventilated animal were exposed to IV infusion of ET-1 (0–30 pmol/kg/min) and p-HBP, $EVLW_{STID}$ and $EVLW_{Grav}$ were measured.

RESULTS. Endotoxemia increased p-HBP more than tenfold (baseline 36 ± 2, max 382 ± 100 ng/ml, p = 0.01), an increase which was markedly attenuated by TZ (TZ 136 ± 23 vs. control 382 ± 109 ng/ml, p = 0.03). TZ also reduced pulmonary edema seen as reduced $EVLW_{Grav}$ (TZ 8.3 ± 0.5 vs. control 13.3 ± 0.9 ml/kg, p = 0.002) and a tendency with $EVLW_{STID}$ (5 h TZ 10.4 ± 0.5 vs. control 12.0 ± 1.3 ml/kg, p = 0.06). TZ decreased pulmonary and systemic resistances, increased cardiac index, arterial pH and respiratory system compliance. ET-1 infusion caused an early and pronounced increase in p-HBP (baseline 37.5, max 472.9 ng/ml) as well as pulmonary edema ($EVLW_{STID}$ 13.8 ml/kg, $EVLW_{Grav}$ 11.4 ml/kg).

CONCLUSIONS. ET-receptor antagonism reduces endotoxin-induced pulmonary edema and plasma levels of the edema promoting protein HBP. These results indicate a potential novel mechanism by which ET-1 contributes to formation of edema during experimental sepsis. Further studies are warranted to elucidate these findings in humans and in in vitro settings.

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GRANT ACKNOWLEDGMENT. Prof. M. Clozel (Actelion Pharm. Ltd) for kind gift of tezosentan. Swedish Research Council, Swedish Heart-Lung Foundation, Funds from Karolinska Institutet (KI), Swedish Society of Medicine and through the agreement on medical research (ALF) between Stockholm County Council and KI.

0854

EFFECTS OF ENDOTOXIN UPON RABBIT SINOATRIAL NODE ACTIVATION SEQUENCE INVESTIGATED WITH OPTICAL MAPPING TECHNIQUE

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INTRODUCTION. Endotoxin may alter electrophysiologic properties of different cardiac myocytes. Changes in the expression of various isoforms of connexins that transmit electric signals between adjacent ventricular cardiac cells have also been found in different animal septic models. However, effects upon whole tissue specimens and particularly sinoatrial node (SAN) remain to be established.

OBJECTIVES. To investigate possible alterations in the rabbit's SAN activation pattern under the influence of different concentrations of endotoxin, using a high resolution optical mapping technique for optical action potential (OAP) recordings.

METHODS. Shinshilla rabbits (n = 15) were anesthetized by intravenous injection of urethane (1.5 mg/kg). After opening the chest, the heart was rapidly removed and rinsed with a Tyrode solution, saturated with a mixture of 95% O_2 and 5% CO_2. The SAN preparations were dissected, pinned in the experimental chamber with 3 mL and superfused at 37.5°C with a flow rate of 10–15 ml/min. Staining of the preparations was performed with 1 μmol of the potential-sensitive dye di-4-ANNEPS (Molecular probes, Eugene, OR, USA), whereas 50 μmol of the excitation-contraction uncoupler (S)-(-)-blebbistatin was added to suppress motion artifacts. Optical signals were recorded at a rate of 1–2 ms/frame using a 16 × 16-element silicone photodiode array (PDA), after exposing the preparation to the green light (C4675, Hamamatsu Photonics, Hamamatsu, Japan). Data were collected using a special data acquisition system (BV data2Asc, Brain Vision LLC, UK) and analyzed using software developed from the University of Amsterdam (MapLab). Five preparations were studied as controls, 5 were incubated with 1 mg of lipopolysaccharide (LPS, from *Escherichia Coli*, Sigma, St Louis, USA) and other 5 with 3 mg of LPS. Activation animations were produced immediately before (t = 0) and after 15, 30, 60 and 90 min of LPS administration and isochronal maps were constructed after considering the dV/dt max as the moment of activation. Analysis of variance (ANOVA) and paired t tests estimated differences between the three groups of preparations and within each group respectively, during different time points.

RESULTS. Both 1 and 3 mg of LPS caused rhythmic slowing of sinus nodes. Cycle length (CL: action potential duration + diastolic interval) of SAN optical action potentials was increased from 345 ± 123 ms (t = 0, 1 mg of LPS) to 452 ± 187 (90 min) and from 320 ± 92 (t = 0.3 mg of LPS) to 685 ± 123 (90 min, p < 0.01 for both comparisons). CL in LPS treated SAN preparations was significantly increased both at 60 and 90 min in relation with controls (p < 0.001 for all comparisons).

CONCLUSIONS. Immediate administration of LPS can reduce sinus rhythm rate in rabbits, possibly through a slowing of conduction velocity within the sinus atrial node.

0855

M1/M2 MONOCYTE POLARIZATION: A TOOL TO DISTINGUISH INFLAMMATION AND INFECTION?

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INTRODUCTION. M1 macrophages are effector cells which destroy micro-organisms and produce pro-inflammatory mediators (TNFα, IL-1, IL-6, IL-12). M2 macrophages exhibit anti-inflammatory properties by producing cytokines (IL-10, TGF ß, IL-1Ra). In an infectious context, macrophages develop an M1-response characterized by a specific transcriptional program. Chronic infections are associated with a M2 reprogramming of macrophages. A study of macrophage polarization among critically ill patients may help to distinguish infectious from non infectious inflammatory states. Polarization was also described in monocytes [1], which can more readily be studied from blood samples.

OBJECTIVES. We analyze (in intensive care patients) the monocyte polarization during infection (ventilator associated pneumonia (VAP), endocarditis) or a pure inflammatory state (severe traumatic injury without infection).

METHODS. Forty patients were included in the study. Ten patients had endocarditis and 30 patients had a severe traumatic injury defined by an injury severity score (ISS) >15. Among them, 10 samples were taken within 24 h following admission, 10 at the diagnosis of VAP. Ten trauma patients who displayed no clinical or biological signs of infection were also sampled between day-5 and day-10 to eliminate a temporal bias [2]. Blood samples were collected in tubes PaxGene® and frozen at −80°C (−112°F). Total RNA was isolated from blood samples using the PaxGene® Blood RNA Kit (QIAGEN®), following the manufacturer's protocol. The RNA quality was assessed using an Agilent Bioanalyzer 2100. The mRNAs were then reverse transcribed into complementary DNA (cDNA). After retro-transcription into cDNA, the expression of 9 M1 polarization genes and 10 M2 polarization genes was studied by RT-PCR using a LightCycler-FastStart DNA Master SYBR Green system (SmartCycler™, Roche) following the manufacturer's protocol.

RESULTS. Our study shows that M1 and M2 polarization genes are overexpressed in inflammatory patients. So there is a distinct signature between traumatic injury patients and patients with VAP. Moreover, a higher level of expression is observed in initial samples (pure inflammatory model) in comparison to samples collected in infected patients. Samples from trauma patients with or without infection were thus correctly classified using this M1/M2 transcriptional signature.

CONCLUSIONS. This study shows for the first time that monocyte polarization can be analysed from whole blood samples in critically ill patients. The analysis of transcriptional modulation of M1/M2 polarization genes may help to distinguish patients with an inflammatory state associated with or independent of infection. However, given the small number of patients studied in this work, these results need to be confirmed.

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0856

MONITORING IL-7 PATHWAY IN SEPTIC SHOCK PATIENTS

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INTRODUCTION. Septic syndromes, defined by the association of an infection and a systemic inflammatory response syndrome are the leading cause of death in ICU. Dysfunctions of the adaptive immune response have been observed after severe sepsis. In patients, the intensity and duration of these lymphocyte alterations are closely correlated with the occurrence of secondary nosocomial infections mainly bacterial but also viral and fungal and mortality. Recombinant human (rh) IL-7, known for its anti-apoptotic and immunostimulating properties on lymphocytes, represents a good candidate for the restoration of normal lymphocytic functions in sepsis. This molecule is currently tested in phase I and phase II clinical trials in other diseases (oncology, HIV, HCV). Studies in murine models have shown its capacity to reduce mortality and restore normal lymphocyte functions after sepsis. However, the capacity of rhIL-7 to reverse sepsis-induced lymphocyte alterations in septic patients is unknown.

OBJECTIVES. Prior to a clinical trial testing rhIL-7 in sepsis, we performed an observational work on IL-7 pathway in septic shock patients.

METHODS. A cohort of 100 septic shock patients for whom plasma samples were stored in a "blood bank" was included and circulating IL-7 concentration was measured by multiplex ELISA technique. Concurrently, cellular expression of IL-7 receptor (CD127) was measured by flow cytometry and an ELISA test was developed to monitor its soluble form (sCD127). Finally, ex vivo capacity of rh-IL-7 to restore lymphocyte proliferation was assessed.

RESULTS. Plasmatic IL-7 concentrations were increased in septic shock patients in comparison with healthy volunteers. Cellular CD127 expression was not modified in sepsis. An early increased sCD127 concentration was observed in patients that however did not reach statistical significance. Importantly, incubation of patients cells with rhIL-7 was associated with a strong restoration of lymphocyte proliferation.

CONCLUSION. The persistence of IL-7 receptor expression and most importantly the potent stimulating effect of rhIL-7 on lymphocyte proliferation after sepsis represent encouraging preliminary results for the development of a clinical trial testing rhIL-7 in septic shock patients.

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GRANT ACKNOWLEDGMENT. GM, FV and AL are supported by the Hospices Civils de Lyon and Université Claude Bernard Lyon I (EAM 4174 UCBL-HCL). GM is also supported by French ministry of health (PHRC interregional 2008), FINOVI and DGOS-INSERM (Recherche clinique translationnelle 2009).

0857

HOMEOSTATIC PULMONARY MICROENVIRONMENT IS RESPONSIBLE FOR ALVEOLAR MACROPHAGES RESISTANCE TO ENDOTOXIN TOLERANCE

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INTRODUCTION. Endotoxin tolerance (ET) is a modification of immune response to a second challenge with lipopolysaccharide (LPS), which results in a decreased production of proinflammatory cytokines, and is considered partly responsible for the susceptibility to infectious processes in hospitalized patients [1]. We previously observed an absence of ET of alveolar macrophages (AM) to LPS in a BALB/c mouse model [2]. This singularity could be mediated by granulocyte-macrophage colony-stimulating factor (GM-CSF) (shown to be predominantly produced by type II pneumocytes) and interferon-g (INFg) [3].

OBJECTIVES. To confirm the absence of tolerance of AM to LPS and to assess the respective roles of GM-CSF and INFg in this phenomenon.

METHODS. We used three different wild type mice strains (BALB/c, C57BL/6 and 129SV), KO mice interesting for their laking leukocytes population (C57BL/6 background) *rag2*$^{-/-}$, *rag2/*$\gamma c^{-/-}$, *cd3*$\varepsilon^{-/-}$, $\mu^{-/-}$, *il-15*$^{-/-}$ and *J*$\alpha 18^{-/-}$. We used an ex vivo model consisting in intravenous injection of LPS 20 h prior to an in vitro stimulation of AM, peritoneal macrophages and monocytes with the same LPS. We pretreated the wild type models with anti-cytokines antibodies, and KO mice with B cells and NK cells adoptive transfer.

RESULTS. We confirmed the absence of AM tolerance to endotoxin in all the wild-type mice strains. Inhibiting either GM-CSF or INFg in vivo at homeostasis lead to a decrease in TNF production by AM during the in vitro stimulation by LPS, confirming the involvement of these cytokines in the prevention of tolerance. The decreased production of TNF by AM in our ex vivo model in *rag2*$^{-/-}$, *rag2/*$\gamma c^{-/-}$, $\mu^{-/-}$ and *il-15*$^{-/-}$ demonstrated that both NK and B cells were necessary to prevent AM tolerance. Adoptive transfer of B cells and NK cells restores the absence of ET, and measurements of INFg at homeostasis before and after adoptive transfer confirm its production by the combination of NK and B cells.

CONCLUSIONS. Version: We confirm the resistance of AM to endotoxin tolerance in different mice strains. Both GM-CSF and INFg within the lung microenvironment at homeostasis are involved in this phenomenon. We showed that INFg is expressed by NK cells in response to a B cells/NK cells interaction.

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0858

DOES THE TIMING OF INSTRUMENTATION UNDER ANAESTHESIA IMPACT UPON MORTALITY AND ORGAN FUNCTION IN A RODENT MODEL OF FECAL PERITONITIS?

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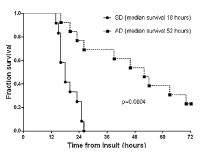
INTRODUCTION. Rodent models of sepsis are commonly used to explore pathophysiology and treatment strategies, yet considerable heterogeneity exists [1]. We anecdotally observed different outcomes when the onset of sepsis was delayed after vascular instrumentation.

OBJECTIVES. To determine whether the timing of instrumentation under anaesthesia impacts upon mortality and organ function in a rodent model of fecal peritonitis.

METHODS. 26 male Wistar rats (296 ± 30 g) were instrumented with tunnelled internal jugular and carotid artery catheters under a brief period of isoflurane anesthesia. Animals were connected via a tethered swivel to allow free movement within the cage and randomized to receive intra-peritoneal injection of faecal slurry (3 µl slurry/g), either at the same time (SD n = 13) or 24 h post-instrumentation (AD n = 13). Half were placed in a metabolic cart for continuous monitoring of oxygen consumption (VO_2). Blood pressure (BP) was continuously monitored. Animals received a continuous infusion of hydroxyethyl starch and glucose at 10 ml/kg/h, halving at 24 h intervals. Blood samples were taken at 6 and 24 h post-slurry for blood gases, cytokines and markers of organ function. Data are presented as mean ± SEM.

RESULTS.



Kaplan–Meier survival curve

Median survival was significantly prolonged in the AD group (52 vs. 18 h, p = 0.0004). At post-mortem all animals but one (SD group, excluded from analysis) had evidence of peritoneal inflammation. During the observation period BP was not different between groups. At 24 h post-slurry lactate (5.0 ± 1.5 vs. 2.3 ± 0.3 mmol/l, p = 0.02) and IL-6 levels (40,312 ± 5,838 vs. 11,086 ± 4,699 pg/ml, p = 0.008) were significantly higher in the SD group. No significant differences were seen in urea, bilirubin, alanine aminotransferase and troponin levels. At the median survival timepoint, SD animals showed significant decreases in VO_2 (1,237 ± 315 vs. 1,750 ± 92 ml/kg/h, p = 0.02).

CONCLUSIONS. Despite an identical septic insult in similar animals receiving equivalent instrumentation and resuscitation those receiving fecal slurry at the time of anaesthesia and instrumentation had a more severe inflammatory response with worse clinical outcomes. However, no clear difference was seen in tested clinically relevant organ function markers. While the mechanisms for this altered phenotype remain to be elucidated, this study highlights the need for caution in attempting to reproduce findings in different experimental models of sepsis.

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0859

PHARMACOKINETIC-PHARMACODYNAMIC (PK-PD) MODELLING OF TNF-α SERUM LEVELS IN PATIENTS WITH SEVERE SEPSIS SHOWS NO RELATIONSHIP WITH BODY WEIGHT

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INTRODUCTION. TNF-α is an important cytokine in the host response to infection. A 70-patient, Phase IIa study in severe sepsis showed that the ovine-derived polyclonal anti-TNF-α Fab fragment (AZD9773) significantly reduced circulating TNF-α levels vs placebo [1]. TNF-α is prone to wide variability during sepsis and obesity may be a predicting factor [2]. AZD9773 is currently dosed on a units/kg basis which is capped at 100 kg.

OBJECTIVES. To understand whether there may be implications for AZD9773 dosing in obese patients >100 kg, we explored. 1. the relationship between weight and TNF-α, and 2. whether the PD effects of AZD9773 are affected by weight.

METHODS. A population PK-PD model was developed to characterize the time-dependent progression of TNF-α levels and the PD effect of AZD9773 in a Phase IIa double-blind, placebo-controlled, dose-escalation (5-cohort) clinical study (NCT00615017). TNF-α levels were determined at baseline and at 2, 8, 24, 48, 72, 96, 120, and 144 h. A mathematical model was developed to incorporate a time-dependent TNF-α production rate that could characterize both population trends and individual patient data. This was used to investigate the relationship between TNF-α and weight, and whether the PD effects of AZD9773 on TNF-α were affected by weight.

RESULTS. The median weight of patients was 89.5 kg (range 35–181 kg), median body mass index was 29 kg m^{-2} (range 12–60 kg m^{-2}). Baseline TNF-α ranged from 1.3 to 61.7 pg/mL in the study population. The model described the TNF-α data at a population and individual level well. Graphical exploration revealed no trend in TNF-α levels with patient weight. In addition, AZD9773-induced decrease of circulating levels of TNF-α was not influenced by weight.

CONCLUSIONS. A substantial proportion of patients in this severe sepsis trial were overweight. Importantly, patient body weight had no impact on TNF-α serum level. In addition, AZD9773 effectively decreased circulating TNF-α level in patients with severe sepsis, independent of body weight. These data support the intended dosing regimen for AZD9773 and demonstrate that further dose adjustments are not required in patients who weigh over 100 kg. A randomized Phase IIb clinical trial (NCT01145560) is ongoing to further characterize the safety and efficacy of AZD9773 in patients with severe sepsis.

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0860

PHOTOPLETHYSMOGRAPHIC ASSESSMENT OF MICROCIRCULATION AND VASCULAR REACTIVITY IN SEPTIC PATIENTS: PILOT STUDY

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INTRODUCTION. Clinical and experimental evidence indicates that microcirculatory dysfunction contributes to organ failure and mortality in sepsis but its non invasive assessment at the bedside is difficult.

OBJECTIVES. The purpose of this study was to evaluate utility of photoplethysmographic (PPG) assessment of microcirculatory perfusion in patients with sepsis, compare early microcirculatory indices in sepsis survivors versus nonsurvivors, and describe patient variables that affect PPG measurements.

METHODS. Prospective observational study. We studied 10 consecutive general ICU patients (age 65 ± 14 years) within 24 h of admission and 6 healthy volunteers (age 47 ± 27 years). Severity of sepsis was assessed with APACHE II score (15 ± 7), SequentialOrgan Failure Assessment (SOFA) score (6 ± 4) and sepsis severity category (SIRS n = 3, severe sepsis n = 2 and septic shock n = 5). After 1 h observation to ensure that hemodynamics have stabilized, mean arterial pressure (MAP), age and sepsis severity were recorded. 3 min PPG signal recording was done with an originally designed photoplethysmograph at rest and after 3 min of induced forearm ischemia. Outcomes were defined as development of multiple organ failure within 48 h and 28 day mortality.

RESULTS. Of the 10 ICU patients 6 developed multiple organ failure and 3 died. The resting PPG pulsatile component mean amplitude decreased in groups from healthy to septic shock (healthy 18.7 ± 5.2, SIRS 19.0 ± 4.0, severe sepsis 16.3 ± 2.7, septic shock 11.1 ± 5.0 arbitrary units) but the difference was only significant between septic shock and healthy group (p = 0.03), the median slope of recovery after ischemia was lower in septic non survivors (−0.53, IQ −1.97 to −0.30) versus survivors (−0.13, IQ −0.36 to 2.04), p = 0.04, with no difference between other groups. Using linear regression PPG pulsatile component amplitude of septic patients correlated well with survival, age and MAP (r = 0.88, p = 0.02). In healthy patients the slope of recovery after ischemia was proportional to resting amplitude, but in septic patients direct relationship was lost and there was a weak correlation with outcome, but not age or MAP (r = 0.68, p = 0.09). No correlation of amplitude or slope of recovery was found with maximum SOFA score.

CONCLUSIONS. Photplethysmographic microcirculatory indices vary between patients in different sepsis categories but are also influenced by age and MAP. Slope of postischemic recovery depends on resting amplitude but in the subgroup of patients with severe sepsis could predict poor outcome regardless of resting amplitude, age or MAP. Larger study is needed to confirm this finding.

GRANT ACKNOWLEDGMENT. Financial support from European Social Fund (grant # #2009/0211/1DP/1.1.1.2.0/09/APIA/VIAA/077) is highly appreciated.

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MECHANICAL VENTILATION CAUSES ABDOMINAL INFLAMMATION IN PORCINE ENDOTOXEMIA

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INTRODUCTION. Acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) carry a high mortality. A corner stone in the definition in the ALI/ARDS is impaired oxygenation of blood and large efforts have been spent on improving the ventilatory support to provide a better gas exchange. However, the poor outcome is more often caused by extrapulmonary, abdominal organ dysfunction. We tested if different ventilator strategies can affect inflammatory responses in distal organs.

MATERIALS AND METHODS. 24 anesthetized pigs (29.4 ± 3 kg) were studied. Septic damage was induced by continuous infusion of endotoxin (lipopolysaccharide *E.Coli,* LPS). Hemodynamics, respiratory data, intra-abdominal pressure (IAP) and abdominal perfusion pressure (APP=MAP-IAP) were registered. During the first 2.5 h of LPS infusion animals were ventilated in volume controlled mode TV 10-11 ml/Kg PEEP 5; during the next 2 h animals were divided into group. 1 (PEEP 5), 2 (PEEP 15) and 3 (spontaneous breathing CPAP PEEP 5). Group 4 consisted of healthy controls studied during spontaneous breathing at ZEEP. After 5 h biopsies were obtained from intestine, liver and lung. Inflammatory markers TNF-α and IL-6 were quantified in plasma and tissue samples from liver, intestine and lung, using commercially available Enzyme Linked Immunosorbent Assays (ELISA) (Quantikine, R&D Systems, Abingdon, UK).

RESULTS. The LPS exposed pigs showed significantly higher TNF-α and IL-6 concentration in all biopsies compared to the spontaneously breathing healthy animals.

In the liver, IL-6 was significantly higher in PEEP 5 compared to CPAP (5.0 vs. 2.1 pg/mg $p < 0.05$) while TNF-α was higher in PEEP 5 compared to both PEEP 15 and CPAP (5.3 vs. 4.1 vs. 1.9 $p < 0.05$). In the intestine, IL-6 was significantly higher in PEEP 5 compared to CPAP (5.4 vs. 1.8 pg/mg $p < 0.01$) while TNF-α was higher in PEEP 5 compared to both PEEP 15 and CPAP (2.3 vs. 1.9 vs. 1.1 $p < 0.05$). No differences in plasma and lung tissue concentration were found between the LPS groups.

In pooled data, a negative correlation was found between APP and TNF-α in the intestine (Pearson's coefficient 0.47, $p = 0.05$).

CONCLUSIONS. Spontaneous breathing with CPAP is associated with lower concentration of pro-inflammatory cytokines IL-6 and TNF-α in liver and intestine in endotoxin-exposed pigs. In the mechanically ventilated animals, PEEP 5 had as high, or higher, levels of inflammatory markers as PEEP 15. The findings suggest that mechanical ventilation per se can trigger an inflammatory response in distal organs and that spontaneous breathing can be protective.

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CELL SURFACE CD64 AND CD11B EXPRESSION AND METABOLIC PROFILE IN PEDIATRIC PATIENTS WITH SEPSIS AND SIRS

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BACKGROUND: Neutrophil CD64 expression has been found to be a better diagnostic marker for sepsis than PCT and CRP in adult sepsis. Increased CD11b-density on circulating phagocytes was shown to be an early sign of late-onset sepsis in extremely low-birth-weight infants.

AIM. 1. To evaluate the cell expression of CD64 and CD11b in children with severe sepsis (SS), sepsis, systemic inflammatory response syndrome (SIRS) and healthy controls; 2. to relate their expression with differences of acute phase proteins and metabolic indices.

METHODS. Blood samples were collected during 24 h after admission for analysis by flow cytometry of the surface expressions on neutrophils, lymphocytes, and monocytes of CD64 and CD11b in children with SS (6), sepsis (8), trauma (4) and healthy controls (11). Simultaneous samples of procalcitonin (PCT), C-reactive protein (CRP), glucose, cholesterol, LDL, and HDL were also measured and clinical and outcome endpoints were recorded.

RESULTS. CD64 levels measured on neutrophils were elevated in patients with SS (64%) and sepsis (65%) as compared to those with SIRS due to trauma (7%) or healthy controls (1.2%) ($p < 0.0001$); CD64 was positively related with CPR, PCT, glucose and negatively with LDL, HDL, and cholesterol ($p < 0.05$). All metabolic indices differed significantly between patients with sepsis and SIRS or controls ($p < 0.001$), whereas none of the 3 cell lines CD11b differed among groups.

CONCLUSION. CD64 levels measured on neutrophils are significantly higher in critically ill children with septic shock and sepsis compared to those of children with trauma or healthy controls. Increased CD64 is associated with high CPR, PCT, glucose and low LDL, HDL, and cholesterol but not with CD11b.

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CEREBRAL MAGNETIC RESONANCE IMAGING IN SEPTIC SHOCK PATIENTS WITH ACUTE BRAIN DYSFUNCTION

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INTRODUCTION. Encephalopathy is a frequent and severe complication of sepsis. Its mechanisms remain to be elucidated. In a previous study, magnetic resonance imaging (MRI) showed cerebral infarct or leucoencephalopathy in 7 out of 9 septic shock patients [1].

OBJECTIVES. The present study has been carried out to determine the prevalence of these lesions in a larger cohort of septic shock patients referred to our ICU and who required MRI for an acute alteration of mental status.

METHODS. Neurological examination was daily performed in patients with septic shock. MRI was indicated in case of focal neurological sign, seizure, coma (Glasgow coma score <8) or delirium (detected with help of CAM-ICU). Patients underwent MRI only if they were deemed transportable. MRI included gradient echo T1-weighted, fluid-attenuated inversion recovery (FLAIR), T2-weighted and diffusion isotropic images, and mapping of apparent diffusion coefficient. Demographic characteristics, SAPS-II, daily SOFA score and standard laboratory test were recorded as well as duration of septic shock. Leucoencephalopathy was graded from 1 (punctiform) to 3 (diffuse). Quantitative and qualitative variables are expressed in median and percentage, respectively.

RESULTS. From 2004 to 2011, 53 patients were included (age: 65 years; women: 22 (42%); SAPSII: 48). MRI was indicated upon focal neurological sign in 8 (15%), seizure in 8 (15%), coma in 24 (45%) and delirium in 23 (43%). Median delay between onset of septic shock and MRI was 6.5 days. MRI was normal in only 6 (12%) patients. It showed leucoencephalopathy in 31 (59%) [grade 1: 19 (36%), 2: 8 (15%) and 3: 4 (7%)], cerebral infarcts in 17 (32%). Cortical necrosis and hemorrhage were found in 3 (6%) and 2 (4%) patients, respectively. Coma and focal neurological sign were more frequent in patients with leucoencephalopathy and ischemia, respectively. 19 (36%) patients died. Mortality rate was not correlated with type of brain lesion.

CONCLUSIONS. The present study showed that septic shock encephalopathy is often associated with brain lesions, including either leucoencephalopathy or ischemia. These lesions might account for the long-term cognitive decline observed in septic patients (2).

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0864

EFFECT OF DROTREGOCIN ALFA (ACTIVATED) ON GHRELIN LEVELS IN BLOOD OF SEPTIC PATIENTS

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INTRODUCTION. Human ghrelin, a 28-amino acid peptide, is predominantly synthesized by the stomach and is the only identified endogenous ligand for the growth hormone secretagogue receptor 1a (HGS-R1a). Ghrelin, originally thought to be stimulator of GH axis and food intake also exerts potent inhibitory effects on proinflammatory mediators via its action on T cells, monocytes, and endothelial cells. We measured Ghrelin concentrations in septic patients under the treatment with and without Drotregocin alfa (activated).

METHODS. Serum samples were obtained from septic patients ($n = 6$; control-group) and septic patients under treatment with Drotregocin alfa (activated) ($n = 6$) on day 1 and 6 of severe sepsis. Ghrelin levels were measured with ELISA-method. Statistical analysis were performed with ANOVA.

RESULTS. Ghrelin levels decreased from day 1 (baseline) ($M_W = 272.6$ pg/ml ± SEM = 111.3 pg/ml) to day 6 ($M_W = 173.8$ pg/ml ± SEM = 70.9 pg/ml) in septic patients without treatment with Drotregocin alfa (activated). In septic patients treated with Drotregocin alfa (activated) Ghrelin levels significantly increases from day 1 (baseline) ($M_W = 183.2$ pg/ml ± SEM = 74.7 pg/ml) to day 6 ($M_W = 409.7$ pg/ml ± SEM = 167.3 pg/ml; $p < 0.05$).

CONCLUSIONS. We can show that Drotregocin alfa (activated) increases Ghrelin serum levels during the time course of septic patients. This observation strongly suggests that Drotregocin alfa (activated) plays an important role in the regulation of adipokines and hormones with metabolic functions in critical ill patients. Further experimental and clinical studies are needed to confirm these results.

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HUMAN MESENCHYMAL STEM CELL-CONDITIONED MEDIUM IS PROTECTIVE IN STRETCH-INDUCED LUNG INJURY

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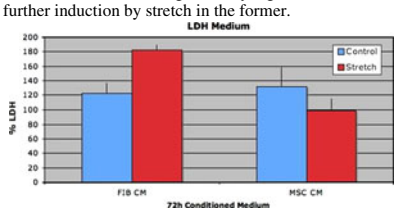
INTRODUCTION. ALI and ARDS are devastating clinical conditions for which there is no specific therapy. Mechanical ventilation may worsen ALI/ARDS, a process termed Ventilator Induced Lung Injury (VILI). Recent literature describes the benefits of MSC-Conditioned medium (MSC-CM) in wound healing [1] and cardiac function [2] following myocardial infarction. The therapeutic potential of mesenchymal stem cells for severe acute lung injury has also been alluded to by Matthay and colleagues [3]. In this study we examined the hypothesis that administration of conditioned media derived from stem cells can diminish the burden of Ventilator-Induced Lung Injury.

OBJECTIVES. To determine the potential benefits of MSC-CM and Fibroblast-Conditioned Medium (FCM) in stretch-induced inflammatory injury.

METHODS. Human alveolar A549 cells were cultured and seeded onto Flexcell Bioflex 6-well plates at a density of 2×10^5/ml and transduced with lentiviral kappa B luciferase reporter. After a 72 h incubation period, the plates were refreshed with either 72 h Human MSC-CM or 72 h FCM. The plates were then subjected to equibiaxial cyclical strain of 23% elongation using the Flexcell Tension Plus FX-4000. After 24 h, the cells were then harvested and MTT and LDH assays were performed to assess cell viability. Luciferase assay was performed to ascertain NF kappa B induction. ELISA was performed on the medium to ascertain IL-8 chemokine secretion.

RESULTS. Cells in the MSC-CM group exhibited increased cell viability in both control and stretch groups compared with cells in the FCM group. Stretch-induced LDH release was inhibited in the MSC-CM group. Although cyclical stretch induced significant IL-8 release in both groups, there was no significant difference in IL-8 release. Significant Kappa B luciferase induction was seen in stretched cells versus controls in the FCM group. However the baseline luciferase in control MSC-CM cells was significantly higher than in the stretched FCM cells, and there was no further induction by stretch in the former.



LDH assay

CONCLUSIONS. Human MSC-CM may have protective effects in an *in vitro* stretch-induced lung injury model and this may translate to potential therapeutic targets in Ventilator-Induced Lung Injury.

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GRANT ACKNOWLEDGMENT. European Research Council grant (Framework 7).

ICU patient safety 2: 0866–0878

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IMPACT OF MATERNAL CRITICAL ILLNESS ON FETAL OUTCOME

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INTRODUCTION. Little data exists to predict fetal prognosis in critically ill mothers admitted to the ICU. The fetus may be at risk from maternal hypoxia and hypotension as well as maternal physiological responses, such as uterine vasoconstriction due to shock; as well as from ICU interventions, eg. vasopressor therapy. A previous report, restricted to women with non-obstetric complications, identified shock, maternal transfusion and gestational age as fetal risk factors. We planned to identify the variables in critically ill mothers associated with fetal mortality.

METHODS. We analyzed an existing database of pregnant and postpartum women admitted to the ICU for more than 24 h after 12 weeks gestation, collected from 6 ICUs in 5 countries over 4 years. Thirty patients (9%) were identified who were pregnant on ICU admission. Mothers of the fetuses who survived ($n = 24$) were compared with those of fetuses that died ($n = 6$), with respect to clinical data. The median and interquartile range (IQR) was used for continuous data and categorical variables were expressed as counts and proportions. Fisher's exact test and Wilcoxon rank-sum test were used and $p < 0.05$ was considered statistically different.

RESULTS. Median maternal age was 25 years (IQR19-33) and gestational age was 29.5 weeks (IQR22-35). The median maternal APACHE II score was 13 (IQR9-14). Several parameters, including age, gravidity, gestation, maximum temperature, low alkaline phosphatase, low serum bicarbonate and APACHE II showed a trend towards association with fetal mortality (see Table). No difference was found for some parameters considered important a priori, e.g. oxygenation, blood pressure, and hemoglobin level. Low partial thromboplastin time (PTT) and duration in ICU were significantly different between the two groups (see Table).

Maternal variables [shown as median (IQR)

	Fetal survived group (n = 24)	Fetal died group (n = 6)	P value
Age (years)	25.5 (19.5–33.0)	24.0 (19.0–28.0)	0.46
Gestational age (weeks)	30.5 (25.5–35.5)	20.5 (18.0–29.0)	0.05
Gravidity	1 (0–1.5)	0 (0–1)	0.31
APACHE II	12.5 (7.5–14.0)	15.5 (13.0–21.0)	0.08
Maximum temperature (°C)	37.5 (36.8–38.1)	38.6 (37.6–39.5)	0.07
Alkaline phosphatase (U/L)	160 (99–251)	57.5 (44.5–91.5)	0.05
Bicarbonate (mEq/L)	22 (18.0–23.6)	18.5 (15.5–20.1)	0.06
PTT (s)	28.7 (25.9–32.4)	20.6 (16.6–24.5)	<0.05
Duration in ICU (days)	2 (2–4)	7.5 (5–9)	<0.05

CONCLUSIONS. This study highlights our poor understanding of factors responsible for fetal mortality in the critically ill. The study is limited by a small sample size, although derived from a relatively large database. The analysis of more than 60 parameters increases the risk of a type 1 error. Parameters such as fever, low bicarbonate and early gestation may be expected to be associated with fetal mortality, but the lack of any signal for poor oxygenation and hypotension is unexpected. It is possible that the alkaline phosphatase level may relate to placental function, but the positive finding with low PTT may simply be a false positive. Further study is required.

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INTRAVENOUS ADMINISTRATION ERROR REDUCTION BY A COMBINED APPROACH OF RISK MANAGEMENT SYSTEM AND SMART INFUSION PUMPS UTILIZATION. FEED BACK FROM AN ICU EXPERIENCE

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INTRODUCTION. The main risk of serious medications errors concerns infusion, especially for ICU patients. Since 2002, our unit has developed an adverse events (AE) declaration and analysis system including a close approach of medication errors (ME) and infusion related ME and use a dilution reference. Smart infusion pumps (SIP) with embedded safety software have been acquired as a part of improvement actions.

OBJECTIVES. The aim of this communication is to evaluate through a 3 years experience how SIPs are helpful for medication use safety and in what conditions.

METHODS. The principle is to always administrate drug in a "supervised mode" (SM) i.e. from a choice in a drug library where administration features are determined for each, the non nominal mode must only be used for non referenced drug. The features values have been set by the team according to pharmacological datas and the identified risks in the unit, some are common to all medication. 1. name, 2. final concentrations, 3. dosages, 4. default flow rate, 5. lower limit: 0.01 ml/h, 6. soft limit, 7. hard limit, 8. bolus, 9. obstruction alarm limit. Start 100% immediately after training (2007.08.01).

RESULTS. 1. The declaration system: a significant and constant diminution of infusion related ME. 2. The integrated software reports: an optimal use: 92.7% of 81,607 administrations in SM, a significant number of drugs alerts (DA), 100 attempts to exceed hard limit, 1.22/1000 uses. In 30 cases, the device has contributed to avoid a serious AE. Some correspond to real errors in dose computation or programming flow rate. Some specific reasons induced improvement actions by library changes, the history of each DA: identification (time, pump number, medication), initial request and final solution allowing an exhaustive approach of team members infusion practices, no potential high risk periods.

CONCLUSIONS. Medication infusion safety is increased by a complete acceptance of SIP. SIP use has provide an enhanced attention of the team to the infusion practice, a removal of dose calculation errors, main overdosing errors, unscheduled interruption by obstruction, a reduction in concentration errors. The main keys to optimise SIP use are a shared culture of drug risk management, an exhaustive and evolutionary drug library, a 100% start, time for training, monitoring, analysis and project progress. To optimise the range of SIP use, the device should be include in a global strategy for a safe drug circuit, combining good practices (including prescribing and dispensing steps) and technologies (bar code for persons and drugs, prescription software, automating dispensing device, industrial preparation).

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CHARACTERISTICS, CLINICAL FEATURES AND PREDICTIVE FACTOR OF ISCHEMIC BOWEL DISEASE

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INTRODUCTION. Ischemic bowel disease (IBD) is result of inadequate blood supply to the bowel. We often encounter IBD patients in the Intensive care unit (ICU) and it sometimes can become fatal. Development of IBD is associated with various factors but only a limited amount of research has been performed on this issue.

OBJECTIVES. We aimed to investigate the clinical feature, epidemiology and predictive factors and tried to figure out how to make a positive outcome.

METHODS. We retrospectively analyzed data collected from 41 patients with IBD who underwent surgery at the Asan medical center during 2007–2009.

RESULTS. Among 41 patients, 48.8% was male, Mean age was 65.8 (SD 11.5). 58.5% of the patients visited ER for symptoms, 41.5% of the patients had the first symptoms during hospitalization for another disease. 82.9% ($n = 34$) of patients had bowel resection and 17.1% ($n = 7$) of patients had a diagnostic laparotomy. In case of diagnostic laparotomy, 3 of them were abandoned cases due to unstable patient vital signs and this followed by death immediately after surgery. 4 of them were cases of SMA thrombosis was done with the thrombectomy. 12.2% of cases turned out to involve the total colon and 14.6% showed simultaneous total colon and partial small bowel involvement. 24.4% showed only small bowel involvement. The mean ICU stay time was 13 days (SD 14.3) after surgery and the mean hospital days was 28.3 days (SD 25.7). 23 patients (56.1%) were discharged with improved symptoms. 18 patients (43.9%) died or were hopelessly discharged. We defined poor outcome groups as patients who died or were hopelessly discharged and investigated associate with patient factors and poor outcome. We analyzed patients' underlying disease and findings (laboratory and physical findings) at the time of first visit (or the day of first onset of symptoms in case of inpatients). In univariate analysis, underlying renal failure, decreased Mean BP (at the time of diagnosis), abnormal Liver function test, onset during hospitalization for other causes seemed to be related. (P-value <0.05) In multivariate analysis, only LFT abnormality (OR 10.48) and Renal failure (OR 20.85) turned out to be a strong risk factor for poor outcome. We also found association with the cause of IBD and poor outcome. IBD which onset after Heart surgery (ex: CABG, valve op) and transplantation and AAA operations showed high mortality rate (66, 100, 66%), and IBD caused by SMV thrombosis showed rather good prognosis.

CONCLUSIONS. We found that almost half of IBD patients who needed surgery died. So to improve treatment outcome, we should remember poor prognostic factors and always be cautious to detect early in especially high-risk post op patients.

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ACUTE FATTY LIVER OF PREGNANCY: A 5 YEAR REVIEW IN INTENSIVE CARE UNIT

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INTRODUCTION. Acute fatty liver of pregnancy (AFLP) remains a medical and obstetric emergency. It is a rare disorder during pregnancy [1].

OBJECTIVES. The objective behind this study was determine epidemiology of AFLP and explore cause of severe obstetric morbidity and mortality in our unit.

METHODS. We conducted a prospective study over 5 years: January 2006–December 2010. Patients first managed in tertiary referral maternity center for high risk pregnancy. Records were reviewed for symptoms laboratory finding, liver biopsy clinical course and maternal outcomes.

RESULTS. During 5 years 289, obstetrical patients required ICU admission, 6 (2.07%)had AFLP Maternal age average was 30 ± 6 years, the mean gestational age is 32 ± 7 weeks, 4 multiparous and 2 primigestous. The patients were admitted 7 ± 3 days after the first symptoms, common signs and symptoms were: nausea and vomiting 6 cases, abdominal pain 6 cases, polydipsia/polyuria 2 cases, encephalopathy 2 cases, pruritus 2 cases and jaundice 4 cases.

Laboratory findings have shown the following: AST 361 ± 301 UI, ALT 236 ± 222 thrombin 47%, blood urea nitrogen 13.6 ± 4 mmol/l, serum creatinine 279 ± 121 µmol/l.

Biological abnormalities associate with elevated serum aminotransferase. High acid uricemia 3 cases, Renal impairment 4 cases, Hyperbilirubinemia 4 cases Hypoglycemia 6 cases and Hypoalbuminemia 3 cases

The diagnosis of AFLP was raised clinically and with ultrasonography in 3 patients, and clinically and with liver biopsy in 3 other patients. Five patients required mechanical ventilation (Vm) duration of Vm was 18 ± 30 days. Complications are: coagulopathy of 4 cases, ARDS of 3 cases, one pancreatitis and one septic shock The median duration of stay in ICU was 20 ± 27 days .median Ob-SAPS was 20 ± 10 and APACHE II was 15 ± 1. Two patients died of multiple organ failure.

CONCLUSIONS. Early diagnosis [1], prompt delivery and intensive supportive care are the cornerstones in the management of AFLP because the laboratory findings frequently do not reflect the gravity of the problem.

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HOSPITAL CHARACTERISTICS AND MORTALITY IN ELDERLY HEART ATTACK

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INTRODUCTION/OBJECTIVES. Meet management plan and predictors of mortality in elderly patients with myocardial infarction.

METHODOLOGY. We reviewed all patients >75 years with myocardial infarction in 2009, on admission, 6 and 12 months after discharge.

RESULTS. 103 patients (p), 52 men. Mean age: 80.21 years (men) and 80.31 years (women). Initial diagnosis: STEMI (15.5%) and NSTE-ACS (84.5%). 62.1% had TIMI e5. Killip class: I–II 85.4% 14.6% III–IV. Echocardiography was performed in 68% of p. Coronary angiography was performed in 35 p, 3 p without significant coronary lesions, 17 p 3-vessel disease. The culprit vessel was: TCI (5 p), DA (15 p), CD (5p) and CX (7p). PCI was performed in 26 p. 8 p was used in thrombolysis. 1 p underwent coronary bypass surgery. Drugs at discharge: aspirin (96.8%), clopidogrel (76.9%), beta-blockers (62.7%), calcium antagonists (38.2%), nitrates (70.2%), statins (96.8%), ACEI/ARB (82.9%). 9 pts died in plant (6 cardiogenic shock, multiorgan failure 2 and 1 malignant arrhythmia). one of them, culprit vessel revascularization in income (DA) in the context of 3-vessel disease. The only predictor of hospital mortality with statistical significance were age (OR 1.32 (95% CI 1.11–1.58).

CONCLUSIONS. Our study shows the high complexity of managing these patients, because of their high comorbidity associated with diffuse coronary artery disease in most cases and with a high rate of resource consumption and hospital complications.

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IMPROVING PATIENT SAFETY IN THE ICU USING THE BOW-TIE PROSPECTIVE RISK ANALYSIS MODEL

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INTRODUCTION. The prevention of healthcare related morbidity and mortality due to medical error is an important goal in healthcare worldwide. In the Netherlands all hospitals are required to have a safety management system including a prospective risk analysis. Prospective risk analysis with the Bow-Tie model originates from the petro-chemical industry and can be used for this purpose.

OBJECTIVES. The aim of our study is to describe the usability of the Bow-Tie model as a prospective risk analysis method in an Intensive Care Unit (ICU). Moreover we try to elucidate the effects on safety in patient care.

METHODS. We performed all Bow-Tie analyses with a team of doctors and nurses in a 28 beds ICU in the Netherlands using Bow-Tie XP software (Governors, version 3.6.20). The safety management committee composed a list of events that carry a high risk for patient safety. Three of these events were analyzed using the Bow-Tie model: in-hospital transportation, unplanned extubation and communication. For each event potential threats and consequences were defined. Then ways to prevent the threat or limit the consequences were determined, so called barriers. This was made visual in a Bow-Tie diagram (Fig. 1). Following the analyses recommendations were generated and implemented where feasible.

Fig. 1

RESULTS. All Bow-Tie analyses led to practical recommendations, many of which were implemented. 1. The Bow-Tie on transportation led to the implementation of a pre-transportation checklist and to a new transportation device (Fig. 1). 2. The Bow-Tie on unplanned extubation showed that this was mostly related to delirium and timing of planned extubation. These insights led to recommendations that have been implemented in the relevant protocols and lead to a change in practice. 3. The Bow-Tie on communication resulted in improvements in the module for communication in our patient data management system, such as the need to co-sign after the handover of a patient.

CONCLUSIONS. The Bow-Tie model proved to be a usable method for prospective risk analysis on the ICU. It is easy to perform and gives a clear visual insight in risk factors for critical events. Furthermore the Bow-Tie analysis leads to practical recommendations that proved feasible in our ICU.

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0872

IMPROVED PATIENT SAFETY DURING CRITICAL CARE TRANSFERS RESULTING FROM A SUSTAINED NETWORK APPROACH

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INTRODUCTION. Critical care transfers are recognised as being an intervention during which patients may be exposed to increased critical events. Several models for improving the quality of critical care transfers have been proposed, all largely focusing on single interventions.

OBJECTIVES. We analysed the 5 year impact of implementing a multifaceted Network strategy aimed specifically at monitoring and improving patient safety during critical care transfers.

METHODS. The North West London Critical Care Network represents member hospitals with critical care requirements but varying capacity. The number of member hospitals was 17 in 2005, increasing to 19 in 2008. Following the implementation of a Network transfer form, analysis of early data revealed: a high number of transfers that were taking place due to lack of capacity (non-clinical transfers); the majority of escorting personnel had not received specific training in critical care transfers; and a large number of critical incidents were occurring, particularly due to equipment problems. In response to these findings a strategic response was developed which included: the development and implementation of transfer training aimed at addressing the specific issues highlighted within the Network sector; the collation of hospital-specific data which was reported quarterly and annually at all clinical and management levels; widespread presentation of data and strategy within a variety of clinical and managerial groups (including nursing, medical, physiotherapy and local critical care delivery groups); the review and renewal (where indicated) of equipment used during transfers at local sites across the sector.

RESULTS. In response to the Network strategy, and despite the increased number of member hospitals in 2008, our transfer data revealed: a sustained year-on-year reduction in level 3 transfers; a sustained improvement (reversal) in the ratio of non-clinical to clinical transfers; a reduction in critical incidents, in particular those due to equipment & battery problems.

Changes in transfer demographics since 2005

Year	Number of level 3 transfers	Non-cinical:clinical transfers	Ratio of non-clinical:clinical transfers	Total number of critical incidents	Number of equipment + battery incidents (% of total incidents)
2005–15 (58)	2006	367	274:93	1:0.33	26
2006–25 (61)	2007	353	138:215	1:1.56	41
2007–31 (58)	2008	310	141:158	1:1.12	53
2008–13 (37)	2009	286	112:161	1:1.44	35
2009–10 (40)	2010	264	93:160	1:1.73	25

Our data also showed that neurosurgical emergencies were consistently the most common indication for clinical transfer.

CONCLUSIONS. Our strategy demonstrates that the safety of critical care transfers can be significantly improved at local and regional levels through the adoption of a multifaceted approach targeting: continued transfer data collection and analysis; improved clinician, managerial and commissioner awareness of transfer issues; education of escorting staff; review of recurring critical incidents with targeted strategies to reduce them.

0873

EQUIPMENT-RELATED CRITICAL INCIDENTS IN INTENSIVE CARE

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INTRODUCTION. Almost one million incidents occur each year within the NHS that harm or have the potential to harm patients [1]. Patients requiring critical care are at particular risk of harm due to multiple procedures, poly-pharmacy and equipment errors. Critical incident reporting aims to identify causative factors and through analysis, prevent or reduce recurrence. It is increasingly recognised as integral to patient care and clinical governance [2]. The aim of this study was to identify frequent causes of adverse events in critical care, with a particular focus on equipment incidents. This was done by analysing data from a voluntary and optionally anonymous reporting system.

METHODS. In our 13-bed, general, adult ICU critical incidents have been routinely recorded since mid-2002. All critical incidents related to equipment were classified in different main categories: Airway adjuncts/manipulation, Ventilation and Breathing System, Infusion Devices, Invasive Catheters, Built Environment and Support Systems, Gas Supplies, Monitoring, Static Measurement, Sterility and Miscellaneous.

The period July 2002 to February 2011 inclusive (102 months) was analysed to determine the commonest types of incidents, and whether any specific strategies for reducing them could be deduced.

RESULTS. 171 different types of critical incident related to equipment were reported, resulting in a total of 360 incidents during the period analysed. The largest sub category of reports related to "Ventilation and Breathing System" (25%), closely followed by "Invasive Catheters" (18%), and "Infusion Devices" (13%). Of particular note, were the 40 reports relating to tracheostomy problems (11% of all reports). 80 incidents were due to staff unfamiliarity or incorrect handling of equipment (22% of all reports).

CONCLUSION. The intensive care unit is a complex and challenging environment. Equipment is used which many people are unfamiliar with, especially with the high turnover of staff who may work on the unit for only a limited period of time. Many of the equipment related incidents resulted from misuse rather than poor maintenance of equipment. This is an area which can be improved only with better training of staff. Of particular concern is the number of tracheostomy related incidents, with the potential for immediate and lasting harm. Continuous capnography monitoring in all patients ventilated via a tracheostomy is now recommended and despite cost implications, is likely to become mandatory in the near future [3].

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0874

IMPLEMENTATION OF A SAFETY PROGRAM IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Patient safety plays a critical role in Intensive Care Units (ICU) because acute ill patients are particularly sensitive to health care errors and ICU is a high risk environment.

OBJECTIVES. The aim of this study was to implement a Safety Program in our ICU and introduce patient safety improvements.

METHODS. Prospective observational study. During 1 year period(January 10–January 11) a Safety Program was implemented in our ICU. The Safety Program consisted in:Education in safety culture. Creation of a safety team. Implementation of daily goals worksheets and meetings. Elaboration of an incident report system. The report included details about patient (demographic data, APACHE II, reason of admission, length of stay) and incident (type, consequences, contributing factors). The report forms were entered into a computer database. We evaluated the kind of incident, severity and preventability every 3 months. Identification of potential risk factors according to the classification of the National Patient Safety Agency. Analysis of the incidents were regularly given back to the ICU team. Discussion of strategies of prevention. Introduction of patient safety improvements.

RESULTS. A total of 300 patients were included. 108 incidents were reported in 63 patients. The median age was 66 years. The mean APACHE II was 20 $\pm$ 8. The reason of admission was in a 87.4% medical. The length of stay was 17.4 days. Most incidents were reported during daytime. The main types of incidents were related to medication errors (25%), equipment failures (17%), nosocomial infections (14%), tubes, catheters and drains (11%), airway management failure (11%), diagnostic errors (11%), invasive procedures (6.5%) and care of patients (4.5%). 19.5% of the incidents reported were incidents without damage and 80.5% adverse events (AE). Severity of AE was 11.5% minor (minimal harm, no treatment required), 54% moderate (harm, requiring treatment) and 34.5% severe (long term harm), none caused death. 86% were considered avoidable or potentially avoidable. The main contributing factors were related to communication, teamwork issues, education and training, professionals and work conditions. Improvements were introduced. Review, elaboration and implementation of guidelines and check-lists. Introduction of preventive strategies such as regular equipment training meetings. Promotion of team work and communication in such a way as to optimize patient care. Adecuation of workload. The aims are a risk reduction for the patient and to standardize diagnostic and therapeutic procedures and patient's care.

CONCLUSIONS. The implementation of a Safety Program has improved the quality of care administered in our ICU. The continuous monitoring and evaluation of the incidents has changed tasks and procedures, has introduced strategies of prevention and has got a safer health care environment.

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0875

RISK MANAGEMENT IN CRITICAL CARE: APPLYING PRELIMINARY RISK ASSESSMENT FOR PERCUTANEOUS TRACHEOSTOMY

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INTRODUCTION AND OBJECTIVES. The implementation of new healthcare procedures in an intensive care unit (ICU) should be associated with proactive and systematic evaluation of the potential risk of adverse events, in order to analyse and control them before they occur. The use of preliminary risk assessment (PRA) for percutaneous tracheostomy (PT) is one such proactive approach to identifying risk and improving quality of healthcare.

METHODS. PT was divided into three phases: (1) preparation of the patient and the equipment, (2) performance of the PT procedure, (3) monitoring of the result and detection of early complications.

A Working Group (WG) comprising 2 physicians, 1 nurse, and 1 chief nurse noted, for each phase, the potential dangers, in order to make a list of all potentially dangerous situations that could arise. Based on the dangerous situations with the highest priority (i.e. most vulnerable areas), potential scenarios for the occurrence of dreaded adverse events were developed, with initial evaluation of the gravity of the consequences, the likelihood of occurrence and the level of criticality. Actions to reduce the risk of occurrence were proposed by the WG, and in order to envisage the control of such situations, and estimate new scales of gravity, likelihood and criticality associated with residual risk.

RESULTS. In our study, the various dangers identified were classified into five general groups (physical and technical; clinical-biological; human resource management; management of material resources; ethical). Eighty dangerous situations with level 1 (top) priority were identified that warranted more in-depth analysis, leading to the development of 130 scenarios of potential adverse event occurrence. Initial evaluation made it possible to classify risk as unacceptably high (maximal criticality of 3) in 66% of these scenarios, justifying essential risk reduction measures before the activity could be performed. These risk reduction measures, with identification of the person responsible for their implementation (physician, nurse, chief nurse, superior hierarchy) made it possible to reduce the proportion of scenarios with a criticality of 3 to only 6%. In parallel, scenarios with criticality level 2 (tolerable risk, under control) increased from 31 to 80%. This improvement in terms of criticality can be explained in most cases by a reduction in the likelihood of occurrence (preventive actions). The majority of risk reduction measures envisaged were associated with a low to medium level of effort.

CONCLUSIONS. PRA applied to PT makes it possible to identify different scenarios of potentially dangerous situations that could lead to the occurrence of major adverse events. Awareness of these potential dangers makes it possible to take anticipatory preventive actions to reduce risk when the procedure is being performed.

0876

INTRAHOSPITAL TRANSFER OF INTENSIVE CARE PATIENTS: PROSPECTIVE EVALUATION IN A TERTIARY HOSPITAL

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INTRODUCTION. Intrahospital transfer of patients from intensive care units leads to important risks and the probability of side effects. The development of standardization transfer protocols can be a strategy to improve clinical safety and assistance quality. Following several notifications recorded at the website of our service about adverse events potentially avoidable, we proposed this study.

OBJECTIVES. To record and describe the incidents during Intrahospital transport of patients from intensive care units (ICU) in our hospital.

METHODS. A descriptive prospective study of intra-hospital transfer from ICU patients at the "Marqués de Valdecilla" University Hospital, during November 2010 to March 2011. The data are shown in absolute value and/or percentage.

RESULTS. There were 145 intrahospital transports in 98 patients. 69% of these transfers were made from the neurocritical ICU, and 31% from the polyvalent ICU. Most of them were made to the radiology department (57.2% CT, 3.4% MRI, 6.2% interventional radiology), followed by the transfers to the operating room (29.7%). Monitoring progress (24.5%) and diagnosis (36%) were the main reasons, leading to a change in the management in 50% of the cases. Patients and/or their relatives were informed before the transfer in 66.2% of the cases. In almost all transfers, previous appropriate measures were taken: bag transfer verification (92.4%); availability of oxygen cylinders for 30 min (97.3%); equipment battery life (99.3%); checking alarms (96.5%); isolated venous access (100%); nasogastric tube bag drainage (81.1%); urinary catheter clamped (91.7%); and aspiration of respiratory secretions (87.1%). Transfers were made by nurses (100%), orderly (100%) and doctors (25.9% staff, 81% residents). Coordination with reception service was marked by poor communication in 5% of cases involving delays, which did not exceed 5 min at admission to the surgical ward or at reception in the radiology department. There was no sentinel case in the study group.

CONCLUSIONS. Measures of patient preparation and verification of equipment were carried out correctly. Coordination with reception service must be a strategy for improvement in our environment. We believe that systematic use of a "check list" can improve safety in the transfer of critical patients.

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0877

THE SINGLE-USE ENDOSCOPE ASCOPE™ FOR FIBREOPTICAL MONITORING IN PERCUTANEOUS DILATATIONAL TRACHEOSTOMY: A FEASIBILITY STUDY

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INTRODUCTION. Use of fiberscope is recommended for the realization of percutaneous dilatational tracheostomy (PDT). In times of increasing rates of infections with multiresistant microorganisms in the intensive care unit (ICU), single-use devices play a growing role in daily clinical practice, especially regarding pitfalls in reprocessing of reusable endoscopes. A single-use fibrescope aScope™ (Ambu®) could allow to prevent cross contamination given sufficient and to diminish material costs. During the realization of PDT, the fiberscope could be injured with important costs of repair.

OBJECTIVES. To evaluate the feasibility of fibreoptical monitoring in PDT by the single-use fiberscope aScope™.

METHODS. This prospective study has included 10 patients requiring a bedside PDT realized under a Scope™ view. Conditions of procedure (duration, visualization) were evaluated by a scale very unsatisfied/unsatisfied/satisfied/very satisfied. Costs of repair were evaluated retrospectively for last 5 years.

RESULTS. A PDT was achieved in 10 patients [median age 60 years (49–70), IGS II 46 (39–62), duration of mechanical ventilation from last intubation 14 days (8–22)]. After the 10 procedures, the practitioners have evaluated the implementation very satisfactory in 9 cases, the interest for anatomical tracking very satisfactory in 8 cases, for the guidewire entry in the trachea very satisfactory in 8 cases, for the endotracheal placement of the tracheotomy tube very satisfactory in 7 cases and et satisfactory in 3 cases. Brightness quality was assessed very satisfactory in 6 cases, satisfactory in 2 cases and unsatisfactory in 2 cases, and picture quality very satisfactory (2 cases), satisfactory (5 cases), unsatisfactory (2 cases) or very unsatisfactory (1 case), due to the presence of secretions and blood. The workability was evaluated very satisfactory in 9 cases. The presence of the screen was very popular in 100% of cases. The absence of aspiration was missed in 4 cases. The interest of aScope® for this indication was considered very satisfactory (5 cases) or satisfactory (5 cases). Overall satisfaction was very satisfactory (7 cases) and satisfactory (3 cases). In one case, the endoscope was turned off before the end of the procedure and the control of the cannula placement in the trachea had to be done with a standard endoscope. No other problems were noted. The only cost to repair / year / fiberscope in our unit was 3,000 euros, all procedures combined with 25 PDT per year. The cost of a disposable endoscope is 200 euros.

CONCLUSIONS. The aScope™ appears to be a good alternative to conventional endoscopes for the realization of PDT in preventing the risk of transmitting infectious inter-patient, reducing costs and ensuring conditions for achieving satisfactory. Its present limits (duration <30 min, no suction) could be improved. His place in the technical arsenal should be discussed with each repair or change of fiberscope.

0878

RISK MANAGEMENT IN CRITICAL CARE: APPLYING PRELIMINARY RISK ASSESSMENT FOR INTUBATION

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INTRODUCTION AND OBJECTIVE. We sought to identify all the dangers and risky situations that could occur during endotracheal intubation in the intensive care unit (ICU), using preliminary risk assessment (PRA), an analysis method used to manage risk.

METHODS. The intubation procedure was divided into three phases: pre-intubation (preparation of the patient and equipment); intubation (induction, glottic exposure); early post-intubation (verify tube placement, adapt to respirator, sedation-analgesia). For each phase, a wide range of potentially dangerous situations were envisaged, cross-referencing specific dangers (organisation of human resources, human error, electric or pneumatic difficulties...) with vulnerable areas of the system. Evaluation criteria were identified by a Working Group (WG), in terms of gravity, likelihood and criticality. Preventive actions to manage risk were proposed. The level of effort required for each action was estimated depending on the human and financial resources it would entail to reduce risk.

RESULTS. In total, 54 dangerous situations with level 1 (top) priority were identified (considered most vulnerable), and 39 dangerous situations with level 2 priority (moderately vulnerable) were identified for the 3 phases. Based on the dangerous situations with level 1 priority, 67 possible scenarios for adverse event occurrence were envisaged and analysed in further depth. Before risk management measures were put in place, 52% of the scenarios presented an unacceptable risk (high criticality), with a high level of gravity and low to moderate likelihood. After risk management measures were put in place (protocols, procedures and maintenance), and the person responsible for implementing them was identified (department chief, biomedical, computer or pharmacy staff), no situations retained an unacceptable risk level, whereas 60% of scenarios had a tolerable under control risk level, and 40% were acceptable as is. The majority of the preventive measures concerned were associated with a low to moderate level of effort.

CONCLUSIONS. PRA for intubation in the ICU made it possible to identify all the possible risks and potentially dangerous situations that could arise. The implementation of risk management measures led to a considerable reduction in the likelihood, and thus criticality of adverse events during intubation.

Rapid response systems: 0879–0886

0879

THE IMPACT OF ACUTE AND CRITICAL CARE SERVICE IMPROVEMENT: MANAGEMENT AND OUTCOMES OF CRITICALLY ILL WARD PATIENTS ADMITTED TO ICU; 1996 VERSUS 2010

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INTRODUCTION. Previous research in our hospitals [1] and worldwide [2–4] found many failings in the management of deteriorating patients prior to ICU admission. Since our initial study, a programme of local service improvements addressing patient safety have been implemented in our 668 bed university hospital. These initiatives include a Consultant-delivered Acute Medicine service, a 24/7 critical care outreach team and Hospital at Night services, staff education, and implementation of a track and trigger warning system.

OBJECTIVES. To appraise the effects of these service reforms on outcomes of unplanned admissions to ICU, in direct comparison with our previous data [1].

METHODS. 50 unplanned admissions to ICU (May–August 2010) were assessed within 24 h, using a data collection system validated by the National Confidential Enquiry into Patient Outcome and Death [4]. Demographics, diagnostic details, and APACHE II scoring at admission were collated, and key events and physiological data from hospital admission to ICU admission detailed. All 50 cases were reviewed in detail. An expert panel of 3 ICU consultants rigorously examined a sample of cases ($n = 9$) where a priori indicators of possible substandard pre-ICU care were triggered.

RESULTS. The acuity of unplanned admissions was significantly higher in 2010 than 1996 (median APACHE II scores 27.5 vs. 17.5; Mann–Whitney $U = 3$, $p = 0.02$; two-tailed test). Nonetheless, there was a trend towards lower hospital mortality in patients admitted from general wards in 2010 as compared to 1996 (36% mortality vs. 50%). Furthermore, fewer patients died than predicted in 2010 (actual/predicted death ratio = 0.84). However, in-patients with longer periods in hospital before transfer to ICU were less likely to survive (mean time in hospital before ICU for survivors = 54 h, vs. 125 h for non-survivors; unrelated $t = 2.2$, $p = 0.05$; two-tailed test). In cases selected for detailed review of pre-ICU care ($n = 9$), there was strong agreement amongst the expert panel about the quality of management of airway, breathing/oxygen, circulation, monitoring and overall care. Using NCEPOD criteria [4], only one case (1/50) was classified as 'less than satisfactory', versus 31 of 86 cases (36%) reported previously [1].

CONCLUSIONS. In comparison with previous data from our hospitals [1], the percentage of patients receiving 'less than satisfactory' management pre-ICU has decreased, with a concomitant improvement in outcomes. These data suggest that the widespread episodes of system failure in acute care identified in the 1990s have largely been ameliorated as a result of the service improvements implemented.

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0880

RAPID RESPONSE SYSTEMS: A RE-ANALYSIS BASED ON FREQUENCY OF RRS CALLS AND DISCOVERY OF METHODOLOGICAL ISSUES

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INTRODUCTION. There is an ongoing debate as to whether Rapid Response Systems (RRS), utilising Medical Emergency Teams (MET), have a beneficial effect on preventing adverse events - notably mortality, cardiac arrest and unplanned ICU admission. Hillman [1] reported no difference between a control and intervention arm, in a cluster randomised trial. Jones [2], using the same data set showed that increased "MET-like" activities (termed "MET dose") in both control and intervention hospitals resulted in improvement in outcomes.

OBJECTIVES. To examine the concept of "MET dose" and look for a correlation with outcomes.

METHODS. We did a systematic review of the adult citations utilised by Chan, supplemented by 4 other adult studies, looking for the MET call rate (calls/1,000 admissions) and the change in cardiac arrest rate and mortality rate. MET dose was calculated as MET call rate × years since MET roll-out. As we used previously published data, no IRB approval was required.

RESULTS. Data from 17 adult studies were included. The cardiac arrest relative risk reduction suggested a positive trend. The regression coefficient with bootstrap at 95% confidence interval was 0.306 (CI: −0.240, 0.863). The correlation with mortality relative risk reduction suggested a negative trend with a regression coefficient of −0.079 (CI: −0.449, 0.090). Furthermore, the correlation between mortality from interventions and MET call rate showed a regression coefficient of 0.585 (CI: 0.192, 1.001). Further analyses are ongoing. The data from these 17 studies produced heterogeneous results making definitive conclusions impossible.

DISCUSSION. There are some potential confounding factors in this analysis. Firstly, it would be ideal to have a long period of follow-up after introduction of a RRS. However this was rarely the case. Secondly, the methodology used for the data collection differed between studies. Thirdly, the apparent improvement in cardiac arrest rates may be influenced by the number of DNR (Do not resuscitate) orders, which were not reported.

We observed a trend towards increasing mortality with increasing MET dose.

CONCLUSIONS. There was a trend towards a reduced cardiac arrest rate but this was associated with a trend towards increased mortality. Methodology varied considerably between studies and the duration of studies was in general short. If we want a definitive answer on the role of METs we need to design studies with standardised methodology and longer duration of data collection.

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ACKNOWLEDGEMENT. The authors wish to acknowledge the support of the UK NIHR Biomedical Research Centre Scheme (Imperial College).

0881

OUR EXPERIENCE AFTER THE IMPLEMENTATION OF A PARTICULAR MEDICAL EMERGENCY TEAM

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INTRODUCTION. Medical Emergency Team system was introduced as a multidisciplinary team of intensive care unit (ICU) personnel charged with the evaluation triage and treatment of non ICU patients with signs of clinical deterioration to improve their benefits on overall wide code rates. In our hospital a MET system was implemented in 2009.

OBJECTIVES. To evaluate outcome of patients for whom the MET was activated and compare ICU wide codes resulting from the implementation of the MET system with ICU wide codes resulting from a control group (period of time between 2007 and 2008).

METHODS. The Marques de Valdecilla Hospital is a 900 bed teaching hospital with a 24 bed mixed intensivist-led ICU. Early warning systems (EWS) identify patients at risk in order to improve morbidity and mortality rates using early, therapeutic and transfer actions. We have just implemented a EWS which works into two slopes: the guidance on the care after discharge from ICU (guidance patients) and the recognition of the onset of deteriorating health of adult patients on general wards through physiologically based early warning scores (MET activation patients). Each group of patients are recorded in a database for evaluation purposes. We studied all MET calls between June 2009 and December 2010.

RESULTS. We have evaluated 1,303 patients: 810 patients as guidance after discharge from ICU and 493 as MET activation. Results of the two groups are presented in Table 1.

Outcome of MET activation

	Guidance patients	MET activation patients
Number of patients	810	493
Mean age	57.3	64.4
Male	65.7%	63%
Hospital mortality	2.7%	15.4%
Mean number of MET visits	3.1	2.4

We compared as well some ICU code rates before and after the implementation of our MET system (Table 2)

ICU code rates before and after the implementation

	Before	After
ICU Mortality Rate	20.99%	16.10%
APACHE II	16.66	16.55
ICU length of stay (days)	7.36	6.31
Number of ICU admissions	972	1098

CONCLUSIONS. Our particular MET shows some organization characteristics that mark the difference with other MET systems. We demonstrate that rapid response team implementation is associated with reduction not only in hospital wide code rates and mortality but also in ICU code rates. Consistently, all this supposes an improvement in the management of the resources of the ICU.

0882

MONTHS ICU FOLLOW-UP SERVICE IN A MEDICO-SURGICAL ICU

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INTRODUCTION. Survival on ICU discharge is not the only criterion of quality of care during ICU stay. What the patient thinks about his stay, his quality of life (QOL) and physical and psychological sequelae after ICU discharge have to be considered. However, resources consumption is warranted only when beneficial.

OBJECTIVES. To evaluate the interest of an ICU follow-up service.

METHODS. Prospective monocentric observational study in a medico-surgical ICU. All ICU survivors that had stayed at least 2 nights in ICU between Jan 2009 and May 2010 were offered a follow-up service with one intensivist 3 months after ICU discharge by mail and phone.

RESULTS. 773 patients (pts) were admitted to ICU during the study period. 275 pts stayed at least 2 nights and were alive on discharge. From these, at 3 months, 32 pts had died. Only 61 pts came to the service (25% of survivors at 3 months). Median age was 57 y (quartiles 50–66). 46 were medical pts. Median SAPS II and SOFA on ICU admission were 36 (27–52) and 5 (3–9). Median stay in ICU had been 6 d (4–12). 37 pts (61%) had received invasive and 13 (21%) non invasive ventilation, 21 (34%) vasopressors, 8 (13%) dialysis. Median time from ICU discharge was 92 d (85–99). Median Karnofsky score was lower at 3 months than before ICU admission [75 (68–90) vs. 90 (70–100), $p < 0.001$]. 38 pts (62%) were autonomous. From 18 pts working before ICU stay, 7 had returned to work. 59 pts (97%) had 176 physical complaints: 33 (54%) sleep disorders, 27 (44%) dyspnea, 25 (41%) persistent pains [median VAS 18 (0–32)]. QOL was ranked on a VAS at 55 (40–83). 53 pts (87%) recalled their ICU stay, 22 pts (36%) pain during cares, 19 pts (31%) fears, 15 pts (25%) hallucinations, 11 pts (18%) nightmares. 13 pts (21%) complained of noise, 11 (18%) of light. On HADS questionnaire median anxiety and depression scores were 5 (4–9) and 4 (2–6), 9 pts (15%) had anxiety and 5 (8%) depression. On PTSS-10 questionnaire median score was 20 (16–29) and 10 pts (16%) were considered to be at risk for post traumatic stress disorder. 19 pts were referred to a specialist, but none of the 8 pts referred to psychiatric consultation went to it. 32 pts (52%) wanted to visit the ICU. 52 pts (85%) valued ICU follow-up service.

CONCLUSIONS. The high prevalence of post ICU physical and psychological sequelae is confirmed. However, an ICU follow-up service is a heavy workload for archives, secretarial department and doctors. Only 25% of pts alive at 3 months post ICU discharge came to the follow-up service. Every unpleasant memory and every physical or psychological sequela prompted us to modify our practices. Nevertheless, all pts troubles could be managed by their general practitioner. Therefore, we decided to stop this systematic service and instead to send a letter to the pt and to his general practitioner to make them aware of troubles frequently encountered after ICU discharge and offer them a selective follow-up service when necessary.

0883

A REAUDIT OF MEDICAL COVER ON A MIXED TEACHING HOSPITAL ICU WITH INCREASING REFERRAL FREQUENCY

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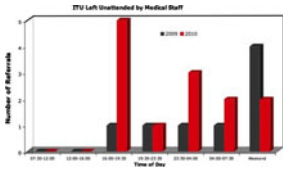
INTRODUCTION. Leicester Royal Infirmary Intensive Care guidelines state there should be a Doctor on the unit continuously. A 2006 audit showed times the unit was uncovered due to out of hours referrals. The staffing was altered to always provide 2 Doctors on the unit. A 2009 audit showed this had improved cover [1]. Referral rates have increased. An audit was performed to examine the effect on medical cover.

OBJECTIVES. The primary objective was to determine whether the staffing remained adequate. Secondary objectives were to evaluate: • Reason for referral/specialty
• Seniority of Doctor attending referrals
• Variation in unit cover at nights/weekends
• The percentage of patients admitted/transferred
• Compliance with the 2005 NCEPOD recommendations mandating Consultant involvement in ICU referrals [2].

METHODS. Data was recorded prospectively (11/8/10–8/11/10). Data collected was matched to the objectives and to the earlier audit.

RESULTS. There were 59 referrals in the 2009 audit and 86 in 2010. On one occasion in 2010 a Doctor repatriated a patient.



ICU left unattended

5% of the time a Consultant attended, 48% ST3-7 and 47% CT1-2.
On 15 occasions the referral was discussed with the parent Consultant. On 4 occasions the ICU Doctor did not record whether this had occurred, of these one patient was admitted. On 67 occasions the referral was not discussed. 9 of these were cardiac arrests. 7/15 referrals with parent Consultant involvement were admitted or transferred by ICU staff. Without involvement, not including the 9 cardiac arrests, 19/56 were admitted or transferred.

CONCLUSIONS. The referral frequency to ICU has increased. There was a 50% increase in the times the ICU was without cover (12 vs. 8). Therefore the medical cover should be maintained at its current level or ideally increased.
Involvement of the Consultant of the parent team occured 18% of the time. The NCEPOD recommendations are not being met [2]. Fewer patients were admitted when there was no parent team Consultant involvement. A referral form has been produced which prompts the referrer to state whether the referring Consultant is involved with the aim of improving the situation and to enable future audit.

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0884

THE OUTCOMES FOLLOWING THE INTRODUCTION OF A MEDICAL EMERGENCY TEAM

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INTRODUCTION. The Medical Emergency Team (MET) provides a skilled and experienced team to intervene early to prevent patient decline. Adverse events occur in 4–17% of patients with up to 70% of these being potentially preventable. The risk of death from such an adverse event is 50–80% [1].Unexpected cardiac arrests in hospital are usually preceded by signs of clinical instability in up to 76% of patients. It is at the point of decline that a MET has its role [1].A study at a teaching hospital that introduced a MET found a 65% reduction in cardiac arrests [2]. However no change in cardiac arrest rate with MET has also been published [3].

OBJECTIVES. 1. To determine whether the MET lead to a reduction in cardiac arrests 2. To assess the work load implications for the staff involved 3. To determine the reasons for assistance and how the team should be best structured

METHODS. Electronic Data for the previous 5 years was collated for historical comparison. Prospective data was collected for 6 months following introduction of the MET. The MET consists of a medical registrar, Surgical trainee and Outreach Sister.

RESULTS. For the time period June to November in the preceding 5 years there had been a non-statistically significant reduction in cardiac arrest calls from 302 in 2005 to 240 in 2009. Following the introduction of the MET in 2010, there were 263 cardiac arrests in addition to 132 MET calls despite the MET issuing 31 Do Not Resuscitate orders.
The workload was evenly spread between in hours (Monday to Friday 08:00 to 17:00) and out of hours calls. There was a significant difference between Surgical calls in hours with out of hours (32 vs. 22) and Medical calls in and out of hours (19 vs. 53) $p = 0.0002$. The comparison of the ward staff assessment of the Early Warning Score (EWS) and the MET assessment showed good correlation, however there is more variation at the lower values of EWS, this being the greatest around the trigger EWS of 6.
Out of 132 MET calls, 12 patients were transferred to ITU, 3 were later semi-electively intubated and 6 patients received non-invasive ventilation. There was no change in the numbers of unplanned ITU referrals post introduction of the MET.

CONCLUSIONS. The introduction of a MET does not reduce cardiac arrest calls in line with published data. There appears to be a discrepancy between specialities requiring MET assistance during the course of the day. In our cohort of patients, an anaesthetist was not required at MET calls.

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0885

COMPARISON OF PHYSIOLOGICAL DETERIORATION TOOLS BETWEEN THE MEWS AND THE ADDS IN PATIENTS ON GENERAL HOSPITAL WARDS ACTIVATED BY MEDICAL EMERGENCY TEAM

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INTRODUCTION. MEWS is known to a screening tool to predict the high-risk critically ill patients. Recently, the new screening tool for safety and quality in management, recognizing and responding to clinical deterioration have been developed. The Adult Deterioration Detection System (ADDS) was developed at The University of Queensland for Queensland Health and the Australian Commission on Safety and Quality in Health Care (ACSQHC), including the design and evaluation of a new adult observation chart that incorporated human factors principles.

OBJECTIVE. To validate two scoring systems, the Modified Early Warning Score (MEWS) and the Adult Deterioration Detection System (ADDS), as a screening tool to predict developing critical illness within the general ward patients.

METHODS. At the Asan Medical Center (2,743 beds) in Korea, Medical Emergency Team (MET) was introduced in March 2008. The MET special nurse, medical ICU resident, fellow, staff can activate MET daily if special vital sign threshold (Medical Alert Screening (MAS) criteria in Asan Medical Center) are reached by Electronic Medical Record (EMR) monitoring or general word nurse or resident called the MET by telephone or pager. During 1 month (August 2010), we reviewed clinical data of 150 patients on general ward screened by MET. The MEWS and the ADDS are also calculated at the MET screen point.

RESULTS. Of the 150 enrolled patients, 95 (63.3%) patients were male, 55 (36.7%) were female. Mean age was 61 years. The mean ADDS score was 9.4 (±3.4), mean MEWS was 5.3 (±2.0). Ninety-seven patients (64.7%) were activated and interventions (assessment, monitoring and resuscitation of acute airway, breathing, and circulatory emergency) were done. The mean ADDS score and MEWS in these patients was 11.1 (±3.0) and 6.3 (±1.6). When ADDS score and MEWS were used to predict these patients might be actually critically ill, the area under the ROC curve was 0.96 (95% confidence interval (CI), 0.93–0.99; $p = 0.000$) and 0.92 (95% CI, 0.87–0.96; $p = 0.000$). The ADDS score cutoff value of 7.5 correlated with sensitivity and specificity values of 92 and 87% and MEWS cutoff value of 4.5 correlated with sensitivity and specificity values of 88 and 81%, respectively.

CONCLUSION. The ADDS score and MEWS are useful screening tools to predict developing critical illness within the general ward.

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0886

CRITICAL CARE OUTREACH SERVICES

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INTRODUCTION. The primary role of Critical Care Outreach Services is to ensure that patients at risk of developing critical illness receive appropriate and timely treatment in a suitable area.

OBJECTIVES. The aim of our study was to record and to evaluate the critical care outreach services of our outreach team, which compromises consultants in critical care with support of senior ward staff.

METHODS. During a 5 years period, from November 2005 to November 2010, part of the outreach services work was recorded to a data base. We retrospectively looked for the number of patients, the ward type, the mainly failing organ system and the number of patients requiring ICU support.

RESULTS. Total number of patients: 107. Mean age: 56.7 ± 18.5, min 16, max 90 years. Wards: Internal medicine: 78 (70%), General Surgery: 7 (6.5%), Orthopedics: 7 (6.5%), Obstetrics: 2 (1.8%), Heart center: 4 (3.73%), Emergency department: 12 (11.2%). Patients requiring ICU support: 16 (14.9%). Admissions to our ICU: 6 (5.6%), to other ICU: 6 (5.6%). Patients died before ICU admission: 4 (3.7%). Calling criteria: Respiratory failure, type I: 38 (35.5%), type II: 19 (17.7%).
ET obstruction: 4 (3.7%), circulatory shock: 10 (9.3%), sepsis: 30 (28%), CNS dysfunction: 25 (16.6%), ARF: 5 (3.3%), gastrointestinal dysfunction: 18 (16.8%). Consultation: Imaging: 25 (23.3%), serum chemistries: 19 (17.7%), monitoring: 22 (20.5%), oxygen: 40 (37.3%), bronchodilators: 8 (7.4%), IV fluids: 10 (9.3%), vasoactive medications: 1 (0.9%), antibiotics: 9 (8.4%), other medications: 19 (17.7%).

CONCLUSIONS. According to our data, the majority of the consultations were about patients with respiratory failure, suggesting that there is need for respiratory care department. Nevertheless, the large number of patients requiring ICU support suggests that the consultation timing may be too late.

Technology evaluation 1: 0887–0900

0887

ACCURACY ASSESSMENT OF SUBCUTANEOUS CONTINUOUS GLUCOSE MONITORING IN AN INTENSIVE CARE UNIT ACCORDING TO THE SEPTIC SHOCK STATE

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INTRODUCTION. Patients with septic shock are the most frequently admitted in the intensive care unit (ICU). It is also in this type of ICU patient in which blood glucose levels are usually in the hyperglycemic range, and glycemic control is often more difficult. It has been shown that a correct glycemic control could improve the prognosis of patients with septic shock. For this reason, international guidelines for management of septic shock recommend the practice of glycemic control.

OBJECTIVE. To assess the accuracy of real-time continuous glucose monitoring systems (CGMSs) using the Guardian® REAL-Time (RTCGMS) system (Medtronic, Northridge, CA) in an ICU. To determine whether the septic shock state of the patient has any influence in the accuracy of the RTCGMS.

METHODS. 41 patients with insulin therapy in an eighteen-bed mixed ICU at the university hospital were included in a prospective observational study (mean age 64±11 years (24 male), mean Body Mass Index 32 ± 7, APACHE II 18.8 ± 5.6, SOFA 8.3 ± 3.3). Patients were monitored for 72 h using RTCGMS. Arterial blood glucose (ABG) samples were obtained following the glycemic control protocol established at the ICU and determined using HemoCue® 201DM (HemoCue AB, Ängelholm, Sweden). ABG measurements (3–4 per day) were used for calibration. Results were evaluated using paired values (ABG/RTCGMS), excluding the calibration set. The performance of the RTCGMS was assessed using numerical and clinical accuracy tools [median relative absolute differences (RAD), International Organization for Standardization (ISO) and Consensus error grid analysis (EGA)]. Nonparametric tests were used to determine statistically-significant differences in accuracy.

RESULTS. 956 ABG/RTCGMS pairs were analyzed. Table shows the numerical-accuracy assessment according to the septic state of the patient.

Assessment using numerical accuracy metrics

	Mean (SD) RAD (%)	Median (IQR) RAD (%)	ISO Criteria (%)	Total reference readings
Overall	17.0 ± 14.5	13.5 (6.0–24.1)	68.1	956
With septic shock	14.8 ± 13.2	11.2 (5.4–20.5)	74.5	326
Without septic shock	18.2 ± 15.0	15.2 (6.7–26.3)	64.8	630

Consensus error grid analysis (EGA) indicated that 65.7% of pairs in the overall population fell in zone A. Consensus EGA reported that 74.5%/61.1% of pairs fell in zone A in patients with septic shock and without septic shock, respectively.

CONCLUSIONS. Results showed that the septic state presented by patients had influence on the accuracy of the RTCGMS in ICU. Accuracy was significantly better in patients with septic shock in comparison with patients without septic shock ($p = 0.003$).

GRANT ACKNOWLEDGMENT. This work is supported by the Spanish Ministry of Science and Innovation through grant DPI-2010-20764-C02 and the European Union through FEDER funds and the Autonomous Government of Catalonia through 2009 SGR 523.

0888

ARTERIAL PRESSURE WAVEFORM DERIVED CARDIAC OUTPUT IN PATIENTS SUFFERING FROM SEPTIC SHOCK. THIRD GENERATION FLOTRAC SOFTWARE VERSUS INTERMITTED BOLUS THERMODILUTION CARDIAC OUTPUT

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INTRODUCTION. Since the introduction of the new minimal invasive cardiac output measurement device, FloTrac/Vigileo™ system (Edwards Lifesciences Irivine, Clf, USA), 4 new software versions have been released. Under hemodynamic stable conditions like cardiac surgery the performance of the device has improved. In clinical conditions associated with vasoplegic states like liver surgery or septic shock, the agreement compared with PAC intermittent bolus cardiac output has been questioned. Recently the newest software version has been released (3.02) targeting the patient in septic shock.

METHODS. This observational clinical study was approved by the Medical Ethics Review Committee (NTR 2072). All patients had to be admitted to ICU with septic shock and organ failure. Patients had to be intubated and ventilated, had to be in sinus rhythm and receive invasive hemodynamic monitoring with a pulmonary artery catheter (PAC) to optimize the hemodynamic profile. The existing arterial catheter was connected to the arterial waveform cardiac output monitoring device FloTrac v3.02, if not already in place. Informed consent was obtained from the next of kin. Thermodilution cardiac (COtd) output measurements were performed in triplicate measurements. Values were averaged. FloTrac cardiac output (COfv) was recorded during triplicate bolus measurement and also averaged.

RESULTS. Nineteen patients are included in this study (30–90 years). A total of 314 paired measurements have been obtained during the clinical treatment of these severely ill patients. The average APACHE II score is 30 ± 10 (16–50). COtd ranged from 3.8 to 17.3 L min^{-1}. COfv ranged from 4.0 to 13.7 L min^{-1}. Mean average Cardiac Output was 7.7 L min^{-1}. Bland Altman plot shows a mean bias of 1.7 L min^{-1} and precision of 2.4 L min^{-1} leading to a percentage of error 62%, so the COft underestimates COtd. The SVR ranged from 254 to 1,102 dyn s cm^{-5}. With an average of 586 dyn s cm^{-5}. Using a ≥10% change measured by PAC as a clinical relevant change in cardiac measured between two consecutive measurements, COfv changed in the same direction in 90% of the time (93 measurements). If a clinical relevant change of ≥15% was used, COfv changed in the same direction in 97% of the time (60 measurements).

CONCLUSIONS. Our results show that the tracking capacities of the latest FloTrac 3.02 software version are good when clinical relevant cardiac output changes (10–15%) are used. COfv underestimate COtd in patients suffering from septic shock. The difference increases rapidly when SVR drops below 500 dyn s cm^{-5}.

C. Slagt has received lecture fees from Edwards Lifesciences

Part of this abstract will be presented at the Annual meeting of the Dutch Society of Anesthetists in May 2011, Maastricht.

0889

PROSPECTIVE EVALUATION OF FLOTRAC™ G3 SOFTWARE IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. Concerns have been raised about the performance of arterial pressure-based cardiac output (CO) monitoring using Vigileo/FloTrac™ (Edwards Lifesciences, Irvine, CA, USA) in vasoplegic patients. The third generation (G3) software was developed to improve the performance of FloTrac™ in septic patients who might have peripheral decoupling due to vasodilation.
OBJECTIVES. The aim of the study was to compare the performance of the FloTrac™ G3 software (CCO-G3) with that of continuous pulmonary artery thermodilution technique (CCO-PAC) against intermittent pulmonary artery thermodilution (iCO-PAC) in septic shock patients.
METHODS. In a prospective observational study, 47 septic shock patients receiving norepinephrine (100%) and dobutamine (49%) infusions were monitored by PAC and FloTrac™ simultaneously. iCO-PAC was assessed using the average of 3 bolus measurements (reproducibility <15%). CCO-PAC and CCO-G3 were recorded before iCO-PAC measurements. Data on 326 matched sets were available for analysis. Bland-Altman analysis for repeated measurements was performed, percentage errors were calculated [1], and trends of CCO-PAC and CCO-G3 were assessed and compared to iCO-PAC changes (concordance) [2]. The potential influence of norepinephrine and dobutamine on the accuracy of each measurement method was determined using correlation statistics.
RESULTS. iCO-PAC ranged from 2.7 to 17.1 l/min, CCO-PAC from 2.8 to 19.8 l/min, and CCO-G3 from 3.0 to 15.6 l/min. Mean iCO-PAC, CCO-PAC, and CCO-G3 were (6.2 ± 2.0 l/min, 6.4 ± 2.2 l/min, 6.2 ± 1.9 l/min, respectively). Bland-Altman analysis showed comparable results (Table).

Bland-Altman analysis

	Bias (l/min)	SD (l/min)	Percentage error (%)	Concordance (%)
CCO-PAC versus iCO-PAC	0.18	1.28	40.3	81
CCO-G3 versus iCO-PAC	−0.05	1.10	34.7	85

FloTrac™ performance was not influenced by the dose of norepinephrine ($r = 0.05$, $p = 0.33$) or dobutamine ($r = 0.03$, $p = 0.57$).
CONCLUSIONS. In septic shock patients, FloTrac™ G3 performance was as accurate and precise as CCO-PAC. The dosage of vasoactive drugs did not affect the FloTrac™ G3 accuracy.
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GRANT ACKNOWLEDGMENT. Sponsored by Edwards Lifesciences, Irvine, CA, USA.

0890

A PRELIMINARY STUDY OF A NEW STROKE VOLUME VARIATION ALGORITHM FOR PREDICTING FLUID RESPONSIVENESS IN PATIENTS WITH SEVERE ARRHYTHMIAS

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INTRODUCTION. Stroke volume variation (SVV) is a better indicator of fluid responsiveness than CVP or PAOP. Arrhythmias are a limitation of SVV. Variations in stroke volume reflect altered cardiac filling times rather than the effects of positive pressure ventilation. An enhanced algorithm, SVVnew, developed from data collected in a porcine model helps to minimize the limitation of using SVV with various arrhythmias. SVVnew rejects irregular beats using multi-parameter signal recognition and restores the respiratory variation of the signal using spline-based interpolation [1].
OBJECTIVES. Improving SVV utility.
METHODS. This study is a convenience sample of 16 patients with severe arrhythmias including atrial fibrillation (Afib) from 2 Institutions. For each fluid bolus given we compared conventional SVV algorithm (SVVstd = (SVVmax − SVVmin)/SVVmean) (FloTrac, Vigileo Edwards Lifesciences, USA) versus SVVnew to prediction of fluid responsiveness, a 15% increase in cardiac output.
RESULTS. 45 fluid boluses were analyzed with 3 rejected due to bad signal. 32 boluses were performed during arrhythmias. 9 patients had a PAC. 15 out of the 32 boluses were (47%) evaluated with the PAC, the rest with FloTrac. 15 were responders (47%) and 17 non-responders (53%). ROC analysis showed that SVVnew is an accurate predictor of fluid responsiveness (sens = 85%, spec = 85%, best cut-off value = 15.5%, AUC = 0.92) while SVVstd was not (sensitivity = 60%, specificity = 64%, best cut-off value = 26%, AUC = 0.68).
CONCLUSIONS. This preliminary study of a new SVV algorithm is more sensitive and specific for predicting responses to fluid in patients with severe arrhythmias including Afib thereby reducing the limitations of SVV during irregular rhythms. Additional studies are needed to fully evaluate the performance of SVVnew in patients with irregular rhythms receiving fluid challenges. SVV thresholds for volume responsiveness in such patients will likely be higher than for patients with regular rhythm.
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GRANT ACKNOWLEDGMENT. Data collection sponsored by Edwards Lifesciences.

SVVstd compared to SVVnew

	SVVstd	SVVnew
Avg SVV Responders (%)	28.4	20.8
Avg SVV Non-responders (%)	23.4	14.4
Sensitivity	0.60	0.85
Specificity	0.64	0.85
Best cutoff value (%)	26	15.5
AUCROC	0.68	0.92

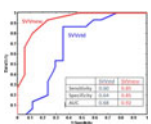

Fig. 1 ROC Curves SVVstd and SVVnew

0891

INTERFERENCE BY WIRELESS LOCAL AREA NETWORK (WLAN) / WIFI SIGNALS ON CRITICAL CARE EQUIPMENT

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INTRODUCTION. Wireless technology on the intensive care unit (ICU) may have potential clinical benefits [1]. However, WLAN/WiFi signals at the bedside can cause interference with critical care equipment, leading to concern regarding patient safety. The electromagnetic interference by mobile phones and radio frequency identification on medical critical care equipment is well recognized with current policy for mobile phones to keep "1 meter" from the bedside [2, 3].
OBJECTIVES. Aim of the study was to assess and classify the interference by WLAN/WIFI signals on medical devices used in the ICU and in the operating room (OR).
METHODS. From June 2009 until October 2009 WLAN interference tests were performed on 97 medical devices at the Academic Medical Centre in Amsterdam. All medical equipment was tested during normal functioning at a test location in the ICU or OR. When required for testing, a patient simulator was used. The commonly used WLAN systems IEEE802.11a, b and g were used for testing. The WLAN signals were transmitted at 100 mW, which is the standardised power in the 2, 4 and 5 GHz frequency. The medical equipment was set up in such a way that it could be radiated from all sides. Testing started at 0 cm distance and the signal was transmitted for 30 s. If disturbance occurred the separation distance (the maximum at which disturbance occurred) and the reaction of the device was noted.
RESULTS. Of the 97 devices tested, 7 (7%) showed disturbance at 0 cm distance (WLAN antenna against medical device). In 4 devices (4%) the disturbance was classified as unsafe. Only one disturbance occurred in a vital device (ventilator), the other six all occurred in non vital equipment. At 20 cm in only 3% of the 97 devices, all non vital, interference was noted. The maximum distance at which interference was found was 30 cm.
CONCLUSIONS. As long as WLAN antennas are kept more 20 cm away from critical care devices, hardly any interference and/or unsafe disturbances is to be expected. At shorter distances unsafe disturbances can occur. When devices with (built-in) WLAN antennas are placed on top of or under medical devices special measures may be needed.
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0892

FATIGABILITY OF THE QUADRICEPS MUSCLE IN NON-COOPERATING SUBJECTS: RELIABILITY OF A NOVEL NON-INVASIVE MODEL

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INTRODUCTION. Intensive care unit (ICU) admission is associated with muscle weakness leading to long-term functional limitations. A plausible contributor is loss of muscle mass experienced by ICU patients during the course of their critical illness [1], of which, the majority may be lost in the early phase of ICU stay. Furthermore, limited information is available on muscle working capacity in ICU patients.
OBJECTIVES. The aim of the study was twofold (A) to develop a novel non-invasive model to evaluate fatigability of the quadriceps muscle in non-cooperating subjects and (B) to measure the test-retest reliability of this model.
METHODS. On two occasions, separated by 7 days, non-voluntary tetanic quadriceps muscle contractions induced by transcutaneous electrical muscle stimulation (3 s on/1 s off) was recorded in twelve healthy adult subjects (22 ± 3 years, mean ± SD) in supine position with knee joint at a 90° angle. Based on the decreasing muscle force responses of the successive contractions outcome measures were the slope of the regression line of the peak torque values for each contraction and a fatigue index (ratio of peak torque values from first and final three contractions). Relative (intra class correlation, ICC3.1) and absolute (standard error of measurement, SEM) reliability were assessed and Minimum Detectable Change (MDC95%) was calculated.
RESULTS. Fatigue index during the first 15 contractions showed substantial relative reliability (ICC3.1 = 0.84) and MDC95% = 0.12. The slope of the regression line during the first 30 contractions likewise showed substantial relative reliability (ICC3.1 = 0.99) and MDC95% = 0.03.

Selected descriptive data and reliability

Variable	Test visit	Retest visit	Difference	$ICC_{3,1}$ (95% CI)	SEM	MDC_{95}
Motor threshold (mA)- v. medialis	16.3 ± 4.5	17.7 ± 4.5	1.36 ± 1.85	0.92 (0.72–0.98)	1.29	3.57
Motor threshold (mA)- v. lateralis	18.9 ± 3.0	19.9 ± 1.6	1.00 ± 1.41	0.64 (0.11–0.89)	1.02	2.84
Peak torque (Nm)	27.0 ± 14.8	29.3 ± 17.1	2.25 ± 3.90	0.97 (0.89–0.99)	2.70	7.48
Fatigue Index						
Contract. 1–15	0.58 ± 0.11	0.59 ± 0.11	0.01 ± 0.06	0.84 (0.51–0.95)	0.04	0.12
Contract. 1–30	0.33 ± 0.08	0.35 ± 0.10	0.03 ± 0.05	0.82 (0.46–0.95)	0.04	0.10
Slope of regression line (Nm/s)						
Contract. 1–15	−0.86 ± 0.20	−0.82 ± 0.23	0.044 ± 0.14	0.77 (0.36–0.93)	0.10	0.28
Contract. 1–30	−0.20 ± 0.12	−0.20 ± 0.12	0.000 ± 0.02	0.99 (0.96–1.00)	0.01	0.03

DISCUSSION. In 95% of the cases, this method is expected to detect individual changes in fatigability that exceeds the MDC values. Any clinically relevant changes in muscle fatigue will expectedly be within the discrimination limit of the method. This model may provide valuable data on quantitative changes in muscle working capacity and treatment effects in non-cooperating patients, e.g. sedated patients in the ICU.
CONCLUSIONS. This non-invasive involuntary model for assessing fatigability of the quadriceps muscle produces reliable results in non-cooperating healthy subjects.
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GRANTS: Supported by The Foundation of Jacob Ehrenreich and wife Grete Ehrenreich, and The A.P. Møller Foundation for the Advancement of Medical Science.

0893

RAPID AUTOMATIC ASSESSMENT OF MICROVASCULAR DENSITY IN SIDESTREAM DARK FIELD IMAGES

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INTRODUCTION. Sublingual sidestream dark field (SDF) imaging is gaining a more prominent role in clinical research. However, the offline analysis of the SDF images is still a time consuming venture (>30 min) requiring a significant amount of user interaction.

OBJECTIVES. The purpose of the present study was to develop a rapid and fully automatic method for the assessment of microvascular density and perfusion in SDF images.

METHODS. To this end, we modified algorithms previously developed by our group for microvascular density assessment and introduced a new method for microvascular perfusion assessment, tSICA. To validate the new algorithm for microvascular density assessment, we reanalyzed a selection of SDF video clips (n = 325) of a study in intensive care patients (Boerma et al. 2010) and compared the results to (semi-)manually found microvascular densities. The method for microvascular perfusion assessment was tested in several video simulations and in one high quality SDF video clip where the microcirculation was imaged (on one spot) before and during circulatory arrest in a cardiac surgery patient (Elbers et al. 2010).

RESULTS. The new method for microvascular density assessment was very rapid (<30 s/clip) and correlated excellently with (semi-)manually measured microvascular density. The new method for microvascular perfusion assessment was shown to be limited by high cell densities and velocities, which severely impedes the applicability of this method in real SDF images. However, in high quality SDF video clips, the tSICA method is able to discriminate between perfused and non-perfused microvasculature.

CONCLUSIONS. Here we present a validated method for rapid and fully automatic assessment of microvascular density in SDF images. The new method was shown to be approximately 60 times faster than the conventional (semi-)manual method. Due to current SDF imaging hardware limitations, we were not able to automatically detect microvascular perfusion.

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0894

DIFFERENTIATION OF LUNG TISSUE OPACIFICATIONS BY TRANSPULMONARY SINGLE THERMODILUTION ASSESSMENT AND QUANTITATIVE COMPUTED TOMOGRAPHY

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INTRODUCTION. With this study we investigated whether measurement of extravascular lung water index (EVLWI) could help to separate different etiologies of lung tissue opacifications. We administered xylazine to sheep which induces pulmonary alterations by an uncertain mechanism [1].

OBJECTIVES. We quantified EVLWI by transpulmonary single thermodilution to study whether pulmonary edema or atelectasis can explain the rapid pulmonary dysfunction developing after xylazine administration (XA).

METHODS. Sixteen anesthetized (Propofol 3 mg/kg/h and Sufentanil 0.6 μg/kg) and mechanically ventilated (FiO_2 = 1, PEEP = 10 cmH_2O, tidal volume 8 ml/kg) sheep received intravenously xylazine in two doses: low-dose xylazine in the first (LoD, 0.15 mg/kg) and, 16 weeks later, high-dose xylazine in a second experiment (HD, 0.3 mg/kg). The total lung volume (V_{Lung}) and the total lung mass (M_{Lung}) were calculated by quantitative computed tomography (qCT) for comparison with the EVLWI results. At baseline and repeatedly after XA the partial pressure of oxygen (PaO_2), EVLWI, V_{Lung} and M_{Lung} were measured. Results are medians (interquartile range).

RESULTS. After XA, PaO_2 (in mmHg) decreased by 360 (417–226) for LoD and 362 (419–173) for HD. EVLWI (in ml/kg body weight) increased by 2 (1–3) for LoD and 4 (2–5) for HD. M_{Lung} (in g) increased by 43 (25–65) for LoD and 48 (38–75) for HD. V_{Lung} (in ml) decreased by 358 (635–230) for LoD and 516 (765–278) for HD. Temporary EVLWI changes after XA of the high-dose experiment are shown in the figure.

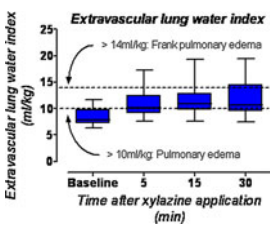

Fig. 1 EVLWI (ml/kg) high-dose experiment

CONCLUSIONS. After XA, EVLWI did not reach values described for acute lung edema in patients (EVLWI >14 ml/kg) or sheep [2]. Pulmonary edema increases M_{Lung} while V_{Lung} remains constant [3]. Our qCT results confirmed that M_{Lung} increased only moderately but showed that V_{Lung} decreased significantly after XA which could be explained by atelectasis and minor edema rather than frank lung edema. Finally, EVLWI measurement detected this absence of significant elevated EVLW and thus helped to differentiate between etiologies of lung tissue opacifications.

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0895

EFFECTS OF INTERNAL CUFF PRESSURE ON FLUID LEAKAGE PAST COMMERCIALLY AVAILABLE ENDOTRACHEAL TUBES

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INTRODUCTION. It is currently recommended to maintain the internal cuff pressure (CP) of the endotracheal tube (ETT) between 25 and 30 cmH_2O.

OBJECTIVES. In this study we compared in vitro sealing properties of the cuffs most commonly used in critical care setting and inflated at different levels of CP.

METHODS. We studied two polyvinylchloride (PVC) cylindrical cuffs: (1) Rüschelit® Safety Clear plus, (2) Mallinckrodt Hi-Lo™; four PVC tapered cuffs: (3) Smiths-medical Blue Line® Profile™ Soft-Seal®, (4) Sacett™, (5) Mallinckrodt Taperguard™, (6) Hudson RCI® Sheridan HVT; and one polyurethane (PU) cylindrical cuff: (7) Kimberly-Clark Microcuff. A PVC tracheal model of 18, 20 and 22 mm of internal diameter (ID), obliquely oriented 30°, was used to test ETTs of 7.0, 7.5 and 8.0 mm, respectively. CP was randomly set at 15, 20, 25 and 30 cmH_20. A subglottic secretions simulant was instilled to create a ~5 cm hydrostatic pressure above the cuff. Leakage flow rate (V_{LEAK}) was assessed up to 60 min.

RESULTS. We carried out 173 tests, as a median of 6 (6–7) tests for each level of CP. Median V_{LEAK} was 2.49 (0.41–6.75) ml/min and significantly different between levels of CP ($P < 0.001$). Particularly, a higher V_{LEAK} was found when the CP was set at 15 cmH_20 ($P < 0.001$ vs. 25 and 30 cmH_2O).The PU cuff showed the best sealing properties in comparison to PVC tubes. The V_{LEAK} per CP, for only ETTs made of PVC, is depicted in Fig. 1. The V_{LEAK} of tubes 1, 5 and 6 was not influenced by change of CP ($P > 0.05$).

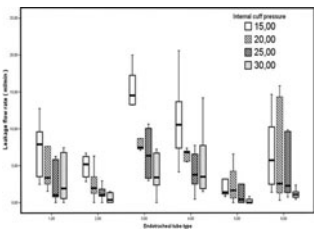

Fig. 1

CONCLUSIONS. Sealing properties of PU cuff outweigh PVC cuff at all levels of CP tested. Different designs of PVC cuffs may influence the effect of CP on leakage across the cuff.

GRANT ACKNOWLEDGMENT. SEPAR-ALAT 2011, CibeRes, IDIBAPS, COVIDIEN. OR and GLB contributed equally to this work.

0896

COMPARISON OF FOREHEAD AND DIGITAL OXIMETRY IN CRITICALLY ILL SHOCKED PATIENTS REQUIRING HIGH DOSE VASOPRESSORS

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INTRODUCTION. Pulse oximetry (SpO_2) in ICU is currently used to monitor oxygenation. However, conventional devices measuring SpO_2 at digital or ear sites by transmission mode may fail in situation of hypoperfusion such as hypothermia, hypotension, and peripheral vasoconstriction (induced or not by vasopressors). Forehead reflectance sensors recently developed might be useful in these circumstances. Indeed, forehead's perfusion is better preserved under conditions of hypoperfusion, and is less sensitive to vasoconstriction.

OBJECTIVES. The aim of our study was to compare SpO_2 obtained by reflectance forehead oximetry and conventional digital oximetry to arterial oxygen saturation (SaO_2) measured by arterial blood gases in critically ill patients requiring vasopressors.

METHODS. The study was approved by the local institutional ethical committee which waived informed consent. During 6 months, from May 2010 to December 2010, adult patients who received by vasopressors (epinephrine or norepinephrine >0.1 μg/kg/min) were included. When an arterial blood gas was performed, the forehead (OxiMax MAXFAST, Pleasanton, CA USA) and digital (OxiMax DS-100A, Pleasanton, CA, USA) SpO_2 were recorded simultaneously A maximum of five data collections per patient was collected. Forehead and digital SpO_2 were compared to SaO_2 by the Bland and Altman statistical method. In addition, the number of outliers defined by the difference $SaO_2 - SpO_2 > \pm 3\%$, was noted. Fisher's exact test was used to compare the number of outliers between the two methods. Data are expressed as mean ± standard deviation.

RESULTS. Among the 32 patients included, 24 were in septic shock, 4 in cardiogenic shock, 4 in hypovolemic or hemorrhagic shock. The population characteristics were age = 64 ± 13, SAPS II = 58 ± 21, SOFA = 10 ± 4, vasopressors = 0.7 ± 0.5 μg/kg/min. 140 data collections were analyzed (4 ± 1 per patient), 4 digital SpO_2 being uninterruptable. Analysis was therefore based on 140 and 136 paired data for forehead SpO_2 and digital SpO_2, respectively.

Results

	Biais (%)	Limits of agreement (%)	Precision (%)	Outliers (%)
Forehead SpO_2	1.01	±5.0	2.01	15.4
Digital SpO_2	1.43	±9.1	3.06	31.2 **p < 0.002

CONCLUSIONS. Forehead reflectance oximetry appears more relevant in critically ill patients who receive vasopressors. It might be an attractive alternative to conventional transmission measurement.

0897

INTERMITTENT PNEUMATIC COMPRESSION TO PREVENT VENOUS THROMBOEMBOLISM IN PATIENTS HOSPITALIZED IN INTENSIVE CARE UNITS WITH HIGH RISK OF BLEEDING: A RANDOMIZED TRIAL

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INTRODUCTION. Venous thromboembolism (VTE) is a leading cause of morbidity and mortality for patients hospitalized in intensive care units (ICU). Mechanical devices are recommended to prevent VTE in patients with high risk of bleeding but their efficacy has not been systematically evaluated in the ICU.

OBJECTIVES. To compare the association intermittent pneumatic compression (IPC) and graduated compression stockings (GCS) to GCS alone in ICU patients with high risk of bleeding.

METHODS. In this multicenter open-label randomized trial with blinded evaluation of outcomes, we randomly assigned 407 patients with high risk of bleeding to receive IPC (SCD-Express™ Compression System) + GCS (TED™ Anti-Embolism Stockings) or GCS alone for 6 days during their stay in ICU. High risk of bleeding was defined as a symptomatic bleeding or the presence of organic lesions likely to bleed, hemophilic diseases, hemostatic abnormalities: platelet <50,000/mm^3, APTT > 2 N, prothrombin time <40%, severe anemia (Hb <7 g/dl) due to a bleeding or unexplained. The primary outcome was VTE between days 1 and 6: non fatal symptomatic documented VTE, death due to a pulmonary embolism, and asymptomatic deep vein thrombosis detected by ultrasonography systematically performed on day 6. The duration of follow-up was 3 months.

RESULTS. The primary outcome was assessed in 363 patients (270 men; mean age: 55 ± 17 years; SAPS II: 43 ± 18; BMI: 25.6 ± 5.2). Events were 26 asymptomatic deep vein thromboses and one pulmonary embolism. The incidence of the primary endpoint was 5.6% (10 of 179 patients) in the IPC+GCS group and 9.2% (17 of 184 patients) in the GCS group, a non significant risk reduction of 40.2% (relative risk: 0.6; 95%CI: 0.28–1.28; p = 0.191). The tolerance of mechanical devices was poor in only 7.1% of patients in the IPC+GCS group and in 4% of patients in the GCS group.

CONCLUSIONS. The results of this study did not support the superiority of the association IPC+GCS compared to GCS alone to prevent VTE in patients with high bleeding risk at admission in ICU. However, the initial event rate assumptions on which the sample size was calculated were not observed, resulting in an underpowered study. A larger study is needed to determine if the trend towards lower event rate in the IPC + GCS group is statistically different. (ClinicalTrials.gov number, NCT00740844).

GRANT ACKNOWLEDGMENT. This study was supported by a grant from the French Ministry of Health (PHRC 2005). COVIDIEN supplied the graduated compression stockings (T.E.D.™ Anti-Embolism Stockings) and the IPC (SCD EXPRESS™ compression systems with tubing sets and sleeves). The sponsor had no role in the study.

0898

BILIRUBIN ELIMINATION CAPACITY AND SAFETY OF SINGLE-PASS ALBUMIN DIALYSIS IN ACUTE ON CHRONIC AND ACUTE LIVER FAILURE. A SINGLE CENTER EXPERIENCE

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INTRODUCTION. Single pass albumin dialysis (SPAD) is a generic procedure of albumin dialysis. SPAD may be used as a bridging method in cases of acute on chronic (ACLF) or acute (ALF) liver failure. It can be performed using various hemofiltration devices and without the use of adsorber columns. Few data on elimination kinetics and safety have been published so far. In our center, since 1995, SPAD has been performed in CVVHD-mode with a dialysate containing 4.4% of human albumin and polysulfone dialyzers. We use a BAXTER BM 25 device with, as a standard, 5 L of dialysate over 5 h per cycle for one to four cycles per day.

OBJECTIVES. Assessment of bilirubin elimination capacity and safety issues of SPAD performed in CVVHD-mode with a dialysate containing 4.4% of human albumin and polysulfone dialyzers.

METHODS. Retrospective analysis of 459 treatment cycles in 28 patients.

RESULTS. 20 patients (age 45 (38-57); m/f 15/8) had ACLF. Upon ICU admission, MELD was 30 (21–37); SOFA 12 (10–13); APACHE II 20 (17–26). Serum-bilirubin (BILI) was 500 (182–668) µmol/L and serum-creatinine (CREA) 159 (88–398) µmol/L. Before the first treatment, BILI had increased to 537 (335–746) µmol/L (p = 0.036), whereas there was no significant change of CREA. During the first treatment, BILI decreased to 372 (239–610) µmol/L (p < 0.001). There was a trend towards a decrease of platelet counts from 74 (45–157) G/L to 57 (43–110) G/L, (p = 0.070) but INR remained stable as did cardiovascular SOFA scores. During the interval after the first treatment, there was a rebound of BILI to 431 (286–780) µmol/L (p =0.019). Patients received 3 (2–8) treatments (min 1; max 59), consisting of 2–3 cycles. 3,591 (2,018–5,216) µmol of bilirubin were removed per cycle. From the beginning of SPAD until the end of the last treatment, BILI decreased to 308 (187–502) µmol/L (p < 0.001) and CREA to 150 (106–221) µmol/L (p = 0.005). Platelet counts decreased to 56 (33–76) G/L (p = 0.04). Higher BILI elimination was associated with higher pre-treatment serum-BILI-levels, post- versus predilution mode and dialysate flow. The mode of anticoagulation (citrate vs. heparin vs. none) had no influence on the amount of BILI removed.
8 patients (age 28 (22–42); m/f 2/7) had ALF. Upon ICU admission, MELD was 30 (18–38); SOFA 9 (5–13); APACHE II 11 (6–16). BILI was 357 (133–526) µmol/L and CREA 71 (53–150) µmol/L. During the first treatment, there was a trend decrease of BILI from 410 (273–564) µmol/L to 324 (239–564) µmol/L, p = 0.069. 6,884 (5,063–8,974) µmol of bilirubin were removed per cycle. In ALF patients, from the beginning of SPAD until the end of the last treatment, BILI remained stable.

CONCLUSIONS. SPAD safely and effectively removes bilirubin in ACLF and ALF. There were no serious adverse events attributed to the procedure.

0899

AUTOMATION OF EXTRACORPOREAL MEMBRANE OXYGENATION USING A COMBINED SAFETY AND CONTROL CONCEPT

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INTRODUCTION. In case of severe acute respiratory distress syndrome with life-threatening hypoxia despite optimized conservative therapy veno-venous extracorporeal membrane oxygenation (ECMO) is used to establish sufficient gas exchange. Application of ECMO in the Intensive Care Unit requires specially trained staff and has a high incidence of technical complications. Commercially available ECMO systems require continuous readjustment of machine operating-values to the patients demand and only basic safety monitoring is integrated.

OBJECTIVES. To overcome these problems, we developed a closed loop control system, which enables direct control of patient target values, combined with a model-based safety concept.

METHODS. An ECMO system with a centrifugal blood pump and an electronic gas blender was combined with a cascaded control scheme implemented on a dSPACE real time control system using additionally physiological target values from extended patient monitoring. An inner control loop was used to control oxygenator performance and an outer control loop to adjust O_2 and CO_2 transfer of the oxygenator to maintain physiological target values of venous pCO_2 and peripheral oxygen saturation. An implemented model based safety concept should detect behavior differing from known pump characteristics to diagnose ECMO problems like air in the circuit, thrombus formation or suction of the cannulas.
The prototype of our ECMO system was tested in an animal study with 8 female pigs by applying hypoxic gas concentrations and hypercapnia following reduced minute ventilation.

RESULTS. With the closed-loop control we were able to set a flow within a settling time of 1.08 s. For different levels of lung failure target values could be kept within close boundaries during more than 90% of the time. In addition to the detection of air in the ECMO system we were able to verify the detection algorithm for suction of the cannulas, which was detected up to 50 s before blood flow dropped. By implementation of an automated treatment algorithm critical reduction of blood flow could be avoided.

CONCLUSIONS. A combined control and safety unit for ECMO could improve individual adjustment to physiological demands of the patient and increase patient safety especially in the Intensive Care Unit without continuous observation by the staff.

GRANT ACKNOWLEDGMENT. The study was supported by a grant from Deutsche Forschungsgemeinschaft (DFG).

0900

THERE'S SOMETHING IN THE AIR

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INTRODUCTION. In April 2008, the Royal London Hospital replaced all the ventilators in the intensive care unit (ICU) with new high specification machines. Between June 2008 and March 2010, the ICU experienced an extraordinarily high ventilator failure rate, occurring in two clusters.

OBJECTIVES. We wish to share the experience of a major London Teaching Hospital ICU and the lessons we learnt during the process of investigating these failures.

METHODS. The investigation was triggered by recurrent ventilator failures, all of which occurred during the 'pre-check stage' prior to use on a patient. Pre-check failure was due to 'sticking' of the air inlet valve at very low gas flows. No ventilators failed during patient use. A serious untoward incident was declared to investigate the problem. This involved close collaboration between ICU staff, clinical engineering, pharmacy, risk management, and external organisations including the ventilator manufacturer, gas quality analysts and the Medicine and Healthcare products Regulatory Agency. Causes considered were ventilator malfunction (including software), poor air quality, staff training issues and possible sabotage.

RESULTS. The first cluster of 30 failures occurred between June and September 2008. Air inlet valves and a complete ventilator engine were sent for analysis. The results were inconclusive; an unidentified contaminant was found. Air quality tests met British BS4275 standards, but the oil content did not meet the European Pharmacopoeia (EP2006) standard [1]. The air inlet valves of all the ventilators were replaced as was the hospital air compressor. These measures initially remedied the problem.
Another cluster of failures occurred between January and April 2009. Air quality tests were repeated and met all standards. A second ventilator engine was sent for analysis; contamination with polyfluoropolyether (PEPE) was found. The source and significance of this contaminant was unclear. With the close proximity of the anaesthetic gas scavenging and vacuum plants to the air compressor, sevoflurane was considered as a possible source; both these plants were therefore re-sited. In addition, air filters were placed at the air inlets at each bedside. No further failures occurred.

CONCLUSIONS. Defining the exact nature of the problem was essential, requiring accurate information to be collected. During investigation of the second cluster of failures, this was extended to link ventilators use with clinical data including geographical use (bed space), number of user hours, etc. Involving all stakeholders early in the investigation was vital to explore and exclude possible causes. The ventilator manufacturers were exemplary in their handling and support.

REFERENCE. 1. European Pharmacopoeia 6th Edition. Council of Europe European (COE), European Directorate for the Quality of Medicines (EDQM), July 2007.

Therapy of sepsis: Clinical practice: 0901–0913

0901

THE CONCEPT OF EARLY GOAL-DIRECTED THERAPY IN SEPSIS SYNDROME

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BACKGROUND. Early goal-directed therapy (EGDT) used in the treatment of sepsis is essentially a comprehensive strategy that involves the early identification of high-risk septic patients and performance of a consensus-derived protocol to reverse the hemodynamic perturbations of hypovolemia, vasoregulation, myocardial suppression, and increased metabolic load by adjustment of cardiac preload, afterload, and contractility to balance oxygen delivery with oxygen demand.

OBJECTIVE. To evaluate the concept of EGDT; provided at the earliest stages of severe sepsis and septic shock; regarding the clinical course and final outcome.

METHODS. A prospective, randomized, single center study were conducted on 60 patients admitted with severe sepsis and septic shock, 30 patients were treated according to the protocol of EGDT which consists of aggressive hemodynamic support during the first 6 h after sepsis is recognized, to achieve certain physiologic targets, the other 30 patients received only conventional sepsis treatment. Both groups were matched by APACHE IV score (within the 1st 6 h). MODS and SOFA scores were calculated at baseline and everyday until ICU discharge or death. Clinical outcome (duration of stay in the ICU, need for mechanical ventilation, need for inotropic/vasopressor support, need for haemodialysis, and final outcome of survival/mortality rates) were recorded for all patients.

RESULTS. EGDT, provided at earliest stage of severe sepsis or septic shock, (1) significantly improved patient outcome as indicated by significant reduction of SOFA and MODS scores from the second day of hospital stay (mean$^{1st\ day}$ 9.5 $\pm$ 3.02 vs. mean$^{2nd\ day}$ 7.8 $\pm$ 3.66; P = 0.006 for SOFA and mean$^{1st\ day}$ 7.93 $\pm$ 1.75 vs. mean$^{2nd\ day}$ 6.86 $\pm$ 2.44; P = 0.03 in MODS), (2) significantly reduced the length of ICU stay for surviving patients (8.2 $\pm$ 3.1 vs. 39 $\pm$ 43 d; P = 0.02), (3) significantly reduced the 28 days mortality (40 vs. 73.3%; P = 0.009), (4) significantly reduced frequency of those needed vasopressor support (P = 0.019) and non significantly reduced frequency of those needed MV (P = 0.09).

CONCLUSION. EGDT provide significant benefits in patients with severe sepsis and septic shock.

0902

IMPLEMENTATION OF THE MEDICAL EMERGENCY TEAM IN PATIENTS WITH SEVERE SEPSIS AT THE GENERAL WARD FOR 3 YEARS

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INTRODUCTION. Early goal-directed therapy (EGDT) has been shown to improve survival for emergency department patients with severe sepsis or septic shock. Medical emergency team (MET) is providing pre ICU care by early treatment and providing EGDT for severe sepsis in 20% of all MET activations. But there are a few reports about MET activities as sepsis team.

OBJECTIVE. To describe the outcome of patient with severe sepsis activated by the medical emergency team for 3 years.

METHODS. A retrospective study of 448 patients with severe sepsis or septic shock who were activated by MET for 3 years (March 2008–February 2011) was done. We measured success rate of EGDT goals for 6 h and hospital mortality of each year.

RESULTS. Of the 448 enrolled patients, 71 to Period 1 (March 2008–February 2009) and 181 to Period 2 (March 2009–February 2010) and 196 patients were activated on Period 3 (March 2010–February 2011). There was no difference in base-line characteristics and laboratory values among groups. There was no difference of success rate of CVP and ScvO2 within 6 h (71.8 vs. 74.0 vs. 77.0%, $p = 0.636$; 71.8 vs. 72.9 vs. 72.4%, $p = 0.984$). Success rate of MAP $\geq$65 mmHg for 6 h was increased for 3 periods (77.5 vs. 89.5 vs. 92.9%, $p = 0.002$). Success rate of EGDT goals for 6 h was showed trend of increasing for 3 periods (45.1 vs. 52.5 vs. 57.7%, $p = 0.177$). The 28 day and hospital mortality were continuously decreased for 3 periods (32.4 vs. 30.4 vs. 20.4%, $p = 0.040$; 43.7 vs. 42.8 vs. 31.4%, $p = 0.045$).

CONCLUSIONS. Medical emergency team showed trend of increasing success rate of Early goal-directed therapy and continued decrease of 28 day and hospital mortality in patients with severe sepsis or septic shock at general ward.

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0903

MANAGEMENT OF SEVERE SEPSIS IN THE EMERGENCY DEPARTMENT OF DIJON UNIVERSITY HOSPITAL, FRANCE

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INTRODUCTION. National guidelines for the early management of severe sepsis were published in 2006 in France further to the publication of the "Surviving Sepsis Campaign" [1].

OBJECTIVES. To evaluate management of severe sepsis in the emergency department (ED) of Dijon University Hospital, France further to the implementation of these new national guidelines.

METHODS. Single-centre, retrospective study of all patients admitted to the ED of our centre with a confirmed diagnosis of severe sepsis. Data were collected on pre-hospital and in-hospital management.

RESULTS. Out of 138 patients admitted with sepsis, 99 patient files were eligible for analysis based on admissions from 15 October 2009 to 15 March 2010. Mean age was 75 years (range 72–78); 65% were addressed to the ED further to a call to the emergency services; 74% had comorbidities. Average time to treatment in the ED was 1 h 13 min (range 57min–1 h 29 min), with no significant difference according to severity. Average time spent in the ED before transfer to another unit was 7 h. Mean time from ED admission to arrival in the intensive care unit (ICU) was 7 h 28 min (range 5 h 49 min–9 h 07 min). For patients in whom basic intensive care procedures were started in the ED (e.g. insertion of central venous catheter, arterial catheter and/or endotracheal intubation), mean time spent in the ED was 8 h 15 min (range 2 h 57 min–13 h 33 min). Among the hemodynamic variables noted in the ED for the 99 patients studied, blood pressure was not noted for any of them. We divided patients into 2 groups for comparison: those with severe sepsis and those in septic shock. There was a significant difference between groups in terms of vascular filling (51 vs. 97%, $p < 0.001$, severe sepsis vs septic shock), prescription of antibiotics (73.6 vs. 94% respectively, $p = 0.02$), and frequency with which an ICU physician was called (13 vs. 48% respectively, $p = 0.002$).

CONCLUSIONS. The time to treatment and length of stay in the ED in patients with severe sepsis appear to be quite long, and could impact on prognosis in these patients. Vascular filling, initiation of antibiotic therapy and use of ICU physicians are all elements that could be improved with a view to formalising a management protocol for these patients. Evaluation of the initial management of patients presenting to the ED with severe sepsis is essential, because the prognosis of these patients is at stake in the first few hours.

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0904

PRESCRIBED TARGETS FOR VASOPRESSOR TITRATION IN SEPTIC SHOCK: A RETROSPECTIVE COHORT STUDY

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INTRODUCTION. Patients with septic shock receive vasopressors under the assumption that correcting hypotension improves perfusion, organ function and survival. However, because optimal targets remain unknown, vasopressor titration could be highly variable.

OBJECTIVES. The primary objective is to measure the proportion of vasopressor prescriptions that incorporate explicitly a physiologic target for the purpose of titration. Secondary objectives are to describe these targets and the influence of patient characteristics.

METHODS. We performed a retrospective cohort study in three intensive care units (ICU) at 1 Canadian University Hospital. We identified consecutive patients admitted between June 2008 and May 2010, who received vasopressors and antibiotics during the same hospital stay. Inclusion criteria were 1. ICU admission, 2. presumptive diagnosis of infection, 3. a systemic inflammatory reaction (SIRS criteria) and 4. at least one hypotensive episode treated with vasopressors. Data entry using electronic forms with logical checks for extreme values and missing data was consistent across all units. We recorded each explicit target as well as chronic comorbidities and acute illnesses from medical notes, nursing records, medical orders and laboratory reports. We conducted univariate analyses, adjusted for multiple testing, measuring the association between the most common target and age, illness severity as well as chronic comorbidities.

RESULTS. We included data from 174 patients. Median age was 65.5 (IQR 56–77) years, 55.8% were males and median Apache II score was 23 (IQR 17–30). An explicit target for vasopressor titration was specified in 173 cases (99.4%). Considering the first target for each episode, the variable used most frequently was the mean arterial pressure (MAP) (83.2%) followed by a combination of MAP and systolic arterial pressure (SAP) (13.3%) and by SAP alone (3.5%). The median MAP target was 65 mmHg (IQR 65–65) while the median systolic arterial pressure target was 100 mmHg (IQR 90–100). Of the 173 initial targets, 73 (42%) were modified during the first 48 h of ICU stay.

When patients had an initial APACHE II score $\geq$ 25 (compared to APACHE II < 25), physicians were more likely to target a MAP > 65 mmHg than 65 mmHg (27 vs. 7.6%, $p = 0.009$). Other paired comparisons were not statistically significant.

CONCLUSION. In 1 Canadian University Hospital, vasopressor titration commonly follows an explicit blood pressure target. A MAP of 65 mmHg is the most frequent target suggesting a high level of adherence to the Surviving Sepsis Campaign Guidelines. Frequent modifications to the initial target suggests an underlying belief that adapting vasopressive support in function of events that occur after initial resuscitation efforts improves outcomes. A deeper understanding of how physicians modify vasopressor prescriptions is required in order to verify whether this approach really benefits patients.

0905

LOWER MORTALITY WITH HIGHER FLUID VOLUME IN PATIENTS WITH PERSISTING SEPTIC SHOCK

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INTRODUCTION. Patients with septic shock require fluids, but the optimum amount is unknown. Recent cohort studies have indicated that higher volume of fluids were associated to worse outcome.

OBJECTIVES. Our aim was to describe patient characteristics and outcome associated to fluid volume in patients with septic shock in particular the subgroup with persisting shock.

METHODS. Prospective cohort study of all adult patients with septic shock in 6 general ICUs in eastern Denmark during a 3-month study period. After the 1 and 3 day of shock, patients were divided into two groups according to the median volume of iv. fluids. Characteristics and outcome were compared between the two groups.

RESULTS. The 164 included patients received median 4.0 l (IQR 2.3–6.3) of fluid during the 1 day of septic shock, see table. In that 1 day of shock, patients in the higher volume group (>4 l) had higher maximum *p*-lactate [3.4 (2.2–5.5) vs. 2.0 (1.6-3.0) mM, P < 0.0001] and a tendency to higher maximum vasopressor dose [0.25 (0.13–0.42) vs. 0.18 (0.10–0.31) µg/kg/min, P = 0.07] compared to the lower volume group. In contrast SAPS II [54 (46–64) vs. 54 (43–67), P = 0.96], SOFA score [11 (9–13) vs. 11 (9–13), P = 0.78] and 90-day mortality (48 vs. 53%, P = 0.27) did not differ between the two fluid volume groups.

Ninety-five patients still had shock on day 3 and these had received median 7.5 l (4.3–10.8) of fluid by the end of the 3 day of shock, see table. The patients receiving higher volume of fluid (>7.5 l) in the first 3 day of shock had lower 90-day mortality (40 vs. 62%, P = 0.03) than those receiving lower volume in spite of comparable admission SAPS II (53 (46–67) vs. 55 (49−62), P = 0.52).

Median (IQR) volumes of fluid during septic shock

	1 day of shock n = 164		1–3 days of shock n = 95	
	Higher volume >4 l	Lower volume <4 l	Higher volume >7.5 l	Lower volume <7.5 l
Total (l)	6.3 (5.1–8.3)	2.3 (1.1–3.0)	10.9 (8.7–13.3)	4.3 (3.0–5.7)
Crystalloids (l)	3.9 (3.0–6.0)	1.1 (0–2.0)	7.0 (4.9–9.8)	2.2 (1.0–4.0)
Colloids (l)	1.0 (0.5–1.6)	0.5 (0.2–0.8)	2.1 (1.0–2.5)	0.9 (0.5–1.5)
Blood products (l)	0.6 (0–1.6)	0 (0–0.5)	2.0 (0.6–4.2)	0.5 (0–1.4)

CONCLUSIONS. In this consecutive cohort of unselected patients with septic shock initial fluid volumes were not associated with mortality. In the subgroup of patients with shock persisting 3 days or more, higher volumes of fluid were associated with improved outcome. This contrasts recent results from other cohort studies underlining the need for an RCT on fluid volume in patients with septic shock.

GRANT ACKNOWLEDGMENT: Rigshospitalets Research Council

0906

A REGIONAL SURVEY OF VASOPRESSIN USE IN SEPTIC SHOCK: WEST MIDLANDS, UNITED KINGDOM

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INTRODUCTION. Surviving sepsis guidelines recommend the use of vasopressin in patients with septic shock. Recent literature suggests that the dose of vasopressin in patients with septic shock demonstrates heterogeneity in outcome dependent on commencement of the drug and dosing. Despite this there is a wide discrepancy in the use of vasopressin. Further research and guidelines are required.

OBJECTIVES. The aims of the study were to investigate the way in which vasopressin is used across different critical care units within the West Midlands; in particular with reference to the availability or otherwise of a formal guideline.

METHODS. 18 distinct adult-based intensive care units were identified. A consultant from each unit was chosen at random and permission was sought to administer a questionnaire regarding various practices relating to vasopressin use on that unit. Questionnaires were sent out via email with a web-based response.

RESULTS. Of the 18 units, 100% agreed to undertake the questionnaire. In total 17 responses were received (94%). 47% of units had no specific vasopressin protocol and half of these admitted that the decision to commence was purely due to individual consultants' experience and opinion. Only 6% cited surviving sepsis guidelines as a reason to consider vasopressin. Some units commenced vasopressin based on noradrenaline infusion rates of 0.3, 0.4, 0.5 or 1.0 mcg/kg/min (18, 18, 41, 6% respectively). The majority of units commenced vasopressin at 0.01 IU/min (59%) with others using up to 0.04 IU/min. There was a significant range of maximum doses, ranging from 0.03 to 0.16 IU/min. 71% of units would specifically start steroid therapy when commencing vasopressin. The majority (88%) agree that renal impairment does not alter their choice of vasopressin use. 12% of units had used vasopressin as a first line vasopressor. Only 12% had experienced side effects purely due to vasopressin alone.

CONCLUSIONS. There is considerable variation in the use of vasopressin across critical care units who all claim 'evidence based practice'. These differences cover factors such as indication for commencement, range of doses, recognition of successful treatment and adherence to local policy, where this exists. In addition there are vast differences in doses used with upper limits far beyond recommended guidelines in some areas. We conclude that the use of vasopressin is generally not uniform across a range of critical care units and often it's use does not follow the most up-to-date published evidence. We suggest that the production of a national guideline for the use of vasopressin would benefit the treatment of patients suffering from septic shock.

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0907

STROKE VOLUME AND SVV MEASUREMENT USING FLOTRAC AND PASSIVE LEG RAISING (PLR) AS A TOOL FOR FLUID MANAGEMENT IN SEPTIC SHOCK NON-VENTILATED PATIENTS ON VASOPRESSORS

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INTRODUCTION. Sepsis and septic shock are commonly encountered conditions in the ICU and volume expansion is the integral part of treatment [1, 2]. Because volume expansion does not always improve hemodynamics, predictive parameters of fluid responsiveness are needed [3]. Static markers of cardiac preload are poor predictors of volume responsiveness and dynamic markers are often limited by the presence of spontaneous respiration or cardiac arrhythmias [4]. Passive leg raising (PLR) is a reversible maneuver that represents endogenous volume challenge can be used to predict fluid responsiveness [5].

OBJECTIVE. PLR induced changes in stroke volume and its surrogates are reversible predictors of fluid responsiveness in mechanically ventilated patients. We hypothesized that changes in SV, SVV (measured by FLOTRAC) in response to PLR indicate fluid responsiveness in non-intubated patients without mechanical ventilation.

METHODS. All septic shock patients requiring volume expansion were eligible for enrollment. An arterial line was inserted if MAP was less than 65 mmHg after fluid challenge on vasopressors and FLOTRAC connected. Measurements of SVV, CO, MAP, BP, HR were recorded before and after PLR. Measurements were than repeated following fluid challenge of 300 ml in those patients who were found to have variations in SVV > 10 and/or SV > 15% Incremental boluses were given till a target of 10 of SVV and SV change of <15% was achieved.

RESULTS. A total of 30 patients were evaluated, with 65 fluid challenges. In 25 (83.33%) patients of 58 (89.23%) fluid challenges SVV of 10 and SV change of <15% was achieved after fluid challenge and vasopressors were tapered off within 24 h. Corresponding changes to PLR in CO, HR, BP were found in 12 (30.76%) patients, 3(7.69%) patients went into fluid overload and required NIPPV and diuretics, 2 patients developed arrhythmia's and were dropped from the evaluation.

CONCLUSION. Changes in stroke volume and SVV using Flotrac in response to PLR can predict fluid responsiveness in non ventilated patients of septic shock on vasopressors .

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0908

SURVIVING SEPSIS CAMPAIGN. CHARACTERISTICS OF PATIENTS AND SAFETY OF RECOMBINANT HUMAN ACTIVATED PROTEIN C FOR SEVERE SEPSIS

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INTRODUCTION. Recombinant human activated proteina C (rhAPC), has antithrombotic, antiinflammatory, and profibrinolytic properties. Produced dose-dependent reductions in the levels of markers of coagulation and inflammation in patients with severe sepsis. Evidence regarding the efficacy and safety of rhAPC in severe sepsis is limited.

OBJECTIVES. To describe the characteristics of patients with septic shock, who were treated with rhAPC and evaluate patients during infusion.

METHODS. Retrospective study the data of all consecutive patients admitted in our ICU suffering septic shock and receiving rhAPC between January 2009 and December 2010. We recorded clinical and demographical data, complications, treatment, mortality and stay in the ICU.

RESULTS. Among 28 patients, the age (mean ± SD) was 42 ± 15.46 years, and more frequently male (63.6%). APACHE II at admission was 27.64 ± 9.75, and SOFA was 11.27 ± 4.29. Most of our patients were healthy (without respiratory, vascular, liver or kidney history). There were no diabetic. IMC was 28.07 ± 6.93. The primary infection was highly variable (essential pneumonia, pyelonephritis and peritonitis) The patients developed multiorgan failure associated: 100% needed norephinephrine, 90.9% needed mechanical ventilation, 100% developed acute renal failure with mean creatinine of 2.6 ± 1.36 mg/dl, treated with diuretics and/or CVVH, 54.5% suffered elevated liver enzymes and 45.5% low platelet. In the admission, temperature was 38.3 ± 1.42°C, pH 7.28 ± 0.08, lactate 5.41 ± 3.38 and PCR 246 (143, 436) mg/l. All our patients had a central line and continuous blood pressure monitoring using PiCCO system (45.5%), femoral artery catheter (45.5%) or radial (9.1%). Initial resuscitation was successfully performed in 81.8% of patients, and in the 100% of them, the cultures were obtained before antimicrobial therapy was initiated. The stress ulcer prophylaxis was given to 100% of patients, and 72.7% received deep vein thrombosis prophylaxis with heparin or graduated compression stockings. The patients received rhAPC 14.63 ± 7.68 h after the admission in the ICU. The infusion was discontinued in 18.2% of patients because it was required an invasive procedure. There were no serious bleeding events (only 18.2% had light bleeding from the gums). No transfusions. The infusion was stopped in 27.3% of patients for thrombocytopenia. The patients needed mechanical ventilation 16.09 ± 10.34 days and vasopressors 10.36 ± 7.15 days. 36.4% required tracheostomy. 54.5% recovered renal function. The stay was 21 (2.38) days. Mortality was 54.5%.

CONCLUSIONS. The clinical profile of septic shock patients who received rhAPC is very critical illness (with APACHE II > 25), with severe multiorgan failure associated. In our ICU, the management of patients was appropriate following the surviving sepsis campaign. There were no complications related to the administration of rhAPC.

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0909

DROTECOGIN ALFA ACTIVATED IN REAL-LIFE. PROWESS-SHOCK STUDY DEVELOPMENT HAS CHANGED DAILY PRACTICE?

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INTRODUCTION. In December 2004 we implemented the use of Drotecogin alfa activated (DAA) to treat patients with septic shock, following the guidelines of SSC. In 2008 was published the design of the study Prowess-shock, whose primary goal is "to provide clinicians with robust evidence regarding the efficacy and safety of DAA into clearly defined and clinically important patient population".
This new study questions the use of DAA and introduce an ethical discussion about to use or not the drug in general practice waiting the new study results.
OBJECTIVES. The purpose of this study is to assess if these controversies affected the use of DAA in our practice.
METHODS. Retrospective study. All ICU patients diagnosed with septic shock, which received DAA were included. We recorded sex, age, sepsis focus, diagnosis on admission, MPM 0, MPM 24, SOFA and APACHE II. Vasopressor drugs doses and hemodynamic parameters at the moment to start DAA treatment were also recorded.
We compared patients admitted between December 2004 and January 2008 to patients admitted between February 2008 and March 2011. Data were analyzed using student t test or non-parametric test whichever was applicable.
RESULTS. In the first period, 2,360 patients were admitted. 233 patients were diagnosed with severe sepsis/septic shock. 45% had respiratory focus, 36% had abdominal focus, 9% had urinary focus, and 9% other sources. During this period 14 patients received DAA (6%). In the second period, 2324 patients were admitted. 262 patients were diagnosed with severe sepsis/septic shock. 41% had respiratory focus, 36% had abdominal focus, 11% had urinary focus, and 12% other sources. During this period 19 patients received DAA (7.2%).
There were no difference between patients received DAA in the two periods ($p > 0.1$ for all comparisons). No patients in both periods had major bleeding. 1 patient in the first period had a minor bleeding.

Characteristics of patients

Period	Age (years)	Sex male (%)	SOFA	APACHE II	Medical diagnosis (%)	MPM 0	MPM 24
First	58 ± 15	68	12 ± 3	28 ± 5	89	56 ± 25	47 ± 13
Second	59 ± 13	71	13 ± 2	30 ± 4	63	60 ± 20	51 ± 10

Period	ICU LOS (days)	Hospital LOS (days)	Hospital mortality (%)	Norepinephrine dose ($\mu g\ Kg^{-1}\ min^{-1}$)	MAP (mmHg)	CVP (mmHg)	SV (ml)
First	18 [9–30]	25 [18–44]	29	0.78 ± 0.51	73 ± 10	13 ± 3	57 ± 17
Second	18 [8-22]	24[19-43]	37	0.97 ± 0.59	72 ± 9	13 ± 5	44 ± 14

CONCLUSIONS. Publication of the Prowess-shock study design did not alter daily practice. In the second period there was a slight increase in the rate of patients who received DAA, especially surgical patients. The efficacy and safety of DAA was the same in both periods. While awaiting new evidence from the trial, we continue using DAA in appropriate patients, with good clinical results.

0910

USE OF ACTIVATED PROTEIN C IN INTENSIVE CARE PATIENTS WITH H1N1 INFLUENZA INFECTION

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INTRODUCTION. A large randomised controlled trial has suggested that patients with severe sepsis treated with recombinant human Activated Protein C (rh-APC) improves outcome and over 50% of the patients in this study had bacterial pneumonia [1]. Patients admitted to critical care with acute H1N1 infection often have pneumonia and multiple organ failure; an ICU survival of 69% for these patients was observed in one UK series [2]. To date little published evidence exists regarding the use of rh-APC in these patients. Animal work, mainly carried out in mice, suggests that H1N1 infection causes intense pro-inflammatory activity and that rh-APC does little to attenuate this [3].
OBJECTIVES. To describe demographic, clinical and outcome data in patients from 3 ICUs with confirmed H1N1 or Influenza A infection who subsequently received rh-APC.
METHODS. Retrospective case note review.
RESULTS. 13 patients infected with Influenza A were identified. Of these patients 11 were known to be infected with the H1N1 strain. In 11 patients the admission diagnosis was presumed bacterial pneumonia, and in two respiratory failure secondary to viral pneumonitis. Mean age was 49.5 (±18.2) and mean admission APACHE 2 score was 22.5 (±4.6). Seven patients went on to have microbiologically confirmed bacterial pneumonia. At time of administration of rh-APC all patients had respiratory and cardiovascular failure and 12 (92%) had acute kidney injury. All patients received 96 h treatment with rh-APC at 24 $\mu g\ kg^{-1}\ min^{-1}$. Nine patients (69%) were treated with low dose steroids for sepsis, five (38%) required high frequency oscillation; none required referral for extracorporeal membrane oxygenation. Two patients (15%) suffered gastrointestinal bleeding during their ICU admission however both survived to ICU discharge. Other complications noted were persistent haemofilter clotting (15%) and pneumothorax (23%). ICU and hospital survival was 85% at 80% respectively. Mean duration of ventilation was 30 (±12.7) days and mean ICU and hospital length of stay was 34.6 (±19) days and 45.2 (±23.9) days, respectively.
CONCLUSIONS. We report the use of rh-APC in 13 patients with severe sepsis associated with Influenza A infection. Gastrointestinal bleeding was reported in two patients. 82% of patients survived to hospital discharge, which compares favourably with nationally published outcomes.
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0911

USE OF DROTECOGIN ALFA ACTIVATED IN REAL-LIFE: 6 YEARS EXPERIENCE IN A SPANISH UNIVERSITY HOSPITAL

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INTRODUCTION. In 2004 we implemented the use of Drotecogin alfa activated (DAA) to treat patients with septic shock.
OBJECTIVES. To evaluate our experience, describing the clinical characteristics and outcome of septic shock patients treated with DAA.
METHODS. Retrospective study including patients with septic shock treated with DAA in our ICU over 6 years (December 2004–February 2011). We collected epidemiological data, severity scores, organ failures, complications, LOS and hospital mortality. We recorded hemodynamic variables and norepinephrine (NE) doses at time of DAA infusion started and after 12, 24, 36 and 48 h. We used multivariate analysis of variance, or non-parametric tests.
RESULTS. 495 patients with diagnosis of severe sepsis or septic shock were admitted at ICU. 33 (6.7%) received DAA. 70% were male, age: 59 ± 14 years. Medical diagnosis was 66% and surgical urgent 28%. MPM 0 = 56 ± 23, APACHE II = 29.5 ± 4.5 and SOFA = 13.3 ± 2.5. Mean organ dysfunction was 4.2 ± 0.7. ICU LOS = 18 [9–25] and hospital LOS = 25 [17–36]. Hospital mortality was 36%. No patients had major bleeding. 1 patient had a minor bleeding. After 12 h of DAA infusion started hemodynamics variables improved and the need of NE decreased.

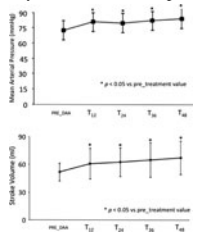

Figure 1

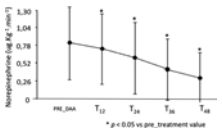

Figure 2

CONCLUSIONS. All our patients were in shock with high NE doses at time of DAA initiation. Treatment with DAA was correlated with NE doses decreased and hemodynamic improvement. DAA use was efficacy and safety when patients were selected appropriately.

0912

THE SCANDINAVIAN STARCH FOR SEVERE SEPSIS/SEPTIC SHOCK (6S) TRIAL: CHARACTERISTICS OF INCLUDED PATIENTS IN THE ONGOING TRIAL

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INTRODUCTION. Hydroxyethyl starch (HES) 130/0.4 is the preferred colloid in Scandinavian Intensive Care Units (ICU)[1]. The Scandinavian Starch for Severe Sepsis/Septic Shock (6S) Trial is a randomised, blinded multicenter trial investigating the effect of this colloid compared to Ringer's acetate on mortality and renal failure in ICU patients with severe sepsis[2].
OBJECTIVES. To show the characteristics of patients enrolled in the ongoing 6S-trial.
METHODS. 500 out of 800 planned patients with severe sepsis have been randomised with concealed allocation to double-blinded resuscitation with either 6% HES 130/0.4 in Ringer's acetate or Ringer's acetate. Masked trial fluid is given for hypovolemia to a maximum daily dose of 33 ml/kg followed by open-labelled Ringer's acetate. In this descriptive analysis, we include 413 patients enrolled into the 6S-trial in 26 Scandinavian ICUs.
RESULTS. 258 (62%) males and 155 females presented primarily with pneumonia (56%) or abdominal infection (31%). 87% had septic shock. The median age and Simplified Acute Physiology Score (SAPS) II were 66 years (IQR 55–75) and 52 (41–63), respectively. Patients received 19 ml/kg (13–25) of masked trial fluid on the "first day" (median length 15 h) and 14 ml/kg (6–25) on the second day after randomisation. The cumulated dose of masked trial fluid during the entire ICU-stay was 44 ml/kg (24–73).
Only secondary outcomes are available at this stage: The ICU-mortality was 31% (95%-CI 26–35). 20% (16–24) of the patients needed renal replacement therapy in median 3 days (2–5) after randomisation. The prevalence of severe bleeding and allergy was 8% (6–11) and 0.2% (0–1), respectively. No SUSARs have occurred.
We will perform the interim analysis in May (400 patients followed up) and with the current monthly inclusion rate of 40 patients recruit the last patient in November 2011.
CONCLUSIONS. We successfully facilitated a Scandinavian network of ICUs, which are enrolling a high number of patients with severe disease in the early phase of sepsis into the trial. This is reflected by a high prevalence of renal replacement therapy and a high ICU-mortality. The 6S-trial will provide urgently needed [3] and important safety data on the use of HES 130/0.4 in patients with severe sepsis.
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GRANT ACKNOWLEDGMENTS: Funded by the Danish Research Councils and supported by B Braun Medical.

0913

RECOMBINANT ACTIVATED PROTEIN C: A PROFILE OF CURRENT PRACTICE IN A LARGE DISTRICT GENERAL ICU IN THE UK

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INTRODUCTION. Use of recombinant activated protein C (rAPC) has attracted controversy [1] with anecdotal evidence suggesting use has declined after an initial surge. The PROWESS trial [2] recommended the use of rAPC in severe sepsis with 2 or more organ failures. Previous national audits in the UK [3] and Canada [4] suggested rAPC was initially used in patients with a higher number of organ failures.

OBJECTIVES. To profile rAPC use on our unit to establish if our target population had changed in the intervening years.

METHODS. We identified all patients whom had received rAPC in our ICU between April 2008 and November 2009. We reviewed case notes for these patients to extract the following data: demographics, sepsis source, duration of organ failure prior to rAPC, number and type of organ failure and outcome.

RESULTS. 30 patients received rAPC; 24 sets of notes were available for analysis. 58% of our patients were male; mean age was 58 ± 18.9 years. Unadjusted mortality was 66%. Sepsis source were predominately chest (50%) and abdominal (33%). There were no documented cases of rAPC being used in uro-sepsis. At commencement of rAPC infusion 42% of patients had 4 or more organ failures whilst 92% had 3 or more. No patient with less than two organ failures received rAPC.

CONCLUSIONS. Our critical care unit admits approximately 1200 patients per annum. In comparison to previously published data for the UK and Canada [3, 4] we treated a similar demographic of patients but had a larger percentage of abdominal sepsis. Sub-group analysis of the PROWESS data reported an greater mortality benefit in this patient sub-group. In comparison to the original PROWESS data our mortality was significantly higher (66% vs PROWESS mortality 24.7%). We believe that this is due to the severity of illness in which we use rAPC, shown using number of organ failures as a surrogate marker. In our population 42% of patients had four or more organ failures, whilst in the PROWESS study 50% of patients had two or less organ failures. This is in keeping with the product cycle of a new treatment; initial adoption and high usage rates followed by a subsequent decline.

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Both CMAB and AK have received honoraria for speaking on behalf of Eli Lilly.

0915

PULMONARY FUNCTION FOLLOWING HEMORRHAGIC SHOCK AND RESUSCITATION. EFFECT OF 7.5% NACL WITH ADENOSINE, LIDOCAINE AND MG^{2+}

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INTRODUCTION. Resuscitation with fluid or blood following hemorrhagic shock (HS) triggers a systemic inflammatory response (SIRS). SIRS plays a major role in the development of the acute respiratory distress syndrome. However, there are conflicting results regarding pulmonary dysfunction following HS.

Adenosine, Lidocaine and Mg^{2+} possesses anti-inflammatory and anti-arrhythmic properties and have been shown to stabilize hemodynamics, transiently lower whole body O_2 consumption and restore kidney function.

OBJECTIVES. To investigate if severe HS without concomitant tissue injury induces pulmonary dysfunction and whether intervention with 7.5% NaCl Adenosine, Lidocaine and Mg^{2+} (ALM) attenuates this dysfunction.

METHODS. Pigs (38 kg) were randomized to: Sham (n = 5), Sham + ALM (n = 5), HS (n = 9), and HS + ALM (n = 9). MAP was lowered to 30–35 mmHg for 90 min and then resuscitated with Ringers acetate (RA) to a MAP of 50–55 mmHg for 30 min (permissive hypotension), followed by re-infusion of 75% of the withdrawn blood. ALM was given as a bolus injection at both fluid and blood infusion. Six hours after reperfusion bronchoalveolar lavage (BAL) was performed, the lungs were removed and wet/dry ratio calculated. BAL fluid was analyzed for protein, LDH, MDA and cytokines (TNFα, IL-1β, IL-6, IL-8 and IL-10). Pulmonary blood flow was determined using microspheres.

RESULTS. An average 49 ml/kg of blood was withdrawn to maintain a MAP of 30-35 mmHg corresponding to a total blood loss of 73%. Eight pigs died of ventricular fibrillation during the shock phase, prior to randomization. During shock and resuscitation, pulmonary vascular resistance (PVR) increased in the HS group (HS: 999 ± 420 dynes/cm^5 vs. Sham: 255 ± 73 dynes/cm^5) with a further significant increase in the HS + ALM group (ALM: 1474 ± 555 dynes/cm^5; p = 0.01).

Pulmonary blood flow decreased by 86% (1.84 ± 1.1 ml/min/g tissue vs. 0.26 ± 0.43 ml/min/g tissue; $p < 0.05$) during hemorrhage and was still significantly reduced after 6 h of reperfusion versus baseline (0.63 ± 0.52 ml/min/g tissue; $p < 0.05$). Treatment with ALM had no effect on pulmonary blood flow. PaO_2/FiO_2 ratio decreased significantly during HS (376 ± 85) compared to sham groups (444 ± 43; $p < 0.0001$) but resuscitation with RA and shed blood restored PaO_2/FiO_2 ratio without intergroup differences.

HS caused an increase in pulmonary tissue wet/dry ratio compared with sham groups (median: 5.85 CI 5.61–6.09 vs. 6.03 CI 5.91–6.16; p = 0.011), without any effect of ALM (6.09 CI: 5.97–6.20; p = 0.3119) Furthermore HS was not associated with changes in protein, LDH, MDA, or cytokine levels in BAL-fluid.

CONCLUSIONS. ALM increased pulmonary vascular resistance during permissive resuscitation, but HS and resuscitation had only minor effects on pulmonary function leaving the question of whether ALM attenuated pulmonary dysfunction unanswered.

Trauma 2: 0914–0926

0914

EXAMINING THE CONSEQUENCES OF EMERGENCY DEPARTMENT CROWDING ON IMPACT OF CRITICALLY ILL PATIENTS

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INTRODUCTION. Emergency department (ED) crowding is a public health concern. Any threat to the EDs ability to provide quality emergency care constitutes a public health crisis.

OBJECTIVES. To determine the association between ED overcrowding and outcomes for critically ill patients.

METHODS. We included patients who met the criteria for admission to ICU. Patients were divided into 2 groups: ED boarding less than 6 h (group A) and Emergency Department boarding greater than or equal to 6 h (group B). Demographics, Acute Physiology and Chronic Health Evaluation (APACHE) II score, Simplified Acute Physiology (SAPS) Score, Glascow Coma Score (GCS), fever, Length of Stay (LOS), and Intensive Care Unit (ICU) and hospital mortality were recorded.

RESULTS. In the study, 200 critically ill patients with a mean age 57.8 ± 21.4 years and APACHE II score 22.6 ± 10.5 were included. The fever rate was 14.3% (group A) vs. 40% (group B) ($p < 0.001$). Among hospital survivors, the median hospital LOS was 27.4 days (group A) vs. 32.4 days (group B) ($p < 0.001$). The median ICU LOS was 12.3 days (group A) vs. 24.1 days (group B) (p = 0.001). The ICU mortality rate was 22.2% (group A) vs. 43.5% (group B) ($p < 0$ .001). The in-hospital mortality rate was 46.7% (group A) vs. 62.9% (group B) (p = 0.001). Among medical and surgical patients, there were 44 (73.3%) patients (group A_{surg}) vs. 80 (57.1%) patients (group B_{surg}) (p = 0.01), and 16 (26.7%) patients (group A_{med}) vs. 60 (42.9%) patients (group B_{med}) (p = 0.005). The mean APACHE II score was 24.4 ± 12.2 for surgical patients vs. 19.5 ± 5.9 for the medical patients (p = 0.001). The mean GCS score was 6.1 ± 1.8 (surgical patients) vs. 5.6 ± 1.5 (medical patients) (p = 0.019). The mean boarding time was 995.7 ± 2,077.7 min (surgical patients) vs. 1,941.8 ± 2,737.2 min (medical patients) ($p < 0.001$). The median ICU LOS was 36.7 days (surgical patients) vs. 14.3 days (medical patients) (p = 0.001). The ICU mortality rate was 22.2% (surgical patients) vs. 47.4% (medical patients) ($p < 0.001$). The in-hospital mortality rate was 54.8% (surgical patients) vs. 63.2% (medical patients) ($p < 0.001$). Higher APACHE II score, lower GCS score, transportation at evening or night, advancing fever, ICU LOS and delayed admission from the ED to the hospital (ICU and floor) were all associated with significantly lower hospital survival.

CONCLUSIONS. Factors such as boarding time of critically ill patients from ED to ICU, direct admission to ICU, and fever are strongly related to the ICU and in-hospital mortality. There is need of faster and more effective management of these patients in EDs and readily available ICU beds.

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GRANT ACKNOWLEDGMENT. We would like to thanks all ED nurses who helped us with this survey.

0916

AN EXPERIENCE OF MEDICAL ASSISTANCE FOR DISASTER CAUSED BY THE EARTHQUAKES AND THE TSUNAMI IN JAPAN

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INTRODUCTION. On March 11, Japan received the disaster caused by the big earthquake and tsunami. The damage was serious, and tens of thousands of people died, and ten tens of thousands of people were evacuated. Furthermore, inhabitants within the range of 20 km were forced to refuge, and it was concerned about the healthy damage to the neighbourhood again by the radiation leak accident of the nuclear power plant. In this situation, an intensive care doctor and an intensive care nurse, a clinical engineering person were dispatched to Kesennuma-shi that was a stricken area as a disaster medical care support team on March 16 by our hospital in Chiba in the suburbs of Tokyo. I report this activity and consider temperament peculiar to the Japanese whom I was able to know through activity.

OBJECTIVES. It informs about the experience of medical support to the disaster with earthquake and the tsunami in Japan.

METHODS. Activity report and considerations about it.

RESULTS. On March 11, Tohoku district of Pacific earthquake was generated. On the evening of March 15, All Japan Hospital Association (AJHA) asked it for the disaster medical care support dispatch for new Tokyo Hospital. On the night of the same day, dispatch by the in-hospital volunteer staff was decided. We participate in the disaster medical assistance team by AJHA. Dispatch was decided in Kesennuma-shi, Miyagi Prefecture, that is the city proud of a large quantity of fish catches of approximately 70,000 population. The most of the city area were destroyed by the damage caused by the tsunami. More than ten thousand people who lost a house evacuated to approximately 80 places of refuges in the city. We left Tokyo on March 16 and arrived at Ichinoseki-shi next to Kesennuma-shi on the night of the same day. Next day, we gathered in the Kesennuma Municipal Hospital. In the first duty, we transported patients rescued by a helicopter from a heliport to the hospital. In an activity period of 3 days, we went around the refuges and we visited them and gave medical care. While the people endure cold and starvation, what was surprised at is that they have healthy lives while helping each other in the shelter. It seemed that the seriously ill patient was not found. But when we took time and talked with an each patient, we noticed the fact that there were various problems about their health. They are patient and bashful in front of strangers. Therefore they do not say their own true feeling immediately even if an outsider visits them suddenly. When we are not aware of their mind, it would not be discovered until a patient turns worse. Although so many people and supplies have supported, there are not yet enough. What they need would not distributed unless we do live with them.

CONCLUSIONS. The experience of medical assistance for disaster teaches us how we do with them.

0917

ANALYSIS OF POLICY OPTIONS FOR THE IMPLEMENTATION OF ICU TRIAGE IN A PUBLIC HEALTH CARE SYSTEM DURING A MASS CASUALTY EVENT

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INTRODUCTION. Several groups have published recommendations for ICU triage protocols, however, none of these groups have addressed how to actually implement these protocols within the policy or legislative framework of a civilian health care system. The aim of this project was to analyze and provide recommendations for potential policy options for implementing ICU triage in a Ontario, Canada.

METHODS. The study consisted of a literature review and qualitative analysis employing Ground Theory in semi-structured interviews. Ethics approval for the study was obtained from the ethics board at the London School of Hygiene and Tropical Medicine. Medical literature (1950–2009), "grey literature", and legislation/policy were searched using OVID Medline, Google and CanLII + Lexis/Nexis respectively. A priori inclusion criteria and criteria for assessing the quality of the papers were used.

Stakeholders were identified by constructing a network map of the key organizations. Interviews were recorded & transcribed. Following each interview emerging themes were identified and used to develop the questions in subsequent interviews. Participants were asked to identify any key organizations missing from the network map. The process was repeated until all key organizations were interviewed.

RESULTS. • Limited evidence was available from the literature to guide policy development as no other jurisdictions have previously addressed this issue.

• There was universal agreement identifying the need for government policy intervention to guide the implementation of triage as opposed to physicians triaging independently.

• Failing to provide policy direction risks significant inequities in resource allocation which could undermine both public/professional confidence resulting in a collapse of the health care system.

Recommendations for government policy intervention: • A policy solution based on a blended approach of a standard-of-care developed by the medical community, and existing powers of the Ontario Health Protection and Promotion Act should be used.

• Broad professional endorsement for the triage protocol should be obtained.

• Prepare necessary draft orders and identify triggers for the implementation of triage.

• Develop a communication strategy targeting the media, professionals, politicians and community leaders to inform them of the plans for triage.

CONCLUSIONS. Evidence obtained through this study suggests that issuing directives or orders in a pandemic without prior preparation will be seen as lacking moral authority and will likely be met with contempt or complacency. Relying upon physicians to adopt a standard-of-care for triage without Government policy direction is fraught with logistical barriers and ethical challenges. However, taken together, the two approaches could provide a practical and feasible solution.

0918

FREEZE DRIED PLASMA: A COST EFFICIENT ALTERNATIVE TO FRESH FROZEN PLASMA?

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INTRODUCTION. Current evidence seems to point towards the benefit of early plasma products in significant trauma haemorrhage at a ratio of 1:1 with packed red cells. It is clear that there is an unwanted delay in administering fresh frozen plasma to patients largely due to the process of thawing and then retrieval of the units. It is possible that lyophilised (freeze dried) plasma offers a practical and logistically appealing alternative.

OBJECTIVES. To establish the number of units and the cost of fresh frozen plasma used over a 9 month period in a busy trauma hospital, in both the emergency department and operating theatres, amongst others. This was then compared to the theoretical cost of using freeze dried plasma.

METHODS. The records kept by the hospital blood bank were analysed over a 9 month period and the numbers of units of fresh frozen plasma used by each department calculated. Overall cost was then established using standardised unit prices and staff costs (blood blank technicians and hospital porters).

RESULTS. To use freeze dried plasma instead of fresh frozen plasma in all situations and in all departments would cost the hospital £26,000 (29,700 Euros) extra over a 9 month period. However, if use was restricted to operating theatres, the emergency department and the paediatric department, the additional cost would only be £11,000 (12,600 Euros).

CONCLUSIONS. It is possible that lyophilised plasma offers a practical and logistically appealing alternative to fresh frozen plasma. Although there are cost implications, this expense could well be retrieved in terms of overall reduction in transfusion requirements and the unquantifiable benefit of reduced morbidity and mortality. Whilst currently available in Germany, freeze dried plasma is not available in the UK and many other European countries.

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0919

ATTENDANCE OF OBESE (OBESE, EXTREMELY OBESE, MORBID OBESE) PATIENTS BY THE ITLS PROTOCOL

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INTRODUCTION. By the epidemical spread of obesity, treatment of the concerned means making it more difficult in all fields of medical attendance and in emergency care as well.

OBJECTIVES. The International Trauma Life Support (ITLS) supplies seriously injured patients by standard rules. In Hungary, the National Ambulance Service educates ITLS rules from 2007, and progressively introduce them in outside attendance.

METHODS. Prehospital care workers, medical employees using standard accessories and ambulance care workers (n = 108) were asked by the authors to fill out a self- constructed questionnaire about obesity (obese, extremely obese, morbid obese) and complications caused by this during attendance. Data were obtained by descriptive statistics and correlations were analyzed.

RESULTS. EMS care workers found the supply of traumatic patient incomplete and/or not appropriate (tools of fastening, Stif neck, vacuum-mattress, Back Board, stretcher, intubating tools) if patient obese or extremely obese. Respiratory tract insurance was found problematic by 78.8% of suppliers and in addition 32.5% declared that there was no obtainable tool for respiratory tract insurance. Vacuum-mattress in proper size was missing almost by all of the patients (92.5%), and fitting stretcher (94.3%). 83.8% answered negatively to the usage of physical examination by obese patients. Difficulties of this point of the prehospital care are: heavy touchable ventral organs (76.6%) and hard auscultation because of the thick fat-tissue (23.4%). 62.5% of the respondents answered that treating of obese patients demands special protocol. On the poster, we are showing the most often occurrent problems with photos about extreme obese volunteers, as the standard care rules could be followed by apparels used by the National Ambulance Service.

CONCLUSIONS. In traumatology, extreme obese patients means special and hardly treatable group. The aim is arousing attention, as the leap of obesity, we must get ready for their full-scale attendance by introducing proper equipment and by developing a correct protocol.

0920

SPINAL CORD INJURY WITHOUT RADIOGRAPHIC ABNORMALITY (SCIWORA) IN ADULT, OUR EXPERIENCE

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[1]HGU Gregorio Marañon, Madrid, Spain, [2]Hospital Universitario 12 de Octubre, Madrid, Spain

INTRODUCTION. Spinal cord injury with no radiographic bone lesion, described as spinal cord injury without radiographic abnormality (SCIWORA), is less often reported in adults than in children. This study was undertaken to report our experience in management of this pathology over 10 years in adult population.

OBJECTIVES. Analyze the incidence of SCIWORA and know the characteristics of these patients.

METHODS. Retrospective observational case series study, collected from a third level hospital Trauma Unit database in Madrid, Spain. The study was conducted between 2001 and 2011 and reviewed twelve patients who sustained spinal cord injury with no radiographic abnormality in adult population.

RESULTS. A total of 2968 patients were admitted, 685 with spinal injury and 127 with medullary injury. Twelve cases presented SCIWORA (incidence 0.004), with a mean age of 53.3 ± 22.5 years and a male to female ratio of 4–1. All patients had severe traumatic injuries (ISS 20 ± 14), most of them caused by accidents not related to traffic (41%). All patients were assessed by emergency medical service, with very similar characteristics: 81% with GCS of 15/15, 83% presented signs and symptoms of medullary injury, 64% were hemodynamically stable and 91% without respiratory compromise, one of them requiring intubation.

Main associated injuries were craneoencephalic trauma (45%), facial trauma (27%) and thoracic trauma (8.3%). No abdominal or orthopaedic injuries were presented simultaneously. Cervical CT scan was performed within the first hours of admission in all cases, 46% described as normal and 54% with chronic lesions (SCIWORET). Magnetic resonance imaging (MRI) was also performed in 91% of cases during ICU stay. All patients presented medullary injury clinical signs, 36% complete and 54% partial (3 patients with central cord syndrome). Only one patient had complete functional recovery. The hospital average stay was 7 ± 10 days.

CONCLUSIONS. The study shows that spinal cord injury with no radiographic abnormality had a low global incidence in our population. MRI is the imaging test of choice, with diagnostic and prognostic value that demonstrates neural and extraneural injuries and helps to identify surgically correctable abnormalities.

0921

CLINICAL COURSE OF 40 PATIENTS WITH HEART FAILURE AND TRAUMA SURGERY TREATED WITH LEVOSIMENDAN

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INTRODUCTION. Heart failure is an important perioperative risk factor [1]. We report the perioperative clinical course of 40 trauma patients with severe heart failure and urgent surgery who were treated with Levosimendan at the University hospital of Vienna.

OBJECTIVES. Analyze the clinical course of our patients to be able to improve our performance.

METHODS. Heart failure was diagnosed according to the guidelines of the European society of cardiologists [2] and national guidelines [3]. Levosimendan is part of our perioperative management plan for patients with severe heart failure [4–6]. Patients were transferred to a specialized postoperative care unit.

We recorded the standardized perioperative treatment of trauma patients with severe heart failure for at least 7 days. All patients were in NYHA state 3 or 4. The mean pro-BNP Level was 14154(2500 bis 30000). 35 patients had reduced left ventricular systolic function [Simpson LVEF 25%(17–35), FS 13%(10–18%)]. Five patients had complex hemodynamic problems.

Patient characteristics	
Sex	24 m/16f
NYHA III/IV	16p/24p
BMI	24.1 (19.4–33.2)
LVF Simpson biplan	28% (17–35%)
FS	13 (10–18)
Pro-BNP	14.202 (2.000–35.000)
$ScVO_2$	50% (37–67%)
Hip fracture	80% (32/40)

RESULTS. We recorded a 30 day mortality of 32.5% (13/40). The in hospital mortality was 45% (18/40). No patient died within 24 h of the operation. 32(80%) Patients showed a reduction of pro-BNP in the postoperative period for at least 1 week.

CONCLUSIONS. We face a high mortality in patients with urgent surgery and heart failure. We have to focus our attention to patients with heart failure as our society grows older and the incidence of heart failure increases.

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0922

ASSESSMENT OF SURVIVAL MULTIPLE INJURED PATIENTS COMPARED TO THE VALUE SOME SCORING SYSTEM

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INTRODUCTION. Trauma scoring systems are divided into three broad groups: physiological, anatomical scores and a combination of both previous.

OBJECTIVES. The aim of this study is the estimated survival of patients with multiple traumas in relation to the value of individual trauma scoring systems (RTS, GCS, AIM and ISS) and APACHE II skor.

METHODS. A prospective study was conducted in the Emergency Center, Clinical Center of Serbia, in the resuscitation room and intensive care. Treated 80 patients who meet the criteria: polytraumatized patients with injury to two or more systems, respiratory and/or hemodynamic instability, altered state of consciousness of various degrees. Variables recorded included: demographic data, mechanism of injury, the vital parameters with the GCS, type and severity of injuries. Based on these data documented for each patient on admission was calculated RTS, AIS and based on ISS.U ICU was calculated APACHE II score and, the length of stay, number of surgical interventions and the occurrence of complications. Finally evaluated the degree of survival and recovery but and mortality.

RESULTS. Of the total number of patients with significant probability are represented male patients (66%), regardless of age. The most common mechanism of harming the performance of both sexes in car accidents (56.3%). Most often associated abdominal injury with limbs (in male) and chest and limbs (in female). GCS □ 9 was found in 50 injured. 31% of patients were hemodynamically unstable and 71% of respiratory insufficient. Each body region is proportionally affected equally (20–30%) but the injuries to over 50% of cases expressed the danger to life or critical. ISS □ 25 was found in 53 injuries (66.3%). The most occur complications are associated with ARDS, MODS/MOF (36%) and sepsis (36%). 60% of patients developed sepsis belonged to the group with ISS □ 50, and spent in the ICU an average of 18 days in the hospital in general 38 days. Death ended the 16 patients (20%). All patients who died had a GCS 8 or less. Most patients, almost 90% who did not survive the RTS had a serious trauma. In patients who died 93.8% had a predictor mortality □ 50 by APACHE II score.

Using *Spearman's correlation coefficient* we showed that final outcome (patient survival) is high and significant correlation (0.624) with Apache II score. Very close to this value and the correlation coefficients of the RTS (0.587) and GCS (0.592) the final outcome.

CONCLUSIONS. We have show that complex APACHE II score has a slight advantage compared to the RTS with GCS and ISS to assess the final outcome. In our conditions, use of RTS, GCS, and ISS is simpler and provides objective data on the severity of injury, while the use of APACHE II score still creates some difficulties because it requires first of all well-trained personnel for accurate record keeping and a good computer desk for computer processing.

0923

BRAIN DAMAGE BIOMARKERS ARE CORRELATED TO BRAIN TISSUE OXYGENATION IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY: A CASE SERIES

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BACKGROUND. Outcome after severe traumatic head injury (sTBI) is determined by both primary and secondary injury. Therapeutic interventions to limit secondary injury have been focused primarily on pressure goal therapy (CPP and CPP). Invasive regional measurement of brain tissue oxygen ($PbtO_2$) has been recently introduced in clinical practice as a metabolic index of regional brain O_2 supply/consumption. However, the relationship between this index and the pathogenesis of neuroinjury in human is still unexplored. We report on four patients with severe sTBI in whom we evaluated relationships between novel CSF levels of brain injury biomarkers and $PbtO_2$ (LICOX, Integra LifeScience, NJ, USA).

MATERIALS AND METHODS. $PbtO_2$ values of 4 sTBI adult patients were correlated with CSF ELISA assays level of glial fibrillary acidic protein (GFAP), Ubiquitin C-terminal hydrolase (UCH-L1) and aII-spectrin breakdown (SBDP145), every 6 h for up to 10 days post admission to the ICU. Regional brain tissue hypoxia was defined as a $PbtO_2 < 15$ mmHg. Data were analyzed with conventional non-parametric statistics.

RESULTS. CSF biomarkers concentrations were highly statistically different following episodes of $PbtO_2 < 15$ mmHg (Median GFAP 5581 vs. 92.25 ng/ml, $p < 0.0001$, UCH-L1 47.43 vs. 3.24 ng/ml, $p < 0.0001$, and SBDP145 57.65 vs. 27 ng/ml, $p = 0.05$). Furthermore, levels of GFAP and UCH-L1 and SBDP145 were significantly higher when low $PbtO_2$ was sustained (>12 h) (12,750 vs. 59.98 ng/ml, $p = 0.03$, and 441.9 vs. 4.97 ng/ml, $p < 0.03$, 231.2 vs. 22.28 ng/ml, $p = 0.06$, respectively).). Overall, CSF biomarkers were statistically higher in subjects with ≥5 events of regional brain tissue hypoxia than in those with less than five events.

CONCLUSIONS. In a small series of sTBI patients, $PbtO_2 < 15$ mmHg is associated with a significant rise in brain injury biomarkers. Our results suggest the use of neurobiomarkers as a complementary parameter to set physiologic treatment thresholds and better define pathogenesis of secondary injuries in Neurointensive Care Units. Clinical outcome correlations are in progress.

0924

ACUTE MYOCARDIAL INFARCTION FOLLOWING BLUNT CHEST INJURY IN A TERTIARY REFERRAL HOSPITAL IN QATAR

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INTRODUCTION. Atherosclerotic plaque rupture resulting in acute coronary closure is the most common underlying cause for the development of acute myocardial infarction (AMI). Rarely blunt chest wall injury or severe chest injury results in AMI.

OBJECTIVES. To evaluate the incidence, management and outcome of patients developing AMI secondary to trauma.

METHODS. All patients admitted between 1 January 2000 and 31 December 2009 to the surgical and trauma intensive care units (SICU/TICU) of Hamad General Hospital, a tertiary teaching hospital in Doha, Qatar, were evaluated for the development of AMI.

RESULTS. Six thousand two hundred eighty one (6,281) patients were admitted during the study period, nine patients were subsequently diagnosed with AMI. The majority of patients were male and 66.7% of them were younger than 45 years. One patient was having co-morbidities, 4 (48.8%) patients were smokers, 5 (55.6%) patients were involved in a road traffic accident, three were fall from height and 1 had a sport injury. All patients had blunt chest injury. The ECG changes were consistent with AMI and all patients presented with abnormally elevated cardiac biomarkers such as CK-MB and troponin. Eighty nine % of patients had wall motion abnormalities on echocardiography, correlating with the ECG findings. Injury severity score (ISS) of these patients was ranged from 4 to 60.

The main management strategy consisted of initial stabilization, optimal pain control, minimization of processes of thrombosis and prevention of AMI. Three patients had therapeutic percutaneous coronary intervention (PCI) resulting in revascularization, myocardial salvage and reversal of the ST segment changes.

CONCLUSIONS. AMI following blunt chest injury is a rare clinical entity. A high index of suspicion in patients with specific ECG changes is essential for prompt diagnosis and proper management. Associated pelvic trauma increases the risk of AMI following BCI. In patients younger than 45 years, the risk of AMI seems to be increased. AMI following BCI can occur without any co-morbidity. Specific ECG, echocardiographic wall motion abnormality with elevated CK-MB and troponin will diagnose AMI.

Management of these patients aims to stabilization, optimal pain control, minimization of processes of thrombosis and prevention of AMI.

PCI with or without stenting has been described in the literature with revascularization and reversal of the ST segment changes.

0925

TRAUMA CALLS: A RETROSPECTIVE AUDIT OF ACTIVATION CRITERIA, ATTENDANCE AND DOCUMENTATION IN A DISTRICT GENERAL HOSPITAL

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INTRODUCTION. Major trauma is the leading cause of death in the under 40 s in the West and is a major cause of permanent disability. Criteria for activation of a trauma call vary widely between hospitals, and composition of teams varies according to the size of the hospital and number of trauma cases seen each year. The Royal College of Surgeons has suggested activation criteria [1], and that trauma calls should be consultant led. The NCEPOD report [2] on trauma recommended that all traumas be recorded in standardised formats to enhance patient care and facilitate audit.

OBJECTIVES. 1. To assess the adherence to trauma call activation criteria and use of prealerts 2. To examine the attendance and documentation at trauma calls by different team members

METHOD. Retrospective study of case notes for patients who met TARN (Trauma Audit & Research Network) criteria in a District General Hospital between February 2008 and June 2009. Cases notes were reviewed with respect to four criteria: whether a trauma call was made in advance, adherence to trauma call activation criteria, attendance by specialties and grade of assessor, and finally, documentation in specified trauma booklets available in the Emergency Department.

RESULTS. 21 cases were identified and reviewed. There were no cases where the trauma call was put out but did not meet criteria. In fact 19/21 (90%) of patients had met the trauma call activation criteria, with the remaining 2/21 (10%) having no documentation. 13/21 (62%) of cases had a trauma call put out, with 6/21 (28%) having no trauma call and 2/21 (9%) no documentation. Of those trauma calls put out, 92% were prior to arrival of the patient, with the mean time difference being 21 min and a range of 3–36 min. The Emergency Department Consultant was present to lead the trauma in 42% of cases, with the Middle Grade leading in 29% cases, SHO 9% and no documentation in 19%. The Anaesthetic Registrar attended 47% of the time, with the SHO attending in 16% of cases and no one from the Anaesthetics Department attending in 36% of cases. The General Surgical Registrar was present in 55% of cases, with no documentation or no attendance in 45% of cases. The Orthopaedic team showed attendance of 26% at Registrar level, 42% by SHOs and no attendance in 32% of cases. Documentation using the specified trauma booklet was present in 11/21 (52%) of cases.

CONCLUSIONS. These preliminary findings would suggest under use rather than over use of Trauma calls. In addition, this study would suggest that attendance by more senior members of the team could be improved upon. The lack of adequate documentation is a recognised limitation for quality improvement and we propose education to staff members to encourage their use.

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0926

OUTCOME AFTER DECOMPRESSIVE CRANIECTOMY FOR THE TREATMENT OF INTRACRANIAL HYPERTENSION AFTER SEVERE TRAUMATIC BRAIN INJURY. OUR EXPERIENCE IN THE LAST FIVE YEARS

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OBJECTIVES. To report the outcome after decompressive craniectomy (CD) included as a therapy in the control of intracranial hypertension (HIC) after traumatic brain injury (TCE) with the help of the Glasgow Outcome Scale (GOS) ant the Barthel Index (BI) at discharge of ICU and after 6 and 12 months.

METHODS. Descriptive retrospective study from 01/01/06 up to 31/12/10 in adults patients (18 years and over) who underwent a DC due to uncontrolled HIC after medical therapy failure. We registered epidemiologic data, cause leading to DC, Glasgow Coma Scales (GCS) at admission, and before an immediately after DC; previous and post DC; computer tomography reports(CT); ICP monitoring prior to after DC; from admission to DC surgery time interval (in hours); destination at discharge, and GCS, GOS and BI on discharge from ICU, and 6 and 12 months later. Qualitative data are shown as percentage and quantitative as mean and standard deviation. We used exact Fisher test or Mann Witney as necessary with a maximum alfa error of 5%.

RESULTS. We collected 22 patients from a total of 410 suffering severe TBI (GCS < 8). 18 males. Age mean was 36 $\pm$ 15.3 years. Cause most frequently of TBI was precipitation (45%) and traffic accident (36.3%). The mean motor GCS at admission was 3.5 $\pm$ 1.6 and mean total GCS 6.7 $\pm$ 2.6. The CT inform at admission (Marshall classification) most frequently was stage II diffuse injury (63.6%) and the less frequent stage I diffuse injury (4.5%). In control TAC, the most frequently was stage III diffuse injury (50%) and stage II in 22.7%. We found frontotemporoparietal CD en 16 patients (72.7%). The mortality at discharge was 27.3% and at 6 and 12 months up to 36.4%. The initial mean PIC was 19 $\pm$ 11 and preCD 30.2 $\pm$ 17. Time interval in hours from admission to DC surgery was 26 $\pm$ 13. Received pentothal 14 patients. The GOS at discharge of ICU was GOS 3 in 50% of patients, GOS 2 (vegetative persistent stage) in 22.7% and death (GOS 1) in 27,3%. At 6 months, 31.8% were GOS 3, and death (GOS 1) in 36.4%. At 12 months, 27.3% were GOS 3 and GOS 1 36.4%. Only two patients were GOS 5 (goog recovery). Barthel index at discharge was severe (<40) in 90.9% of patients. At 6 months was 77.3% and 12 months 72.7%. We did not find differences on functional status (measured like GOS 4–5 or Barthel <40 points) in patients with earlier CD, neither pentothal treatment adjuvant to CD, neither type of CD. Just only Glasgow coma scale at hospital discharge were related to functional status after 12 months ($p = 0.002$).

CONCLUSIONS. Our results don't show a good functional outcome after CD as a therapy in patients suffering HIC. Prospective and multicenter studies are and have to be carried out.

REFERENCE. Rescue. ICP study. DECRA study.

AKI & RRT: 0927–0939

0927

THE OUTCOME OF NGAL-POSITIVE SUBCLINICAL ACUTE KIDNEY INJURY: A MULTICENTER POOLED ANALYSIS OF PROSPECTIVE STUDIES

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INTRODUCTION. Neutrophil gelatinase-associated lipocalin (NGAL) detects subclinical acute kidney injury (AKI) hours to days before increases in serum creatinine indicate manifest loss of renal function.

OBJECTIVES. We tested the hypothesis that, without diagnostic changes in serum creatinine, increased NGAL levels identify patients with subclinical AKI and, therefore, worse prognosis.

METHODS. We analyzed pooled data from 2,322 patients with critical illness from ten prospective observational studies of NGAL. We used the terms NGAL(−) or NGAL(+) according to study-specific NGAL cut-off for optimal AKI prediction and the terms sCREA(−) or sCREA(+) to consensus diagnostic increases in serum creatinine defining AKI. Outcomes included need for RRT, hospital mortality, their combination and duration of stay in intensive care and in-hospital.

RESULTS. Of study patients, 1,296 (55.8%) were NGAL(−)/sCREA(−), 445 (19.2%) NGAL(+)/sCREA(−), 107 (4.6%) NGAL(−)/sCREA(+) and 474 (20.4%) NGAL(+)/sCREA(+). There was a stepwise increase in subsequent RRT initiation, (NGAL(−)/sCREA(−): 0.0015% vs. NGAL(+)/sCREA(−): 2.5% [odds ratio 16.4, 95% CI 3.6–76.9, $P < 0.001$], NGAL(−)/sCREA(+): 7.5% and NGAL(+)/sCREA(+): 8.0%, respectively), hospital mortality (4.8, 12.4, 8.4, 14.7%, respectively) and their combination (four-group comparisons: all $P < 0.001$). There was a similar and consistent progressive increase in median number of intensive care and in-hospital days with increasing biomarker positivity; four-group comparisons: $P = 0.003$ and $P = 0.040$, respectively. Urine and plasma NGAL indicated a similar outcome pattern.

CONCLUSIONS. In the absence of diagnostic increases in serum creatinine, NGAL detects patients with subclinical AKI who have an increased risk of adverse outcomes.

REFERENCE. Haase M, Haase-Fielitz A, Devarajan P, et al. J Am Coll Cardiol. 2011 (accepted).

0928

ONE-YEAR MORTALITY AFTER ACUTE KIDNEY INJURY AMONG DANISH INTENSIVE CARE PATIENTS: A COHORT STUDY

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INTRODUCTION. Acute kidney injury (AKI) is associated with increased in-hospital mortality among intensive care unit (ICU) patients [1]. However, there are only few studies on long-term mortality and most have only included cohorts of ICU patients requiring acute renal replacement therapy [2].

OBJECTIVES. To examine 30-day and 1-year mortality of patients with and without AKI at ICU admission.

METHODS. We identified all adults admitted to any ICU in Northern Denmark ($\sim$ 1.15 million inhabitants) between 2005 and 2008 using the Danish National Registry of Patients. We used a laboratory database to classify each patient at ICU admission into one of three groups using the RIFLE criteria: *Risk* was defined as 50–100% increase of plasma creatinine from baseline level, *Injury* as 100–200% increase and *Failure* as an increase of 200% or more or values $\geq$354 μmol/l with an acute rise >44 μmol/l. All other ICU patients were assumed not having AKI. We followed patients from ICU admission until death, emigration or for up to 1 year. Patients with chronic kidney disease (3.9%) and patients without creatinine measurements at ICU admission were excluded (9.9%). We used Kaplan–Meier method to estimate 30-day and 1-year mortality and Cox proportional hazards regression to compute hazard ratios as an estimate of mortality rate ratios (MRRs), controlling for age group, gender, surgery prior to ICU admission, and comorbidity level.

RESULTS. We identified 19,653 ICU patients. Among the 3,585 (18.2%) patients with AKI, 1,540 (7.8%) were classified as *Risk*, 1,076 (5.5%) as *Injury* and 969 (4.9%) as *Failure*. Patients with AKI were older and had more comorbidity than patients without AKI. Additionally, patients with AKI were more often treated with mechanical ventilation and inotropic agents. The 30-day mortality was 32.4% for the *Risk* group, 40.8% for the *Injury* group and 45.6% for the *Failure* group compared with 11.4% for patients without AKI. The adjusted MRRs compared to patients without AKI were 2.4 (95% CI 2.2–2.7), 3.2 (95% CI 2.9–3.6) and 3.8 (95% CI 3.4–4.2) for the *Risk*, *Injury* and *Failure* groups, respectively.

The 1-year mortality was 45.1% for the *Risk* group, 53.6% for the *Injury* group and 58.2% for the *Failure* group compared to 20.7% for patients without AKI. The adjusted MRRs compared to patients without AKI were 2.0 (95% CI 1.8–2.1), 2.6 (95% CI 2.4–2.9) and 3.1 (95% CI 2.8–3.3) for the *Risk*, *Injury* and *Failure* groups, respectively.

Including patients without creatinine measurement at ICU admission in the group without AKI did not affect the results.

CONCLUSIONS. AKI at time of ICU admission is present in almost one fifth and associated with markedly increased 30-day and 1-year mortality compared with patients without AKI.

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GRANT ACKNOWLEDGMENT. The work was made possible through financial support from the Clinical Epidemiological Research Foundation, Denmark.

0929

ACUTE KIDNEY INJURY TREATED WITH RENAL REPLACEMENT THERAPY IN FINLAND

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INTRODUCTION. Acute kidney injury (AKI) increases mortality and length of stay (LOS) of intensive care patients. In a multinational study the period prevalence of severe AKI in non-selected intensive care patients was 5.7%, and 4% received renal replacement therapy (RRT) (1). Hospital mortality of 63% in patients who received RRT has been reported (2).

OBJECTIVES. We aimed to study the incidence of AKI treated with RRT in Finland and the mortality of these AKI-RRT patients.

METHODS. We performed a retrospective cohort study including all ICU admissions of Finnish Consortium of Intensive Care between January 1, 2007 and December 31, 2008. Detailed data on disease characteristics and patient outcomes were collected prospectively. Database comprised 9 ICU's in 5 university hospitals and the ICU's in the all 15 Finnish central hospitals. We searched the database for patients who had received RRT due to AKI. We obtained data from all ICU admissions in Finland for the same period. We excluded end-stage renal disease patients requiring dialysis (n = 351), patients with intoxication (n = 2187), patients under the age of 15 (n = 597) and readmissions (n = 2035). We used chi-square test to compare categorical data and Mann–Whitney U-test to compare continuous data.

RESULTS. We studied 25 210 admissions of whom 1686 patients received RRT due to AKI (RRT-patients). The incidence of AKI treated with RRT was 6.7% (95% confidence interval (CI) 6.4% to 7.0%) among all ICU patients, which corresponds a yearly incidence of 19.2/100 000 (95% CI 17.9 to 20.5) among ≥ 15 year-old Finnish inhabitants. The demographics and outcome of the patients are presented in Table 1. Of patients with emergency admission treated with RRT (n = 1558), 9.6% (150) had severe sepsis and 24.8% (387) had septic shock. In these patients the hospital mortality rates were 46.7% and 43.5%, respectively, which were significantly ($p < 0.001$) higher than in RRT-patients without sepsis.

Table 1. Demographic characteristics and outcome

	RRT (n = 1686)	Non-RRT (n = 23524)	p
Age	63 (52–72)	62 (50–73)	0.201
Male gender (%)	67.8	63.1	0.001
SOFA (1.d) score	10 (7–13)	6 (3–8)	<0.001
Emergency (%)	92.4	82.4	<0.001
Operative (%)	24.3	40.4	<0.001
Hospital-LOS (days)	16 (8–29)	9 (5–16)	<0.001
Hospital mortality (%)	35.0	15.7	<0.001
Six-month mortality (%), n	48.3 (670)	26.9 (4,944)	<0.001

Data expressed as median (IQR) or percentages. RRT, renal replacement therapy; non-RRT, patients treated without RRT; SOFA, sequential organ failure assessment; LOS, length of stay

CONCLUSIONS. The incidence of AKI treated with RRT in Finland was comparable to previous reports, while the hospital mortality rate in Finland seems to be lower than previously reported.

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0930

EARLY DETECTION OF ACUTE KIDNEY INJURY BY NOVEL BIOMARKERS IN ICU PATIENTS. A PROSPECTIVE FOLLOW UP STUDY

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INTRODUCTION. Neutrophil-Gelatinase-Associated-Lipocalin (NGAL) and Cystatin C (CysC) are considered to be promising novel biomarkers for the early prediction of acute kidney injury (AKI).

OBJECTIVES. The aim of the present study was to compare the predictive ability of both biomarkers for the early detection of AKI in the non-homogeneous population of a multidisciplinary ICU.

METHODS. Consecutive intubated patients admitted to the general ICU of a tertiary hospital were eligible to participate in the study. Exclusion criteria: Chronic renal failure, AKI prior to ICU admission, brain death, pregnancy, age <18, predicted ICU stay <48 h. Plasma CysC and plasma NGAL were measured within the first 24 h after ICU admission. The primary outcome was AKI development within the first 72 h after admission, according to RIFLE criteria.

RESULTS. Of the 269 consecutive patients that were initially screened, 91 patients were finally included in the analysis (age: 56 ± 19 years, 60% males, APACHE II score 15 ± 5, ICU mortality 33%) and 26% developed AKI by day 3 post-admission. NGAL and CysC were significantly higher between AKI and non-AKI patients (215 ± 172 vs. 88 ± 65, $p < 0.001$ and 1.4 ± 0.7 vs. 0.95 ± 0.4, $p < 0.001$, respectively). A multivariate logistic regression model including Creatinine, NGAL and CysC revealed a significant association between NGAL and AKI (OR 1.014, $p < 0.001$). ROC analysis revealed that the overall predictive ability of NGAL was better compared with that of Creatinine's (AUCs 0.78, $p < 0.001$ vs. 0.72, $p < 0.001$, respectively). An NGAL cut-off value of 110 ng/mL had 71% sensitivity and 82% specificity for the early AKI detection.

CONCLUSIONS. In our study, reference NGAL levels had better ability in predicting early AKI compared with reference CysC levels in critically ill patients.

0931

ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS WITH NEWLY DIAGNOSED HEMATOLOGICAL MALIGNANCY : PREDICTORS AND LONG-TERM OUTCOME. A PROSPECTIVE ANALYSIS OF 219 CASES

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INTRODUCTION. Acute Kidney Injury in hematological malignancy can be related to the disease or side-effects of the therapeutics.

OBJECTIVES. The aims of this study were to describe the epidemiology, morbidity and mortality of acute kidney injury in critically ill patients with newly diagnosed hematological malignancy.

METHODS. We conducted a prospective observational study between 11/01/2007 and 10/31/2010 in the Saint-Louis Teaching Hospital. All consecutive patients admitted to the medical ICU with a newly diagnosed hematological malignancy were included.

RESULTS. 219 patients were included in the study with a 6-month follow-up data for all patients. Median age was 48 years [14–78] and time since the diagnosis of malignancy was 5 days [0–47.7]. Main hematological malignancy were acute myeloid leukemia (30.6%), non-Hodgkin's lymphoma (26%) and acute lymphoid leukemia (10%). Reasons for ICU admission were sepsis or septic shock (29.7%), acute respiratory failure (27.9%), acute kidney injury (11.4%), metabolic disturbances (11.4%), coma (9.6%) and close monitoring (9.6%). SOFA score at ICU admission was 7 [4–11], 39.7% patients required mechanical ventilation, 41.5% vasopressors and 33.3% dialysis. Hospital mortality was 29.7% and 6-month mortality was 50%. Five variables were independently associated with hospital mortality: time from hospital to ICU admission (>2 days) (OR: 3.3 IC = [1.36–8.28], p = 0.0087), SOFA score at ICU admission (OR: 1.19 IC = [1.108–1.29], $p < 0.001$), hemophagocytosis (OR 2.91 IC = [1.1–7.7], p = 0,03), Hodgkin's disease (OR 4.5 IC = [1.1–18.7], p = 0,04), amendment to the chemotherapy regimen because of renal failure (OR 5 IC = [2.2–11.36], p = 0.0001). According to the RIFLE classification, 66% of patients had acute kidney injury secondary to one or more of the following: acute hypoperfusion (32.4%), tumor lysis syndrome (26%), acute tubular necrosis (20.5%), hemophagocytosis (13.2%), nephrotoxicity (11.4%), ureteral obstruction (3.7%), glomerulopathy (3.2%), infiltration of the kidney (2.7%), pyelonephritis (2.3%) or hemolytic uremic syndrome (0.5%). Amendment to the chemotherapy regimen because of renal failure has affected 30.5% of patients. Hospital survival was inversely correlated to the RIFLE classification (p = 0.0009). Independent risk factors for Acute Kidney Injury included: African race, hemophagocytosis, shock, platelet count <50,000/mm^3.

CONCLUSIONS. Critically ill patients with hematological malignancy had a high incidence of Acute Kidney Injury that jeopardize optimal administration of chemotherapy and increase hospital and long-term mortality. Early recognition of risk factors for acute kidney injury might improve outcome.

0932

IDENTIFICATION OF RISK FACTORS FOR ACUTE KIDNEY INJURY IN A UNIVERSITY TEACHING HOSPITAL

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INTRODUCTION. Development of acute kidney injury (AKI) is associated with worse patient outcomes for morbidity, mortality, hospital length of stay, and is a risk factor for development of end stage kidney disease. Better identification and classification of AKI and publication of the NCEPOD 2009 report "Adding Insult to Injury" has heightened awareness of its importance. Preventative strategies remain elusive.

OBJECTIVES. Simple techniques to identify those at risk could benefit early diagnosis and allow implementation of preventative strategies. Many individual characteristics have been identified as risk factors for the development of AKI but little is written to help clinicians weight these risk factors in relation to each other. To our knowledge no trusts in the UK use a 'care bundle' to stratify patients' risk of developing AKI.

METHOD. We retrospectively reviewed case notes of all 386 emergency admission to a university hospital trust during the week commencing 13th November 2009. The presence or absence of recognised risk factors for the development of AKI was recorded. RIFLE, AKIN and AKI (Bonventre) criteria were used in each case to define AKI. 89 patients (23.4%) developed AKI using one or more of these definitions. Risk factors for AKI and non-AKI groups were analysed using univariate logistic regression and subsequently multivariate logistic regression in order of their univariate importance.

RESULTS. Nine potential risk factors were identified: sepsis, IV contrast, hypertension, diuretic use, age >65 years, ACEi use, pre-existing CKD (eGFR < 60 ml/min), diabetes mellitus, NSAID use.

Identifiable risk factors for AKI

	Univariate odds ratio	Univariate p value	Multivariate odds ratio	Multivariate p value
Sepsis	4.1 (2.3–7.5)	<0.0001	4.7 (2.4–9.0)	<0.0001
Known CKD	6.6 (2.9–15.1)	<0.0001	3.6 (1.4–9.1)	0.006
Diuretic use	5.0 (2.9–8.5)	<0.0001	3.0 (1.5–5.7)	0.001
Age >65 years	3.3 (2.0–8.5)	<0.0001	1.6 (0.9–3.0)	0.122
Contrast	1.8 (2.3–7.5)	0.047	1.6 (0.8–3.1)	0.164
Diabetes Mellitus	2.5 (1.4–4.4)	0.001	1.4 (0.7–2.8)	0.271
Hypertension	2.7 (1.7–4.4)	<0.0001	1.2 (0.6–2.3)	0.605
ACE	2.1 (1.2–3.5)	0.006	1.2 (0.6–2.4)	0.642

In univariate analysis, all were associated with an increased odds ratio for developing AKI with the exception of NSAID use. In multivariate analysis, sepsis, pre-existing CKD and diuretic use remained statistically significant predictors for the development of AKI.

CONCLUSIONS. The significant effects of sepsis, diuretic use and pre-existing CKD highlight the importance of these factors in the development of AKI. Their importance may be under-recognized by clinicians. 'Classical' risk factors for AKI such as angiotensin blockade and IV contrast use played a smaller role than anticipated as risk factors for development of AKI. This may be due to increased awareness of these modifiable factors. From this data we are developing a risk stratification tool to prospectively identify admissions at risk of AKI, and potentially allow intervention at an earlier stage.

0933

DOES A DEDICATED TECHNICAL NURSE TEAM INCREASE FILTER LIFE SPAN DURING CVVH IN ICU?

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INTRODUCTION. In our ICU, the management of continuous veno-venous haemofiltration (CVVH) has moved from a dedicated technical nurse team (TNT) to the nurses who were caring the patients daily (NC).

OBJECTIVES. We aimed at looking at the effect of this organisational change on the filter life span.

METHODS. A before-after study in our 14-bed medical ICU was carried out. In the TNT period, the TNT handled all the components of CVVH, as circuit setting-up, CVVH starting, monitoring and management of problems 24 h a day. However, it was not at the bedside during the night shift. The TNT also performed other technical activities in the ICU and beyond. In the NC, all the management was performed by the NC. The switch from one strategy to the other was done after every caring nurse had completed a full CVVH training for 6 months. The main end-point was the filter life span due to circuit or filter clotting or catheter dysfunction. The secondary end-point was the other reasons for filter interruption. The following data were extracted from a database set out in 1994 and prospectively filled for every filter in every patient: patients' characteristics, filter life span, reason for failure, site and kind of vascular access, filter characteristic, anticoagulation, CVVH machine, CVVH mode. These variables were compared between the two periods. A Cox proportional hazard model with mixed effects was used to adjust the effects of covariates on filter life span by taking into account the patient.

RESULTS. The TNT period lasted from January 2004 to june 2006, the training period from June 2006 to December 2006, and the NC period from June 2007 to December 2009. In the TNT period, 124 patients were enrolled totalizing 833 filters and in the NC period these numbers were 154 and 1,467, respectively. The two periods were similar for patients' gender, age, SAPS2, Charlson's comorbidity score, end-of life decision, Rifle score, blood urea at time of CVVH onset, ICU length of stay and mortality rate. Circuit or filter clotting or catheter dysfunction was the main cause of CHHV interruption in both periods but was more common in the TNT period then in the NC period (65.2 vs. 51.8%, $P = 0.0001$). The median life span was 15.67 h (95% CI 15.64–17.70 h) in the TNT period and 17.17 (15.59–18.74) hours in the NC period ($P > 0.05$). The Cox's model identified two covariates independently associated to higher filter life span: Prismaflex as compared to Prisma machine and haemodiafiltration mode as compared to hemofiltration mode. The TNT or NC was not an independent and significant factor of filter life span.

CONCLUSIONS. The NC team is efficient to manage CVVH in the ICU. This could allow the TNT to concentrate on other technical activities in the ICU and beyond.

0934

SYSTEMIC LOAD OF CITRATE, PERFORMANCE AND EFFICIENCY OF CONTINUOUS HAEMODIAFILTRATION UNDER 2.2% ACD AND 4% CITRATE - COMPARATIVE STUDY OF TWO ALGORITHMS

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INTRODUCTION. Citrate anticoagulation is associated with metabolic side effects which are linked to a portion of citrate reaching systemic circulation. Data on significance of systemic gain of citrate and its relationship to method configuration are missing.

OBJECTIVES. Systemic gain of citrate and performance of CVVHDF was compared between patients anticoagulated with 2.2% citrate (ACD Fenwal, Baxter, $n = 29$) using calcium containing solution (1.9 mmol/l, Baxter E2), patients on 4% citrate (GML Czech Republic, $n = 34$) using calcium free bags (Citralysate, GML, Czech Republic) and control group on unfractioned heparin ($n = 18$). All were treated with CVVHDF, Baxter Aquarius, polysulfone filters Aquamax 1.9 m^2.

METHODS. Citrate was titrated in increments to maintain the postfilter Ca^{2+} less than 0.4 mmol/l. Samples were taken from central venous catheter, ports pre and post filter and from dialysate/filtrate 24 h after commencing with CRRT (T0) and 60 min later (T1). The settings were kept constant between T0 and T1. Citrate levels were measured with capillary zone electrophoresis.

RESULTS. The mean blood flow (Qb) in ACD group was 165 ± 25 ml/min, dialysis (Qd) 1,414 ± 464 ml/h, haemofiltration (HF) 718 ± 375 ml/h. Mean Qb in 4% citrate was 114 ± 18 ml/min, Qd 1545.5 ± 261 ml/h, HF 376 ± 349 ml/h. Heparin controls were running on Qb 164 ± 21 ml/min, Qd 1,194 ± 649 ml/h, HF 724 ± 734 ml/h. For the same endpoint of postfilter Ca^{2+} the mean dose of ACD prefilter was 41.5 ± 10.1 mmol/h (367.5 ± 89.0 ml/h) compared to the mean of 23.6 ± 3.7 mmol/h (175.1 ± 27.4 ml/h) of 4% citrate ($p < 0.0001$). Dose of citrate in relation to blood flow was 4.35 ± 0.97 mmol/l h in ACD group versus 3.52 ± 0.65 mmol/l h ($p < 0.0001$). Calculating the mean costs of citrate showed savings on citrate in 4% group (1.40 ± 0.22 Eur/h vs. 3.91 ± 0.51 Eur/h in ACD). Mean systemic gain of citrate was 14.4 ± 4.4 mmol/h in 4% group compared to 28.8 ± 7.7 mmol/h in ACD patients ($p < 0.0001$). A small loss of endogenous citrate (−0.26 ± 0.27 mmol/h, $p < 0.0001$) was found in the heparin controls. Median filter survival in 2.2% ACD was 55.5 h (interquartile range 38.5–74), which was similar to 4% citrate with 57.0 h (31.0–98.5) and longer than filter longevity in heparin (38 h, 30–51, $p < 0.02$). Only one patient of ACD group (4.3%) and one (3.0%) of 4% group showed metabolic alkalosis, rates of dysnatremias or bleeding were zero in both citrate groups.

CONCLUSIONS. Requirements for citrate dosage prefilter are much higher if calcium containing solutions are used resulting in higher citrate circuit concentrations and higher systemic citrate gain. Savings on 4% citrate may justify use of more expensive calcium free solutions.

0935

AKI PATIENTS WITH POOR PERIPHERAL PERFUSION SHOW HEMODYNAMIC INSTABILITY DURING CRRT FLUID WITHDRAWAL

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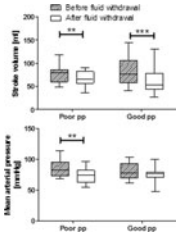
INTRODUCTION. Fluid therapy is one of the cornerstones of hemodynamic management in critically ill patients and as such an important strategy to play a role in the prevention of acute kidney injury (AKI). However, fluid overload is frequently encountered in these patients, which is associated with a poorer prognosis as well. The goal of renal replacement therapy in these patients is to reduce fluid overload yet without inducing hemodynamic instability. We investigated the value of peripheral perfusion parameters for the prediction of hemodynamic instability during CRRT fluid withdrawal.

METHODS. Consecutive patients with AKI receiving CRRT were included in our study. Mean arterial pressure (MAP), heart rate, pulse contour-derived cardiac output (CO) and stroke volume (SV) (PiCCOplus®) were measured continuously during fluid withdrawal. Peripheral perfusion parameters were measured continuously with forearm-to-finger temperature gradient ($T_{skin\text{-}diff}$) and finger photopletysmography (peripheral flow index). A protocol was followed where net fluid withdrawal was doubled every 15 min starting with 100 ml/h with a maximum of 1,000 ml/h until stroke volume decreased by >20% or MAP decreased below 60 mmHg.

RESULTS. Data is presented as median [IQR]. 25 patients (M/F 15/10, age 52 [38–72] years, APACHE II 25 [19–33], SOFA 13 [11–15], fluid balance 14.5 l [8.4–21.5], 92% mechanical ventilation) were included in our study. Patients were divided in either poor or good peripheral perfusion based on a peripheral flow index threshold of 1.4. At baseline there were no differences in hemodynamic and general characteristics. A median volume of 1,500 [750–2,250] ml was withdrawn. In both groups CO and SV decreased significantly, however only in the patients with poor peripheral perfusion MAP decreased significantly as well (Graph 1).



[Graph 1]

CONCLUSIONS. CRRT fluid withdrawal leads to a significant and uniform decrease in circulating volume in patients with AKI. In patients with good peripheral perfusion at baseline UF is hemodynamically well tolerated, while in patients with poor peripheral perfusion hemodynamic instability occurs.

0936

ONSET OF NORMOTENSIVE ISCHAEMIC ACUTE KIDNEY INJURY AMONG MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. The need for minimally invasive bedside tools, which can help to assess volume status and potentially prevent new onset or worsening acute kidney injury necessitated this prospective, cohort study.

OBJECTIVES. Our aim was to integrate the information obtained by brain natriuretic peptide (BNP) and bioimpedance vector analysis (BIVA) measurements with conventional hemodynamic and oxygenation parameters in accurate assessment of hydration status and its relationship with new onset or worsening acute kidney injury (AKI) among unselected mechanically ventilated critically ill patients.

METHODS. We enrolled a cohort of 27 mechanically ventilated critical care patients applying RIFLE criteria for kidney function upon which patients were categorized as, Group I: normal kidney function or non-worsening of established AKI and Group II: new onset or worsening of established AKI. Clinical variables measured were: central venous pressure, mean arterial pressure, urine output, daily fluid balance, use of vasopressor medication, hematocrit, arterial oxygen tension/fractional inspired oxygen ratio and Sequential Organ Failure Assessment score. In parallel, bioimpedance vector analysis, blood brain natriuretic peptide and neutrophil gelatinase-associated lipocalin levels were monitored at the bedside. The follow-up time was 3 consecutive days

RESULTS. 11% of the patients indicated some degree of AKI at the time of ICU admission, and 26% developed new or worsening AKI during the study period. Patients in Group II were older, and more likely to be female with a history of hypertension. Baseline (Day 1) mean arterial pressure in patients without AKI versus new onset or worsening AKI was 93 (84; 105) versus 73 (64; 80) mmHg ($p = 0.003$). Using relative risk regression, with new onset or worsening AKI as the outcome variable and factors proven significant in univariate analyses, only mean arterial pressure at Day 1 was significantly associated with outcome. For every 1 mmHg increase in MAP, the risk of developing AKI decreased by 4.4% [95% confidence interval (CI) 1.6–7.1%, $p = 0.002$]. This association was independent of age, gender, history of hypertension, SOFA score, other conventional hemodynamic and oxygenation parameters, use of vasoactive drugs, BNP and BIVA measurements.

CONCLUSIONS. The so called normotensive acute kidney injury can occur, and there is an association between relative hypotension and new onset or worsening AKI—classified by RIFLE criteria—among a mechanically ventilated, unselected group of critically ill patients. This study could not support that BNP or BIVA alone are useful methods to assess and distinguish fluid status among a mechanically ventilated critically ill patients. Greater attention must be paid to the avoidance of relative hypotension to prevent new onset or worsening AKI and its consequences among mechanically ventilated critically ill patient.

0937

ACUTE KIDNEY INJURY AND OUTCOMES IN ISCHEMIC CARDIOMYOPATHY: EVALUATION OF THE RIFLE CRITERIA

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INTRODUCTION. There is little information about acute kidney injury (AKI) in patients (P) with acute coronary syndromes (ACS). The Risk, Injury, Failure, Loss, End stage (RIFLE) criteria have recently been established as the standard method for evaluating AKI in critically ill P, but have not been tested in the setting of ACS.

OBJECTIVES. Evaluate the association between ACS outcomes and AKI evaluated by RIFLE criteria.

METHODS. Retrospective study of 506 P (68% male, age 67.2 ± 13.7 years), consecutively admitted for ACS to a Coronary Unit. AKI was classified according to RIFLE criteria. Mortality (M) was assessed at follow-up (FU) (7.5 ± 5.2 months). Uni and multivariate analysis was performed using SPSS 17.0.

RESULTS. AKI occurred in 184 P (36.4%), with the following RIFLE class distribution: 137 (74.5%) Risk, 25 (13.6%) Injury and 22 (11.9%) Failure. The factors at admission associated with AKI were: female gender ($p = 0.003$); older ages (72 ± 12 vs. 65 ± 14; $p < 0.001$); diabetes mellitus ($p < 0.001$); high blood pressure ($p < 0.001$); chronic heart failure (HF) ($p = 0.018$); chronic renal disease ($p = 0.022$); acute HF (KK ≥ 2) (41.3 vs. 16.1%; $p < 0.001$); cardiogenic shock (11.4 vs. 2.2%; $p < 0.001$); higher levels of BUN ($p < 0.001$), creatinine (115 ± 63 vs. 93 ± 44; $p < 0.001$) and NT-pro-BNP ($p = 0.003$); lower glomerular filtration rate (MDRD) (62 ± 28 vs. 80 ± 26; $p < 0.001$) and haemoglobin ($p < 0.001$). There were no differences in the incidence of coronariography or angioplasty. P with AKI had more extensive coronary artery disease (number of segments evolved); higher incidence of diastolic dysfunction ($p < 0.001$), mitral regurgitation ($p = 0.031$) and a trend towards higher incidence of left ventricular dysfunction (EF < 40%; $p = 0.087$). They also had longer hospitalizations (6.7 ± 5.6 vs. 4.7 ± 2.1; $p < 0.001$); more frequently were discharged with the diagnosis of new HF (38.7 vs. 16.9%; $p < 0.001$); had higher M both in-hospital (13 vs. 2.5%; $p < 0.001$) and during FU (17.6 vs. 3.9%; $p < 0.001$). In P with AKI there was an association between RIFLE class (Risk vs. Injury vs. Failure) and the duration of hospitalization (5.8 ± 4.8 vs. 8.4 ± 6.4 vs. 10.2 ± 7.4; $p = 0.001$), in-hospital M (4.4 vs. 28 vs. 50%; $p < 0.001$) and M in the FU (14.1 vs. 33.3 vs. 42.9%; $p = 0.027$). In multivariate analysis, AKI stratified by RIFLE adds prognostic value to Grace Score regarding M both in-hospital and during FU.

CONCLUSIONS. AKI is common in P with ACS and as expected has negative impact on prognosis. Its stratification according to RIFLE allows us a more accurate determination of its prognostic importance, showing that the severity of AKI is even more important than its mere occurrence, being an independent predictor of M.

REFERENCE. Eur J Heart Fail. 2010;12:32–37; Kidney Int. 2008;73:538–546.

0938

THE BEST PREDICTOR OF CARDIORENAL SYNDROME IN ISCHEMIC CARDIOMYOPATHY

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INTRODUCTION. Acute renal dysfunction has an unquestionable negative impact on prognosis of patients (P) with acute coronary syndromes (ACS).

OBJECTIVES. The purpose of this study was to determine the prevalence of cardiorenal syndrome (CRS) in P with ACS, its best predictor and prognostic importance.

METHODS. Prospective study of 368 P (66.6% male, age 66.8 ± 13.8 years), admitted for ACS to a Coronary Unit, along 16 months. CRS was defined as an increase in serum creatinine ≥26.5 μmol/L. Demographic, clinical and analytical parameters; development of new heart failure (HF); severity of coronary artery disease (CAD) and in-hospital (IH) mortality (M) were compared. A follow-up (FU) (7.1 ± 5.3 months) concerning mortality was performed.

RESULTS. CRS occurred in 93 P (25.8%). The factors at admission associated with CRS were: older ages (73 ± 12 vs. 65 ± 14; $p < 0.001$); diabetes ($p < 0.001$), hypertension ($p < 0.001$), chronic HF ($p = 0.001$), chronic renal failure ($p < 0.001$); higher levels of BUN (12.4 ± 11.5 vs. 7.3 ± 3.6; $p < 0.001$), creatinine (147.7 ± 135.0 vs. 86.9 ± 27.7; $p < 0.001$), cystatin-C (Cys-C) (1.57 ± 0.9 vs. 0.87 ± 0.3; $p < 0.001$) and NT-pro-BNP ($p < 0.001$); lower glomerular filtration rate (GFR, calculated with MDRD) (57.7 ± 30.6 vs. 80.6 ± 24.6; $p < 0.001$) and haemoglobin (12.7 ± 2.0 vs. 13.9 ± 1.8; $p < 0.001$). No association was found between CRS and sex, blood pressure at admission and troponin. In multivariate analysis Cys-C was the best predictor of CRS ($p < 0.001$). Among P who developed CRS 33.3% had normal creatinine and 22.6% normal GFR although high Cys-C. P who developed CRS were treated with higher daily doses of intravenous (iv) furosemide ($p < 0.001$); required more often iv inotropes ($p < 0.001$), intra-aortic balloon pump ($p = 0.005$) and renal replacement therapy ($p < 0.001$). Those P had higher GRACE risk score ($p < 0.001$); longer hospitalizations (7.6 ± 5.5 vs. 4.7 ± 2.9, $p < 0.001$); higher incidence of acute HF (KK ≥ 2; $p < 0.001$); more extensive CAD (number of vessels and segments evolved); more frequently were discharged with the diagnosis of new HF ($p < 0.001$) and had higher mortality both IH ($p < 0.001$) and in FU ($p < 0.001$).

CONCLUSIONS. Worsening renal function is common in ACS P and as expected has a negative impact on prognosis. In this study, Cys-C is the parameter at admission that best predicts cardiorenal syndrome, being able to identify the high risk P among those with normal GFR. This work highlights the importance of preventive measures of renal injury in parallel to the treatment of ACS and the importance of biomarkers, such as Cys-C, able to identify the P at risk.

REFERENCE. Arch Intern Med. 2008;168(9):987–995; Clin Biochem Rev. Vol 29 May 2008; N Engl J Med, 2004;351:1285–95.

0939

ACUTE RENAL FAILURE IN INTENSIVE CARE UNIT PATIENTS: CAUSES, OUTCOME, AND PROGNOSTIC FACTORS FOR ICU MORTALITY; A PROSPECTIVE, 9-YEAR STUDY

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OBJECTIVES. To describe the epidemiology of acute renal failure (ARF) in intensive care unit (ICU), defining causes, outcome and prognostic factors for death.

METHODS. Prospective, observational, single center (polyvalent ICU) study. All patients with ARF admitted in the ICU in 9 consecutive years were included. ARF was defined with: serum creatinine ≥1.2 mg/dL or urine-output <500 ml/24 h (or <180/8 h) or need for renal replacement therapy (RRT). Patients with chronic renal failure were excluded. Age, sex, type of ARF, APACHE II and SAPS II on ICU admission, reason for admission, clinical parameters (hemodynamic data, inotropes/vasoactive agents, mechanical ventilation), RRT, 24 h urine-output, laboratory values and blood gases were recorded. All parameters were analyzed with stepwise logistic regression analysis (SPSS, V. 15.0) for the estimation of risk factors for ICU death [odds ratio (OR), 95% confidence interval (CI), $p < 0.05$ was considered statistically important].

RESULTS. ARF was diagnosed in 200 of 3387 admitted patients (5.9%), 146/200-73% had ARF on ICU admission. Reasons for ICU admission were: respiratory (66/200-33%), hemodynamic (32/200-16%), severe sepsis-septic shock (33/200-16.5%), surgery (24/200-12%, vascular surgery 16/24-66.7%), abdominal pathology (17/200-8.5%), metabolic (7/200-3.5%), neurological (5/200-2.5%) and polytrauma 3/200-1.5%). 111/200-55.5% patients presented prerenal, 75/200-37.5% renal and 14/200-7% postrenal ARF. Mean age was 68 years (range 50–75), men 100/200-50%, APACHE II (mean value) 20.41 ± 6.44, SAPS II (mean value) 53 ± 18.23. 125/200-62.5% patients had creatinine ≥1.8 mg/dl, 95/200-47.5% pH ≤ 7.3, 100/200-50% HCO_3 < 20, 144/200-72% Ht < 35%, 152/200-76% received inotropes/vasoactive agents, 168/200-84% were mechanically ventilated, 138/200-69% had urine-output >500 ml/24 h and 73/200-36.5% received RRT. 100/200 (50%) patients died in the ICU, among the patients with RRT, 38 (52%) died as well. In multivariate analysis, SAPS II (OR 1.039; 95% CI 1.018–1.061, $P < 0.01$), inotropes/vasoactive agents on ICU admission (OR 2.533; 95% CI 1.137–5.644, $P = 0.023$) and pH < 7.30 (OR 2.632; 95% CI 1.359–5.097, $P = 0.01$), were statistically related to ICU death.

CONCLUSIONS. Mortality in ICU patients with ARF remains high. SAPS on admission, hemodynamic instability and acidosis are important risk factors for death and should be taken into consideration when studying ICU patients with ARF.

Technology evaluation 2: 0940–0953

0940

COMPARISON OF CIMON-DERIVED CONTINUOUS TRANSGASTRIC INTRA-ABDOMINAL PRESSURE MEASUREMENT WITH INTRA-VESICAL AND INTRA-PERITONEAL MEASUREMENTS IN PATIENTS WITH TENSE ASCITES DURING PARACENTESIS

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AIMS. Increased IAP in critically ill patients is a well recognized cause of significant morbidity and mortality. In diagnostics the intra-vesical pressure measurement is postulated to be the gold standard. Major drawbacks are the intermittent nature of the method and measuring errors due to zero-reference leveling of fluid based systems. This study compared the CiMON-device, a continuous intra-gastric IAP measuring appliance (IGP), with both intra-peritoneal (IPP) and intra-vesical pressure (IVP) measurements.

METHODS. IAP was measured before, during and after 23 paracenteses in 11 patients with tense ascites in an ICU of a university hospital. IVP was detected using a pressure transducer with bladder instalment of 25 ml saline(2). IGP was identified via the CiMON-Device. IPP was measured directly through the paracentesis catheter using a scaled CVP gauge. IVP/IPP measurements were zero-leveled at the midaxillary line. Measurements were performed simultaneously prior to paracentesis and after each 500 ml of drained ascites.

RESULTS. Mean values of IAP at the start of paracentesis measured by IVP (13.7 ± 3.3), IPP (13.5 ± 3.4) and IGP (12.4 ± 3.2) were not significantly different ($p = 0.138$ for IVP vs. IGP; $p = 0.665$ for IVP vs. IPP and $p = 0.139$ for IGP vs. IPP). Similarly, at the end of paracentesis mean values of IAP were not significantly different when measured by IVP (6.4 ± 4.3), IPP (6.3 ± 3.0) and IGP (7.0 ± 4.3); ($p = 0.6$ for IVP vs. IGP; $p = 0.898$ for IVP vs. IPP and $p = 0.486$ for IGP vs. IPP). All methods demonstrated a significant decrease in IAP after paracentesis with a mean difference of 7.3 ± 4.0 ($p < 0.001$) for IVP, 7.2 ± 2.7 ($p < 0.001$) for IPP and 5.6 ± 3.2 ($p < 0.001$) for IGP. The decrease in IAP measured by the three methods significantly correlated: ΔIVP vs ΔIPP (rs 0.627; $p < 0.01$), ΔIVP versus ΔIGP (rs 0.567; $p < 0.01$) and ΔIGP versus ΔIVP (rs 0.482; $p < 0.05$). Assuming IVP as the gold-standard for IAP, mean Bias and the ULLOA between IGP and IVP at baseline were −1.3 (+7.9) mmHg with IGP underestimating IVP. Mean Bias and ULLOA between IPP and IVP were −0.3 (+5.7) mmHg with IPP underestimating IVP. The bias between IVP and IGP was significantly greater in patients with spontaneous breathing compared to those ventilated (3.66 + 2.96 vs. −0.32 +3.80 mmHg; $p = 0.016$) suggesting that spontaneous breathing might decrease IGP. ROC-analyses regarding "decrease in IVP > 4 mmHg after paracentesis" provided great and significant AUCs for both IPP (AUC 0.961; $p < 0.001$) and IGP (AUC 0.844; $p = 0.007$).

CONCLUSIONS. Paracentesis results in a significant decrease of IAP which is reliably detected by all three methods. The bias of IPP and IGP in regard to the IVP as gold standard was low, but ULLOAs show a certain dispersion of the different techniques. Regarding the CiMON, there might be an impact of spontaneous breathing significantly lowering the IGP compared to IVP. In summary, the CiMON device is a promising and straightforward technique to measure the IAP.

0941

NOVEL APPROACH TO MEASURE EXTRAVASCULAR LUNG WATER (EVLW) USING TRANSPULMONARY ULTRASOUND-THERMAL DILUTION (TUTD) METHOD

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INTRODUCTION. Measurement of EVLW is important in the management of critically ill, especially in patients (pts) with acute lung injury (ALI). Novel HCM101-L (Transonic Systems Inc, NY, USA) offers a minimally invasive approach to measure EVLW and other hemodynamic parameters in ICU by TUTD. Two indicators used by HCM101-L for EVLW measurement are thermal (diffusible) and saline (non-diffusible) indicators.
OBJECTIVES. Aim of the study was to compare EVLW measured by TUTD with EVLW measured by transpulmonary thermodilution (TTD) using single thermal indicator (PiCCO).
METHODS. 34 adult pts with sepsis and ALI were studied per the approved protocol. The severity of their disease by APACHE II score was 29.5 ± 6.2. Twenty six pts patients were mechanically ventilated, 5 pts were noninvasive ventilated and 6 pts breathed spontaneously. All pts had a central venous catheter and PiCCO femoral artery catheters. Cold saline (20 ml) was injected to obtain EVLW by TTD. For TUTD EVLW measurements, an extracorporeal AV loop was connected between the in situ catheters in the pt. A thermistor was incorporated into the AV loop such that the withdrawn blood is first sensed by the inline thermistor and then by the ultrasound sensor on the arterial side. Two body temperature isotonic saline injections (30 ml) and then 2 cold saline (30 ml) injections were performed for TUTD measurements. Difference between the mean transit time of the diffusible indicator (measured by thermistor) and the non-diffusible indicator (measured by ultrasound sensor) and the CO measurement is used to measure EVLW.
RESULTS. Total 61 EVLW comparisons were performed and a correlation of R = 0.48 was found. Correlation between cardiac output measured by TTD vs TUTD was found to be R = 0.95 in an analogous study [1].

Comparison of EVLW and EVLWI measurements

Parameter	EVLW range (ml)	EVLW mean ± SD (ml)	EVLWI range (ml/kg)	EVLWI mean ± SD (ml/kg)
TTD	495–1,700	1,090 ± 290	6.2–29	15.4 ± 4.9
TUTD	440–1,810	1,040 ± 310	5.9–26	14.6 ± 4.3
Bias		49		0.81
% Error (2SD/mean)		62		

CONCLUSIONS. First comparison of EVLW measured by PICCO and HCM101-L produced close readings in average values, but relatively low correlation was found between them.
REFERENCES. Galstyan G, et al. Intensive Care Med. 2010;36(12):2140–4.

0942

BASIC AND OPTIONAL REQUIREMENTS FOR CLINICAL INFORMATION SYSTEMS IN ICU. PROPOSALS OF A PANEL OF EXPERTS COMMITED BY THE SPANISH NATIONAL SOCIETY OF INTENSIVE CARE MEDICINE (SEMICYUC)

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INTRODUCTION. Clinical Information Systems (CIS) are becoming a useful tool to manage patients and data in the ICU. However, the CIS solutions currently available in the market differ in the capabilities and technical requirements. As such, it is absolutely necessary that intensivists, as final customers, define the suitable minimum requirements necessary to ensure the solutions are operative and helpful.
OBJECTIVES. The Spanish Society of Intensive Critical Medicine and Coronary Units, through its Workgroup of Organization and Management, has commissioned a group of both clinical and informatics experts to write a document with technical and operating requirements identifying necessary features in these systems.
METHODS. The group consisted of ten people (eight doctors, one of them an IT engineer, and two nurses), recognized experts in the use and application of the CIS. The group was assisted by managers or engineers from the five principal industries manufacturing CIS in Spain. The project included the following phases: (a) Completing a check list (modified from a Canadian questionnaire) for the five systems: MetaVision—IMD Soft™, Intellivue—ICIP Philips™, Centricity—General Electric Health Care™, Innovian—Draeger™, Critical Care Manager—Picis™. This step was considered necessary to determine the current disposition of the CIS industry. (b) Discussing the results, grouping the requirements in four sections: technical, functional, safety and data management. Each requirement was classified as either basic or optional to allow final users to choose between different options. (c) Compiling and presenting the results to the SEMICYUC Scientific Committee, and to the Industry.
RESULTS. The requirements in four sections are expressed in Tables I, II and III.

Item	Basic	Optional
Data transmission	• HL7 protocol or any other that ensures intercommunication	• Meet IHE standards • Meet CDA standards • Re-map HL7 messages • Data summaries in XML format
Architecture	• Data access from multiple locations • Simultaneous data mining: Data should be available for use within the application and for reporting simultaneously • Possibility of having access to the parametrization of all functions, depending on the user's skill level	• Service-oriented architecture • Access to other applications in a direct way, without passwords if possible
Functional modules	• Specify type and number of independent modules	
Fault tolerance and crisis	• Backup protocol and ability to recover data generated during a fault. • Possibility of correcting erroneous data with appropriate audit trails.	• Ability to resend interface messages following a failure. • See previous information from patients through local cache or redundant network architecture
Performance	• Short response time • The hospital needs to ensure sufficient servers, bandwidth and network • Maintenance shouldn´t affect response time	• Mirrored servers, clusters, virtualization, load balancing

[Technical Requirements]

Item	Basic	Optional
Pharmacy orders	• Configurable pharmacy drug index (group, name, presentation, dose, route) • Notification of potential conflicts with allergies	• Edit without making a new order • Alarms for interactions, clinical criteria, pharmaceutical or laboratory anomalies.
Devices connection	• Monitors, ventilators, cardiac output monitors, pumps (to the lowest rate)	• Pumps: pharmacy drug index, with doses and volumes • Hemodialysis • Discrimination and filtering of anomalous and incorrect imported data • Create Alarms regarding anomalous and
		incorrect data
Protocols	• Medical and nursing protocols for each patient type Includes assessments/nursing care, medication, fluids and scores • Create protocols based on triggers from pre-determined guidelines.	• Flowsheets with daily issues and objectives
Alarms and Notifications	• Allergies • Clinical or laboratory critical values exceeding a pre-determined range.	• Sentinel indicators that show protocol deviations or important guidelines • Deviations of quality indicators • Potential adverse effects • Simple programming like 'if... then...' • Data transmission to wireless devices
Reporting	• Reports production tool • User friendly configuration and use (also for the administrator) • Export of key data to the HIS	• Import fields straight from the CIS to the reports template • Export to external data bases through accepted specific formats

[Functional requirements]

Parameter	Basic	Optional
Data analysis	• Data analysis and search tool • The data analysis solution can be a third-party application, but it will always be supplied by the provider • Ability to drill into high level "dashboard" data	• Reports on key quality indicators • Ability to export original data to a Data warehouse. The ability to extract, refine and generate reports and models
Accesses	• Password and user identification with defined expiration periods • Ensure password strength • Access levels or different rights	• Unsuccessful access log • PKI (Personal Key Identifier) using smart cards
Application	• Backdoor lock • Data confidentiality protocol for maintenance tasks • Only administrators can edit and update databases	• Encryption without reporting limitation
Remote access	• With private or virtual networks • Personal devices connectivity (phones, PDA) via secure networks	

[Database and security requirements]

CONCLUSIONS. Issues such as data management, patient safety and report generation were considered critical. They show room for improvement through specific modules and programation tools. These instruments should be integrated in CIS or offered as a pack to customers.
GRANT ACKNOWLEDGMENT. This work has been granted by SEMICYUC.

0943

EFFECTS OF NOREPINEPHRINE ON FOUR DIFFERENT CONTINUOUS CARDIAC OUTPUT SYSTEMS USING THE FEMORAL AND RADIAL ARTERIAL PRESSURE WAVEFORM IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Pharmacological alterations of the arterial blood pressure waveform (ABPW) can affect arterial pressure-based cardiac output systems (APCOs) independently of stroke volume. However, the morphology of the ABPW can vary between femoral or radial arteries especially in hypovolaemic patients or requiring high-dose vasopressors. We assessed the agreement between the CCO derived from the femoral vs radial artery during a 'double-pump' norepinephrine manoeuvre (NEDP) using four APCOs (PiCCO, LiDCO, PRAM, Vigileo v03.02.pic).
METHODS. Comparisons were performed in nine ICU patients before, during and after NEDP. The recorded both radial and femoral ABPW were played back in each APCOs to calculate CCO.
RESULTS. Bland-Altmann analysis of the ABPCOs (Femoral-Radial) before, during and after NEDP is shown as [bias (L/min), limits of agreement (LOA)]. **LiDCO.** Before [−0.06 (−0.5 to +0.38]; During [0.13 (−0.94 to +0.67)]; After [0.25 (−1.1 to +1.6)] **PiCCO.** Before [−0.03 (−0.53 to +0.47)]; During [0.8 (−1.9 to +3.4)]; After [0.24 (−1.0 to +1.4)] **PRAM.**; Before [−0.2 (−3.4 to +3.9)]; During [0.1 (−3.7 to +3.9)]; After [0.5 (−3.8 to +4.8)] **Vigileo.** Before [−0.54 (−0.89 to +2.0)]; During [0.5 (−2.2 to +3.2)]; After [0.4 (−1.9 to +2.8)].
CONCLUSIONS. ABPCOs can give potentially large differences in CCO when ABPW is obtained from different arterial sites particularly during rapid changes in vasopressors and in uncalibrated systems.

0944

ASSESSMENT OF SEALING PROPERTIES OF ENDOTRACHEAL TUBE CUFFS: AN IN VITRO STUDY USING A SUBGLOTTIC SECRETIONS SIMULANT

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INTRODUCTION. Studies have shown that endotracheal tubes (ETT) comprising high-volume low-pressure cuffs do not avoid leakage of subglottic secretions. New cuff shapes and materials are under investigation.
OBJECTIVES. In this work we compared in vitro sealing properties of the ETTs most commonly used in critical care settings.
METHODS. We studied two polyvinylchloride (PVC) cylindrical cuffs: 1. Rüschelit® Safety Clear plus and 2. Mallinckrodt Hi-Lo™; four PVC tapered cuffs: 3. Smiths-medical Blue Line® Profile™ Soft-Seal® and 4. Sacett™, 5. Mallinckrodt Taperguard™ and 6. Hudson RCI® Sheridan HVT; and one polyurethane (PU) cylindrical cuff: 7. Kimberly-Clark Microcuff. A PVC tracheal model of 18, 20 and 22 mm of internal diameter (ID), obliquely oriented 30°, was used to test ETTs of 7.0, 7.5 and 8.0 mm, respectively. Cuff pressure was maintained at 30 cm H_20. A subglottic secretions simulant was instilled to create a 5 cm hydrostatic pressure above the cuff. 60 min-leakage, as a percentage of the instilled volume, and leakage flow rate were assessed.
RESULTS. We performed 42 tests, 6 for each ETT type. The overall median of leakage percentage and flow rate was 100% [84–100] and 0.76 [0.01–2.67] ml/min, respectively. All ETT types, except types 5 and 7, had 100% leakage of the instilled volume (P < 0.001). ETT 5 and 7 leaked 84% [30–100] and 16% [03–30], respectively. The results for the leakage flow rate are shown in figure 1.

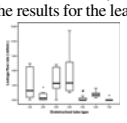

Figure 1

Kruskal–Wallis test (P < 0.001). *Post-hoc* analysis, Bonferroni's correction: ^ P = 0.002 vs. 4; # P = 0.002 versus 4 and * P = 0.002 versus 1, 2, 3, 4 and 6.
CONCLUSIONS. ETT cuffs made of PU show the best sealing properties. A great variability in leakage flow rate is reported between cuffs made of PVC. Importantly, depending on the ETT used, macro-aspiration could occur even during brief disconnection from the ventilator.
GRANT ACKNOWLEDGMENT. SEPAR-ALAT 2011, CibeRes, IDIBAPS, COVIDIEN. OR and GLB contributed equally to this work.

0945

EVALUATION OF A MINIATURIZED TEE PROBE IN VENTILATED ICU PATIENTS. PRELIMINARY RESULTS

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INTRODUCTION. The emergence of miniaturized esophageal probes (microTEE) potentially reinforces the clinical value of TEE in the ICU settings, providing that the resulting information is similar to that obtained by conventional multiplane TEE probes.
OBJECTIVES. To prospectively evaluate the feasibility, accuracy, and tolerance of hemodynamic assessment using a recently available miniaturized TEE probe in ventilated ICU patients.
METHODS. During 6 weeks, 22 ventilated patients with circulatory and/or respiratory failure (mean age 69 ± 12; SAPS2 53 ± 14; vasopressor support: 13) who required a TEE examination were studied (Institutional Ethics Committee approval). Each sedated patient underwent successively a conventional TEE examination (10 mm, 7.5 MHz) and a microTEE study (5 mm, 5 MHz) with an upper-end system (iE33, Philips). The two procedures were performed in random order independently by two highly trained intensivists within a 30-min time frame. The quality of TEE views was recorded (0 absent to 4 excellent). Hemodynamic indices were measured and compared using the concordance correlation coefficient: LV ejection fraction and fraction area change (EF, FAC), ventricular end-diastolic areas ratio (RVEDA/LVEDA), aortic and pulmonary artery Doppler velocity time integrals (VTI), mitral E/A and E deceleration time, pulmonary vein S/D and systolic fraction, and collapsibility index of the superior vena cava (dSVC). Qualitative diagnoses included: hypovolemia (dSVC > 36% or respiratory variations of AoVTI > 12%), LV systolic dysfunction (LVEF < 40%), valvulopathy (mild-to-moderate or severe), acute cor pulmonale (ACP if RVEDA/LVEDA > 0.8 and paradoxical septal motion), pericardial effusion (PE) with tamponade or not.
RESULTS. Insertion of the microTEE probe required less frequently laryngoscopic guidance (10/22 vs. 21/22: 0.0006). Imaging quality was significantly better with conventional TEE (2D: 3.6 ± 0.7 vs. 3.1 ± 0.9: $p < 0.0001$; color mapping: 2.7 ± 1.5 vs. 2.2 ± 1.4: $p = 0.06$; Doppler: 2.6 ± 1.6 vs. 2.1 ± 1.6: $p = 0.02$). Hemodynamic diagnoses were similar with the two approaches: hypovolemia ($n = 4$), LV dysfunction ($n = 3$), ruptured papillary muscle requiring surgery ($n = 1$), ACP ($n = 2$) and no PE. Related therapeutic impact was noted in 13/22 patients. Overall, the agreement of hemodynamic indices was excellent (intraclass correlation coefficients between 0.65 [95%CI 0.19–0.87] to 0.97 [95%CI 0.93–0.99]). MicroTEE was used to monitor 6 patients successfully during a period of 92 ± 45 min. No complications related to TEE procedures were encountered.
CONCLUSIONS. Despite a lower imaging quality, the tested miniaturized TEE probe provided accurate hemodynamic assessment and led to similar therapeutic changes when compared to conventional TEE examination. Further experience is required to confirm these preliminary data.
GRANT ACKNOWLEDGMENT. Philips healthcare US and France provided the upper-end system and miniaturized TEE probe, but had no role in the study.

0946

PERFORMANCE OF TWO FLOTRAC-VIGILEO™ VERSIONS DURING NOREPINEPHRINE-DRIVEN CHANGE IN ARTERIAL BLOOD PRESSURE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The superiority of the newer algorithm of the FloTrac-Vigileo is uncertain during changes in vascular tone. We assessed the effect of the increase in ABP during a 'double-pump' norepinephrine manoeuvre (NEDP) on CCO and trans-pulmonary thermodilution (TPTDCO) and the agreement between TPTDCO of FloTrac-Vigileo v1.0 and v03.02.
METHODS. TPTDCO was performed in fifteen patients before and during NEDP.
The same ABPW, was employed for both algorithms.
RESULTS. Both algorithms under-estimated TPTDCO at baseline and during NEDP: [bias (L/min), limits of agreement (LOA)] of [1.2 (−3.0 to +5.4)] and [1.0 (−2.0 to +3.9)] for Vigileov1.0 and [1.1 (−2.0 to +4.5)] and [0.4 (−2.3 to + 3.2)] for Vigileo v03.02.pic. The percentage error was unacceptable in both versions: (45.3% Vigileo v1.0 and 37.7% Vigileo v03.02). During NEDP, TPTDCO and Vigileov1.0 did not change significantly from baseline [median % (IQR)], [4.5% (–0.9–13.4)] and [11.8% (3.9–22.4)], respectively. Vigileo v03.02.pic demonstrated a significant increase in CCO, [17.4% (6.7–34.0)]; $p < 0.001$, diverging from the trend in TPTDCO.
CONCLUSIONS. Both versions of Vigileo showed a false increase in CO during NEDP. A smaller bias during NEDP was due to baseline underestimation of CO and the directionally opposite changes in CCO. This suggests that both algorithms are unreliable during changes in vascular tone and reactivity.

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COMPARISON OF NICOM BIOREACTANCE TECHNOLOGY AND TRANSPULMONARY THERMODILUTION DURING NOREPINEPHRINE-DRIVEN CHANGE IN ARTERIAL BLOOD PRESSURE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. NiCOM (Cheetah Medical) is a truly non-invasive cardiac output monitor based on bioreactance technology, which is independent on arterial blood pressure waveform (ABPW). This can be advantageous in conditions when changes in arterial tone make systems based on ABPW unreliable.
We assessed the effect of the increase in ABP during a 'double-pump' norepinephrine manoeuvre (NEDP) on CCO and trans-pulmonary thermo-dilution (TPTDCO) and the agreement between TPTDCO and NiCOM in a mixed population of critically ill patients.
METHODS. TPTDCO and NiCOM was performed in thirteen patients before, during and after NEDP.
RESULTS. NiCOM showed a small bias compared to TPTDCO but large Percentage error (PE) at all time-points.
The [bias (L/min), limits of agreement (LOA)] was [0.1 (−3.8 to +4.0), PE 56%] before NEDP; [0.4 (−2.5 to +3.3), PE 39%] during NEDP, and [0.1 (−2.5 to +2.7), PE 38%] after NEDP.
CONCLUSIONS. NiCOM showed a small bias but unacceptably large LOA in this mixed population of haemodynamically unstable ICU patients. At present, NiCOM cannot be considered an alternative to TPTDCO.

0948

NOVEL CONTINUOUS CARDIAC OUTPUT MEASUREMENT APPROACH WITH BEDSIDE ROUTINE CALIBRATION TECHNIQUE: A COMPARISON STUDY

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INTRODUCTION. Measurement of Cardiac Output continuously (CCO) is important to monitor the dynamic changes in the patient. CCO is mostly calculated using arterial pulse pressure waveform. While some of these need prior calibration, some approaches base their measurements on demographic information. However, literature suggests that in order to accurately reflect the varying conditions in the patient and thus accurately measure CCO, a calibration is required.
OBJECTIVES. Purpose of this study was to assess the ability of new CCO option of COstatus monitor (HCM101-C, Transonic Systems Inc, NY, USA) to accurately monitor the patient's condition and trigger an alarm to alert the doctor when the patient becomes unstable. Instability was defined as CO measured by dilution changed by three scenarios—less than 10%; 10–15% and greater than 15%.
METHODS. Ten adult ICU patients (65 ± 10.4 kg) with sepsis were studied per the approved protocol. All patients had a central venous catheter and an arterial catheter (either in femoral or radial locations). A pressure transducer was connected in-line with the hospital transducer for HCM101-C pressure recording and CCO calculation. COstatus CO (dilution) measurements was obtained by injecting 30 cc of warn isotonic saline into the extracorporeal AV loop connected between the in situ catheters in the patient. This was then used to calibrate the arterial pressure waveform and continuous monitoring was performed between 30 min and 5 h. Intensive therapy was performed during this time as required by the patient's clinical condition and independent of this study.
RESULTS. A total of 35 measurements sets were compared between dilution and CCO. In case of >15% change by dilution, the CCO also showed more than 15% change in all cases. In the case of 10–15% change by dilution, CCO correctly tracked the change in 5 cases (62.5%). In the case of <10% change by dilution, CCO correctly track the change in 12 cases (75%). This shows that CCO measured by HCM101-C was able to correctly recognize changes of more than 10% change by dilution in more than 84% cases and always when the change was greater than 15%.
CONCLUSIONS. The first pilot study showed that CCO measured by HCM101-C could be used as a monitoring tool and to reliably alert the doctor when CO changes by 10-15% or more. Further studies should be done under varying conditions to establish its clinical validity under those conditions.

0949

CHARACTERIZATION OF OXYGEN DYNAMIC RESPONSE FOR PATIENTS AND HEALTHY SUBJECTS

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INTRODUCTION. Our group develops a closed-loop system ($FreeO_2$) that adjusts the oxygen flow to maintain the SpO_2 constant, using a Proportional integral (PI) controller. For better performances, the PI parameters must be adjusted based on patient's oxygen dynamic response.

OBJECTIVES. The aim of the study is to assess the oxygen dynamic response for healthy subjects and patients, using first-order models.

METHODS. We prospectively included spontaneously breathing patients using nasal oxygen with different pathology (COPD, pulmonary fibrosis, pulmonary hypertension, obese patients, cardiopulmonary edema) and healthy subjects (during hypoxic challenge breathing 10% of FiO_2) to assess their response to oxygen increases or decreases. The initial oxygen flow was set to obtain 94% of SpO_2, and then oxygen flow was increased and decreased following a series of predefined steps. The oxygen responses were then analyzed and characterized by first-order models, defined by a gain (ratio of SpO_2 variation to oxygen flow variation, in steady-state) and a time constant (time necessary to reach 67% of the steady state value).

RESULTS. Thirty-five subjects have been included in the study. Figure 1 shows the unit step response of the identified model for 5 healthy subjects and 5 patients, with the corresponding 99% confidence intervals. Among the thirty-five subjects, the gain varies from 1 to 8 (% of SpO_2 per oxygen liter) and the time constant from 30 to 300 s. The gain is usually higher for healthy subjects than for patients. The time constant is usually larger for patients.

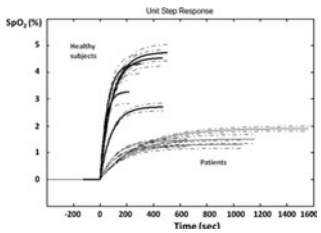

Fig. 1 Model step responses (-) and their 99%

CONCLUSION. The response to oxygen widely differs in patients and in healthy subjects as expected. These data suggest that with fixed parameters, PIs could not suit to all subjects with the certainty of reaching correct oxygenation in a reasonable time and with reasonable damping. An adaptive PI is a solution to improve oxygen adjustment in populations with wide ranges of oxygen dynamic responses. Present data are used to refine the controller used in the $FreeO_2$ system.

GRANT ACKNOWLEDGMENT. Fond de Recherche en Santé du Québec, Fondation Canadienne pour l'Innovation.

0950

TREATMENT OF LIVER FAILURE DUE TO MUSHROOM POISONING WITH TWO EXTRACORPOREAL LIVER SUPPORT SYSTEMS

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INTRODUCTION. In patients with liver failure, artificial liver support systems represent a potential useful option both for the treatment of liver failure and also as a bridge-therapy prior to liver transplantation (LTX). The "Molecular Adsorbent Recirculating System" (MARS) and "Fractionated Plasma Separation and Adsorption system" (FPSA) should support liver regeneration and would also help with possible liver transplantation. Mushroom poisoning is one of the reasons of the acute liver failure; and extracorporeal methods can be considered as a possible treatment option for toxin removal

OBJECTIVES. We present our experience with both MARS and FPSA in mushroom poisoning.

METHODS. In 11 patients, MARS (n = 5 pts) and FPSA (n = 6 pts) were performed 11 and 24 times respectively. A variety of clinical and biochemical parameters were assessed. Comparisons between pre- and post-treatment data were performed using paired t-test.

RESULTS. The 35 sessions had a mean duration of 6 h. There were no differences between the groups in demographic variables. Overall survival was 54.5% (three in MARS, and three in FPSA; two transplanted and four treated patients). Two patients in MARS group and one patient in FPSA group received liver transplantation after the treatments; in four patients the transplantation was not necessary anymore. One of the three transplanted patients (FPSA) has died. A significant decrease in bilirubin was observed in FPSA, but not in MARS (Table 1). Three patients in FPSA group experienced hemodynamic complication (hypotension), whilst this was not the case in any patient in MARS group.

Laboratory parameters

	BUN-pre	BUN-post	Albumin-pre	Albumin-post	NH3-pre	NH3-post	Tot. bilirubin-pre	Tot. bilirubin-post
MARS	18.2 (24.9)	13.4 (17.4)	3.6 (0.5)	3.4 (0.5)	160 (149)	204 (121)	7.9 (4.2)	7.9 (4.1)
FPSA	14.7 (10.5)	10.5 (9)	2.7 (0.4)	2.3 (0.5)	138 (73)	125(82)	6.6 (3.3)	5 (3.4)

CONCLUSIONS. Both FPSA and MARS Systems are safe and effective detoxification methods for patients with liver failure due to mushroom poisoning. MARS is associated with a more stable hemodynamic status during treatment. On the other hand, FPSA can obtain a more pronounced decrease in bilirubin levels.

REFERENCE. Senturk E et al. The treatment of acute liver failure with fractionated plasma separation and adsorption system: experience in 85 applications. J Clin Apher. 2010;25:195–201.

0951

THE EFFECT OF THE MOLECULAR ADSORBENT RECIRCULATING SYSTEM (MARS) ON ANTIBIOTIC CLEARANCE

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INTRODUCTION. Adequate plasma antibiotic concentrations are necessary for effective elimination of invading microorganism in the host, however extracorporeal organ support systems are well known to alter plasma concentrations of antibiotics, requiring dose adjustments to achieve effectual minimal inhibitory concentrations in the patient's blood.

OBJECTIVES. So far very little data pertaining antibiotic clearance and the molecular adsorbent recirculating system (MARS) system exist, in our study we tried to elucidate the influence of various MARS components to antibiotic elimination.

METHODS. A mock MARS circuit was set using 5,000 ml of bovine heparinized whole blood to simulate an eight hour MARS treatment session. After the loading dose of 400 mg of moxifloxacin or 2 g of meropenem was added, blood was drawn at various time points from the different parts of the MARS circuit. Additionally, meropenem concentrations were determined in the plasma of one patient treated with MARS suffering from acute liver failure (ALF) due to a idiosyncratic reaction to immunosuppressive medication. Moxifloxacin concentrations in serum and ultrafiltrate were measured with an UltiMate 3000 fluorescence detector. The concentration of meropenem in plasma and dialysate was determined by HPLC. Coefficients of accuracy and precision for both compounds were <8%. The experiments were run in triplicates.

RESULTS. In our single compartment model a significant decrease in the "systemic" concentration of moxifloxacin and meropenem could be detected as early as 15 min after commencing of the MARS circuit ($P < 0.01$). Moreover, within 60 min the moxifloxacin and meropenem concentration was less than 50 percent of the initial value. The albumin circuit removed the majority of moxifloxacin and meropenem. Similarly, the plasma meropenem concentration in the ALF patient fell to less than 25% of the initial peak value. Moreover, we could demonstrate a significant increase of meropenem in the dialysate.

CONCLUSIONS. Our data provide evidence, that it is possible that antibiotics are removed from the patient's blood causing inadequately low plasma levels in the respective individual, and therefore might mitigate beneficial effects of the MARS system.

GRANT ACKNOWLEDGMENT. No disclosures

0952

LIFE IN TRANSITION: A QUALITATIVE STUDY OF LVAD-PATIENTS' ILLNESS EXPERIENCE AND VOCATIONAL ADJUSTMENT

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INTRODUCTION. A left ventricular assist device (LVAD) is used as a bridge to transplantation (BTT) for patients with acute heart failure. The device represents a major bodily invasion challenging everyday life. Little is known of how patients with a LVAD experience daily life and the transition to cardiac transplantation.

OBJECTIVES. The aim of the study was to explore the lived experience of LVAD-patients.

METHODS. The study had a qualitative explorative design using depth interviews of 10 adult patients in Denmark with a LVAD in 2008–2010. The semi-structured interview guide consisted of themes related to the chronology of the illness trajectory and a thematic analysis with focused and open coding was conducted. Data were managed by qualitative computer package NVivo 8. Our theoretical framework was a life-stage model describing developmental tasks in relation to age-groups. The model provided a context for our description of physical, psychological, social, and vocational adjustments of LVAD-patients.

RESULTS. Despite the suddenness of onset and gravity of illness, the patients in our study coped well with their situation. All patients relied on close relatives; parents, spouses and children. While bridging to transplantation the patients experienced ambivalent feelings of gratitude and frustration toward the LVAD, and hope and fear toward cardiac transplantation. Younger patients resolved their emotional ambiguity by procrastination in relation to necessary vocational adjustments, while older patients with occupational security were quicker to resume work and a normal life.

CONCLUSIONS. LVAD-patients reestablish normal life to a certain extent, but the younger individuals might need assistance for life redesign and vocational adjustment to avoid permanent disability. The time bridging to transplantation should be reframed from "life on standby" to normal life including meaningful occupational adjustment.

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0953

ALBUMIN DIALYSIS USING MARS (MOLECULAR ADSORBENT RECIRCULATION SYSTEM) - SINGLE CENTRE EXPERIENCE

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INTRODUCTION. In the last 10 years different methods of supporting liver function were introduced. Nowadays in clinical practice we generally use only some of them: MARS—molecular adsorbent recirculation system, Prometheus, SPAD—single past albumin dialysis, rarely perfusion through live lines of hepatocytes due to high cost of this method. Main indication for treatment with the above methods is acute liver failure (ALF) irrespective of the cause and acute on chronic liver failure (AoCLF), mainly due to decompensated chronic liver disease.

OBJECTIVES. The aim of the study was presentation of results of acute/chronic liver failure treatment with MARS/PRISMA-FEX system

METHODS. Up till now 123 sessions of albumin dialysis were performed in 35 patients. Following variables were analyzed: encephalopathy, MELD score, APACHE score, mortality, bilirubin level, creatinine clearance, INR, factor V. Variables were compared before and after albumin dialysis treatment.

RESULTS. The results are presented in the table below

Final results

	Before dialysis	After dialysis	p
Encephalopathy	3	1	p=0,2
APACHE	27	17	p<0,05
MELD	31	21	p=0,2
Mortality	0	15/35 (42%)	ns
Bilirubin (mg%)	27,8	17,3	p=0,06
Creatinine clearance	46	76	p=0,07
INR	3,01	2,56	p=0,2
FV	31	52	p<0,05

CONCLUSIONS. 1. Average it was 3, 5 session for 1 patient, (1–10) 2. 15 patients died which constitutes 42%. 3. 4 patients had orthotopic liver transplantation, 4. In 3 patients the liver was regenerated spontaneously. 5. The 13 patients were transferred do hepatology department for further treatment.

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GRANT ACKNOWLEDGMENT. Team of ICU.

Influenza & other viral infections in the ICU: 0954–0966

0954

SIMPLE FEATURES TO EARLY DIFFERENTIATION BETWEEN SEVERE H1N1 INFLUENZA A VIRUS PNEUMONIA AND SEVERE COMMUNITY-ACQUIRED BACTERIAL PNEUMONIA

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INTRODUCTION. The pandemic A/H1N1 influenza virus emerged in 2009, with a high rate of intensive care unit (ICU) admissions. Because of the high frequency of bacterial infection, most hospitalized patients with H1N1 community-acquired pneumonia (CAP) are treated with antibiotics, even though bacterial co-infection could be unlikely.

OBJECTIVES. To determine if simple clinical data could help in the early identification of patients with H1N1 CAP, and to compare if previously described model, based on five simple criteria [1] (age, white blood cell (WBC), bilateral radiographic changes, temperature and mental status), are useful in the critically ill patient setting.

METHODS. In a polyvalent ICU we retrospectively analyzed adults admitted from January 1, 2009 to April 1, 2011 with severe CAP, with or without influenza-like illness. During the H1N1 epidemic period, a routine H1N1 viral real time reverse PCR analysis was done.
Severe H1N1 CAP were compared with severe bacterial CAP. The variables for the differentiation of the two groups were selected using stepwise logistic regression. Our findings were grouped in a score which was assessed by calculating the area under the curve (AUC) of the receiver-operating characteristic (ROC) curve. Statistical significance was set at $p < 0.05$.

RESULTS. 65 patients with CAP were admitted to the ICU. H1N1 was confirmed in 16 patients (24.6%), 10 in 2009 and 6 in 2010–2011 epidemic period. WBC and C reactive protein (CRP) were higher in the bacterial CAP group and the Lung Injury Score (LIS) at admission was lower (Table 1). With these variables we designed a H1N1 CAP score, the resulting 3-point score generated a ROC curve with an AUC of 0.88. Patients with 0 or 1 of this characteristics: LIS (≥2.4), WBC (<7 × 10^9/l) and CRP (<190 mg/L) had a PPV > 90% and those with all the characteristics had a PNV = 100% (Table 2). There were no differences between groups in 4 of the 5 mentioned variables cited by Bewick T. et al. [1]

CONCLUSIONS. The presence of the 3 above factors (WBC, CRP and LIS) strongly suggest the H1N1 etiological diagnosis in severe CAP during H1N1 epidemic period and its absence calls to dismiss. The early management decisions relating to infection control and treatment are facilitate by the application of these easy three values.

REFERENCE. 1. Bewick T et al. Clinical and laboratory features distinguishing pandemic H1N1 influenza-related pneumonia from interpandemic community-acquired pneumonia in adults. Thorax 2011;66:247–252.

Table 1

Variables at admission	Bacterial CAP (n = 49)	H1N1 CAP (n = 16)	p value
LIS	1.6 ± 0.9	2.6 ± 0.9	0.02
WBC ×109/l	18,500 ± 2,200	8,248 ± 6,400	0.04
CRP (mg/L)	305 ± 147	193 ± 114	0.03
Age (years)	58.12 ± 18.4	51.5 ± 15.9	0,6
Mental orientation (%)	17	20	0.8
Temperature (°C)	37.8 ± 1.2	38 ± 1.2	0.6

Table 2

LIS, WBC and CRP score	0	1	2	3
Bacterial CAP	22 (91.7%)	22 (91.7%)	5 (41.7%)	0 (0%)
H1N1 CAP	2 (8.3%)	2 (8.3%)	7 (58.3%)	4 (100%)

0955

COMPARISON BETWEEN 2009 PANDEMIC INFLUENZA H1N1 VIRAL INFECTIONS AND 2010–2011 INFLUENZA SEASON INFECTIONS IN AN ICU OF A COMMUNITY HOSPITAL

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INTRODUCTION. 2009 pandemic influenza by H1N1v was associated with a high morbidity and mortality, 1 year later admissions in ICU of several cases of Influenza A infections have been described.

OBJECTIVES. The objectives of the study were to describe clinical features of patients admitted in ICU with influenza A infections occurred during this epidemic time and to compare clinical characteristics and outcome according year of admission: pandemic Influenza A (H1N1)v infections versus 2010–2011 Influenza season infections.

METHODS. Consecutive patients admitted in a 17-beds medical-surgical ICU from October to January during past year and 2011 with influenza A H1N1v infections were included. Main variables of interest were age, APACHE II at admission, diagnosis, non invasive and invasive mechanical ventilation requirement, time of mechanical ventilation, ICU length of stay, radiological pattern, cultures result, procalcitonin and C-reactive protein levels, leukocytes count and mortality. Patients were classified according the year of ICU admission.

RESULTS. During the time of study 25 patients were admitted in ICU with confirmed Influenza A infection. 18 patients were admitted in ICU during pandemic time and 7 in the present year. Table shows the comparison between groups:

	Pandemic 2009 Influenza A N:18	Seasonal Influenza A 2010–2011 N:7
Age	42.6 ± 12.7	38.4 ± 19.3
Apache II at admission	12.8 ± 6.5	10 ± 2.9
Time of mechanical ventilation (days)	8.7 ± 8.8	15.2 ± 9.8
ICU length of stay	13.9 ± 11	11.9 ± 10.2
Radiological infiltrate	Normal 11.1% Unilateral 11.1% Bilateral 77.8%	Normal: 42.9% Unilateral 14.3% Bilateral 42.9%
PCR/PCT/leucocytes	20 ± 15.3/4.94 ± 15.8/8588 ± 6852	13.9 ± 17.6/1.17 ± 2.1/8702 ± 6256
ICU diagnosis	Primary viral pneumonia: 83.3% Congestive Herat failure: 5.6% Myopericarditis: 5.6% Acute asthma: 5.6%	Primary viral pneumonia: 57.1% Acute asthma: 42.9%

Mortality in pandemic and seasonal Influenza A subgroups were 16.7 and 28.6% respectively.

CONCLUSIONS. Pneumonia was the most common expression of Influenza A (H1N1)v infections in ICU during pandemic time and 2010–2011 influenza season. A decrease in the number of ICU admissions by Influenza A infections have been observed one year after the 2009 pandemic.

REFERENCE. Rello J, Pop-Vicas A. Clinical review: primary influenza viral pneumonia. Crit Care. 2009;13(6):235.

0956

PANDEMIC INFLUENZA A AND INTENSIVE CARE: EXPERIENCE IN OUR HOSPITAL

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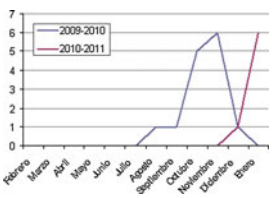
INTRODUCTION. The importance of Intensive Care in the influenza pandemic is well known, since its inception in 2009. We also know the rapid onset and evolution of viral infection that it has caused, as well as its diverse clinical response in patients, in the worst case, not uncommon to acute respiratory distress syndrome (ARDS) and even some death.

OBJECTIVES. The purpose of this registry is to describe our experience, identifying common features and differences of severe cases of influenza A (H1N1) which have required ICU admission.

METHODS. A longitudinal descriptive study included all patients admitted to the ICU with a diagnosis of the H1N1 virus infection, confirmed by RT-PCR of influenza in a nasopharyngeal swab/aspirate bronchial during the period from the first case (August 2009) until its reappearance again early this year (February 2011). Statistical analysis was performed using the SPSS-15.0.

RESULTS. During the above-mentioned study, there were 21 patients. Of these, 52% men with an average age of 37.6 (±15.02) years. Prevalent comorbidities were being a smoker 33%, asthma 24%, obesity 14%, pregnancy 10%. The average number of days to ICU admission are 4.75 (±2.09), finding as the most common symptoms at admission, fever >38° (90%), dyspnea (81%), cough (76%) and musculoskeletal pain (62%). In 71% of patients with pulmonary infiltrates radiology found compatible with a mean of quadrants affected 1.81 (±1.4). It is worth mentioning the admission APACHE-II with an average of 11.53 (±4.11) and SOFA 5.53 (±3.99) points, respectively, likewise PaO_2/FiO_2 with an average of 196 (±96.92) and SpO_2/FiO_2 199.50 (±76.86). 47% said VMI with an average of 4.55 (±5.68) days, finding an average number of maximum PEEP 12 (±5.83), 10% used the prone position. Flag as SpO_2/FiO_2 worst record an average of 146 (±91.58). 33% had bacterial infection at admission. 38% required vasoactive drugs, for an average of 2.08 (±2.72) days. From a therapeutic standpoint, the average change to the start of oseltamivir was 4.57 (±3.14) days, likewise, in 81% of cases associated with corticotherapy. ICU mortality was 14%, 3 patients, being discharged with improvement/cure the remaining 18. The average length of stay in ICU was 6.24 (±5.18) days, in hospital being 27.6 (±80.62).



Incidence graph H1N1

CONCLUSIONS. Primary viral pneumonia H1N1 presents a considerable number of cases with poor outcome, affecting the young population with a high rate of morbidity and mortality, in our series, mortality is 14% and hospital stay is high (average number of days 27.6). A strategy for early identification and appropriate treatment, based on clinical practice guidelines could reduce associated morbidity and mortality.

REFERENCE. * Pérez-Padilla R, de la Rosa-Zamboni D, Ponce de León S, et al. for the INER working Group on influenza. Pneumonia and respiratory failure from swine-origin influenza A (H1N1) in Mexico. N Eng J Med. 2009;361:680–9.

0957

"TWO YEARS SWINE FLU ANNIVERSARY ON ICU" TWO YEARS ANALYSIS OF THE IMPACT OF PANDEMIC INFLUENZA A/H1N1 OUTBREAK ON INTENSIVE CARE IN TERTIARY CARE CENTER

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INTRODUCTION. Influenza A/H1N1 outbreak in the season 2009/2010 had a massive impact on intensive care all over the world. 14.9% of total number of ICU beds in our hospital were occupied by patients with A/H1N1 infection during the first outbreak, almost 31% were occupied in days of seasonal peak. Our analysis describes changes in population of A/H1N1 patients and compares the impact on tertiary care center between seasons 2009/2010 and 2010/2011.

METHODS. We retrospectively reviewed medical data during 2 years influenza A/H1N1 outbreak. Data were obtained from all patients admitted in ICU with positive RT-PCR for pandemic influenza A/H1N1.

RESULTS. Our hospital is a tertiary care hospital covering population 250 000 inhabitants at potential risk from A/H1N1 influenza infection. All diagnoses of A/H1N1 were confirmed by using RT-PCR technique. Samples for RT-PCR were acquired by using nasopharyngeal swab in case of non-intubated patients and by bronchoalveolar lavage in intubated patients. From November 1st 2010 until March 31st 2011, 13 patients with confirmed A/H1N1 infection were admitted to our hospital, 6 of them required admission to intensive care. Median age was 57.5 years, median duration of stay in ICU was 18.5 days and median length of ventilation was 14 days. Total number of ICU bed-days in our hospital was 123, total number of days on ventilator was 107. Majority of patients required orotracheal intubation and invasive ventilation, only one was on noninvasive ventilation. No patient required ECMO therapy and no patient with confirmed A/H1N1 infection had died during this season.

CONCLUSIONS. Our data collected between November 1st 2010 and March 31st 2011 show a decrease of pandemic A/H1N1 infection in our region in comparison with the same period in season 2009/2010. Total number of admitted patients with A/H1N1 in this season was only 28% of patients admitted for the same diagnosis in season 2009/2010. Almost all patients admitted to ICU this year were previously diagnosed with serious chronic respiratory insufficiency (COPD, sarcoidosis) or were treated with immunosuppressive agents. All ventilated patients with respiratory and "flu" symptoms had RT-PCR for A/H1N1 performed from BAL. Considering the limits of nasopharyngeal swab there is a possibility that a certain percentage of non ventilated patients went undetected.

0958

CLINICO-EPIDEMIOLOGICAL FEATURES OF PATIENTS WITH INFLUENZA A (H1N1) VIRUS INFECTION

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OBJECTIVES. From September, 2009 to April, 2010, we observed 274 persons infected with influenza A (H1N1) virus. Real-time reverse-transcriptase-polymerase-chain-reaction (RT-PCR) testing was used to confirm infection; the clinico-epidemiological features of the disease were analyzed and recorded.

METHODS. From September, 2009 to April, 2010, we observed 274 persons infected with influenza A (H1N1) virus. Real-time reverse-transcriptase-polymerase-chain-reaction (RT-PCR) testing was used to confirm infection; the clinico-epidemiological features of the disease were analyzed and recorded.

RESULTS. Of 274 patients, median age was 22.5 years, and 59% were males. Only 8% of patients had recent travel history to infected region. Median time of 5 days was observed from onset of illness to influenza A (H1N1) diagnosis, while median time of 6 days reported for hospital stay. All admitted patients received oseltamivir drug, but only 16.1% received it within 2 days of onset of illness. The most common symptoms were cough (96.7%), fever (92%), sore throat and shortness of breathing, and coexisting conditions including diabetes mellitus (9.9%), hypertension (8.8%), chronic pulmonary diseases (5.5%) and pregnancy (5.5%) ($P < 0.05$). Pneumonia was reported in 93% of admitted patients after chest radiography.

CONCLUSIONS. We have found that infection-related pulmonary infection affects adults with survival range in 94% of these patients. The median time from onset of illness to virus detection with use of real-time RT-PCR is 5 days.

0959

LOOKING FOR INFLUENZA A H1N1 V INFECTIONS IN ICU ONE YEAR AFTER THE 2009 INFLUENZA PANDEMIC

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INTRODUCTION. During the 2009 influenza pandemic 18 patients were admitted in our ICU from October 2009 to January 2010.

OBJECTIVES. The objectives of the study were to describe clinical features of cases admitted in ICU with clinical suspicion of Influenza A H1N1v infections during the year after pandemic and to analyze clinical outcome and definitive diagnosis.

METHODS. Prospective observational study in a 17 beds medical-surgical ICU of a community hospital. Consecutive patients admitted in ICU from October 2010 to January 2011 with clinical suspicion of Influenza A H1N1v infections were registered. Flu-like symptoms, high fever, dyspnea, hypoxia with and no apparent cause that justifies it were the suspicion clinical criteria at admission in ICU. Respiratory specimens from upper respiratory tract for identification of Influenza A H1N1v were obtained in all the patients. Main variables of interest were age, APACHE II at admission, non invasive and invasive mechanical ventilation requirement, time of mechanical ventilation, ICU length of stay, and cultures result. Mortality and definitive diagnosis were collected.

RESULTS. 13 consecutive patients with clinical suspicion of Influenza A H1N1v were admitted in ICU during the time of study. Microbiologic confirmed infection by Influenza A H1N1v was obtained in seven patients, 4 with primary viral pneumonia and three cases of acute asthma. In the other six patients with negative RT-PCR test for Influenza A H1N1v definitive diagnosis were two cases of viral pneumonia caused by varicella and cytomegalovirus, one case of viral suspected pneumonia with unknown origin, a case of myopericarditis, a case of cardiogenic shock and one case of debut of a myelomonoblastic leukemia with a fatal evolution. According definitive diagnosis there were not differences between "other diagnosis" group and confirmed influenza group in age (37.2 ± 17 vs. 38.4 ± 19.3), APACHE II score (9.5 ± 3.3 vs. 10 ± 2.9), time of mechanical ventilation (10.7 ± 8.4 vs. 15 ± 9.8) and ICU length of stay (10.8 ± 7.1 vs. 11.8 ± 10.2). Mortality in the Influenza A group was 28.6 and 33.3% in the "other diagnosis" group.

CONCLUSIONS. When microbiological test result negatives in patients with suspicion of Influenza AH1N1v other diagnosis must be taken into account. Influenza A H1N1v causes respiratory failure with similar clinical characteristics of other virus infections like varicella or cytomegalovirus.

REFERENCE. Rello J, Pop-Vicas A. Clinical review: primary influenza viral pneumonia. Crit Care. 2009;13(6):235.

0960

EVALUATION OF INTENSIVE CARE PATIENTS WITH SEVERE INFLUENZA A (H1N1) 2009

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OBJECTIVES. The purpose of the study—to evaluate the results of intensive therapy in patients with severe influenza A (H1N1), 2009, and its complications in a department of anesthesiology, intensive care unit during the epidemic.

METHODS. A retrospective and prospective analysis of the IT, including respiratory support, in department of anesthesiology and reanimation in 42 patients aged 33.6 ± 1.6 years with severe forms of influenza caused by virus A (H1N1) in the period from 13/10/2009 to 30/01/2010. Severe forms of influenza caused by virus A (H1N1) were complicated by a 28.6% one-sided in 71.4%—two-way viral and bacterial pneumonia and septic shock occurred accompanied by pneumonia in 11 (26.2%) patients. At the same time 90.5% of observations pneumonia combined with acute lung injury. Diagnosis and assessment of severity of acute lung injury were the scale of LIS. "Traditional" mechanical ventilation was performed in 39 (92.9%) cases, and in 3 (7.1%) patients used NIV.

RESULTS. Established that the patient comes to the department of anesthesiology, intensive care unit by an average of 5.1 ± 0.3 day from the onset. Causal treatment was carried out with oseltamivir at a dose of 75 mg 2 times a day (14 cases) or 150 mg 2 times a day (28) within 10 days. Empirical antibacterial therapy began a 4–6 day illness. In 61,9% appointed karbopinemy, in 35,7% of macrolides in combination with carbapenems, to 64.2% a combination of cephalosporin with aminoglycosides and fluoroquinolones, vancomycin, as an additional antibiotic was used in 26.2% of patients. Before the start of ventilatory support for acute lung injury severity scale LIS averaged 2.8 ± 0.1 points. After transferring to the ventilator to maintain $PaO_2 = 74.7 \pm 4.1$ mmHg the following parameters were required respiratory support in the PC mode: PIP = 26.4 ± 0.7 mbar, PEEP = 10.7 ± 0.4 mbar, F = 14.6 ± 0.3, Vt = 643.5 ± 6.8 ml. In this case, $PaO_2/FiO_2 = 131.6 \pm 18.2$ mmHg, and Clt, d—32.7 ± 1.1 ml/mbar. In the course of respiratory support in ten patients (23.8%) occurred pulmonary barotrauma: in six cases—two-sided pneumothorax (including an iatrogenic) and 4-sided.

In general, the use of the concept of 'safe' (protective) ventilation used in patients with acute lung injury, for this category of patients in 76.2% of cases efficiently manages gas exchange and mechanical properties of the lungs.

Duration of respiratory support was 10.1 ± 0.8 days, stay in Macao—15.1 ± 1.2 days of treatment in a hospital—28.8 ± 2.5 days. Fatal outcome occurred in eight cases. In all cases, the cause of death was progressive hypoxemia due to increase the severity of acute respiratory failure, including acute respiratory distress syndrome.

CONCLUSIONS. Despite the rather late arrival, intensive care, including individualized choices of respiratory support, will ensure survival in the department of anesthesiology and intensive care at 80.9% of patients with severe forms of influenza A (H1N1), 2009.

0961

THE RISK FACTOR FOR ACTIVE CYTOMEGALOVIRUS (CMV) INFECTION IN IMMUNOCOMPETENT CRITICALLY ILL PATIENTS

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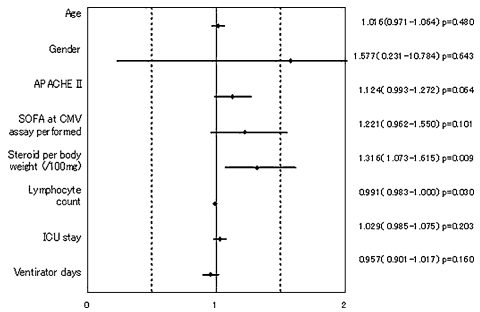
INTRODUCTION. Recently, many reports have shown that CMV infection in immunocompetent patients is frequent in the ICU, and may be associated with a poor outcome.

OBJECTIVES. We investigate the risk factor for active CMV infection in the ICU.

METHODS. We retrospectively examined patients admitted to the ICU for over 7 days between January 2005 to May 2009. The pp65 antigenemia assay for CMV over the 7 days after admission was performed when a physician suspected a CMV infection. Transplant patients, those who had received long-term administration of steroids, and those younger than 12 years old age were excluded. We compared age, gender, transfusion, CRRT time, steroid dosage per body weight, lymphocyte counts, ventilator days, ICU stay, APACHE II score, SOFA score, and ICU mortality between the patients and the association with CMV infection.

RESULTS. A total of 140 patients were examined using the CMV assay. Sixty-seven patients out of the 140 patients were evaluated using the CMV antigenemia assay more than 7 days after admission, and were included in this study. Of these 35 patients were antigenemia positive and 32 were negative. The CRRT time, steroid dosage per body weight and SOFA score were significantly different between the two groups. The multivariate analysis showed that steroid dosage per body weight (OR 1.316, 95%CI 1.073–1.615, $p = 0.009$) and lymphocyte counts (OR 0.991, 95%CI 0.983–1.000, $p = 0.030$) are two independent predictors of an active CMV infection.

CONCLUSIONS. The CMV infections were frequently observed in critically ill patients. Steroid use and lymphocyte counts were two independent risk factors of an active CMV infection.



Figure

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0962

THE PATHOGENIC ROLE OF HERPES VIRUS-1 RECOVERED FROM THE LOWER RESPIRATORY TRACT IN THE CRITICALLY ILL

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INTRODUCTION. Infection with human herpes simplex virus (HSV) in the upper respiratory tract of the immunocompetent adult host usually has a benign course. As is the case with other herpes viruses, the initial infection is followed by a lifelong latent infection, from which reactivation can occur. In the critically ill patient the downstream pathogenic role of reactivation of HSV-1 in the lower respiratory tract is still controversial.

OBJECTIVES. To investigate the pathogenic role of herpes virus-1 DNA in the lower respiratory tract and identify possible clinical associations.

METHODS. We prospectively studied 77 consecutive critically ill patients from June until August 2006, in whom tracheal aspirates or bronchoalveolar lavage was done because of suspected pulmonary infection, either during mechanical ventilation ($n = 70$) or not. We looked at disease severity (SAPS II), microbial and clinical infection parameters, including the clinical pulmonary infection score (CPIS), lung injury by the lung injury score (LIS) as well as quantitative HSV-1 load using real-time polymerase chain reaction (PCR), to determine the potential pulmonary pathogenicity of HSV-1 in the course of critical illness.

RESULTS. 137 specimens were obtained, (6 bronchoalveolar lavage fluids and 131 tracheal aspirates from 77 patients, from day 1–38 after admission in the ICU, and arbitrarily divided into those with ($n = 39$; 28.5%) and without ($n = 98$; 71.5%) positive HSV PCR. Of these 77 patients, 26 patients (33.8%) during any time of ICU admission were HSV-1 positive and 51 HSV-1 negative (66.2%). Comparing patient groups, no difference was seen in patient characteristics and demographics and underlying reasons of ICU admission were similar. Mean SAPS II score was 48 in HSV+ and 44 in HSV- patients ($p = 0.30$) and mortality during ICU-admission 15.4% among HSV-positive patients vs. 23.5% among HSV-negative patients ($p = 0.41$). The groups differed in the duration of mechanical ventilation (20.1 days for the HSV-positive group vs. 12.1 days for the HSV-negative group; $p = 0.01$). Length of stay in the ICU tended to differ (20.3 vs. 13.2 days; $p = 0.07$). Quantitative HSV-1 DNA levels correlated to the SAPS II score ($r_s = 0.48$; $p = 0.01$). In comparing sample groups clinical scores did not differ among positive and negative samples.

CONCLUSIONS. The data suggest that reactivation of HSV-1 relates to increasing duration and severity of illness in the critically ill, but argue against pulmonary pathogenicity even when HSV is recovered from the lower respiratory tract.

0963

MCP-1/CCL2 PREDICT MORTALITY IN HIV SEPTIC PATIENTS IN THE INTENSIVE CARE UNIT

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INTRODUCTION. Severe sepsis has emerged as a common cause of intensive care unit (ICU) admission for those living with HIV. Recently we demonstrated that sepsis is the main cause of death in HIV-patients in ICU. However, the pattern of inflammatory response and the influence of innate immune response in outcome in critically ill HIV patient is not known.

OBJECTIVES. This study evaluate patterns of inflammatory mediators in HIV septic patients, aiming to identify biomarkers related to prognosis.

METHODS. All HIV patients admitted in ICU with sepsis criteria (consensus conference ACCP/SCCM) in a Regional Reference Center for HIV care were included from March/2009 to December/2010. Clinical data and inflammatory mediators (MCP-1/CCL2, IL-8/CXCL8, IL-6, MIF and IL-10) were evaluated sequentially. Non-HIV septic patients and elective postoperative were included as controls.

RESULTS. Thirty patients were included with a mean CD4 count 160 cells/mm^3 (IQR: 30–287). We observed increased concentrations of MCP-1/CCL2, IL-8/CXCL8, IL-6, and IL-10 in the first and seventh days in HIV/sepsis patients when compared with non-septic patients. MIF levels are higher in HIV septic patients when compared to non-HIV in days 1, 7 and 14. Elevated concentrations of MCP-1/CCL2 in plasma samples, 7 days after sepsis diagnosis was related with the higher hospitalar mortality.

CONCLUSIONS. Our data demonstrate that HIV septic patient has a similar profile of inflammatory mediators than non-HIV septic patients. Elevated levels of MIF seems to be a predictor of mortality in HIV patients. Increased concentrations of MCP-1/CCL2 7 days after sepsis diagnosis was associated with hospitalar mortality, suggesting a role of this chemokine in predicting outcome.

GRANT ACKNOWLEDGMENT. FAPERJ/CNPq/FIOCRUZ

0964

MICROBIOLOGICAL EPIDEMIOLOGY WITHIN FIRST WEEK OF LIVER TRANSPLANT RECIPIENTS: AN INDIAN EXPERIENCE

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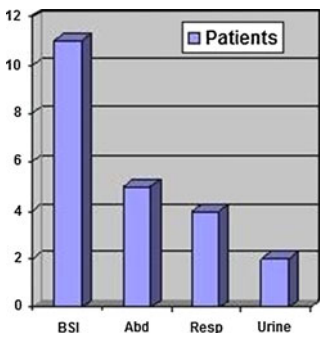
INTRODUCTION. Infections are a major determinant of the outcome of a patient after solid organ transplant. Complexity of procedure, long duration of surgery and sick pre-operative status of the patient makes liver transplant a high risk surgery. Steroids along with immunosuppressants also contributes to higher risk for infections. Bacterial and fungal infections are more common in the postoperative phase and can be detrimental in patient outcome.

OBJECTIVES. To analyse the incidence, site and common organisms of infection within the first week of liver transplant

METHODS. A retrospective survey of 107 Live Donor Liver Transplant (LDLT) recipients was done. Blood cultures, urine culture, Endotracheal tube secretions culture till the patient was on ventilator and abdominal drain fluid culture that were sent for all patients for first 7 days after transplant were retrieved. Patients who had prolonged duration of surgery (>10 h), requirement of more than eight units packed red blood cell transfusion, high bilirubin level (>10 mg/dl) preoperatively and spontaneous bacterial peritonitis just before surgery were labelled as high risk candidates.

RESULTS. Eighteen patients (16.8%) had developed twenty one bacterial infections and one fungal infection out of which four bacterial infections were considered as skin contaminant based on clinical judgement. The most common sites of infection were bloodstream infection (BSI) (11 patients), abdominal infections (5 patients), respiratory infections (4 patients) and urine infections (2 patients).



Number of patients

The most common organism was *Acinetobacter baumannii* present in six patients. Other organisms were *E. coli* (4 patients), *Enterococcus faecium* (3 patients), Coagulase negative *Staphylococcus aureus* (3 patients) and *Pseudomonas areuginosa* (1 patient). Only one patient had *Candida albicans* growth in abdominal fluid. Only one patient expired during the first week of transplant and she had Gram negative growth from multiple culture sites.

CONCLUSIONS. Epidemiological awareness [1] of commonest site of infection, most common micro-organism and time of infection can help us to rationalise optimal prophylactic antibiotic therapy in early phase of post live donor liver transplant recipients in an Indian perspective.

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0965

INFLUENZA A IN CRITICALLY ILL PATIENTS. THE SECOND OUTBREAK IN OUR ICU

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INTRODUCTION. Influenza A is an infection with significant morbidity and mortality among middle age adults and they often need to be admitted in ICU.

OBJECTIVES. To describe the clinical features and the evolution of a group of patients infected by the Influenza virus and admitted to an ICU.

METHODS. Observational and prospective study done in patients diagnosed with Influenza A virus that required ICU admission. The infection was confirmed by PCR performed in nasopharyngeal swabs and/or endotracheal aspirates.

RESULTS. During the Influenza A outbreak in Spain a total of 135 patients were admitted to our hospital with this virus suspected infection. Of them, 7 were admitted in ICU with confirmed infection with PCR. Five were women and the mean age was 48.6 years (range 30–62). Six of them had previous clinical conditions of importance such as: diabetes (2), COPD (2) cardiopathy (2). Other factors of importance were: obesity (2), smoking habit (3) and alcoholism (1).

The mean time of symptoms before admission was 5.6 days (range 3–8). Six patients developed a complicated pneumonia, with a *S. pneumoniae* isolation in two cases. The principal reason for UCI admission was: acute respiratory failure and/or shock. Five patients required intubation and mechanical ventilation (mean time of ventilation 19 days) and one, non invasive mechanical ventilation. Two patients required further therapies to guarantee oxygenation such a prone position and nitric oxide. All of them received antibiotics and Oseltamivir during a mean time of 11 days

CONCLUSIONS. Middle age patients with previous pathologies and other risk factors such as obesity, smoking habit and pregnancy that suffer from Influenza A require more frequently ICU admission. Respiratory failure and shock are the principal reasons for it and they usually need intubation, prolonged mechanical ventilation and other strategies.

0966

THE BATTLE OF INFLUENZA A, HOW IS STILL BEHAVING?

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INTRODUCTION. The influenza pandemic caused by a new influenza virus, the H1N1, had different characteristics from the seasonal flu, like the frequency and severity of lung involvement and the need in these cases, to place patients in Intensive Care Units. The data collected in some studies by the Spanish group of influenza A serious work/SEMICYUC, reflects how is the typical patient: young and with risk factors (COPD, obesity, heart disease or pregnancy). The most common reason for admission to the ICU was primary viral pneumonia with a high need for mechanical ventilation (MV), with mortality between 25 and 50%.

OBJECTIVES. To describe characteristics, clinical evolution and outcomes in patients for confirmed influenza A (H1N1) and how were treated.

METHODS. Retrospective study of all consecutive patients admitted in our ICU suffering Influenza A infection between October 2009 and January 2011. We recorded clinical and demographical data, complications, treatment, respiratory evolution, mortality and stay in the ICU. We expressed results in percentage, mean or median. T-test and Chi-square test were used in a SPSS program.

RESULTS. We analyzed 20 patients admitted in the ICU, with age 37.47 $\pm$ 13.82 years. 80% were women. At admission, 60% of them had PCR positive, and they had APACHE II 15.75 $\pm$ 5.84. Most of our patients were healthy (without chronic organ insufficiency or immunosuppression) however 30% had BMI $>$ 30. 30% were pregnant. Infection debuted as acute respiratory failure in 100% of cases (90% developed hypoxemia), involving SIRS in 20% of patients. After the admission, about half of patients developed septic shock and ARDS, but only 35% had acute renal failure, and 20% had elevated liver enzymes. 50% of patients had a bacterial infection documented by positive cultures. 100% had antibiotics from the first day of admission to the unit, and 70% were treated with corticosteroids. Received Oseltamivir for 8 (3, 14) days, with a mean delay of 5 $\pm$ 2.42 days. 75% of the patients needed $FiO_2 > 60\%$ (PaFi 90.94 $\pm$ 48.16). The mean PEEP was 10.19 $\pm$ 5.86. 45% had muscle relaxants and 40% were in prone. Main complication of the MV was pneumothorax (25%). The patients needed MV 10.50 (0, 40) days, and 25% required tracheostomy. The stay was 12.5 (1, 53) days. Mortality was 30%. We compared the group of pregnant with other patients, and both groups were homogeneous, without significant differences in demographic data, complications or mortality (16.7 vs. 35.7%, $p = 0.63$). We have only observed that the presentation is more severe (SIRS) in the nonpregnant group (50 vs. 16.7%, $p = 0.005$).

CONCLUSIONS. The baseline characteristics, presentation, evolution and mortality of our patients are similar to those described by the Working Group A severe flu of SEMICYUC. There are no differences in pregnancy. So, the management in our ICU is right.

REFERENCE. Pneumonia and respiratory failure from Swine-Origin Influenza A (H1N1) in Mexico. N Eng J Med. 2009.

AKI: Epidemiology, diagnosis & therapy: 0967–0979

0967

HIGH OXYGEN DELIVERY IN EARLY AKI I IS ASSOCIATED WITH A LOWER RISK OF PROGRESSION TO AKI III

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INTRODUCTION. Acute kidney injury (AKI) affects 30–65% of critically ill patients and is associated with high mortality, morbidity and financial costs. There is no curative therapy. Research in surgical patients has shown that pre-emptive strategies of perioperative haemodynamic monitoring and optimisation can reduce the incidence and mortality of postoperative AKI [1]. There are no data on the role of haemodynamic monitoring in critically ill patients with early AKI.

OBJECTIVE. Our aim was to determine whether there is an association between increased systemic oxygen delivery and outcome in critically ill patients with AKI I.

METHODS. We retrospectively reviewed the electronic medical records of all patients in the Adult Intensive Care Unit during a 12 months period between June 2008 and May 2009. We identified patients with AKI I as defined by the AKI Network classification [2]. We recorded whether haemodynamic monitoring had been performed during the first 12 h after the diagnosis of AKI I. Based on data in high risk surgical patients, we used a systemic oxygen delivery index (DO_2I) $\geq$ 450 ml/min/m^2 to define the high DO_2I group [1, 3]. Outcomes were the proportion of patients who progressed to AKI III and hospital mortality. Patients with AKI III within 24 h after ICU admission were excluded.

RESULTS. During a 12 months period, 373 patients had AKI I (ICU mortality 23.8%, hospital mortality 31.6%). Haemodynamic monitoring was performed in 124 patients during the first 12 h of diagnosis of AKI I. Mean DO_2I was 401 ml/min/m^2 (SD 152).34 patients (27.4%) had a $DO_2I \geq 450$ ml/min/m^2 of whom 18% progressed to AKI III. 90 patients (72.6%) had a $DO_2I < 450$ ml/min/m^2 of whom 39% progressed to AKI III ($p = 0.04$). There was no statistically significant difference in hospital mortality between the high and low DO_2I group (32.4 vs. 50%).249 patients did not have any haemodynamic monitoring in the first 12 h of diagnosis of AKI I. 48 patients (19.3%) progressed to AKI III. Hospital mortality was 26%.

CONCLUSION. Critically ill patients with AKI I and $DO_2I \geq 450$ ml/min/m^2 during the first 12 h of diagnosis of AKI I had a significantly lower risk of progression to AKI III compared to patients with $DO_2I < 450$ ml/min/m^2. Future trials are necessary to determine the role of targeted haemodynamic optimisation in patients with AKI I.

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0968

A ROLE OF RENAL VENOUS CONGESTION IN SEPTIC ACUTE KIDNEY INJURY?

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INTRODUCTION. Sepsis is the leading cause of acute kidney injury (AKI). The pathophysiology of septic AKI remains poorly understood and the role of renal hypoperfusion is matter of debate. Experimental data suggest that renal venous congestion may participate to kidney failure in sepsis. We therefore hypothesized that increase of central venous pressure is associated to renal venous congestion and AKI during sepsis.

METHODS. Retrospective study in a surgical ICU. All patients with severe sepsis or septic shock admitted between 2006 and 2010 were included. Patients who died within 24 h or with chronic renal failure were excluded. Cardiac output was monitored using trans-oesophageal doppler (CardioQ-ODM, deltex medical. UK). Minimum and maximum values of Pcv, CO, $SvcO_2$ were collected on admission and D1. AKI was defined by renal items of SOFA score (SOFAcreat, serum creatinine $\geq$110 µmol/l or urine output <500 ml/24 h). Results expressed in median (IQR), non-parametric tests, $p < 0.05$ considered as significant.

RESULTS. 153 patients were included, origin of sepsis : abdomen (53%), lung (20%), urine (6%), cellulitis (6%). SAPS2 49 (37–60). All but one were in shock, including 129/153 (84%) on admission, mechanical ventilation (MV) 125/153(82%), PEEP 5(5–5) cmH_20, baseline serum creatinine 60 (50–84) µmol/L, ICU admission plasma creatinine 121 (72–177) µmol/L, 103/153 (65%) patients developed AKI, including 33/153(21%) requiring RRT. Duration of MV 6 (3–12) days, ICU stays 9 (5–17) days, ICU mortality 34/153 (22%). MinPcv on admission and D1 and maxPcv at D1 was higher in patients with AKI. All patients with minCVP > 12 mmHg were on MV with PEEP 5(2) cmH_20. 91% of patients with minCVP > 12 mmHg on admission and/or D1 developped AKI. All patients with minPcv > 14 mmHg at D1 developed AKI

Table 1

	AKI–	AKI +	p
Admission minPcv (mmHg)	6(4–8)	8(5–10)	0.01
D1 minPcv (mmHg)	5(3–8)	7(5–10)	0.002
Admission maxPcv (mmHg)	11(8–15)	12(10–16)	0.09
D1 maxPcv (mmHg)	11(7–13)	13(10–16)	0.0003
Admission min cardiac output (L/min)	3.9(3.5–6.0)	4.2(3.1–6.0)	1.00
D1 min cardiac output (L/min)	4.2(3.3–4.9)	4.2(3.3–5.4)	0.46
Admission Min$SvcO_2$ (%)	75(71–82)	71(63–76)	0.03
D1 max$SvcO_2$ (%)	75(70–78)	71(64–75)	0.006

CONCLUSIONS. Our preliminary results suggest that septic shock patient with AKI had a higher Pcv during the first 24 h from admission compared to patients without AKI, while cardiac output did not differ. Renal venous congestion may therefore be involved in the development of AKI in septic patients. The guideline to maintain Pcv > 12 mmHg in patients on mechanical ventilation (1) warrants evaluation (1). Our results call for additional studies to determine whether a causal relationship exists between high Pcv and AKI.

REFERENCE. (1) Surviving sepsis campaign. Crit Care Med. 2008

0969

SEPTIC AKI PATIENTS REQUIRING CVVH CONSUME MORE ICU RESOURCES

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INTRODUCTION. Sepsis contributes to the development of acute kidney injury (AKI) and is associated with high mortality [1].

OBJECTIVES. Aim of this study was to compare ICU resources and outcome between patients with septic AKI with those having non-septic AKI.

METHODS. Retrospective database study of consecutive patients admitted to a 20-bed mixed ICU of a teaching hospital in the year 2010 needing renal replacement therapy (RRT), provided as continuous venovenous hemofiltration (CVVH).

RESULTS. Of the 149 patients receiving CVVH (68% medical, 32% surgical), 73/149 (49%) had sepsis on admission. Primary site of infection was pulmonary (29/73), abdominal(18/73), bloodstream (13/73), urogenital (6/73), soft tissue (5/73) and endocarditis (2/73). The table compares ICU resources and outcome between patients with septic AKI and those with non-septic AKI.

Table 1

Septic AKI	No (N = 76)	Yes (N = 73)	p value
Age	68 (58–77)	70 (61–77)	0.34
Mech. ventilation	91%	93%	0.60
Duration MV (days)	4.5 (2–9)	6.0 (4–13)	0.007
Duration CVVH (h)	43 (24–81)	72 (39–170)	0.007
ICU stay (days)	5.9 (2.2–10.2)	8.6 (3.9–16.1)	0.005
APACHE III score	105 (34)	113 (31)	0.11
APACHE IV predicted mortality	51 (32)	63 (26)	0.01
Hospital mortality	45%	49%	0.64

CONCLUSIONS. Half of the patients with AKI requiring RRT had sepsis on admission. Although patients with septic AKI do not have a higher mortality, they consume more ICU resources.

REFERENCE. 1. Mehta RL et al. Sepsis as a cause and consequence of acute kidney injury: program to improve care in acute renal disease. Int Care Med. 2011;37:241–46.

0970

FLUID BALANCE ON EARLY STAGES OF SEPTIC SHOCK PATIENTS WITH CONTINUOUS RENAL REPLACEMENT TECHNIQUES

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INTRODUCTION. Septic shock (SS) patients with acute renal failure who receive continuous renal replacement techniques (TCRR) present high mortality. This study tries to identify all those variables that modify survival in septic shock patients with acute renal failure needing CRRT. Positive fluid balance produces tissue oedema and seems to increase organ dysfunction in septic shock patients. We studied the effect of initial fluid balance when starting CRRT in septic shock patients.

OBJECTIVES. Evaluate mortality risk factors in septic shock patients on CRRT and analyze fluid balance importance during initial CRRT stages in these patients.

METHODS. Prospective observational study. We studied 262 patients with septic shock and acute renal failure who went on CRRT for more than 24 h.

RESULTS. Baseline parameters: age 62 $\pm$ 13, sex (males) 183, SOFA 12 $\pm$ 3.8, APACHE II 26 $\pm$ 8. Type of patients: 57% medical and 43% surgical. When starting CRRT: creatinine 320 $\pm$ 167, lactate 5.6 $\pm$ 5, 24 h previous urine output 721 $\pm$ 742, 87.9% were on mechanical ventilation, 47.8% presented DIC, and 41.5% presented liver failure. All of them were on vasopressor support when CRRT was started. Global mortality was 65%, 28 day mortality was 54% and 90 day mortality was 63%. Cox regression multivariable analysis identified as independent variables for 90 day mortality, five risk factors: age (p 0.027), creatinine ($p < 0.0002$), days to CRRT initiation from hospital admission ($p < 0.021$), days to CRRT initiation from ICU admission ($p < 0.036$), and fluid balance over the first 24 h on CRRT ($p < 0.0001$). When analyzing fluid balance we could establish +1,000 ml/24 h as a middle point in order to divide our sample in two groups. Our fluid isovolemic group (<+1,000 ml/24 h) included 149 patients and our positive volemia group (>+1,000 ml/24 h) included 113 patients. Main differences between both groups were 70.8% 90 day mortality in the positive group and 55% in the isovolemic group. Other observed differences were days on CRRT 6.3 $\pm$ 6 vs. 7 $\pm$ 9, days on mechanical ventilation 16 $\pm$ 16 vs. 21 $\pm$ 21, ICU length of stay 16 $\pm$ 18 vs. 22 $\pm$ 24, hospital length of stay 26 $\pm$ 24, 36 $\pm$ 36.

CONCLUSIONS.

- Independent risk factors for SS + ARF + CRRT mortality were identified.
- Risk factors: age, creatinine, time from admission to CRRT, and first CRRT 24 h fluid balance.
- Positive fluid balance (>1,000 ml/24 h) over the first CRRT 24 h seems to increase mortality.

0971

COMPARISON OF THE INCIDENCE OF ACUTE KIDNEY INJURY USING THREE DIFFERENT RECOGNISED SCORING SYSTEMS

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INTRODUCTION. The 2009 NCEPOD report "Adding Insult to Injury" reviewed patients who died in hospital with a primary diagnosis of acute kidney injury. It is well established AKI is associated with high individual morbidity and mortality, and places a huge burden on health services in terms of increased LOS, critical care requirements and interventions, and also long term costs of chronic kidney disease and renal replacement therapy if ESRF is reached. There have been no definitive studies undertaken within the UK to determine the exact prevalence of AKI. In the US the prevalence within hospitalised patients has been shown to be 4.9%. The figures for patients admitted to ICU is considerably higher, with rates of AKI of up to 35–85% and between 5 and 15% requiring RRT.

OBJECTIVES. No Renal association or Intensive Care Society has adopted a common definition for AKI. If as anticipated the definition such as the AKI (Bonventre) is adopted, as opposed to RIFLE or AKIN criteria due to the ease of data collection (urine output is not part of this scoring system) we have concerns that this staging system might lead to under-recognition of AKI, as well as delayed diagnosis since urine output is reduced earlier in the disease process than a detectable rise in serum creatinine.

METHOD. We retrospectively reviewed the case notes of all 386 emergency admissions to the Central Manchester Foundation Hospital trust during the week commencing 13th November 2009. They were assessed for evidence of AKI on admission, and subsequent development of AKI any time during the hospital episode. AKI was scored using 3 different scoring systems, with the highest stage achieved recorded.

RESULTS. The overall incidence of AKI was 23.5%, with approximately two thirds of this developing post admission. All 3 scoring criteria produced broadly similar results at the more severe end of the AKI spectrum.

AKI Incidence using 3 scoring systems

RIFLE		AKIN		AKI (Bonventre)	
Stage	%	Stage	%	Stage	%
Risk	13.5	1	11.1	1	7.8
Injury	7.0	2	5.4	2	4.9
Failure	1.8	3	2.1	3	3.9
Total	22.3		18.6		16.6

However in the earliest stages of AKI the RIFLE and AKIN systems which include urine output as well as a change in serum creatinine and/or MDRD eGFR, identified 13.5% and 11.1% of our population, whereas the AKI (Bonventre) criteria identified only 7.8% of the population.

CONCLUSIONS. AKI may be both predictable, and in some cases avoidable. Assuming that a proportion of AKI can be avoided then it is imperative that the "at risk" population is identified early. Our study demonstrates that nearly a quarter of all emergency admissions developed a degree of AKI. Our study suggests that by excluding urine output from the scoring tool, clinicians might not recognise the earliest evidence of AKI, at which point simple interventions are likely to be most effective.

0972

FUNCTIONAL LEVEL OF PATIENTS SUBJECTED TO HIGH FLOW CONTINUOUS RENAL REPLACEMENT THERAPY 90 DAYS AFTER DISCHARGE FROM AN INTENSIVE CARE UNIT

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INTRODUCTION. After a research study in our unit on the survival of septic patients subjected to continuous renal replacement therapy (CRRT), we were in doubt about what the functional level of the patients included in this study would be, 90 days after their discharge from our intensive care unit (ICU).

OBJECTIVES. To determine the functional level of patients subjected to high-flow CRRT after discharge from the ICU.

METHODS. Quantitative retrospective study. The Bathel scale modified by GRANGER et al. was used. Arranging an appointment by phone for an interview in our unit, or an interview over the telephone in very specific cases. Inclusion criteria: those patients included in the previous ICU study: patients in septic shock, over 18 years of age. Exclusion criteria: patients we have been unable to contact (prisoners, foreigners) and deceased patients.

RESULTS. The sample was of 60 patients, with an average age of 57.63, weight 75.66 kg, apache II upon admittance 26.63. 34.42% deceased, 65.58% living (39 patients) present total independence 23 patients (58.96%), scant dependence 4 patients (10.25%), moderate dependence 1 patient (2.56%), severe dependence 3 patients (7.69%).

CONCLUSIONS. The data demonstrates a large percentage of patients survive, bearing in mind the high morbidity of the apache upon admittance, with a functional independence level of over 50%, some 13.81% of scant/moderate dependence, with the prevalence of severe dependence in 3 patients from amongst the cases studied, and no case presenting total dependence. This type of analysis is little studied in patients who have been treated in the ICU, with scant bibliography in existence. We consider this important due to the severe economic and social repercussions in high dependence patients.

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0973

THE IMPACT OF ACUTE RENAL FAILURE (ARF) ON OUTCOME OF MECHANICAL VENTILATION

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INTRODUCTION. Mechanical Ventilation (MV) is a factor that may induce or worsen lung injury and also contribute to the failure of other organs. An early manifestation of multiple organ failure in ICU is Acute Renal Failure (ARF), with a prevalence ranging from 4% to 16%, which is associated with increased rates of mortality.

OBJECTIVES. The aim of this study was to analyze the outcome of MV in patients with ARF in the ICU.

METHODS. This is a retrospective and analytical study that included patients aged >18 years, hospitalized in the ICU of Santa Luzia Hospital under MV for more than 24 h, from June/09 to June/10. Patients with chronic renal failure were excluded. The AKIN criteria was used to stratify patients into three groups: non-ARF, ARF and dialysis ARF. The variables analyzed were age, gender, APACHE II, length of ICU, length of MV, MV outcome and mortality. Statistical analysis used Chi-square and ANOVA, with significance level of 5%.

RESULTS. The sample consisted of 131 patients, 51.1% women, mean age 65.6 ± 20.0 years. According to the criterion AKIN, 69.5% of patients had ARF, dialysis was 31.9%. APACHE II was higher in ARF (17.6 ± 7.7) and IRA-dialysis (18.6 ± 11.0), compared to the group non-ARF (13.2 ± 7.7), $p = 0.01$. The ICU stay was similar between groups (non-ARF 21.8 ± 32.5 days; ARF 20.8 ± 19.9 days; dialysis ARF 27.1 ± 23.4 days, $p = 0.53$). The duration of MV was higher in the dialysis ARF (non-ARF 5.5 ± 4.7 days; ARF 6.9 ± 7.6 days; dialysis ARF 14.2 ± 15.1, $p < 0.01$). Considering the outcome of MV, there were more episodes of weaning the dialysis ARF group (54.5%) compared with the other groups (non-ARF 41.7%; ARF-35.1%). However, the same trend was not observed in relation to the success of weaning (non-ARF 90%; ARF 80.8%; dialysis ARF 33.3%, $p < 0.01$). Mortality was higher among patients with dialysis ARF (89.6%) compared to the groups non-ARF (42.5%) and ARF (64.5%), $p < 0.01$.

CONCLUSIONS. In the sample studied, we observed a high prevalence of the MV and ARF, and the presence of renal failure is associated with a lower success rate of weaning and higher mortality.

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0974

PREDICTIVE MODEL ASSESSMENT OF MORTALITY IN CRITICALLY ILL PATIENTS WITH ACUTE RENAL INJURY

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OBJECTIVES. To search for independent predictors of mortality in critically ill patients with acute renal injury (AKI). To analyze the clinical and epidemiological characteristics of patients admitted to ICU with AKI in accordance with the RIFLE criteria.

METHODS. Prospective observational study of adult patients consecutively admitted to an intensive care unit from January 2008 to November 2008 who developed AKI (assessed using the RIFLE scale) during the first 24 h of admission. Demographics, clinical data, laboratory tests, APACHE II, SOFA were collected at admission, as well as concomitant supportive measures and use of extracorporeal clearance techniques. Mortality rate was assessed at discharge (ICU), 30 and 60 days. Qualitative variables are expressed as percentage and quantitative variables as mean and standard deviation. Logistic regression was performed of multivariate analysis. We considered statistically significant a p value < .05.

RESULTS. 928 patients were admitted in our ICU during the inclusion period, 70 of them developed an AKI. Main quantitative variables: age 63.8 ± 14.3, APACHE II 26.3 ± 6.5, SOFA at admission 9.9 ± 3.7, Max SOFA 11.5 ± 4.1, SAPS II first 24 h 60.9 ± 16.6.

Demographic data

Variable	n (%)
Hypovolemia	61 (87.1)
Sepsis	42 (60)
Onset: hospital/community	33 (47.1)
Vasopressor	50 (71.4)
Mechanical ventilation	45 (64.3)
RRT	46 (65.7)
RIFLE (F) admission	35 (50)
Pathophysiological (mixed)	60 (85.7)
60 days mortality	29 (41.4)

Multivariate. ICU mortality

ICU mortality	p	OR	CI (95%)
SOFA at admission	NS		
Maximum SOFA	0.01	1.71	1.11–2.63
Mechanical ventilation	NS		
CRRT	NS		
SAPS II	NS		

Multivariate. 60 days mortality

60 days mortality	p	OR	CI (95%)
Mechanical ventilation	0.003	7.5	1.15–44.15
AKIN at discharge (2–3)	0.001	58	5.72–596.51
Maximum SOFA	NS		
RIFLE at discharge	NS		

CONCLUSIONS. Patients admitted to the ICU who developed AKI had high APACHE II and SOFA score. They required high support (mechanical ventilation, CRRT and vasopressors) and had a high mortality.
In our sample, the use of mechanical ventilation and an AKIN of 2–3 were independently associated with 60 days mortality.

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0975

URINARY CYSTATIN C AS A PREDICTOR OF ACUTE KIDNEY INJURY REQUIRING RENAL REPLACEMENT THERAPY IN ICU

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INTRODUCTION. It is a priority the identification of patients who may benefit from early renal replacement therapy (RRT), as it encourages the prognosis of patients with acute kidney injury (AKI) admitted to the Intensive Care Unit (ICU).

OBJECTIVES. Study whether the urinary cystatin C (uCyC) on admission to the ICU is able to predict the development of AKI requiring RRT.

METHODOLOGY. Prospective observational and cohort study in patients over 18 admitted to the ICU with hemodynamic instability (defined as systolic blood pressure below 90 mmHg or vasopressor requirement). uCyC was determined at admission. We record the maximum values of RIFLE and AKI during stay in ICU. The association between the values of uCyC and development of AKI requiring RRT, was determined through χ^2 and Fisher exact test, establishing the odds ratio (OR). A value of p less than 0.05 was considered statistically significant.

RESULTS. We studied 66 patients, 57.6% (38) male, with a mean age of 63.11 ± 16.02 years, average length of stay 14.50 ± 11.98, SAPS-3 of 55.83 ± 12.92 and 28-day mortality of 21.1%. According to the RIFLE classification, were found in level of risk (R) 12.1%, injury (I) 22.7%, failure (F) 15.2%, loss (L) 1.5% and end stage renal disease (E) 1.5%. According to the classification of AKI: stage I 59.1%, stage II 22.72% and stage III 18.18%. Average values of uCyC were of 0.81 mg/L (0.040–14.6). Values greater than 0.77 mg/L were associated with the possible need for RRT during ICU stay (CI 0.008 to 0.555, $p = 0.006$), with an OR: 20.4 (IC 2058–202.21).

CONCLUSIONS. The value of uCyC at the ICU admission is a predictor of the need for RRT during ICU stay. A value ≥0.77 mg/L may identify patients who benefit from more aggressive renoprotection therapy or early RRT.

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0976

INCIDENCE AND CONSEQUENCE OF ACUTE KIDNEY INJURY IN UNSELECTED EMERGENCY ADMISSIONS TO A TERTIARY HOSPITAL

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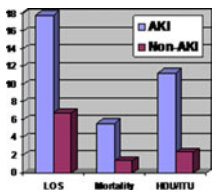
INTRODUCTION. The NCEPOD report 2009 "Adding Insult to Injury" delivered a review of the care of patients who died in hospital with a primary diagnosis of acute kidney injury. There are no definitive studies in the UK to determine the exact prevalence of AKI. In the US the prevalence within hospitalised patients has been shown to be 4.9%, and in patients admitted to ICU considerably higher, with rates up to 35–85% and 5–15% requiring RRT. It is well established that AKI is associated with high individual morbidity and mortality. It places a major burden on health services through increased LOS, critical care requirements and long term cost of subsequent chronic kidney disease, including RRT if ESRF is reached.

METHOD. We retrospectively reviewed case notes of all 386 emergency admissions to the trust during the week commencing 13th November 2009. All acute medical and surgical admissions, and acute tertiary admissions to Cardiology, Haematology, Transplant, Vascular and Cardiothoracic surgery were included. We assessed for development of AKI using three recognised scoring systems (RIFLE, AKIN and AKI Bonventre).

RESULTS. The distribution of admissions was 45% general medicine, 10% cardiology, 1% renal, 28% general surgery/urology and 9% other surgical specialties. The incidence of AKI in our population was 23.5% overall. One third was present on admission and two thirds of the AKI group developed post admission.



AKI impact on LOS, mortality, critical care beds

The AKI group had a hospital LOS three times higher than the non AKI group, with mean LOS of 17.8 days compared to 6.8 days in the non AKI group. The need for a level 2 or 3 critical care bed was 11.5% in the AKI group, compared to only 2.3% in the non AKI group. Overall group mortality was 2.3%, with the AKI group 5.6% compared to 1.37% in the non AKI group.

COMMENT. AKI is common in acute admissions to hospital. It may be predictable, and in some cases avoidable. Assuming a proportion of AKI can be avoided, we calculate that a modest reduction of 10% in the incidence of AKI could save around 5,000 bed days per annum in our trust alone. This would require a better method of identifying the 'at risk' group, and in particular those in whom AKI may be preventable. Using our database of cases we hope to develop a risk stratification tool. This will be trialled to validate the assumption that AKI incidence can be predicted and reduced, in the hope that it improves patient outcome and LOS significantly reduced.

0977

DIURETICS IN SEPTIC ACUTE RENAL FAILURE NEEDING CONTINUOUS RENAL REPLACEMENT THERAPIES

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INTRODUCTION. Diuretics play an important role in septic patients with acute renal failure (ARF) who present oliguria. Small studies report renal injury improvement with the use of diuretics as those would change oliguric ARF to non oliguric ARF, shortening renal injury duration and possibly avoiding renal replacement therapies. These findings have not been proved in large studies and adverse diuretic related effects are usually not reported

OBJECTIVES. Analyze diuretic therapy effect in septic shock (SS) patients with ARF when administered previous to continuous renal replacement therapies (CRRT) initiation.

METHODS. Prospective observational study with 120 patients presenting ARF-SS, all of them requiring CRRT more than 24 h. We analysed diuretic impact pre-CRRT considering as diuretic positive patients those who had received more than 100 mg of furosemide within 24 h previous to CRRT.

RESULTS. We studied 120 with FRA-SS with these baseline characteristics: 78 diuretic +/42 diuretic −: Sex (males) 57 versus 24, age 65 ± 11.9 versus 61 ± 13.5, SOFA 11 ± 3.7 versus 12 ± 4.5, APACHEII 25 ± 8 versus 28 ± 8, basal creatinine 108 ± 48 versus 112 ± 63, lactate 4.6 ± 3.8 versus 7.7 ± 9.1, 24 h urine output pre-TCRR 673 ± 630 versus 359 ± 227, creatinine when starting CRRT 322 ± 151 versus 359 ± 227. Days on CRRT 8.6 ± 12 vs 4.8 ± 3.7*, days on mechanical ventilation 22 ± 23.6 versus 13 ± 14*, ICU length of stay 24.5 ± 28.4 versus 13.5 ± 13*, hospital length of stay 40 ± 41 versus 27 ± 29.5*. 90 day mortality 71 versus 55%. * $p < 0.05$

CONCLUSIONS. • Diuretics use in ARF-SS meeting CRRT criteria should not be recommended. Diuretics seem to increase days on CRRT, days on MV and ICU days.
• Bigger sample is needed to evaluate possible impact on mortality.

0978

SYSTEMIC BLOOD FLOW STATUS IN THE EARLY STAGE OF SEPTIC ACUTE KIDEY INJURY (AKI)

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INTRODUCTION. Acute kidney injury (AKI) concomitant with severe sepsis and septic shock, hereafter termed septic AKI, is associated with higher mortality and morbidity. The mechanism of development of AKI is thought to involve renal ischemia, but few studies have focused on systemic blood flow in the early period of septic shock. The efficacy and accuracy of the cardiac output evaluation of the pulse contour cardiac output (PiCCO™) system (Pulsion, Germany) has been reported in many studies, and we use PiCCO system™ data measured by the transpulmonary thermal dilution (TTD) technique in the assessment of patients with septic AKI just after intensive care unit (ICU) admission.

OBJECTIVES. The study aimed to determine systemic blood flow status in the early stage of septic AKI.

METHODS. We retrospectively analyzed 75 consecutive patients in the early stage of septic AKI who were ventilated and evaluated using the PiCCO™ system between July 2007 and December 2010. AKI was diagnosed by RIFLE criteria. Patients were divided accordingly into the kidney risk and injury group (RI) and kidney failure (F) group and their clinical and hemodynamic data were compared by univariate analysis using the chi-square and Mann–Whitney U tests.

RESULTS. Median age and SOFA scores of the patients were 72 [interquartile range: 63–81] years and 12 [10–14], respectively. Thirty eight patients were assigned to the F group and 37 to the RI group. Univariate analysis indicated that 28 days mortality and norepinephrine infusion rate were significantly different between the two groups ($P = 0.032$, < 0.01). Median cardiac index value (ml/m^2) was higher in the R group than in the RI group (3.49 vs. 2.80, respectively, $P = 0.034$) and median systemic vascular resistance index value (dyn*s*cm-5*m) was lower in the R group than in the RI group (2,133 vs. 1,468, respectively, $P = 0.039$). Total volume of infusion (ml) in the 24 h after admission was significantly higher in the R group than in the RI group (7,689 vs. 5,916, respectively, $P = 0.031$).

CONCLUSIONS. Systemic blood flow status in the early period of septic AKI differed significantly by grade of kidney injury.

0979

SDD REDUCES THE INCIDENCE OF SEPSIS AFTER AKI AND USE OF ICU RESOURCES

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INTRODUCTION. Sepsis after acute kidney injury (AKI) may occur in up to 40% of the cases and increases mortality [1]. Selective decontamination of the digestive tract (SDD) reduces the risk of acquiring infection in the intensive care unit (ICU).

OBJECTIVES. Aim of the present study is to evaluate the incidence and consequences of ICU acquired infections in critically ill patients receiving continuous venovenous hemofiltration (CVVH) for AKI in the setting of SDD.

METHODS. In a retrospective database study we evaluated the incidence and consequences of new infections in all consecutive patients needing CVVH, admitted in the year 2010 to a 20-bed mixed ICU of a teaching hospital. Patients received SDD, consisting of polymyxin 100 mg, tobramycin 80 mg, amphotericin 500 mg enterally 4-times daily and cefotaxim 1 g iv 4-times daily. The latter was discontinued after 3–4 days, when cultures were negative.

RESULTS. 149 patients received CVVH; 73 (49%) had sepsis on admission, 76 (51%) did not. Of those without sepsis on admission, 13 (17%) acquired an infection. Sites of infection were bloodstream 9/13, pneumonia 3/13, soft tissue 3/13, urinary tract 2/13 and abdominal/pleural 2/13. Microbes were CNS or enterococci (13), Gram negatives (4), anaerobes (3) and fungus (1). 12/13 (92%) of the acquired infections were exogenous.

Table 1

Acquired infection	No (n = 63)	Yes (n = 13)	P value
Age (years)	68	70	0.98
Duration mechanical ventilation (days)	3 (2–6)	15 (10–30)	<0.001
Duration CVVH (h)	38 (22–77)	80 (55–506)	0.002
ICU stay (days)	4.5 (1.9–8.0)	21 (10.5–32)	<0.001
APACHE III score	105 (SD 36)	106 (SD 27)	0.95
APACHE IV Predicted Mortality (%)	50 (SD 33)	57 (SD 27)	0.52
Hospital mortality	46%	46%	1.0

CONCLUSIONS. Compared to literature, SDD reduces the acquisition of new infections after AKI, especially endogenous infections. Although patients acquiring sepsis after AKI do not have a higher mortality, they consume considerably more ICU resources.

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Neurointensive care: 0980–0989

0980

MONITORING OF PRESSURE GRADIENT BETWEEN THE SUPRA AND INFRATENTORIAL REGIONS OF THE SCULL IN THE PATIENT OPERATED FOR THE REMOVAL OF HEMANGIOBLASTOMA OF THE FOSSA POSTERIOR USING TWO INTRAPAPINCHEMAL SENSORS CODMAN. CASE REPORT

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INTRODUCTION. The driving force of herniation is the pressure gradient

OBJECTIVES. Evaluation of the of pressure gradient between the supra and infratentorial regions

METHODS. Monitoring of the intracranial pressures in two points using the intraparenchymal sensors Codman and calculation of the ICP gradient.

RESULTS. High ICP gradient was discovered in the first postoperative day. Patient required mechanical ventilation (MV), has unstable hemodynamics and mental disorders. The table presents correlation between the changes in status of the patient and reduction of ICP gradient.

Postoperative ICP gradient dynamics

Day	Glasgo Coma Scale	Arterial pressure (mmHg)	Mean arterial pressure (mmHg)	Heart rate (bpm)	Maximal ICP supratentorial (mmHg)	Maxinal ICP infratentorial (mmHg)	ICP gradient (mmHg)	Mechanical ventilation
0	15	110/60–120/80	60–90	60–100	–	–	–	Spontaneous
1	9	100/45–195/105	60–135	45–125	21–26	28–31	6–10	SIMV
2	11	140/70–160/90	80–100	55–115	10–21	14–28	4–8	SIMV
3	13	140/70–160/90	80–100	60–100	10–21	14–26	4–5	ASV
4	15	135/60–145/70	70–90	60–90	5–15	6–16	<1	ASV/ weaning
5	15	100/60–120/80	60–90	60–90	–	–		Spontaneous

On the forth p/o day patient was successfully liberated from MV he was active and adequate, hemodynamics returned to normal. At that time ICP gradient reduced < 1 mmHg.

CONCLUSIONS. Supratentorial ICP alone does predict of the development of infratentorial hypertension. We observed correlation between the signs of the recovery and the reduction of the ICP gradient.

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0981

DO PATIENTS OPERATED BY RESECTION OF PITUITARY ADENOMAS HAVE MORE BENIGN PERIOPERATIVE COURSE WITH REGARD TO THAT OBSERVED IN PATIENTS AFTER RESECTION OF OTHER TYPES OF BRAIN TUMORS?

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INTRODUCTION. Regarding brain tumors (BT), the relative frequency with which pituitary adenomas are operated in Mexico (33% or more than all the BT) is higher than that reported in big international series (7%). It is usual to believe, a priori, that intraoperative and postoperative clinical course of patients operated by resection of pituitary adenomas (PA) is more benign than that observed in patients operated for another type of BT.

OBJECTIVES. To compare the intraoperative and postoperative course in patients admitted to NICU immediately after a PA elective resection versus that observed in patients admitted to NICU immediately after an elective resection of any other type of brain tumors (BT-no-PA).

METHODS. Data of 101 patients operated for BT elective resection and consecutively admitted to NICU at IMSS UMAE 1 Bajío, were prospectively obtained. NICU BT database includes 269 perioperative items. We divided the series in two groups: (PA) and (BT-no-PA); and we analyzed the differences in the perioperative course and hospital mortality between both groups. Either Student's t-test or Chi-square test was used, as it corresponded, for the analysis of differences observed between both groups. Values of p lower than 0.05 were considered significant.

RESULTS. From these 101 patients, 39 belong to PA group (38.6%) and 62 patients to BT-no-PA group (61.4%). Hospital mortality in PA group was 5.1% (2/39) versus 11.3% (7/62) in BT-no-PA group (N.S.). Hospital mortality of the whole sample was of 8.9% (9/101). Data of the seven variables showing significant differences between both groups are shown in the Table 1.

CONCLUSIONS. In our series, patients operated by PA resection had more benign intraoperative and postoperative course than that observed in the group of patients admitted to NICU after elective resection of BT-no-PA. On average, in patients operated for PA, we observed shorter surgical and anesthetic times, lower perioperative hemorrhage, shorter LOS, and better neurological conditions and functional status upon discharge from the hospital.

Table 1 Results

Variable	Pituitary adenoma group (PA)	No-PA brain tumors group (BT-no-PA)	p
Intraoperative time (min)	186.5 ± 86.0	260.8 ± 106.2	p<0.005
Anesthetic time (min)	233.7 ± 87.6	297.9 ± 114.0	p<0.005
Intraoperative hemorrhages (cm^3)	436.5 ± 428.5	633.5 ± 582.0	p<0.05
% of patients extubated in operating room	28.2% (11/39)	3.2% (2/62)	p<0.001
Length of stay (LOS) (days)	16.8 ± 10.1	22.6 ± 15.1	p<0.025
Glasgow Outcome Scale (GOS)	1.5 ± 1.0	2.2 ± 1.3	p<0.005
Outcome Karnofsky Performance Score (KPS)	80.5 ± 21.0	65.3 ± 29.5	p<0.005
Hospital mortality	5.1% (2/39)	11.3% (7/62)	p=NS

0982

INTRACRANIAL PRESSURE DYNAMICS DURING HYPERBARIC OXYGENATION IN MECHANICALLY VENTILATED PATIENTS WITH TRAUMATIC BRAIN INJURY AND SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Hyperbaric oxygenation (HBO) in mechanically ventilated neurosurgical patients is a perspective method of intensive care. But intracranial pressure (ICP) dynamics during HBO is still unknown.

OBJECTIVES. ICP dynamics investigation during HBO in mechanically ventilated patients with severe traumatic brain injury (TBI) and non traumatic subarachnoid hemorrhage (SAH).

METHODS. We analyzed intracranial pressure dynamics in 12 patients with non traumatic SAH and 9 patients with severe TBI during 48 sessions of HBO. All patients had Glasgo Coma Scale 9 or less at the moment of study inclusion. HBO was performed by ≪ Sechrist ≫ HBO chamber equipped with ventilator ≪ Sechrist-500 ≫ at 1.2–1.6 absolute atmospheres for 40–50 min daily in first postoperative week (average three sessions for each patient). Heart rate (HR) and arterial blood pressure (ABP) were recorded during session. Arterial oxygen tension (PaO_2), arterial carbon dioxide tension ($PaCO_2$) and intracranial pressure (ICP) before and after HBO were analyzed.

RESULTS. Twelve patients with non traumatic SAH received 26 HBO sessions.
HBO was accompanied by ICP increase during 6 sessions (23%) from 14.3 ± 4.4 mmHg to 22.7 ± 8 mmHg ($p < 0.05$). $PaCO_2$ did not change (before HBO 33.8 ± 9.5 mmHg, after 35.5 ± 13 mmHg). During 5 sessions (19.2%) ICP decreased from 19 ± 2 mmHg to 15.5 ± 2.7 mmHg ($p < 0.05$), $PaCO_2$ was unchanged (before session 35.2 ± 4.3 mmHg, after 38.5 ± 4 mmHg). ICP didn't change during 15 sessions HBO (57.8%) (15 ± 4.7 mm Hg before session, 15.4 ± 5 mm Hg after HBO). $PaCO_2$ slightly increased from 30.4 ± 6.4 mm Hg to 33.6 ± 6.4 mm Hg. Nine patients with severe TBI received 22 session of HBO. HBO was accompanied by ICP increase during 9 sessions (40.9%) from 16 ± 3.7 mm Hg to 23.2 ± 4.2 mm Hg ($p < 0.05$). $PaCO_2$ increased significantly from 30.8 ± 3.7 mm Hg to 37.5 ± 9 mm Hg ($p < 0.05$). We found tight correlation between ICP and $PaCO_2$ dynamics ($n = 18$, $r = 0.65$; $p = 0.003$). ICP decreased during 2 sessions (9%) from 18.4 ± 4.7 mm Hg to 11.5 ± 3.5 mm Hg. $PaCO_2$ did not change (before HBO 30 ± 12,6 mm Hg, after-29,4 ± 6,5 mm Hg). ICP did not change during 11 sessions (50%) (15.6 ± 4.7 mm Hg before 15.6 ± 5 mm Hg after HBO). $PaCO_2$ was also unchanged (33.7 ± 3.8 mm Hg before, 33 ± 2 mm Hg—after HBO).

CONCLUSIONS. Hyperbaric oxygenation in mechanically ventilated patients with severe TBI and non traumatic SAH can be accompanied by different ICP dynamics. ICP evaluation in patients with severe TBI is tightly correlated with $PaCO_2$ increase.

0983

PREDICTORS OF MALIGNANT MIDDLE CEREBRAL ARTERY INFARCTION IN ACUTE STROKE

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INTRODUCTION. Space-occupying, malignant middle cerebral artery (MCA) infarctions are still one of the most devastating forms of ischaemic stroke, with a mortality of up to 80% in untreated patients.

OBJECTIVES. Early identification of patients at risk of space-occupying malignant MCA infarction is needed to enable timely decision for potentially life-saving treatment such as decompressive hemicraniectomy.

METHODS. To evaluate characteristics of patients with MCA infarction, admitted in an intensive care unit, a retrospective review of medical records of 236 patients hospitalized with principal diagnosis of stroke was carried out between July 2007 and January 2010.

RESULTS. Of 236 of patients included, 19 (7.9%) developed malignant MCA infarction (mean age 70 ± 14 yeas, 52% were men). Nine (47%) of the 19 underwent decompressive hemicraniectomy. The following parameters were identified as independent predictors of malignant MCA infarction: NIHSS, atrial fibrilation, temperature, blood glucose levels, Glasgow Coma Scale, blood cholesterol levels and male sex. The only variables that remained significant predictors of poor outcome were NIHSS score (OR = 1.16 per point increase; 95% CI 1.07–1.26; $p < 0.001$). The mean NIHSS was 5, range 0–34. Modified Rankin Scale (mRS) score was 4.2 ± 1.7. Mortality rate was 52% in patients with malignant MCA infarction

CONCLUSIONS. Many predictors must be considered to patients with malignant MCA infarction. Intensive care treatment must be considered to follow patients with MCA infarction. Decompressive surgery is aggressive but sometimes life saving and should be discussed with patient/family.

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GRANT ACKNOWLEDGMENT. Federal University of Bahia, Hospital Espanhol/BA

0984

CARDIAC AFFECTION AFTER SUBARACHNOID HEMORRHAGE, CORRELATION WITH SEVERITY AND ETIOLOGY

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INTRODUCTION. Cardiac affection is common after subarachnoid Hemorrhage (SAH).

OBJECTIVES. To evaluate cardiac affection in patients with SAH and to correlate it with the neurological status in these patients.

METHODS. 30 patients with acute SAH were included in the study, 20 patients had aneurysmal SAH and 10 patients had traumatic isolated SAH. All patients were subjected to daily neurological assessment (graded according to Hess and Hunt score), daily ECG, biochemical measurement of cardiac troponin I (cTnI) every other day till day 7. and transthoracic echocardiography on day 1 and day 7 for assessment of both global and regional left ventricular systolic function, it was reported as abnormal if there was evidence of regional wall motion abnormalities (RWMAs) and/or EF < 45%.

RESULTS. Out of twenty patients with aneurysmal SAH, (12 women, 8 men, with mean age 47.55 ± 12.356 years), 15 patients (75%) had ECG changes, distributed as follow: ST-T wave changes in 13 patients (65%), long QTc in 3 patients (15%), and arrhythmias in 6 patients (30%), including 4 patients (20%) with sinus tachycardia, 3 patients (15%) with atrial premature beats, and 1 patient (5%) with sinus bradycardia. By day 7, All ECG abnormalities showed complete reversibility except for partial reversibility of ST-T wave changes in 6 patients (30%) and persistence of the long QTc in one patient (5%), sinus tachycardia in one patient (5%) and sinus bradycardia in one patient (5%). Six patients (30%) had elevated cTnI, which normalized in 3 patients (15%) on day 7. Two patients (10%) had a low EF on day 1 that normalized on day 7. Three patients (15%) had RWMAs on day 1, which completely reversed in 2 patients (10%) and partially reversed in one patient (5%) on day 7. In aneurysmal SAH, ECG abnormalities, elevated cTnI and left ventricular dysfunction were associated with more severe Hess & Hunt score (p value = 0.035 and 0.001 and 0.021 respectively). Out of 10 patients with traumatic SAH, (4 women, 6 men, with mean age 42.10 ± 14.75 years) 3 patients (30%) had ST-T wave changes associated with sinus tachycardia on day 1 that partially reversed in 2 (20%) of them on day 7. No evidence of elevated cTnI or echocardiographic abnormalities in any patient with traumatic SAH. Correlation between neurological status and cardiac function in traumatic SAH lacked any statistical significance (p value = 0.5). Comparison between aneurysmal and traumatic SAH revealed a statistically significant higher incidence of ECG abnormalities and positive cTnI I in patients with aneurysmal SAH (p value = 0.045 and 0.05 respectively).

CONCLUSIONS. ECG abnormalities are common after SAH mainly the aneurysmal type. Elevated cTnI and echocardiographic abnormalities were less common after aneurysmal SAH, none of the patients with traumatic SAH showed elevated cTnI or echocardiographic abnormalities. Cardiac affection after aneurysmal SAH was associated with more severe neurological injury.

0985

PROGNOSTIC FACTORS FOR NEUROLOGICAL OUTCOME IN PATIENTS WITH NON TRAUMATIC SUBARACHNOID HEMORRHAGE

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INTRODUCTION. The mortality rate for subarachnoid haemorrhage (SAH) is 30%, with the majority of deaths occurring in the first days after SAH. Rebleeding and cerebral vasospasm are classical prognostic factors.

OBJECTIVES. The aim of this study was to analyse prognostic factors for neurological outcome in our patients with SAH treated by a multidisciplinary protocol that focused in early aneurism repair and aggressive treatment (endovascular approach) of cerebral vasospasm.

METHODS. Prospective observational study. Patients with SAH haemorrhage admitted in our critical care unit between January 2007 and December 2010. All patients were managed following a multidisciplinary protocol that includes an early aneurism repair (<48 h), an invasive an urgent management (endovascular) of associated cerebral vasospasm. We analysed epidemiological variables, SAH severity (WFNS and d Fisher scales), aneurysm or vascular malformation as a cause of SAH, type of aneurysm treatment (coiling or clipping), complications: rebleeding, hydrocephalus, cerebral vasospasm and systemic ones. Neurological outcome using a Glasgow outcome scale (GOS) at 3 months. Results are expressed as mean or percentage, using a $p < 0.05$ as significance level. We applied SPSS with the t test for continuous variables and Chi-square for categorical ones, and logistic regression tests, calculating odds ratio with confidence interval of 95% for the significant variables.

RESULTS. We have treated 65 patients (31 males, 34 females) aged 56 ± 12 years. We have found a cerebral aneurysm in 43 patients and a vascular malformation in 6. Cerebral aneurysms were treated with coiling in 26 patients and surgical clipping in 15. Symptomatic cerebral vasospasm was diagnosed in 14 patients (21%) and hydrocephalus in 21 patients (32%). A good neurological outcome (GOS 4–5) at 3 months was present in 47 patients (72%) and only 6 patients died (9%).

Variables related with the neurological outcome were: history of hypertension, intracerebral haematoma, intraventricular haemorrhage (IVH) or acute hydrocephalus on admission CT, vascular malformation as a cause of SAH, presence of delayed neurological ischemic deficit (DNID), fever and hyponatremia. Independent factors related to neurological outcome in multivariate analysis were presence of IVH (OR 12, CI 1.3–113) and fever in the ICU (OR 5, CI 1.1–27).

CONCLUSIONS. In our series of non traumatic SAH patients treated with a strict protocol we found a good neurological outcome at 3 months in 72% of patients. We found that IVH on admission CT and fever during the ICU were related with poor outcome, while classic factors as rebleeding or cerebral vasospasm were not related (due to early aneurysm repair and invasive cerebral vasospasm treatment?).

GRANT ACKNOWLEDGMENT. CIBERES

0986

RESIDUAL NEUROMUSCULAR BLOCKADE AFTER ROCURONIUM BROMIDE ADMINISTRATION IN THE NEUROSURGICAL PATIENTS. INCIDENCE AND TREATMENT OPPORTUNITIES

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INTRODUCTION. Neurological status assessment is one of the main methods of neuromonitoring in the neurosurgical ICU. Residual neuromuscular blockade (NMB) after muscle relaxants administration significantly complicates neurological status investigation and could be associated with hyperdiagnosis of consequence level deterioration. But data about NMB incidence and methods of NMB reversal in neurosurgical patients are insignificant.

OBJECTIVES. To assess residual NMB incidence and possibility of its reversal with sugammadex.

METHODS. We analyzed neuromuscular conductance (NMC) in the early postoperative period in 23 neurosurgical patients (age 52.2 ± 11.3 years, male/female 12/11). Three patients had brain tumors, 15 cerebral aneurism rupture, 3 arterial-venous malformation rupture, 2 hemorrhagic stroke. Rocuronium bromide ("Esmeron", MSD) was used for muscle relaxation during surgery (mean dose 0.44 ± 0.22 mg/kg per h, operation procedure duration 225 ± 60 min). NMC assessment with TOF-Watch SX was started at the admission to the ICU. Residual NMB was diagnosed as NMC alteration more than 90 min after last muscle relaxant administration during surgery (TOF = 0, deep NMB; TOF 1–3, moderate NMB; TOF, 1–90%, NMC restoration; TOF >90%, normal NMC). Sugammadex ("Braidan", MSD) was used for residual NMB reversal in 10 patients (mean dose 2.1 ± 0.4 mg/kg). Data are expressed as M ± SD and median (25 and 70 percentile).

RESULTS. Residual NMB incidence was 69.5% (deep NMB, 43,8%; moderate NMB, 56.2%). Time for spontaneous NMB reversal in patients who did not receive sugammadex (n = 6) was 193 ± 53 min. Sugammadex administration effectively reverse residual NMB in all patients (n = 10). Time from drug injection to TOF > 90% was 173 (150; 221) seconds. Reversal speed was depended on initial NMB depth. In patients with deep NMB time from sugammadex injection to TOF > 90% was 278 (221; 353) seconds in comparison with 150 (83; 161) seconds in patients with moderate NMB.

CONCLUSIONS. Residual NMB incidence after rocuronium bromide administration during neurosurgical procedures is 69.5%. NMB could persist more than 3 h and complicates neurological assessment in the early postoperative period. Sugammadex administration is effective method of residual NMB reversal and can restore NMC in 3–5 min.

0987

EFFECT OF HEAD AND BODY POSITIONS ON CEREBRAL BLOOD FLOW VELOCITY IN PATIENTS WHO UNDERWENT CRANIAL SURGERY

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This clinical study was planned to determine the effect of head and body positions on the cerebral blood flow velocity in patients who underwent cranial surgery. Our sample consisted of 38 patients who underwent cranial surgery between October 2009 nad May 2010. The measurements of mean cerebral blood flow velocity were performed by the transcranial doppler ultrasound through the temporal window. The mean cerebral blood flow velocity of the patients was measured in supine position with 0° and 30° head elevation, right lateral position, left lateral position, right and left lateral positions with head flexion and extension. The measurements were performed before surgery and within 72 h after surgery. At the end of this study, the mean cerebral blood flow velocity of the middle cerebral arteries increased in head elevation of 30°, in right and lateral positions, but the velocity decreased in head flexion and extension positions in preoperative and postoperative periods. The mean cerebral blood flow velocity of the middle cerebral arteries increased in the postoperative period when compared with the preoperative. The changes in the mean cerebral blood velocity were found within the normal limits. According to these results, the head elevation of 30° and the right and left lateral positioning are suggested for the patients who underwent cranial surgery. It should be also avoided from the head flexion and extension because of the decrease of cerebral blood flow.

0988

CEREBRAL BLOOD FLOW BY THERMAL DIFFUSION DURING ASSESSMENT OF BRAIN DEATH

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INTRODUCTION. Brain death has been defined by the scientific community as the irreversible ending of the functions of all the intracranial neurological structure. The loss of cerebral autoregulation in some traumatic brain injury (TBI) can lead to decreased cerebral blood flow (CBF) and cause the death of patient (1). Based on the assumption that brain ischemia and hypoxia are central causes of brain damage, the maintenance of an adequate tissue perfusion is a primary objective in the field of neurocritical care. Thus, monitoring CBF to discriminate between normal and critically impaired tissue perfusion, is recognized as a leading indicator of neurocritical care management.

The Hemedex perfusion system® allows continuous monitoring of CBF by application of thermal diffusion, in real time and in absolute physiologic units of ml/100 g-min (2).

CASE DESCRIPTION: Our case involved a 57 year old male patient, he was admitted to the intensive care unit (ICU) diagnosed with severe TBI with Glasgow Coma Scale 3 and severe chest trauma. Severity score was calculated by TRISS aiming a survival probability of 5%. Treatment and advanced neuromonitoring were introduced, under care protocol based on the Brain Trauma Foundation guidelines, recording: intracranial pressure (ICP), tissue oxygen pressure (PtiO2), bispectral index (BIS). He was included in a prospective, nonrandomized, observational study in order to determine the correlation between continuous monitoring CBF by thermal diffusion (Hemedex ®) and multimodal neuromonitoring in severe TBI. Patient treatment was introduced in a phased manner according to ICP values. Second CT scan was performed at 12 h aiming hemorrhagic foci in the frontal lobe, left temporal lobe and posterolateral lobes; right parietal ischemic area, mild mass effect on lateral ventricles, occupation of sphenoid sinuses and base fracture skull. Surgical intervention was dismissed. The patient's clinical course was torpid with refractory intracranial hypertension and drastic decrease in cerebral oxygenation values. Gradual deterioration with BIS values decreased to 0 with a 100% suppression rate, and CBF values decreased under 10 mL/100 g/min. We proceed to brain death diagnosis, initiating legal medical paperwork for organ donation within 36 h of patient admission.

METHODS. Data were statistically correlated using Pearson's r bivariate correlation. Results obtained from this patient emphasizes a high statistical correlation between CBF and ICP ($r = -0.429$, $p < 0.05$), $PtiO_2$ ($r = 0.822$, $p < 0.05$), BIS ($r = 0.889$, $p < 0.05$).

CONCLUSIONS. As a newly added device in ICU, further studies are needed to establish the role of CBF measurement by thermal diffusion in multimodal neuromonitoring. Probably, having early signs of neurological deterioration (including FSC) allows the beginning of medico-legal protocols of brain death.

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0989

INCIDENCE AND PROGNOSIS OF DYSNATREMIAS AMONG CRITICALLY ILL PATIENTS WITH SUBARACHNOID HEMORRHAGE

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INTRODUCTION. Disturbances of sodium balance are common in the patients admitted to the Intensive Care Unit and are independent factors for poor prognosis. Both hypernatremia and hyponatremia are frequently observed in neurologic patients which could have an important effect on prognosis. The most common cause of hypovolemic hypernatremia in those patients is central Diabetes Insipidus (DI), the most common cause of euvolemic hyponatremia is the Syndrome of Inappropriate Antidiuretic Hormone Secretion (SIADH) and the hypovolemic hyponatremia is the Cerebral Salt Wasting Syndrome (CSW)

OBJECTIVES. To determine the incidence and prognosis of dysnatremias among critically ill patients with subarachnoid hemorrhage

METHODS. We conducted a retrospective study in two medical-surgical ICUs in a public and a private hospital of Monterrey, Mexico during a 3 year period. Retrospective data collection from medical records were performed between January 2008 and December 2010, we collected information from all the consecutive patients with subarachnoid hemorrhage diagnosis due to ruptured intracranial aneurysms who underwent neurosurgical clipping (Group A) or coil embolization (Group B), where also included in the last group patients with SAH but with no evidence of ruptured aneurysms and excluded patients with traumatic SAH.

RESULTS. 60 patients were retrospectively evaluated, 41 patients from the public hospital (Group A) and 19 patients from the private hospital (Group B). Mean age was 68 ± 15 years, 25 (41.6%) were males and 35 (58.3%) females. At admission Glasgow Coma Scale was 12.6 ± 3.18, Hunt Hess 2.48 ± 0.96, Fisher 3.06 ± 1.0 and WFSN 2.3 ± 1.27. Of the total patients 15 (24%) developed dysnatremias, 10 (24.3%) Group 1 and 5 (25.3%) Group 2. Three patients (5%) developed Diabetes Insipidus, six (10%) met SIAH criteria and six (10%) developed CSW. Of total patients 14 (23.3%) developed vasospasm. 7 (50%) patients with dysnatremia developed vasospasm, 5 (50%) Group A and 2 (40%) Group B (OR 0.93, RR 0.9; $p > 0.05$). There was no association between dysnatremias and vasospasm (OR 2.0, RR 1.67, p 0.3). 2 Patients with DI died (66.6%) Group A.

CONCLUSIONS. In this retrospective analysis hyponatremia alterations were more common than hypernatremia. The incidence of dysnatremias were no statistically significant and were similar between groups with no significant associations for each group. No statistically significative association were found between dysnatremias and vasospasm. Hypernatremia was associated with poor outcomes.

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GRANT ACKNOWLEDGMENT.

Perioperative care: Fluid & temperature management, safety, sedation, immunology: 0990–1003

0990

PLASMA LEVELS OF SOLUBLE RECEPTOR FOR ADVANCED GLYCATION END PRODUCTS ARE ASSOCIATED WITH LUNG INJURY FOLLOWING CARDIAC SURGERY, IRRESPECTIVE OF BLOOD TRANSFUSION

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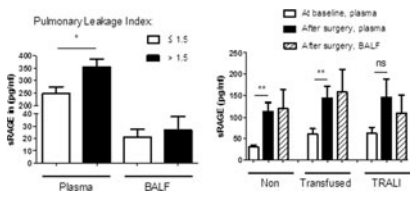
INTRODUCTION. Plasma levels of soluble receptor for advanced glycation end products (sRAGE) have been implicated as a marker of acute lung injury (ALI). Pulmonary leakage index (PLI) is an early indicator of ALI.

OBJECTIVES. We hypothesized that plasma sRAGE levels are increased after cardiac surgery and associated with an elevated PLI. We also examined the role of blood transfusion as a determinant of plasma sRAGE levels in transfused patients and in patients developing transfusion-related acute lung injury (TRALI), according to the consensus criteria.

METHODS. In two university hospital ICUs in The Netherlands, sRAGE and PLI were measured in a cohort of cardiac surgery patients after receiving no, restrictive (1–2 units) or multiple (≥5 units) transfusion(s) ($n = 20$ per group). In addition, 16 cardiac surgery patients developing transfusion-related (TR)ALI following transfusion were randomly matched with control patients (transfused and non-transfused patients not developing ALI) and compared using Kruskal–Wallis or Mann–Whitney U test.

RESULTS. Cardiac surgery resulted in elevated plasma sRAGE levels compared to preoperative baseline levels [315 (±181) vs. 110 (±55) pg/ml resp., $p < 0.001$]. There was a correlation between plasma sRAGE and PLI (Pearson $r = 0.425$, $p = 0.001$). Levels of sRAGE did not differ between patients who had received no, restrictive or multiple transfusion. In TRALI patients, sRAGE levels were not different compared to controls.



sRAGE in cardiac surgery patients

CONCLUSION. Plasma levels of sRAGE are elevated following cardiac surgery and associated with an increase in pulmonary vascular permeability. The level of sRAGE is not significantly influenced by transfusion, nor does it seem to play a role in the first hours of TRALI.

0991

INTEREST OF NIRS PARAMETERS TO EVALUATE MICROCIRCULATORY DISORDERS AND TO PREDICT ORGAN DYSFUNCTION IN THE POSTOPERATIVE PERIOD OF CARDIAC SURGERY

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INTRODUCTION. The presence of organ dysfunction after a cardiac surgery is associated with an increase of postoperative morbi-mortality. In this context, the role of microcirculatory impairment remains unclear.

OBJECTIVES. The purpose of this study was to describe the perioperative evolution of the microcirculation using the technology of near infrared spectroscopy (NIRS) in patients operated under cardiopulmonary bypass (CPB). The secondary objective was to find out a correlation between microcirculatory alteration and organ dysfunction occurrence.

METHODS. 31 patients at risk of developing a postoperative organ dysfunction (predictable CPB duration >120 min or left ventricular ejection fraction (LVEF) < 40%) were prospectively included over 9 months in a single center. Muscle tissue oxygen saturation (StO_2) and its changes during a vascular occlusion test (recovery slope) were measured at the thenar eminence using a near-infrared spectroscopy (NIRS) device. Organ failure was assessed by the SOFA score. Parameters were investigated at different time points: before the induction of anaesthesia (baseline); after anaesthesia; 30 min after the beginning of CPB [during CPB); 6; 12; 24 and 48 h after the end of CPB (H6; H12; H24; H48]. Those time points were compared with repeated measures ANOVA and Scheffé's post-hoc test.

RESULTS. 20 men and 11 women were included (age 68 ± 11 years, EuroSCORE 7.1 ± 2.6, LVEF 50 ± 11%). The mean duration of CPB and length of stay in ICU were 127 ± 50 min and 5.6 ± 7 days, respectively. StO_2 and the recovery slope were significantly different from baseline values only at H6 (Table 1). At this time point, both StO_2 and the recovery slope were not correlated with the SOFA score measured at H6, H24 or H48. We found a weak correlation between the recovery slopes at H6 and the length of stay in ICU ($r^2 = 0.16$, $p = 0.04$).

Table 1: Micro and macro circulatory data (mean ± EC)

	Baseline	After anaesthesia	During CPB	H6	H12	H24	H48
StO2 (%)	82 ± 5	80 ± 8	79 ± 9	76 ± 9.8*	82 ± 9	83 ± 8	80 ± 10
Recovery slope (%/s)	4.5 ± 1.3	3.8 ± 1.7	2.6 ± 1.2*	2.7 ± 1.2*	3.7 ± 1.5	4.1 ± 1.5	3.6 ± 1.7
Temperature(°C)	37	36.2 ± 0.7	34 ± 3.3*	37.5 ± 0.8	37.5 ± 0.6	37.1 ± 0.4	37.2 ± 0.5
Haemoglobin (g/dl)	11.3 ± 2.1	nm	9 ± 1.7*	11.6 ± 1.5	11.7 ± 1.5	11.8 ± 1.4	11.8 ± 1.4
Lactate (mmol/l)	1.2 ± 1.9	1.6 ± 1.9	1.4 ± 0.5	1.7 ± 1.9	1.8 ± 1.5	1.7 ± 0.8	1.5 ± 0.8
SvO2 (%)	72.2 ± 7.3	76.8 ± 8.3	76.9 ± 8.3–	69.7 ± 6.6	70.5 ± 8.4	67.1 ± 4.6	65.1 ± 4.6
Cardiac index (l/min/m^2)	nm	1.9 ± 0.6	2.3 ± 0.1	2.1 ± 0.5	2.3 ± 0.4	2.3 ± 0.5	2.5 ± 0.5
Mean arterial pressure (mmHg)	87 ± 14[c]	75 ± 12	65 ± 8[a]	74 ± 8	74 ± 7	76 ± 8	77 ± 8
SOFA score	0	nm	nm	7.5 ± 2	nm	5.7 ± 3	4 ± 3

nm not measured
* $p < 0.05$ versus baseline
[§]$p < 0.05$ versus baseline and H6 and H24

CONCLUSIONS. Despite a transient but significant alteration of microcirculatory parameters (StO_2 and recovery slope) we failed to find a correlation between these microcirculatory parameters and an organ dysfunction with the SOFA score in post cardiac surgical context. The large inter individual variations may explain these results. This research received funding support from the University Hospital of Saint Etienne.

0992

PATIENTS WITH CHRONIC ALCOHOL CONSUMPTION UNDERGOING PANENDOSCOPIC SURGERY HAVE ALTERED CYTOKINE LEVELS IN THE LUNG

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AIMS. Bacterial pneumonia is the most common cause of lower respiratory tract infection in immune compromised populations, including patients with chronic alcohol consumption. Furthermore, alcoholics are frequently infected with highly virulent respiratory pathogens and consequently experience increased morbidity and mortality from bacterial pneumonia (Happel KI, Proc Am, 2005; Spies C, Resp. Crit C. Med. 2006). A prominent role in pulmonary immune defense is played by the alveolar macrophages (AMs), which constitute over 80% with the majority of the cells in the alveoli. In addition to phagocytic properties, AMs also secrete superoxide and a variety of pro-and anti-inflammatory cytokines and therefore the first "barrier" is an important function in the pulmonary immune defense. As such, we tried to characterize the influences of chronic alcohol consumption on the function of AMs.

METHODS. After approval from our ethics committee and informed consent 46 of 51 patients, 15 with alcohol use disorder (AUD) and 31 of non-AUD (nAUD), undergoing panendoscopic surgery were included in the study. The stratification by alcohol abuse was carried out according to DSM IV criteria and alcohol-related questionnaires (AUDIT, CAGE) and biomarkers (CDT). Exclusion criteria overall were age <18 years, lung disease, liver failure, heart disease, current immunosuppressive therapy, state after transplantation and preoperative existing infections. Before the scheduled panendoscopy, a bronchoalveolar lavage (BAL) was performed in the right middle lobe with 140 ml of NaCl 0.9%. The patients are ventilated during the investigation with Fi02 1.0. HLA-DR expression (BD Quantibrite™ Bead Array) and subsequently, the concentration of pro-and anti-inflammatory cytokines in the supernatant of BAL after lipopolysaccharide (LPS)—recorded stimulation was specified.

RESULTS. Patients of the AUD had significant higher AUDIT scores and increased CDT values. The unstimulated measurements of cytokines showed significances in the AUD group in IL-10, IL-1β and IL-12p70 (unit: pg/10^6 AMs). After 4 h LPS—recorded stimulation IL-10 was significantly increased in the AUD group whereas about that TNF-α was decreased. After 24 h of stimulation IL-8 was decreased in the AUD group. In HLA-DR could be found no differences between AUD and nAUD.

Measurements of cytokines

	AUD	nAUD	p
IL-10 unstimulated	72.35 (14.7/223.03)	16.79 (0.00/39.15)	0.025
IL-1ß unstimulated	61.44 (19.65/262.84)	20.62 (0.00/57.05)	0.041
IL-12p70 unstimulated	49.47 (28.88/187.43)	28.24 (0.00/53.59)	0.016
IL-10 LPS 4 h	96.05 (29.20/123.31)	33.97 (10.83/68.91)	0.039
TNF-α LPS 4 h	2,034.55 (160.28/6,588.86)	6,141.11 (3,076.21/9,973.63)	0.05
IL-8 LPS 24 h	44,805.52 (7,909.95/178,510.18)	112,769.30 (38,882.32/345,782.13)	0.05

CONCLUSIONS. The significantly altered levels of cytokines in the lung of alcoholics, especially the decrease of pro-inflammatory TNF-α and IL-8 after LPS-recorded stimulation while the anti-inflammatory IL-10 was increased, may be indicative of an impaired immune function of alveolar macrophages.

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FLUIDS ADMINISTRATION CAN MODULATE INFLAMMATORY NEUTROPHILS RESPONSE AND MMP-9, MPO ACTIVITY. AN IN VITRO STUDY

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INTRODUCTION. Inflammation is characterized by a tight balance between pro-inflammatory and anti-inflammatory mediators. In presence of a pro-inflammatory condition, a lot of cytokines are produced, among them matrix metalloproteinases 9 (MMP-9) and myeloperoxidase (MPO). These proteins could be very dangerous since they are involved in many pathological processes such as: tumor spread and metastatization, COPD, ALI/ARDS, fibrosis, sepsis and cardiovascular diseases. Moreover an over-expression of MMP-9 is involved in anastomotic leakage after major bowel surgery [1]. Recent studies have suggest that the quality of fluidic therapy can modulate the activity of inflammation mediators. Colloids, for example, reduces the circulating levels of MMP-9 during abdominal surgery (2). However, the solutions used in the clinical setting differ not only for the presence or not of colloids, but also for the electrolytes component. For example, balance solution are characterized by the presence of several components (malate, acetate, calcium,...) that are not present in normal saline. Since balanced solutions have influence on inflammation, we can make the hypothesis that the components characterizing balanced solution may have a modulatory effect on inflammation.
OBJECTIVES. To observe, in vitro, the modulation of MMP-9 and MPO activities by two different solutions for volume replacement: 6% hydroxyethylstarch (HES) in natural saline (S), and 6% HES in balanced solution (B). Moreover we verified whether B and S solutions might influence neutrophils response to pro-inflammatory stimuli.
METHODS. The MMP-9 and MPO activity was measured with commercially available Activity Assay kits. The levels of MMP-9 and MPO were determined with ELISA in after LPS and IL-8 stimulation of neutrophils.
RESULTS. The B solution showed more inhibitory effect on both MMP-9 and MPO activities compared to S solution. Compared to RPMI, the S and B solutions had the same effect on MPO release under IL-8 and LPS stimulation. On the contrary, the release of MMP-9 increased in the B solution after IL-8 stimulation, whereas it was reduced in B and unaffected in S solution after LPS treatment.
CONCLUSIONS. MMP-9 and MPO activities as well as neutrophils response to inflammatory stimuli are influenced by the ionic composition of the different solutions used. These results suggest that different fluids can have different effects on inflammation. Balanced solution seems to better modulate inflammation compared to normal saline.
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0994

CLINICAL EFFECTS OF ORAL MELATONIN IN HIGH-RISK CRITICALLY ILL

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INTRODUCTION. Endogenous blood melatonin in critical patients is often dramatically low, in both basal levels and night peaks. Exogenous supplementation could determine hypnogogue, immunomodulating and antioxidant effects. Prolonged administration (possible undesirable effects: sleepiness, bronchospasm, accumulation) has not previously been described in critically ill.
OBJECTIVES. Evaluating safety and clinical effects of oral melatonin in high-risk critically ill [1] treated with conscious sedation [2].
METHODS. Double-blind RCT between placebo and melatonin (3 mg ×2), administered daily at 8 and 12 pm from the third ICU day until discharge. Inclusion criteria: age ≥ 18, SAPS II > 32, expected mechanical ventilation (MV) ≥ 4, practicability of gastroenteric tract. Statistical analysis performed with mixed-effects regression models for repeated measures (Stata 11).
RESULTS. 96 patients enrolled: age 72 [60–77] years, SAPS II 41 [34–54] pts, MV 11 [6–22] days. Diagnosis: 17 pancreatitis, 37 acute lung diseases, 23 acute heart diseases, 19 other. Melatonin fastened sepsis resolution and ventilation weaning; it also guaranteed hemodynamic stability and helped restoring a quite normal circadian rhythm (Table 1). Differences in length of stay, days of MV and ICU/hospital mortality were not statistically significant. Undesirable effects were not reported.

Variables	Placebo (825 patient-days)	Melatonin (593 patient-days)	p
LOC HT - n (%)	733 (88.9)	475 (80.1)	0.033
SOFA - median [IQR]	3 [2-5]	2 [1-4]	<0.001
WBC - n/mm³	13779 ± 6886	11975 ± 5762	0.006
PLT - n/mm³	274609 ± 192342	250859 ± 139037	0.019
SEPTIC STATE			
no SIRS - n (%)	265 (32.9)	245 (46.8)	
SIRS - n (%)	119 (14.8)	112 (21.4)	
sepsis - n (%)	263 (32.6)	114 (21.8)	<0.001
severe sepsis - n (%)	84 (10.4)	33 (6.3)	
septic shock - n (%)	75 (9.3)	20 (3.8)	
Total Bilirubin - mg/dL	2.8±3.6	2.5±3.3	<0.001
AST - IU/L	62±60	74±105	0.207
ALT - IU/L	72±128	67±84	0.433
Blood Urea - mg/dL	100±62	96±55	0.449
Creatinine - mg/dL	1.8±1.5	1.5±1.4	0.123
Drugs			
Vasoactives - n (%)	93 (11.3)	32 (5.4)	0.005
Beta-blockers - n (%)	39 (4.7)	18 (3.1)	0.008
Antiarrhythmics - n (%)	126 (15.3)	135 (23)	0.227

Variables	Placebo (3335 observations)	Melatonin (2414 observations)	p
Axillary T - °C	37.1±0.7	37.2±0.8	<0.001
HR - bpm	95±16	92±15	<0.001
SBP - mmHg	128±20	129±21	0.076
DBP - mmHg	57±13	61±14	<0.001
Ventilation			
Spontaneous - n (%)	416 (12.6)	485 (20.4)	
CPAP - n (%)	514 (15.1)	718 (30.2)	<0.001
PSV - n (%)	2286 (69)	1172 (49.3)	
PCV - n (%)	95 (2.9)	1 (0.04)	
RR - breaths/min	23±7	23±6	<0.001
SpO - %	97.8±4.1	98.1±2.4	0.043
Venous pH	7.40±0.13	7.42±0.09	0.110
PvCO - mmHg	48.4±8.2	48.9±9.1	<0.001
GRV>250mL - n (%)	120 (4.4)	61 (3.2)	0.103
Sleep - hours			
Morning (7am-1pm) - n	2 ± 1.8	1.9 ± 1.8	<0.001
Afternoon (1pm-9pm) - n	2.7 ± 2.2	2.3 ± 2.3	0.003
Evening (9pm-12pm) - n	1.4 ± 1.3	1.5 ± 1.6	0.216
Night (12pm-7am) - n	4.3 ± 1.8	4.4 ± 2	0.027

CONCLUSIONS. Melatonin administration was shown safe regarding cardio-respiratory and neurological stability. It determined fastened sepsis resolution in both lab measurements (WBC, PLT, bilirubin) and clinical observations (SOFA, septic state) probably due to its immunomodulative action and reactive oxygen species scavenging. The Melatonin group had faster ventilation weaning; nurse-observed decreased sleep hours in the morning/afternoon and increased in the night highlighted a quite restored circadian rhythm. GRV was not different, as the need for bronchodilators; no excessive sleepiness was shown. No differences in MV days, ICU days or ICU/hospital mortality were reported, being this study not powered for these outcomes. In two post-hoc analyses, Melatonin decreased MV days ($p = 0.013$ in patients treated >7 days) and ICU mortality ($p = 0.047$ in patients treated >40 days), suggesting the necessity of new and adequately powered studies for long-term ICU patients. (Clinicaltrial.gov n° NCT00470821)
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0995

THE POSSIBILITY OF USING CITICOLINE FOR CEREBRAL PROTECTION DURING TOTAL INTRAVENOUS ANESTHESIA

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INTRODUCTION. General Anesthesia (GA) may cause some side effects due to the direct action of anesthetics on the central nervous system (CNS), for example: postoperative cognitive dysfunction (POCD). Experimental data (Lobov et al. 2009) showed that propofol has a negative impact on populations of hippocampus cells in intact rats, causing a twofold increase in changes of neurons in comparison with the norm.
OBJECTIVES. The aim of study was examine the possibility of using Citicoline for intraoperative cerebral protection during total intravenous anesthesia (TIVA) based on propofol and fentanyl.
METHODS. In double-blind, randomized clinical trial, we included 40 patients (ASAII-ASAIII, age 17-69 years) who underwent laparoscopic cholecystectomy under TIVA. The induction of TIVA was standard in all patients. Maintenance of anesthesia: infusion of propofol (3.3–7.3 mg/kg per h), fentanyl (3.5–6 mkg/kg per h) and esmerone (0.6 mg/kg per h). In the study group (A, $n = 20$) we used Citicoline (Ceraxon®, Nycomed) 1,000 mg dissolved in 200 ml 0.9% NaCl, and in the control group (B, $n = 20$) used only 200 ml 0.9% NaCl. Blinding: Anesthesiologist received ready solution before surgery from a third party, without knowledge of its composition. Infusion of solution (of the same color and volume in all cases) began immediately after the imposition of carboxyperitoneum at a rate of 3 ml/min. Monitoring: Harvard Standard, Bispectral Index (the value of BIS in all patients were maintained in the range 45–50%), Perfusion Index (PI), Heart Rate Variability (HRV). Neuropsychological study (including test "Tables Schulte", Hospital Anxiety and Depression Scale (HADS) and the "10 words" test) was performed the day before, in the 1st and 3rd day after surgery. Results are presented as average (M), maximum (Max) and minimum (Min) values, statistical significance was determined using Wilcockson-Mann–Whitney's criterion (u).
RESULTS. In all patients, anesthesia was adequate (in accordance with monitoring data of BIS, HRV and hemodynamics). Dosage of propofol and fentanyl was equal in both groups. Characteristics of the post anesthesia recovery period were significantly better in main group (see Table). In group A in the 1st days after surgery events of POCD was observed in 20% of patients, whereas in group B—in 50% of cases ($p < 0.05$). In the study group was observed the improvement of long-term memory by 56% ($p < 0.05$) and an increase in the effective discharge of 14,3% ($p < 0.05$) compared with controls on the third day after surgery.

Characteristics of the post anesthesia recovery pe

Group	Awakening, min	Extubation, min	Orientation, min	10 points for Aldrete, min
A [M (Max–Min)]	3.6 (1.6–10.5)	15.0 (5.0–22.1)	16.4 (6.5–23.8)	20.1 (12.6–26.3)
B [M (Max–Min)]	10.1 (3.8–18.4)	22.4 (12.8–33.1)	24.0 (14.2–35.8)	28.1 (18.3–38.9)
p (U)	0.022	0.013	0.015	0.007

CONCLUSIONS. The results show, that Citicoline can be used intraoperatively as cerebroprotector during TIVA based on propofol and fentanyl. Its application accelerates the period postanesthetic recovery and reduces the early manifestations of POCD.
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0996

INTERNATIONAL MULTICENTER STUDY ONE DAY PREVALENCE OBSERVATIONAL STUDY FOR DELIRIUM ON ICU (IMPROVE-ICU): SUPPORTED BY THE EUROPEAN CRITICAL CARE RESEARCH NETWORK (ECCRN)

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INTRODUCTION. Delirium is seen in 11–87% of the ICU patients. It is associated with a threefold risk of dying within 6 months after ICU discharge [1] and a worse cognitive outcome [2]. Delirium monitoring is performed rarely in only 30% of the ICU patients [3]. The ability to accurately detect ICU delirium improved after the use of a validated delirium score [4].
OBJECTIVES. The primary aim of the study was to investigate the implementation rate of delirium monitoring in critically ill patients after having increased awareness in the last years ESICM meetings.
METHODS. The study (ethical approval No EA1/165/10) was designed as an anonymous international multicenter clinical survey. The data assessment on the 25th of January (one-day prevalence study) was performed with an online questionnaire (electronic case report file, eCRF; created with LimeSurvey, version 1.55+). Repeated email invitations were sent to all ESICM members 6 months prior to the study date. All ICUs were eligible for taking part in the study. Descriptive statistics were computed for all study variables using IBM SPSS Statistics 19.
RESULTS. 657 visitors accessed the website, 129 questionnaires were submitted. Finally, 101 ICUs completed the questionnaire and were included in the analysis. Most institutions taking part were university hospitals (86%) including mixed (68%), surgical (26%) and medical ICUs (5%). A validated score for delirium monitoring was implemented in 55 out of 101 ICUs (55%): Confusion assessment method for the ICU > Delirium Detection Score > Intensive Care Delirium Screening Checklist > Nursing Delirium Screening Scale. However, merely 30% of the ICUs monitored delirium every 8 h. Almost all ICUs treated delirium symptoms with pharmacological agents: antipsychotics > benzodiazepines > α2 adrenergic agonists > serotonin antagonists and reuptake inhibitors. 77% of the ICUs monitored sedation, 80% of the ICUs routinely assessed pain levels.
CONCLUSIONS. The implementation rate of delirium monitoring was 55%. This shows the right trend of increasing awareness in ESICM members to use delirium monitoring. However, more education is needed to increase the frequency of delirium monitoring compared to sedation and analgesia monitoring to improve early treatment (5, 6).
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GRANT ACKNOWLEDGMENT. Many thanks to all ESICM members who had spent time participating in this survey

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RESTRICTIVE FLUID THERAPY IN MAJOR ABDOMINAL SURGERY: SELECTION OF FLUID COMBINATION

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INTRODUCTION. Fluid management in abdominal surgery is an important part of anesthesia maintenance. Use of unbalance solutions can lead to hyperchloremic or dilutional metabolic acidosis.

OBJECTIVES. To evaluate the effect of some combinations of colloids and crystalloids on acid–base and electrolytic balance in major abdominal surgery.

METHODS. After the permission of the Ethics Committee 75 patients were randomly divided into five equal groups. Patients in the compared groups were identical in sex, age (52.75 ± 1.33), ASA score (2.01 ± 0.01), and duration of surgery (320.68 ± 8.89 min). Group 1 received unbalanced 6%HES 130/0.4 (Voluven®) and saline solution (0.9% NaCl), Group 2—Voluven® and Ringer's solution, Group 3—Voluven® and Ionosteril®, Group 4 - balanced colloid 6%HES 130/0.42 (Tetraspan®) and Ringer's solution, Group 5 - Tetraspan® and balanced crystalloids (Sterofundin®). Intraoperative fluid administration was 9.25 ± 0.65 ml × kg^{-1}×h^{-1} in all groups. Colloids–crystalloids ratio was 1:2. All patients were underwent elective surgery: esophagectomy, pancreatoduodenal resection, right or left hepatectomy. All patients received combined epidural inhalation anesthesia. Mean ± SEM, Bonferroni's correction ($P < 0.05/5$) were calculated.

RESULTS. There were no differences in blood loss (809.3 ± 98.6 ml, in average) and urine output (1.08 ± 0.50 ml × kg^{-1}×h^{-1}) between groups. We not observed the reliable differences in K^+, Na^+, Ca^{2+} and lactate plasma levels which remained within the standard limits. The plasma level of Cl^- and BE deficit were significantly higher (106.3 ± 1.08 and −6.39 ± 0.81) in group 1 (with saline) as compared with that (102.76 ± 0.39 and –3.00 ± 0.43) in group 5 (with balanced solutions) $P < 0.05/5$. The reliable decreased pH_{art} in group 1 as compared with group 5 took part during the main step of procedure (7.200 ± 0.015 vs. 7.360 ± 0.001) $P < 0.05/5$. For stabilization blood pressure during the surgery in patients of groups 1 and 2 we used phenylephrine in doses (2.28 ± 1.47 and 2.11 ± 0.35 mg) while in the rest groups the doses of phenylephrine were (1.15 ± 0.38, 0.73 ± 0.20 and 0.53 ± 0.20 mg) $P > 0.05/5$. Acidosis was developed in eight patients in group 1, which required the administration of sodium bicarbonate solution.

CONCLUSIONS. Our data suggested that using unbalance solutions in restrictive fluid therapy in major abdominal surgery was associated with hyperchloremic metabolic acidosis.

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CAN INITIAL DISTRIBUTION VOLUME OF GLUCOSE, NOT RIGHT VENTRICULAR END-DIASTOLIC VOLUME, BE AN ALTERNATIVE INDICATOR OF POSTOPERATIVE FLUID VOLUME MANAGEMENT FOLLOWING CARDIAC SURGERY IN THE PRESENCE OR ABSENCE OF APPARENT ARRHYTHMIAS?

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BACKGROUND/OBJECTIVES. We have reported that initial distribution volume of glucose (IDVG) has potential as an alternative cardiac preload variable [1]. Right ventricular end-diastolic volume (RVEDV) has been shown to be a better indicator of cardiac preload than cardiac filling pressures [2]. This study was intended to determine whether IDVG, RVEDV, cardiac filling pressures are correlated with cardiac output (CO) following cardiac surgery in the presence or absence of apparent arrhythmias.

METHODS. Eighty-six consecutive cardiac surgical patients were studied. Patients were divided into two groups; non-arrhythmia (NA) group (n = 72) and arrhythmia (A) group such as atrial fibrillation (n = 14). Patients associated with excess hyperglycemia, apparent tricuspid regurgitation and/or mechanical cardiovascular supports were excluded from the study. A volumetric thermodilution pulmonary artery catheter was placed before the study. Three sets of measurements were performed; on admission to the ICU and daily on the first 2 postoperative days. Immediately after cardiovascular variables were recorded, IDVG was determined as described previously [1]. The relationship between volumetric or static variables and cardiac index (CI) was evaluated throughout the study period. When volume loading was clinically required in NA group, studied variables were measured during hypotension and 10 min after completion of volume loading (250 ml of 5% albumin). A P value <0.05 was considered statistically significant.

RESULTS. All but five patients required vasoactive drugs during the study period. Each studied variable was not different between two groups immediately after admission to the ICU. Indexed IDVG (IDVGI) had a moderate correlation with CI (NA group: $r = 0.49$, $n = 216$, $p < 0.01$; A group: $r = 0.61$, $n = 42$, $p < 0.01$), but indexed RVEDV (RVEDVI) had a slight correlation with CI (NA group: $r = 0.27$ $n = 216$, $p < 0.01$; A group: $r = 0.22$, $n = 42$, $p = 0.036$). Fourteen patients required volume loading. After volume loading CI, IDVGI and CVP, but not RVEDVI and PCWP, were increased compared with those before volume loading ($p < 0.01$, respectively). Changes in IDVGI had a moderate correlation with those in CI ($r = 0.69$, $n = 14$, $p < 0.01$), but neither changes in RVEDVI nor cardiac filling pressures had a correlation with those in CI.

CONCLUSIONS. Our results demonstrate that IDVG rather than RVEDV is correlated with CO regardless of the presence of apparent arrhythmias. IDVG has potential as being an alternative indicator of fluid volume management following cardiac surgery.

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0999

EVALUATION OF THE RISK OF ACUTE KIDNEY INJURY ASSOCIATED WITH THE USE OF HYDROXYETHYL STARCH 130/0.4 (VOLUVEN 6%) IN CARDIAC SURGERY

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INTRODUCTION. Acute kidney injury (AKI) occurs in up to 30% of patients following cardiac surgery and is associated with significant morbidity and mortality. Hydroxyethyl starch (HES) solutions are effective volume expanders and are frequently used in cardiac surgery. However, Pentastarch 10% (250 kDa/0.45) has been associated with an increased risk of ARF. It remains unclear whether other lower molecular weight HES are associated with an increased risk of AKI.

OBJECTIVES. The objective was to evaluate the risk of AKI associated with the use of HES 130/0.4 6% following cardiac surgery.

METHODS. We retrospectively reviewed all cardiac surgeries between January 2008 and 2010. We excluded patients with end-stage renal disease or an active renal disease. Preoperative and postoperative risk factors for AKI including the volume of HES 130/0.4 6% during surgery and in the first 36 h were assessed. AKI in the first 96 h following cardiac surgery was evaluated using the AKIN creatinine criteria (level 1 or greater). Volume of HES 130/0.4 6% was compared between patients with and without AKI. Univariate and multivariate logistic regression were used to evaluate independent risk factors of AKI. Variables with a $p < 0.05$ were included in the multivariate model.

RESULTS. 719 patients were included in the analysis. The mean age was 66 ± 10, mean weight was 80 ± 17 kg and 73% were men. In the first 96 h, 89 patients developed AKI (12.3%). The mean total volumes of HES 130/0.4 6% per kg administered in patients with and without AKI were 5.8 and 6.1 ml/kg, respectively ($p = NS$). In univariate analysis, administration of greater than 16 ml/kg (75% percentile) of HES 130/0.4 6% was not associated with increased of AKI. In multivariate analysis, statistically significant risk factors of AKI were weight (OR 1.03 per kg), intra-aortic balloon (OR 2.14), duration of bypass (OR 1.84 per hour), volume of albumin 25% administered (OR 1.34 per 100 ml) and vasopressor use in the first 96 h (OR 5.2).

CONCLUSIONS. HES 130/0.4 6% administration during surgery and within 36 h of surgery was not associated with an increased risk of AKI in the following 96 h. Future randomized controlled trials comparing the use of HES and other colloids are warranted before any recommendation can be made.

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IMPACT OF TETRASTARCH INFUSION ON THE INCIDENCE OF ACUTE KIDNEY INJURY IN SURGICAL CRITICALLY ILL PATIENTS: A RETROSPECTIVE ANALYSIS OF 3362 PATIENTS

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INTRODUCTION. Acute kidney injury is a common complication among critically ill patients and is associated with increased mortality.

OBJECTIVES. The purpose of the present study was to retrospectively analyze the influence of tetrastarch infusion (hydroxyethyl starch, 6% HES 130/0.4) on the risk of acute kidney injury (AKI) in a large cohort of mixed surgical critically ill patients.

METHODS. Data of 3362 surgical critically ill patients were extracted from an electronic database and analyzed using univariate and multivariate logistic regression analysis. Patients were stratified as having received 1. no colloids, 2. a cumulative amount of ≤33 ml/kg, or 3. a cumulative amount of >33 ml/kg of tetrastarch. AKI was defined as grade "I" or higher according to the RIFLE classification.

RESULTS. The overall incidence of AKI was 18.4% (no colloids, 5.2%; tetrastarch ≤ 33 ml/kg, 9.6%; tetrastarch > 33 ml/kg, 35.0%; univariate $p < 0.001$). SOFA score (OR 1.58; 95% CI 1.52, 1.64; $p < 0.001$), gender (OR 1.57; 95% CI 1.22, 2.02; $p < 0.001$), creatinine at admission (OR 1.39; 95% CI 1.20, 1.61; $p < 0.001$), and patient age (OR 1.02; 95% CI 1.01, 1.03; $p = 0.004$) represented independent risk factors for AKI in multivariate logistic regression analysis, whereas cumulative tetrastarch amounts ≤33 ml/kg (OR 1.41; 95% CI 0.68, 2.90; $p = 0.35$) and >33 ml/kg (OR 1.59; 95% CI 0.77, 3.30; $p = 0.21$) did not.

CONCLUSIONS. Neither tetrastarch infusion *per se,* nor cumulative tetrastarch amounts were independently associated with AKI in the present cohort of surgical critical care patients.

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INADVERTENT HYPOTHERMIA IN A GENERAL ADULT INTENSIVE CARE UNIT: AN AUDIT OF NICE GUIDELINES IN OVER 500 PATIENTS

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INTRODUCTION. Inadvertent hypothermia is associated with multiple physiological effects in various organ systems which can lead to adverse outcomes. The incidence of inadvertent hypothermia amongst patients admitted to Intensive Care Units (ICU) is alarmingly high. In the UK, the National Institute of Clinical Excellence (NICE) recently published guidelines [1] defining hypothermia as a core temperature below 36°C. If found to be hypothermic, forced air warming devices should be applied.

OBJECTIVES. We aimed to assess the incidence of inadvertent hypothermia amongst patients admitted to our general ICU and audit our compliance with published UK guidelines.

METHODS. We conducted a retrospective analysis on all patients admitted to the ICU in Queen Alexandra Hospital, Portsmouth from January to June 2010. Temperature measurements were recorded on admission to the ICU and throughout the duration of their admission. Patients who were being cooled for therapeutic reasons were excluded from the analysis.

RESULTS. Of the 573 patients admitted to the ICU during the 6 month period, 186 patients had at least one incident of inadvertent hypothermia. These patients comprised: 140 emergency admissions, 20 post scheduled surgery admission and 26 post unscheduled surgery admissions. Overall incidence of inadvertent hypothermia was 32.4%. Only 18.8% of hypothermic patients had documented use of a warming device.

CONCLUSIONS. Inadvertent perioperative hypothermia is a common but preventable complication which is associated with poor outcomes for patients. The quoted incidence of inadvertent hypothermia amongst ICU patients is high (>50%) [2]. Karapillai et al. [13] carried out a large retrospective audit of over 5000 patients and concluded that inadvertent hypothermia amongst ICU patients is not only common but also associated with increased patient mortality and morbidity. There was an increased incidence of cardiac events, bleeding, wound infection and longer hospital stay. The overall incidence of hypothermia on our ICU during the first half of 2010 was a surprisingly high 32.4%; 13.1% of patients had a temperature below 35°C. Following the publication of the NICE guidelines on hypothermia in 2008, this figure is a cause for concern. Limitations of our audit include the fact that it is a retrospective analysis and the lack of documentation of warming device use may not reflect actual practice. We plan to re-audit after our departmental meeting and a period of staff education.

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THE EFFECTS OF MAINTAINING BODY CORE TEMPERATURE DURING CABG WITH THERMOWRAP™ ON MYOCARDIAL INJURY ASSESSED BY CARDIAC TROPONIN I

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INTRODUCTION. In patients undergoing coronary artery bypass surgery (CABG), core normothermia at ICU admission has been demonstrated to reduce adverse outcomes [1]. Moreover, maintenance of normothermia through the "non cardiopulmonary (CPB) phase" of CABG attenuates myocardial ischemic injury [2]. Therefore we investigate the effect of thermoregulatory control with Thermowrap™ on myocardial injury assessed as release of cardiac troponin I (cTnI).

METHODS. The study was approved by the Institutional Review Board. After signing an informed consent, candidates for elective primary isolated CABG surgery were enrolled. Pts with fever, a history of acute MI in the last week or with EKG signs of preoperative ischemia were excluded. Eligible patients were randomized into a normothermia group, (THERMO), and a routine care (CONTR) group. Anaesthetic technique included sufentanyl, propofol, pancuronium and desflurane; CPB technique (centrifugal pump and membrane oxygenator) and myocardial protection (cold blood antegrade-retrograde cardioplegia) was standardized. In THERMO, Allon Thermowrap™ unit was set to 37°C before anaesthetic induction until start of CPB and from rewarming to ICU. During CPB rectal temperature was allowed to decline to 33°C and rewarmed to 37°C. In CONTR no warming devices were utilized. In ICU convective air warmers to reach rectal 37°C were utilized in all pts. Blood samples for cTnI were collected at ICU arrival and 24 h later. Data are presented as mean ± SD; Fisher's exact test or t test were used for comparison between groups. A $P \leq 0.05$ was considered significant.

RESULTS.

Result bis

	Thermo	Control	*p*
Gender F/M	9/80	14/80	0.377
Age (years)	67 ± 7	68 ± 7	0.361
Weight (kg)	78 ± 14	76 ± 11	0.183
Creat. Clear. (mL/m)	81 ± 24	81 ± 23	0.977
Temp. CPB start (°C)	36.3 ± 0.4	35.3 ± 0.6	<0.0001
Temp. in ICU (°C)	36.6 ± 0.3	35.7 ± 0.5	<0.0001
cTnI in ICU (ng/mL)	3.80 ± 7.86	3.41 ± 6.33	0.708
cTnI 1st POD (ng/mL)	7.53 ± 16.06	6.69 ± 10.62	0.630

CONCLUSIONS. Although the pts were maintained significantly warmer by Thermowrap, both during surgery and at ICU arrival, this does not results in less myocardial damage as assessed by cTnI. Other AA found opposite results; possible explanations are different times points in measuring cTnI or different subset of pts (OPCAB). Perioperative hypothermia is a frequent occurrence and can lead to several complications, which adversely affect the patient's outcome; however it is currently believed that moderate hypothermia plays a protective role in preventing myocardial damage by reducing oxygen consumption, therefore it is still to demonstrate that normothermia during CABG could be advantageous.

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A RANDOMIZED, CONTROLLED CLINICAL TRIAL OF TRANSFUSION OF REQUIREMENT IN PATIENTS AFTER ORTHOTOPIC LIVER TRANSPLANTATION

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INTRODUCTION. Red-cell transfusions are a cornerstone of critical care practice, but there are divergent views on the risks of anemia and the benefits of transfusion in patients after orthotopic liver transplantation.

OBJECTIVES. To determine whether a restrictive strategy of red-cell transfusion and a liberal strategy produced equivalent results in patients after orthotopic liver transplantation (OLT), we compared the rates of death from all causes at 30 days.

METHODS. We enrolled 226 patients after orthotopic liver transplantation who had hemoglobin concentrations of less than 9.0 g per deciliter after admission to the intensive care unit and randomly assigned 112 patients to a restrictive strategy of transfusion, in which red cells were transfused if the hemoglobin concentration dropped below 7.0 g per deciliter and hemoglobin concentrations were maintained at 7.0–9.0 g per deciliter, and 114 patients to a liberal strategy, in which transfusions were given when the hemoglobin concentration fell below 10.0 g per deciliter and hemoglobin concentrations were maintained at 10.0–12.0 g per deciliter.

RESULTS. Overall, 30-day mortality was similar in the two groups (2.7 vs. 3.5%, $p > 0.05$). There is no difference between two groups in duration of ventilation, recovery of liver function, stay in SICU and complications. The patients in restrictive-strategy group receive much less RBC than those in liberal-strategy group.

CONCLUSIONS. A restrictive strategy of red-cell transfusion is at least as effective and safe as a liberal transfusion strategy in transplantation recipients without active hemorrhage.

Pathophysiology of sepsis: Experimental models: 1004–1017

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CIRCULATING MONOCYTE ENDOTOXIN TOLERANCE IN ACUTE LIVER FAILURE: ROLE OF HEPATICALLY DERIVED IL-10

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BACKGROUND. Infection is a common complication of acetaminophen-induced acute liver failure (AALF) and a significant contributor to mortality. In AALF, circulating monocytes have reduced HLA-DR expression with lowest levels in non-survivors. Reduced HLA-DR expression is associated with monocyte deactivation and may contribute to the immunoparesis observed in AALF. We investigated whether monocyte dysfunction is associated with endotoxin tolerance and to identify the underlying cause.

METHODS. In 20 AALF and 10 healthy volunteers (HV) peripheral blood mononuclear cells (PBMC) were labeled with CD14, HLA-DR, -DQ and CD86. In ten AALF patients, PBMC were labeled with CD14, HLA-DR and IL-10. TNF-α and IL-10 secretion was evaluated using ElISPOT at baseline and after stimulation with lipopolysaccharide (LPS). Serum TNF-α, IL-4,-6,-10, IFN-γ and TGF-β1 were measured by ELISA. Transhepatic gradients for TNF-α and IL-10 [portal vein (PV), hepatic vein (HV)] were determined in a further 5 AALF patients at time of liver transplantation. Using Phosphoflow, ex vivo CD14+/CD33+ monocytes were stimulated with TLR-2 (zymosan), TLR,-4 (LPS) ligands, IFN-γ and IL-10 and phosphorylation of NF-kBp65, MAPKp38, STAT1 and STAT3 was assessed in 10 AALF patients and 10 healthy volunteers (HC).

RESULTS. Significant reductions in median monocyte HLA-DR (15 vs. 72%; $p < 0.001$) and CD86 (7.5 vs. 21%; $p = 0.002$) were detected, whilst HLA-DQ (98 vs. 99%; $p = NS$) expression was preserved when compared to HV. Serum levels of IL-4, -6, -10 and TNF-α were significantly elevated in AALF patients compared to HV; whilst no significant differences in TGF-β and IFN-γ were detected. TNF-a production from monocytes in response to LPS stimulation was impaired in ALF patients (103 vs 61 spSFC/10^6 PBMC; $p = 0.7$) whereas IL-10 production was normal or increased (225 vs. 431; $p = 0.09$). There was a strong inverse correlation between TNF-α and IL-10 secretion; monocytes with the highest IL-10 response having the lowest TNF-α secretion ($r = -0.6$, $p = 0.012$). Furthermore, serum IL-10 was negatively correlated with monocyte surface HLA-DR ($r = -0.7$, $p < 0.05$). A trans-hepatic (HV > PV) gradient was seen for IL-6 and IL-10 but not for TNF-α and TGF-β1. Ligation of TLR-2,-4 failed to produce the normal pattern of activation in signal transduction molecules (NF-kB, MAPK p38), whilst ligation with exogenous IL-10 resulted in a normal/augmented pattern of STAT3 activation.

CONCLUSIONS. In AALF, monocytes demonstrate phenotypic and functional changes compatible with ET. ET is accompanied by profound reductions in the TLR evoked and preserved STAT3 signaling responses leading to monocyte dysfunction. As IL-10 is known to negatively regulate TLR signaling it is likely that hepatic and monocyte IL-10 production contributes to the monocyte dysfunction and immunoparesis in AALF.

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BACTERIAL SEPSIS INDUCES A PROFOUND DEPLETION IN CIRCULATING MUCOSAL-ASSOCIATED INVARIANT T (MAIT) LYMPHOCYTES

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INTRODUCTION. The contribution of lymphocyte subsets to the pathophysiology of sepsis remains poorly understood. In between innate and adaptive immunity, the so called innate-like lymphocytes express nearly invariant antigen receptors and display some of the cardinal features of innate immunity. The recently identified Mucosal-associated Invariant T (MAIT) lymphocytes carry a specific bacterial reactivity and are likely to be involved in anti-bacterial immune response [1].
OBJECTIVES. We aim to investigate the potential role of MAIT lymphocytes in the pathophysiology of human septic shock. For this purpose, we first quantified the circulating MAIT cells during the course of human septic shock.
METHODS. All consecutive adult patients hospitalized in the MICU for sepsis severe or septic shock were included. Two control groups were also studied: patients with cardiogenic shock and healthy subjects. Patients with known immune deficiency, malignancies or treated with immunosuppressive drugs were excluded. Blood samples were drawn at day 1, 4, 7 and 14 of the ICU stay. MAIT cell enumeration was based on multiple-staining flow cytometry assay. MAIT cells were identified as $CD3^+/TCR\gamma\delta^-/CD4^-/CD161^{hi}$ lymphocytes carrying the specific invariant TCRα chain Vα7.2. MAIT cell counts were reported as median [IQR] through the percentage of $CD3^+$, $TCR\gamma\delta^-$ lymphocytes or absolute blood counts.
RESULTS. 50 patients (29 with septic shock, 11 with severe sepsis, 10 with cardiogenic shock) have been enrolled into the study. Main characteristics of the total population: age 61 ± 15.6 years, SAPS II 57 ± 24, in-ICU mortality rate 22%. In comparison to the healthy controls, where MAIT cells represented 3.11% [2.27–3.80] of T lymphocytes, the proportion of MAIT among T cells was dramatically decreased at day 1 in both sepsis and cardiogenic groups. MAIT cell depletion tended to be more pronounced in patients with septic shock (0.38% [0.16–0.88]) than in those with severe sepsis (0.58% [0.38–1.28]) or cardiogenic shock (0.9% [0.33–2.5%]). MAIT cell depletion was sustained throughout the early 14 days. Similar results were observed with absolute MAIT cell counts. Interestingly, two patients with severe H1N1 flu pneumonia without bacterial superinfection displayed normal MAIT cell proportion and counts despite ARDS and hemodynamic failure.
CONCLUSIONS. This pilot study in critically ill patients suggests that severe acute inflammatory disorders, and particularly septic shock, lead a dramatic decrease in MAIT lymphocyte count. Whether blood MAIT cell depletion is associated with outcome, and more specifically may favour the occurrence of ICU-acquired infections, remains to be investigated. The study is ongoing and updated data will be presented at the congress.
GRANT. This work was supported by grants from the European Society of Intensive Care Medicine and the French Ministry of Health.
REFERENCE. 1. Le Bourhis L et al. 2010 Nat Immunol 11:701-8.

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CEREBRAL BLOOD GLUCOSE DURING SEPSIS: AN EXPERIMENTAL STUDY

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INTRODUCTION. Metabolic alterations may contribute to cerebral cell dysfunction in septic encephalopathy. Although hyperglycemia is associated with increased neuronal loss during sepsis, the evolution of cerebral glucose has not been well described in this setting.
OBJECTIVES. The aim of this study was to evaluate the time course and the determinants of cerebral glucose levels during experimental sepsis.
METHODS. Peritonitis was induced by intra-abdominal injection of autologous feces in 24 anesthetized, invasively monitored and mechanically ventilated female sheep, observed until spontaneous death or for a maximum of 18 h. In addition to global hemodynamic assessment and blood glucose measurements, cerebral metabolism was evaluated hourly using a microdialysis probe (CMA20, CMA, Sweden) inserted via a burr hole in the frontal cortex. Central nervous system fluid was perfused via the catheter at 1.0 mcl/min, and collected fluid analyzed by an ISCUS instrument. Normal blood glucose levels in sheep are between 2.21-5.52 mmol/L. Animals did not receive insulin or enteral nutrition during the experiment, but blood glucose were maintained above 2.21 mmol/L by IV boluses of 10 g glucose.
RESULTS. All animals developed a hyperdynamic state associated with organ dysfunction and, ultimately, septic shock. 479 microdialysis samples were analyzed and glucose values ranged from 0.12 to 5.95 mmol/L. Brain glucose progressively increased from baseline (0.98 ± 0.32 mmol/L) to 6 h after peritonitis induction (1.22 ± 0.54 mmol/L), then decreased progressively (0.75 ± 0.45 mmol/L at 18 h). Changes in brain glucose significantly correlated with changes in blood glucose ($p < 0.001$) and mean arterial pressure (MAP, $p < 0.02$). Hypoglycemic events ($n = 38$) were associated with the lowest brain glucose concentrations (0.59 ± 0.33 mmol/L) when compared to other blood glucose levels. Also, hypotensive episodes (MAP < 60 mmHg, $n = 61$) were associated with the lowest brain glucose levels (0.57 ± 0.33 mmol/L) than other levels of MAP. The combination of hypotension and hypoglycemia were associated with lower glucose levels (0.39 ± 0.31 mmol/L) than hypotension alone (0.68 ± 0.38 vs. 0.62 ± 0.31 mmol/L, respectively). These values were significantly lower than brain glucose levels found within normal MAP and blood glucose levels (1.14 ± 0.53 mmol/L, $p < 0.001$).
CONCLUSIONS. In this model of peritonitis, brain glucose levels were influenced by both blood glucose and mean arterial pressure. Hypoglycemic events occurring during a hypotensive episode may result in particularly low brain glucose levels, with potentially brain damage
GRANT ACKNOWLEDGMENT. Basic Science Award - ESICM/ECCRN 2009

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EFFECT OF LPS ON THE EXPRESSION OF INCRETIN RECEPTORS IN MONOCYTIC AND HEPATOCYTIC CELL LINES

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INTRODUCTION. Incretin hormones include glucagon like peptide-1 (GLP-1) and gastric inhibitory polypeptide (GIP). Both of them are gut hormones, GLP-1 is secreted from L-cells which are located in the proximal part of caecum, while GIP is secreted from K cells, located mainly in the duodenum and jejunum. GLP-1 and GIP are produced in response to nutrient ingestion and they play a crucial role in the maintenance of normal glucose homeostasis by enhancing meal-induced insulin secretion, induction of pancreatic beta cell proliferation, inhibition of beta cell apoptosis and gastric empting. GLP-1 also inhibits glucagon secretion and reduces appetite and food intake (1, 2, and 3). Glucose metabolism is significantly altered during sepsis and endotoxaemia; however, the mechanisms of sepsis-induced hyperglycaemia are poorly understood. We therefore wished to investigate the effect of lipopolysaccharide (LPS) on GLP-1 and GIP receptor expression in a monocytic and a hepatocyte cell line.
OBJECTIVES. To establish an in vitro model of sepsis employing monocytic (U937) and hepatocytic (HUH7) cell lines by co-incubation with lipopolysaccharide (LPS) and determine whether receptor expression for GIP, GLP-1 and insulin (INS) was altered.
METHODS. U937, a monocyte cell line and HUH7, a hepatocyte cell line, were cultured in Dulbecco's Modified Eagle Medium (DMEM) (Sigma) containing 10% fetal calf serum (FCS). Both U937 and HUH7 were cultured with different LPS concentrations (0, 2, 1 and 5 μg/ml) for 24 h. mRNA was obtained using TRI Reagent and was reverse transcribed using Superscript II. Real-time RT-PCR quantification of gene expression was used to compare relative expression using β-actin as a reference gene.
RESULTS. PCR results showed a direct correlation between LPS doses and expression of mRNA for GIP Receptor (GIPR) and insulin receptor (INSR) in U937 cells. There was a significant decrease in expression of GIPR and INSR at 1 μg and 5 μg/ml LPS (Fig. 1; A, B). No GLP-1 receptor (GLP-1R) expression was detected in U937 cells. Results obtained from HUH7 cells indicate for the first time that GLP-1R and GIPR mRNA was expressed on HUH7 cells. Moreover, LPS treatment induced a significant decrease in the expression of GLP-1R, GIPR and INSR (Fig. 2, A, B, C).

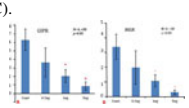

Fig 1

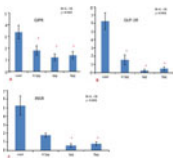

Fig 2

CONCLUSIONS. Our study demonstrates that LPS alters the expression of incretins and insulin receptors in monocyte and hepatocyte cell lines.
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GRANT ACKNOWLEDGMENT. MOHE of Iraq.

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BRAIN METABOLIC ADAPTATION IN RESPONSE TO SEPSIS

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INTRODUCTION. Complex metabolic changes are common in sepsis, including hyperglycemia, insulin resistance and hyperlactatemia. During sepsis oxygen utilization and mitochondrial function are affected and associated with organ dysfunction and mortality. Mitochondrial dysfunction in brain tissue also occurs and may be related to short and long term cognitive impairment.
OBJECTIVES. The goal of this study was to characterize brain metabolic adaptations associated to sepsis and systemic inflammation.
METHODS. We used murine models of endotoxemia and polymicrobial peritonitis to access brain glucose uptake and oxygen consumption, oxidative stress, neuroinflammation and cognitive function. For glucose uptake study, Positron Emission Tomography (PET) with fluordeoxyglicose (FDG) and NBDG uptake for acute brain slices were used. Oxygen consumption was measured by oxygraphy; tissue oxidative stress was measured by protein immunoblot (dot-blot) for 4-hydroxynonenal. Neuroinflammation was evaluated by immunohistochemistry and cognitive impairments were accessed by behavior tests.
RESULTS. Rodents with experimental sepsis induced by fecal peritonitis present low blood pressure, hyperlactatemia, renal and hepatic dysfunction, increased blood cytokines (IL-6, IL-1β and MIP) and late-cognitive impairments. We detected a rapid increase in brain FDG uptake in rats with endotoxemia in vivo by PET. Brain glucose uptake took place before peripheral organs, in 2 h and peaked around 6 h after LPS injection. Acute brain slices from septic mice uptake more glucose and consume more oxygen 6 h after fecal peritonitis induction, compared to slices from healthy animals. Hydrogen peroxide production by brain slices was completely inhibited by apocynine, a NADPH oxidase inhibitor, and we detected oxidative stress in brain tissue from septic animals at the same time.
CONCLUSION. We identified a new metabolic phenotype that occurs in the brain after systemic inflammation, which is characterized by a rapid increase in glucose uptake that can feed oxidative stress pathways, such as NADPH oxidase, contributing to neuronal damage and the development of cognitive deficits.
GRANT ACKNOWLEDGMENT. FAPERJ/CNPq.

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THE ROLE OF THE SYMPATHETIC NERVE ACTIVITY ON RENAL BLOOD FLOW IN SEVERE SEPSIS

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INTRODUCTION. In experimental sepsis, acute kidney injury (AKI) occurs despite increased renal blood flow (RBF). RBF is regulated by hormonal factors and sympathetic nerve activity (SNA). We have shown that sepsis is associated with a biphasic response of renal SNA. An increase in renal SNA results in glomerular arteriolar vasoconstriction and decrease in glomerular filtration rate. Whether the increase in SNA to the kidney plays a role in the development of septic AKI is not known.
OBJECTIVES. To address in a physiologic study the role of renal SNA in hyperdynamic sepsis on RBF and kidney function
METHODS. Seven animals underwent bilateral surgical renal denervation. Renal nerves were cut and phenol was swabbed on renal veins and arteries (DG, denervated group). Four animals with intact renal nerves served as control (CG, control group). Renal and cardiac flow probes were implanted around left renal artery and pulmonary artery to measure RBF and cardiac output (CO). Urine output (UO) was measured. Following a recovery period of 2 weeks, experiments were performed. All baseline variables were recorded for a 24 h baseline. Sepsis was induced through a bolus of live *E. coli* (3×10^9 colony forming unit-CFU) followed 3 h later by a continuous infusion (1.2 CFU per hour for 21 h). A p value of 0.05 was considered significant (NS: not significant, $p > 0.05$)
RESULTS. There was no difference in baseline levels between the two groups and sepsis resulted in a similar hyperdynamic state in both groups.

Table 1: Haemodynamic changes in CG and DG

	Baseline CG	Baseline DG	Sepsis CG	Sepsis DG	P value
CO(L/min)	3.7 (1.2)	3.4 (0.6)	5.2 (2.1)	4.9 (1.1)	<0.001
HR(bpm)	79 (17)	78 (19)	135 (36)	135 (36)	<0.001
MAP(mmHg)	87 (7)	89 (23)	87 (12)	80 (22)	NS
Lactate(mmol/L)	0.6 (0.5)	0.7 (0.3)	1.5 (1)	1.3 (0.6)	0.02

Mean ± SD

RBF was increased in both groups compared to baseline (83 and 69 ml/min in DG and CG respectively).

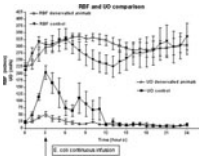

Figure 1: RBF and UO (mean; SEM)

Even though there was no statistical difference in the change in RBF between the two groups, a trend towards significance was noted. There was a large increase in UO in the intact animals followed by oliguria. Interestingly, the initial polyuric phase was significantly attenuated in animals with denervated kidneys ($p = 0.001$).
CONCLUSIONS. We conclude that renal SNA may be involved in the initial changes observed in UO in an animal model of hyperdynamic sepsis.
ACKNOWLEDGMENT: The authors would like to acknowledge the expert technical assistance of Alan McDonald and Tony Dornom

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MONOCYTE TACE ACTIVITY PROFILES ARE ALTERED BY INFLAMMATORY STIMULI

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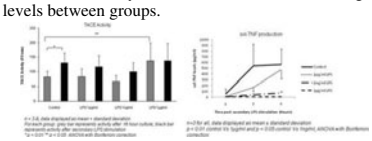
INTRODUCTION. Sepsis is comprised of both a systemic inflammatory response syndrome (SIRS) and a compensatory anti-inflammatory response syndrome (CARS). Monocytes produce soluble tumour necrosis factor-α (sol-TNF) after exposure to inflammatory stimuli such as lipopolysaccharide (LPS) through the action of tumour necrosis factor-α converting enzyme (TACE) [1]. Monocytes can display states of priming and tolerance in response to LPS and these may reflect the systemic processes occurring in SIRS and CARS respectively.
AIMS. To induce priming and tolerance in human monocytes using in vitro models and determine cellular TACE activity.
METHODS. Monocytes were isolated from volunteer blood using density gradient centrifugation and magnetic activated cell sorting employing CD14 positive bead selection. Isolated cells were placed in 16-h non-adhesive culture with LPS at a range of doses (1 pg/ml, 1 ng/ml, 1 μg/ml and nil as control) designed to induce priming and tolerance. Cells were subsequently retrieved and re-suspended before being exposed to a secondary LPS stimulus (1 μg/ml) for 1 hour with TACE activity levels determined using a cell-based fluorometric assay [2]. Supernatant sol-TNF levels were quantified by ELISA and enzyme expression levels by flow cytometry. ANOVA with Bonferroni correction was used for analysis.
RESULTS. Secondary LPS stimulation induced up-regulation of TACE activity in control cells and at attenuated levels in those exposed to an initial 16-hour LPS culture. Monocytes cultured with 1 μg/ml of LPS displayed significantly elevated baseline TACE activity levels which did not increase on further stimulation. Cells cultured with LPS produced reduced sol-TNF levels in response to a secondary LPS stimulus. There were no significant differences in TACE expression levels between groups.



TACE activity and sol-TNF levels

CONCLUSIONS. Initial LPS culture induced a state of tolerance as evidenced by an attenuated TACE response to secondary LPS stimulation and reduced sol-TNF release. High-dose initial LPS culture led to alterations in enzyme behaviour that may reflect a memory to LPS exposure whereby baseline activity is higher and cannot be re-induced. No evidence of priming was elicited within this model and additional environmental stimuli may be required to generate this phenotype.
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1011

TIME-DEPENDENT EXPRESSION OF ENDOTHELIN-1(ET-1) IN LUNGS AND THE EFFECTS OF TNF-A BLOCKING PEPTIDE ON ENDOTHELIN-1 LEVELS IN LUNGS IN ENDOTOXEMIC RAT MODEL

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INTRODUCTION. ET-1, a potent vasoconstrictor, is implicated in the pathogenesis of a number of diseases. Some evidences suggest that circulating ET-1 is elevated in sepsis. A close association seems to persist between TNF-a and ET-1 in the pathogenesis of ALI in endotoxemia.
OBJECTIVES. The present study investigated whether ET system (ET-1, ETA and ETB receptors) has a potential role in the acute lung injury of sepsis in a time-dependent manner and whether the blockade of TNF-α has a regulatory role on the ET-1 level in septic lung.
METHODS. Male Wistar rats at 8 weeks of age were administered with either saline or lipopolysaccharide (LPS) at different time points (1, 3, 6 and 10 h) [1, 2]. The rats were killed with ether and lungs were either frozen or preserved in formalin. Blood gas analysis was done immediately after opening the chest. In the second part of the study the TNF-a blocking peptide (TNF BP) was used to treat the rats in addition to LPS.
RESULTS. The features of acute lung injury were observed at 1 h after LPS administration, which gradually became severe with time. Systolic and diastolic pressures were drastically lower just 1 h after LPS administration. Pulmonary TNF-α level was significantly increased at various time points after LPS administration. A time-dependent increase of ET-1 expression was observed in LPS administered lungs compared to control lungs and ET-1 level was peaked at 6 h (threefold) after induction of endotoxemia by LPS. Immunoblot analysis demonstrated a time-dependent gradual increase of ETA receptor after LPS administration while opposite result was found in ETB receptor expression. ETB receptor with vasodilating property, was remarkably downregulated in septic lung in a time-related manner. We conclude that time-dependent increase of ET-1, ETA receptor with the downregulation of ETB receptor may play a role in the pathogenesis of acute lung injury in endotoxemia. In the second part of this study, we treated the LPS-administered rats with TNF-α blocking peptide for 3 h and found that pulmonary ET-1 level was significantly suppressed by the blockage of TNF-α.
CONCLUSIONS. Thus, TNF-α-mediated ET-1 upregulation may be a crucial pathological response to cytokine induction following an inflammatory response.
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GRANT ACKNOWLEDGMENT. This work was supported by a Grant-in-Aid for Scientific Research from the Ministry of Education, Science, Sports and Culture of Japan.

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MONOCYTE TACE ACTIVITY MAY RESPOND TO ENVIRONMENTAL STIMULI

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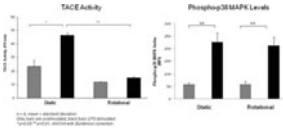
INTRODUCTION. In response to an inflammatory stimulus circulating monocytes migrate to the site of infection and are therefore subjected to signalling in both non-adherent (circulating) and adherent (marginated) environmental conditions. Lipopolysaccharide (LPS) induces phosphorylation of p38-mitogen activated protein kinase (MAPK), which activates tumour necrosis factor-α converting enzyme (TACE)[1] leading to shedding of membrane-bound tumour necrosis factor-α (TNF).
OBJECTIVES. To determine whether TACE activity responds to different environmental stimuli.
METHODS. Monocytes were isolated from volunteer blood via density gradient centrifugation and magnetic bead selection. Cells were stimulated with LPS 1 μg/ml for 60 min in either static (marginated) or in rotating (circulating) culture conditions. TACE activity was measured using a fluorescence resonance energy transfer (FRET) assay[2]. Flow cytometry was used to determine TACE expression at 60 min and intra-cellular phosphorylated p38-MAPK levels at 15 min.
RESULTS. LPS produced substantial elevation of monocyte TACE activity in static culture conditions which was in direct contrast to the results obtained in rotating culture conditions. Stimulation induced phosphorylated p38-MAPK levels were elevated across both groups. There were no significant differences in TACE expression.



TACE activity and Phospho-p38 MAPK levels

CONCLUSIONS. These results indicate that a contact signal may be required for full monocyte TACE activation in response to an inflammatory stimulus. As phosphorylated p38-MAPK levels elicited by LPS were not altered by the culture conditions in this model, the contact signal is acting down-stream of known TACE regulators. In vivo, marginated monocytes may produce a greater inflammatory response than those in the central circulation, a fact which previously has not been fully appreciated.
REFERENCES. 1. Scott AJ et al. Thorax. 2009;64:A47–482. 2. Alvarez-Iglesias A et al. Lab Invest 2005;85:1440–8.

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SYSTEMIC OXYGEN CONSUMPTION AND MITOCHONDRIAL RESPIRATION ARE MAINTAINED IN LETHAL PORCINE FECAL PERITONITIS

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INTRODUCTION. Mitochondrial dysfunction has been implicated in sepsis-induced organ failure.

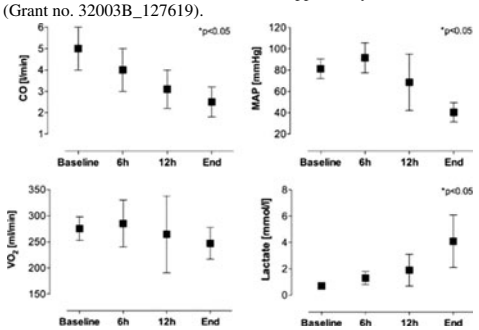
OBJECTIVES. To evaluate systemic oxygen consumption (VO2) and skeletal mitochondrial respiration in a lethal model of fecal peritonitis.

METHODS. In eight anesthetized pigs [43 ± 2 kg (mean ± SD)], fecal peritonitis was induced by instillation of 2.0 g/kg of autologous feces. Besides infusion of Ringer's lactate and glucose 50% (in total 1.5 mL/kg/h), no resuscitation was performed until death occurred. Cardiac output was measured by thermodilution, and VO_2 by indirect calorimetry. At baseline and before death occurred, biopsies of skeletal muscle were obtained, and mitochondrial respiration was measured using high-resolution respirometry (Oxygraph-2k, Oroboros Instruments, Innsbruck, Austria).

RESULTS. Death occurred in 21 ± 6 h. Cardiac output and mean arterial pressure decreased (Figure). Arterial lactate concentration increased, but VO2 was maintained and maximal mitochondrial respiration (Complex I, State 3) was enhanced [baseline (median, range) 1,320 (1,151–1,585) pmol/s/mg, end 1,838 (1,454–2,581) pmol/s/mg, p = 0.043, Wilcoxon Test]. The respiratory control ratio (state 3/state 4) remained unchanged [baseline 9.7 (8.4–12.6), end 9.3 (7.8–18.3)].

CONCLUSIONS. Despite severely deteriorating hemodynamics and impending death, systemic and skeletal muscle Complex I maximal oxygen consumption were maintained without signs of deteriorated efficiency. In this sepsis model, organ failure and death were not associated with impaired skeletal muscle mitochondrial respiration.

GRANT ACKNOWLEDGMENT. This work was supported by the Swiss National Science Foundation (Grant no. 32003B_127619).



Cardiac output, mean arterial pressure, VO_2 and lactate concentrations. Data are shown as mean ± SD. CO, cardiac output; MAP, mean arterial pressure; VO_2, systemic oxygen consumption. *Stats: ANOVArm

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TRACKING THE PATHOGENESIS OF ABDOMINAL SEPSIS. I. ROLE OF THE LIVER AND KIDNEYS

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INTRODUCTION. Role of the organs in the pathogenesis of abdominal sepsis (AS) is not equal due to their different pathological workload and also linked to the primary location of pathologic factor.

OBJECTIVES. To identify dysfunction of main organ systems in the timeline of AS.

METHODS. We used 32 inbreed dogs divided between 3 groups. Group 1 (n = 10) and 2 (n = 10) were dogs in whom the experimental AS model (intraabdominal injection of feces) was implemented. They were killed respectively, 12 and 24 h thereafter; blood, urine and pieces of organs (laparotomy) were collected for analysis, intended to trace the changes according to the time after infection. Group 3 (n = 12) was control. We analyzed different biochemical parameters and parameters related to energy metabolism, intensity of lipid peroxidation and endotoxemia (oligopeptides, substances of lower and medium molecular mass).

RESULTS. At 12 h we observed tachycardia, hypotension, tachypnoe and hypoxia. At 24 h there were severe bradycardia and hypotension and the signs of severe respiratory insufficiency.

We observed serious metabolic malfunction of the liver parenchyma with the disturbances of glucose utilization, deficit of energy substrates and switching to anaerobe way of the glucose oxidation at 12 h with almost full depletion of the functional reserves at 24 h. With the increase of intoxication we noticed the growth of the intensity of lipid peroxidation which can be identified already at 12 h and the significant consumption of antioxidant substrates leading to their deficit. Starting from 12 h we have seen the growth of endotoxins in the liver parenchyma, but detoxication function was still active, but at 24 h liver fails to override intoxication and becomes the depot of endotoxins with the systemic outflow.

As for kidneys, decompensation of the energy metabolism was only evident at 24 h. This could be due to a more dependent state of the kidneys to the external energy supply and also to the fact that in critical situation the gluconeogenesis could be activated in kidneys producing up to 50% of whole amount of glucose. Regarding to the lipid peroxidation we observed the disbalance between the oxidant and antioxidant compounds only at 24 h. At 12 h we observed the active detoxication function of kidneys via the endotoxins elimination with urine. At 24 h kidneys are still active but start to accumulate endotoxins, this leads to their insufficiency.

CONCLUSIONS. The liver in our experiment was the first target for AS. Functional reserve of the liver and the activity of detoxication function are the main barriers to fail before problem extends to the other organs. Kidneys are also very important detoxication organs. Decompensation of their function occurs late in the pathogenesis, after failure of liver.

The major clinical implication of our work is the importance of the hepatoprotection as the key direction of therapy in patients with AS. This warrants further work in this area.

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HEMODYNAMICS AND FLUID SHIFTS IN THE EARLY STAGES OF BACTERIAL PERITONITIS—EVALUATION OF AN EXPERIMENTAL MODEL IN PIGS

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INTRODUCTION. Pigs are commonly used in experimental models for studies on sepsis due to anatomical and physiological similarities with humans.

OBJECTIVE. This study was undertaken to evaluate a new model of peritonitis in pigs with particular focus upon fluid and protein homeostasis and hemodynamic parameters.

METHOD. 14 young pigs were blindly randomized to two groups. The peritonitis-group (n = 7) received 200 ml of growth medium with E coli into the abdominal cavity while the control-group (n = 7) received only the growth medium. Acetated Ringer's solution was given i.v. with 10 ml/kg/h. The animals were then observed for 3 h before they were killed. Plasma volume at baseline was determined by the CO-method and changes were calculated based on repeated hematocrit values and measurements of blood loss. Net fluid balance and fluid extravasation rate were calculated. Hemodynamic values were recorded. A microdialysis catheter was introduced into the portal vein and energy metabolites recorded. Blood samples from the femoral artery and portal vein were collected for analysis of TNFα, IL-6 and IL-10.

RESULTS.

Fluid shift and hemodynamics

		Peritonitis-group	Control-group	P
Plasma volume change (%)	0–180 min	−20.7 (5.6)	−5.1 (7.5)	0.001
Mean pulmonary artery pressure (mmHg)	Baseline	19.0 (0.9)	21.4 (3.0)	
	60 min	28.2 (5.4)	22.1 (4.4)	<0.05
	180 min	30.3 (9.2)	22.6 (5.8)	0.05
Cardiac output (L/min)	Baseline	3.70 (0.6)	3.84 (0.7)	
	180 min	2.77 (0.7)	3.54 (0.6)	<0.05
Fluid extravasation rate (ml/kg/h)	Baseline	0.21 (0.03)	0.21 (0.03)	
	0–180 min	0.27 (0.02)	0.23 (0.02)	<0.01

Results as mean with SD. P-values indicate between-group differences at the same time. The dose of *E. coli* varied between 1.7×10^7 and 1×10^8 CFU/ml. Mean arterial pressure did not differ between the study groups. Protein mass was reduced in both groups with tendency to lower values in the peritonitis-group. The levels of glucose, lactate, pyruvate and glycerol in portal vein remained within normal range in both groups. Results of the cytokine analysis will be presented later.

CONCLUSION. The results indicate that this dose of living *E. coli* causes fluid extravasation and plasma contraction similar to the early septic phase in humans. The reduction in cardiac output at the end of the experiment may be explained by inadequate fluid resuscitation, since fluid infusion rate was held constant and not guided by hemodynamic parameters as recommended in patients. The increase in pulmonary mean arterial pressure seen 60 min after intervention may be explained by rapid absorption of endotoxin from the peritoneal cavity. The experimental model may be applied in further studies on pathophysiology and therapeutic interventions during early abdominal sepsis.

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GELATINASE ACTIVITY IS ASSOCIATED WITH BLOOD–BRAIN BARRIER BREAKDOWN IN AN ANIMAL MODEL OF SEVERE SEPSIS

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INTRODUCTION. The extracellular matrix provides a biophysical filter protection that is maintained by a fine balance between its degrading enzymes called matrix metalloproteinases (MMPs) and MMPs inhibitors. Alterations in this balance can lead to the disruption of the blood brain barrier (BBB) contributing to neuroinflammatory responses, but there is no description of the mechanisms associated with BBB alterations in severe sepsis.

OBJECTIVES. Determine changes in the permeability of the BBB in an animal model of severe sepsis and the role of MMP 2 and 9 in the breakdown of BBB.

METHODS. Sepsis was induced in Wistar rats by the cecal ligation and perforation model. BBB permeability was assessed using the Evans Blue dye method. The content of MMP in the cerebral microvessels was determined using Western Blot. An inhibitor of gelatinases was administered to define the role of gelatinases on BBB permeability, brain inflammatory response and sepsis-induced cognitive alterations.

RESULTS. The increase of BBB permeability is time-related to the increase on MMP-9 content and activity, and to a less extent MMP-2, in the microvessels in both cortex and hippocampus. Using a MMP-2 and -9 inhibitor the increase in permeability of the BBB was reversed in the hippocampus and partially in the cortex. The reversion of BBB increased permeability was associated with lower brain levels of interleukin-6, interleukin-10 and oxidative damage. In addition, it was associated with an improvement on cognitive alterations associated with sepsis.

CONCLUSIONS. Gelatinase activation in brain microvessels seemed to be a major step on BBB breakdown and brain dysfunction during sepsis development.

GRANT ACKNOWLEDGMENT. This research was supported by grants from CNPq (JCFM, CR, FD-P and JQ), UNESC (CR, FD-P and JQ). HAR is holder of CNPq Studentship.

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SUBSTANTIAL DIFFERENCES IN TRIGGERING EVENTS AND FUNCTIONAL CONSEQUENCES BETWEEN MODELS OF ENDOTOXEMIA- AND SEPSIS-ASSOCIATED LIVER DYSFUNCTION

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INTRODUCTION. Endotoxemia has been shown to contribute to hepatic dysfunction in patients with liver cirrhosis and portal hypertension. Furthermore, many of the concepts describing molecular mechanisms of liver failure in sepsis are derived from models of endotoxemia.
However, concerns have been raised about its biological significance as the complexity of clinically relevant sepsis and associated organ failure is only partially replicated.
OBJECTIVES. We thus examined differences in the initiating events and functional consequences during the early phase of sepsis in fluid-resuscitated rat models of polymicrobial sepsis compared to endotoxemia.
METHODS. Cytokine response, leucocyte recruitment, oxidative stress levels, markers for cholestasis as well as parameters pertinent for critical care pharmacology were comparatively investigated.
RESULTS. After induction of the insult, animals in both groups displayed clinical and laboratory signs of multiple organ dysfunction, including pronounced excretory dysfunction and impairment of phase I/II and III biotransformation. However, TNF and oxidative stress responses as well as the degree of cell death in the septic model were minimal compared to that seen with endotoxemia. Despite the latter, cholestasis was even more pronounced in sepsis.
CONCLUSIONS. Taken together, we found that the initiating events (and thus potential avenues to interfere therapeutically) were strikingly different in polymicrobial sepsis compared to endotoxemia. Nevertheless, the clinically relevant molecular events affecting handling of xenobiotics, such as biotransformation and canalicular transport, were most pronounced in polymicrobial sepsis.

General ethical issues & communication in critical ill patients: 1018–1031

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BURNOUT IN INTENSIVE AND PALLIATIVE CARE IN PORTUGAL

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INTRODUCTION. Burnout is a syndrome of emotional exhaustion related to the job. It is characterized by the establishment of frosty relations with people and personal satisfaction and professional. Widely studied by psychologists and occupational health, this question acquires an ethical dimension that underlies the project "Who cares for those who care", Institute of Bioethics, Catholic University of Portugal.
OBJECTIVES. 1. to study burnout incidence in doctors and nurses who work in palliative and intensive care units in Portugal, 2. to identify risk factors of burnout 3. to identify the protective factors and preventive strategies.
METHODS. 1. Questionnaire of socio-demographic variables and life experiences in the workplace, 2. Maslach Burnout Inventory, 3. Interviews, 4. Observations. 1. and 2. Simple descriptive and correlational analysis with SPSS version 17.0 â 3. and 4. grounded analysis, using the program QSR—NVivo 8 â.
RESULTS. A total of nine palliative care teams and 10 Portuguese intensive care units. The identified burnout levels represent a low risk of burnout in palliative care teams and the preliminary results for the intensive care units show a medium risk [S1]. There were no statistically significant differences depending on the different types of palliative care teams. The main risk factors at the level of palliative care are organizational in nature, and protective factors are based predominantly in the implementation of an ethic of care and all teams realize strategies for preventing burnout. In relation to intensive care units, there are differences in levels of burnout among physicians and nurses: nurses have a higher emotional exhaustion and reduced personal accomplishment; doctors greater depersonalization. The risk of burnout is higher for nurses OR 1:45, however, there is a statistically significant 95% (0837, 2834). 9% of 300 professionals studied show burnout, with 31% in burnout or high risk of burnout.
CONCLUSIONS. These results highlight the importance of implementing active strategies to prevent burnout in palliative and intensive care units, allowing the preparation of an intervention program. With this program we aim to help professionals to develop their knowledge about burnout, namely it emotional and physical symptoms, and also the mediating agents. Thus, professionals will become able to identify warning signs, to do self-assessment, and also to minimize or eliminate the stressors factors, assuming preventive measures and coping mechanisms, through self-knowledge, life-styles and professional practices.
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GRANT ACKNOWLEDGMENT. Fundação Grünenthal â Fundação Merck Sharp and Dohme â

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COMMUNICATION BETWEEN GENERAL PRACTITIONERS (GPS) AND INTENSIVE CARE : A SURVEY OF ATTITUDES AND OPINIONS AMONGST GPS

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INTRODUCTION. In order to improve not just outcome but quality of care, it is crucial that there are timely and accurate channels of information between the two disciplines.
OBJECTIVES. The aim of this epidemiological and descriptive survey was to assess the satisfaction of General Practitioners (GP) with the information that they received from their eight bedded (375 admissions per year) Intensive Care Unit (ICU).
METHODS. A questionnaire was sent out to 40 GPs in the catchment area of a busy District General hospital. The questionnaire consisted of two parts. The first part consisted of three questions namely age, professional characteristics and gender of the GP. The second part consisted of 13 questions pertaining to the timeliness, content and form of the current discharge letters. The questions also explored how the information flow could be improved. Data was collected and the results were tabulated.
RESULTS. A total of forty GPs were contacted. Of these, three were returned blank. Twenty completed questionnaires were received, giving a response rate of 54%. Regarding their professional characteristics, 12 (60%) had been qualified for more than 20 years. When asked about how they were usually informed that their patient had been admitted to ICU, 6 (30%) said that they were informed by the relatives, 5 (20%) said that they received it from discharge letters and 8 (40%) said that they received it from both. 14 (70%) said that relatives consulted them during the ICU stay of patients. Eight (60%) felt it was because they did not comprehend the information given at the hospital and 4 (20%) said that it was because they were dissatisfied. 19 (95%) said that they did read the discharge letter while one said that they did not.
Most of them (75%) were satisfied with the level of detail in the current letters. 11 (55%) felt that the diagnosis and details of treatment were equally important while 8 (40%) felt that only diagnosis and 9 felt that only details of treatment were crucial. Regarding overall level of satisfaction with current practice, 15 (75%) was satisfied as evidenced by satisfaction scores of greater than 6 on scale from 0 to 10. In the section of questions about improving practice, 16 (90%) wished to be informed about the admission of their patient. 9 out of 20 (45%) felt that it was essential they were informed and involved in decisions particularly pertaining to end of life care while 11 (55%) felt that it was not essential but could be mutually beneficial. 17 (85%) opined that they would like to receive a letter for all admissions not just death as per current practice.
CONCLUSIONS. Although the numbers are small, it is evident that while the majority of GPs are satisfied with current practice, the information flow could be improved in order to enhance the quality of care that patients and their relatives receive in the ICU.
REFERENCE. Etesse et al. Critical Care. 2010;14:R1112.

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AN AUDIT ON INFORMATION GIVEN TO PATIENTS AND/OR THEIR RELATIVES DURING STAY IN INTENSIVE CARE UNIT

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INTRODUCTION. Approximately 110,000 people are admitted to Intensive Care Units (ICU) in England and Wales each year, the majority surviving to be discharged home. Research has shown that significant numbers of patients surviving critical illness have important continuing problems. Thus the optimisation of recovery as a therapeutic objective rather than mere survival has developed increasing prominence. NICE has developed a clinical guideline on rehabilitation after critical illness requiring a stay in an ICU.
OBJECTIVES. This audit aims to identify the extent of communication given to patients and their relatives regarding ICU stay and further rehabilitation against NICE recommendation, thus ensuring continuity of care.
METHODS. All 86 patients admitted to our ICU over a 3 month period were included. 59 of the 60 survivors were sent audit forms by post. The questionnaire consisted of two sections, one to filled by the patient and the second to be filled by the relative. We evaluated the information given to the patient and/or family on the following aspects during their stay on ICU and ward. Critical illness, treatment given, special equipment used, potential muscle weakness, potential post traumatic disorder, transfer to ward, difference in care on ICU and ward, rehabilitation pathway, degree of recovery, diet and Activities of Daily Living (ADL) were included. We received a 45% response rate (27 patients).
RESULTS. The number of patients given the following information as a percentage are as follows. Critical illness (70%), treatment given (70%), special equipment used (26%), potential muscle weakness (41%), potential post traumatic disorder (19%), transfer to ward (60%), difference in care on ICU and ward (52%), rehabilitation pathway (30%), degree of recovery (56%), special dietary requirement (30%) and managing Activities of Daily Living (56%). Relatives were informed when the patient could not be informed, for example when the patient was sedated. Three families did not receive any information regarding their illness. Two families were not informed of the treatment the patient had on ICU. 37% were not informed about the possibility of physical/psychological illnesses they could develop after discharge from critical care.
CONCLUSIONS. Though reasonable amount of information was given to patients and/or their relatives, the recommended 100% adherence to NICE guidelines is not observed. Information regarding the psychological aspects after critical care discharge seems very poor. We recommend implementing a protocol based on the NICE guideline which includes educating the staff and using a standard form with the above details. A copy of ICU discharge summary to patient/relative/General Practitioner may be appropriate. On discharge patients could be provided with booklets on rehabilitation and seen in follow-up clinics.
REFERENCE. Rehabilitation after critical illness. NICE guideline. 2009.

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A PROSPECTIVE VIDEO RECORDED STUDY ABOUT CONSCIOUS PATIENT'S STATEMENTS OF RECEIVING MECHANICAL VENTILATION

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INTRODUCTION. Light or no sedation has been more common while receiving mechanical ventilation treatment (Samuelsson 2006) and it is preferable from a medical perspective (Strøm et al. in Patients' experiences of mechanical ventilation treatment are often associated with discomfort and feelings of panic caused by the tube. 2010; Samuelsson 2006; Davies 2007). To communicate perceived as difficult and evoked feelings of helplessness (Samuelsson 2006).

OBJECTIVES. The aim of this study was to describe patients' statements of their situation during a video recorded interview while receiving mechanical ventilation in an intensive care unit.

METHODS. Fourteen patients treated with no or light sedation while receiving ventilator treatment was interviewed. An interview guide was used during the video recorded interview. The interviews lasted about 3–16 min. A qualitative manifest content analysis was used to analyze the text.

RESULTS. Patients felt pain and dyspnoea caused by the endotracheal tube or tracheotomy. Some felt that they always had to think about breathing. Not getting air also made it difficult for them to sleep and unable to relax. Suction procedures caused both panic but also relief depending how it was performed. The patients experienced it strange and problematic to have no voice and limited ability to communicate. It was vital for the patients to create and establish a communication and a way of being understood by nurses and visiting next-of-kin. It was through continuity a caring relationship could be created and maintained and thus a functioning communication established with the nurse. Relatives' visits instilled security and made the patient long for home and a normal life again.

CONCLUSIONS. Patients' experiences of dyspnoea, pain and panic indicate that actions had to be taken for alleviating uncomfortable situations. Nurses are important for supporting and instructing both patients and relatives different ways of communication so that they can understand each other as this is vital for patients' feelings of being safe.

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GRANT ACKNOWLEDGMENT. Financial support was obtained from the Intensive Care Unit, Skaraborg's Hospital, Skövde, the Research and Development Center, Skaraborg's Hospital Sweden and the Skaraborg Institute, Sweden.

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FAMILY SATISFACTION WITH CARE IN THE ICU

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INTRODUCTION. Effective communication between intensive care unit (ICU) caregivers and patients' family members is a vital component of quality care.

OBJECTIVES. We tried to evaluate the satisfaction of family members with the processes of care, making an effort to improve physician–patient communication and to provide the family with a realistic understanding of the ICU patients' condition.

METHODS. All consecutive patients who were admitted to our general ICU during a 15-month period entered the study. The family members were asked to complete a questionnaire themselves, anonymously. ICU characteristics, patient and family member demographics and data on satisfaction were collected. Principal components analysis (PCA) for the evaluation of the questionnaire and univariate as well as multivariate analysis were performed to summarize predictive information. Data were analyzed with logistic regression with statistical significance set at $p < 0.05$.

RESULTS. Sixty consecutive patients were enrolled. Age (mean ± SD) was 55.6 ± 20.7 years, APACHE II score at admission 16.5 ± 7.4, length of stay (LOS) in the ICU 17 (6–29) days. Fifty-two were intubated. Nineteen of the patients died (31.7% mortality). Sixty-one questionnaires were analyzed that corresponds to forty-three of the patients. Age of the representatives 44.1 ± 13.6 years. Through the PCA eight parameters were extracted (information procedure, physician's gender, visiting hours, the need of psychologist's assistance in relation with the visitor's gender, patient's age and severity of illness, visitor's age and level of education, ICU atmosphere and difficulty in understanding the information). Most significant was found to be the information procedure ($p = 0.001$) and the time and duration of the visiting hours ($p = 0.019$). All the family members desired to know the truth for the condition and prognosis of their relatives. Family members of the non survivors experienced less satisfaction with care ($p = 0.172$). Patients with no visitors tend to have higher mortality rates ($p = 0.193$). These are preliminary results. Bigger sample is needed to confirm the trends.

CONCLUSIONS. Honesty, completeness, consistency and adequate duration of information play a major role in family members' satisfaction with care in ICU. This field deserves to be investigated further with goal of improving the satisfaction of ICU patients' family members.

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FAMILY SATISFACTION IN THE ICU OF A UNIVERSITY HOSPITAL IN ATHENS, GREECE

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INTRODUCTION. Integrating a family-centered approach to care, especially in ICU, where critically ill patients are admitted, is very important. The benefits of family-centered care include improvements in satisfaction [1] and quality of patient care [2].

OBJECTIVES. This study was planned to measure the family satisfaction of ICU patients, related to offered care, family's participation in decision making and total relatives' impression of patients' staying in the ICU of a University Hospital in Athens, Greece.

METHODS. FS-ICU 24 Scale [3] (Family Satisfaction in the Intensive Care Unit-24) was translated and distributed in the family members of the patients that were hospitalized in the ICU from August 2008 to September 010. Two measurements took place: The first one 7–10 days from the admission of the patient in the ICU and the second one after 15–20 days from the admission. The only criterion for the supplementation of the questionnaire was the patient to be intubated for 48 h at least. The maximum score of FS-ICU 24 Scale was 100, indicating the highest level of family satisfaction and the minimum score was 0. Mean scores fluctuated between 60 and 75, represented average to high levels of family satisfaction.

RESULTS. First measurement's mean score: satisfaction with care: 76.26, family satisfaction with decision making around care of critically ill patients: 70.67 and total family satisfaction: 72.03.

Second measurement's mean scores: satisfaction with care: 71.28, family satisfaction with decision making around care of critically ill patients: 70.03 and total family satisfaction : 70.99.

CONCLUSIONS. The families of the ICU patients in the University Hospital were pleased from the care level the ICU personnel offered to the patients. That is proved from the fact that the mean scores of the measurements that took place were 70 (range 65–75). Higher satisfaction scores concerned caring and symptom management from the ICU personnel, doctors' and nurses' skills, competence and team work too. Lower levels of satisfaction were related to the decision making part, concerning the process of decisions around care of critically ill patients.

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GRANT ACKNOWLEDGMENT. The authors are grateful to ICU personnel for their cooperation and to the ICU patients' relatives for their willingness to help with the research.

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INCREASED NON-BENEFICIAL CARE IN PATIENTS SPENDING THEIR BIRTHDAY IN THE ICU

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INTRODUCTION. Making end-of-life decisions relies on objective and subjective criteria. Previous studies identified substantial biases during end-of-life decision-making.

OBJECTIVES. We hypothesized that patients spending their birthday in the ICU would experience different management than other patients.

METHODS. Patients admitted >48 h to 12 ICUs over a 10 years study period were included. Patients spending birthday in the ICU were matched for center, gender, age, severity at admission, type of ICU admission and length of ICU stay before birthday's date.

RESULTS. 223 birthday patients were compared with 1,042 controls. They were more frequently admitted for unscheduled events (septic shock or trauma) and received more intensive and sustained life support than controls. Increased life support was related to a higher use of therapy after but not before the birthdate. Birthday patients had a longer length of ICU stay. ICU and hospital mortality were not different between the two groups. However, likelihood of end-of-life decisions was significantly decreased and these decisions were implemented later in Birthday patients [18 (5–33) vs. 9 (3–19) days].

CONCLUSIONS. Patients celebrating birthday in the ICU experience decreased likelihood of end-of-life decisions, delayed end-of-life decisions, prolonged and more intensive life support and prolonged ICU stay for similar outcomes. These findings highlight a case situation for compassionate non-beneficial care.

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BRAIN DEATH AND ORGAN DONATION: CLINICAL PROFILE OF OUR PATIENTS

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INTRODUCTION. Despite the downward trend in the number of donated organs and tissues that occurred in Spain during 2010, our country continues being the leader in this area. According to the National Organization of Transplants, in 2010, there were 1502 donations in Spain, thanks to which 3,773 organs were transplanted, being our region one of that heads of the list as for number of effective donors and organs transplanted in the country.

OBJECTIVES. The goal of our study was to analyze the clinical profile of the patients who died in situation of brain death in our center, as well as that of those who finally were donors of organs during 2010.

METHODS. Retrospective study of all consecutive patients admitted in our ICU with a diagnosis of brain death between January 2010 and October 2010. We recorded clinical and demographical data, etiology of brain death, Glasgow coma scale at admission, evolution in the ICU, diagnosis of brain death and organ donation. We expressed results in percentage, median or mean. T-test and Chi-square test were used in a SPSS program.

RESULTS. We analyzed 36 patients admitted in the ICU, with age 52.97 $\pm$ 16.93 years. 55.6% were men. At admission, the patients had APACHE II 26.06 $\pm$ 5.21 and Glasgow coma scale 4.83 $\pm$ 3.03. Most of our patients had not respiratory history (only 13.9% COPD and 2.8% OSA), but 55.6% had hypertension or ischemic heart disease. There was a 30.6% of diabetics. BMI 26.32 $\pm$ 4.03. The patients had no liver or renal disease history. The most common causes of brain death were brain hemorrhage (38.9%), subarachnoid hemorrhage (25%), head trauma (11.2%) and stroke (8.3%). Other causes were less frequently (anoxic encephalopathy, brain tumors). The diagnosis of brain death was performed in 77.8% of cases by EEG (11.4% only by clinical examination, 8.3% by CT angiography and 2.8% by arteriography). 69.4% were organ donor. Of the non-donors, 19.4% was for medical contraindication, 8.3% familiar negative and 2.8% after suffering a cardiac arrest during maintenance. We compared the group of organ donor with the non-donors, and both groups were homogeneus, without significant differences except in the percentage of patients with ischemic heart disease (48% in donor group vs. 72.7% in non-donor group, $p = 0.02$), which could be related to non-donation. Although there were more diabetics in the group of non-donors, the difference was not significant ($p = 0.06$).

CONCLUSIONS. In our experience, at admission to the ICU, the patients have a poor prognosis (high APACHE II and mean Glasgow coma scale of 4.83), and the evolution is to brain death. The most common cause of brain death is hemorrhagic stroke, and the head trauma is becoming less frequent. In our ICU, the diagnosis of brain death is performed by EEG and only in barbiturate-induced coma patients, must perform a CT angiography or arteriography. There are no big differences between donors and non-donors groups.

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SERUM CONCENTRATION OF PROTEIN S100B IN BRAIN-DEAD ORGAN DONORS—PRELIMINARY REPORT

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INTRODUCTION. Protein S-100B is currently considered one of the most promising candidates for neurological predictors.

METHODS. The concentration of plasma S-100B protein was established in 12 brain-dead organ donors. All measurements were taken after brain death was confirmed by the commission, up to 24 h before organ retrieval. 29 patients who died in the medical ICU with confirmed permanent brain injury, but without signs of brain death acted as controls. In these patients all measurements were taken at ICU admission. The result obtained had no impact on the clinical management and the process of treatment. Accordingly, in compliance with the decision of the Local Ethics Committee, the informed consent was waived. U Mann–Whitney test was used for statistical analysis and $p < 0.05$ was considered significant.

RESULTS. In brain-dead organ donors mean values of plasma S-100B protein were much higher in comparison to control group (5.04 $\pm$ 4.27 vs. 1.47 $\pm$ 1.64 mcg/L, $p = 0.0011$). This fact may be of value, when the presence of reflex movements (frequently reported despite brain death) might delay determination of brain death and result in the failure of organ donation.

CONCLUSIONS. Concentrations of plasma S-100B protein in brain-dead organ donors are extremely high and may support the diagnosis of brain death.

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A COMPUTER ASSISTED LEARNING PACKAGE ON DECEASED DONATION: A TOOL FOR WIDESPREAD EDUCATION OF PROFESSIONALS

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INTRODUCTION. Deceased donation is a relatively infrequent event. Recommendation 11, of the UK 2008 Organ Donor Taskforce Report[1], called for mandatory training in the principles of donation for all clinical staff likely to be involved in the treatment of potential donors. To provide training and continual professional development to large numbers of clinical staff, additional learning resources are needed. Computer Assisted Learning (CAL) is becoming increasingly prominent in medical education. The benefits associated with it, including accessibility, breadth of content, the ability to update information, and interactive control over time, place and pace of learning [2], make it a potentially useful tool for creating an effective learning resource on deceased donation for medical and nursing staff.

OBJECTIVES. The aim of this project was to create a CAL package which would educate clinical staff regarding the principles of donation as well as provide a lasting internet based resource for regional hospitals where such information could be accessed as and when it was needed. Additionally to evaluate the usefulness of CAL as a learning style and determine effective techniques through package design.

METHODS. A learning needs analysis questionnaire was produced and undertaken to determine the target population's prior knowledge. The package was produced using Microsoft Expression Web, allowing it to be displayed in Internet Explorer and therefore ensuring most users would be familiar with it. A true/false test was used by trainee doctors to assess effectiveness of the package, and feedback from intensive care staff (both medical and nursing) was collected through an online survey.

RESULTS. The evaluation survey showed that this CAL package was an effective learning resource. All participants reported a positive experience of using the package, which highlights successful use of the beneficial aspects that a CAL resource can provide, and 100% of participants would recommend others use this package. The true/false test showed improvement in knowledge in 80% of participants after having used the package.

CONCLUSIONS. This CAL package is successful in fulfilling the aim of producing a useful resource for teaching about the principles of donation. Staff were impressed by the opportunities CAL offers for learning, and the use of it in this field of medical education has been proven effective and beneficial.

The package now forms part of the pre-reading requirements for Nottingham University Hospitals inaugural Donation Simulation Day on May 17, 2011, and has been adopted as an online public resource by the United Kingdom Mid Trent Critical Care Network (to be accessed from May 2011 at the following web address: http://www.midtrentccn.nhs.uk/educational-resources).

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INCREASING THE NUMBERS IN ORGAN DONATION: INTRODUCTING THE DONATION INTENSIVIST

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INTRODUCTION. The organisation of organ donation in the four Northern provinces of the Netherlands was changed due to the growing demand for organ donors in the "Masterplan for Organ Donation".

OBJECTIVES. Key issues in the 2009 "Masterplan for Organ Donation" were optimal detection of donors, improved donor management and reduction in refusal of consent.

METHODS. All 21 hospitals of the Northern provinces were grouped in four clusters including a core centre and satellite hospitals. A donation intensivist was appointed in each core centre. The tasks of the donation intensivist were to introduce donor management protocols in all intensive care units, to provide a helpdesk function concerning organ donation and to evaluate all donation procedures with the physician in charge on all cases where a potential donor was not effectuated.

RESULTS. The helpdesk function and the donor management protocol were introduced in all hospitals by the donation intensivist. Misconceptions about organ donation and errors in checking the national donor registry were detected. The helpdesk was functional and resulted in two successful procedures that would otherwise have been abandoned.

In 2009, 85% of the reported donation procedures were effectuated compared to 100% in 2010. The evaluation of procedures identified physicians not following guidelines when checking the donor registry and asking relatives for consent. The promotion of a strategy for asking relatives for consent resulted in a higher participation in communication training in this subject. In the first 3 months of 2011 the number of procedures effectuated was already 17, which is 58% of the total number of procedures in all of 2010.

CONCLUSIONS. The donation intensivist plays a crucial role in the organ donation organisation by stimulating focus on donation and promoting cooperation between hospitals. As a result there is a trend towards an increase in the number of procedures and a decrease in loss of potential donors after the introduction of the Masterplan for Organ Donation.

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ADMISSION OF UNRECOVERABLE NEUROCRITICAL PATIENTS IN ICU: ANOTHER POSSIBILITY TO EXPAND DONORS POTENTIAL

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INTRODUCTION. Donors rate has experimented a stabilization or slight decline in the last years in our country. So it is singularly important to reinforce all possible paths to detect and monitor any potential donor of organs and tissues.

OBJECTIVES. With this aim, a detection track was developed in our Hospital to detect patients with unrecoverable severe neurological damage, with no options for treatment and survival, whose ICU admission should be motivated by the possibility of evolving to brain death and organ donation.

METHODS. Data were collected from the 2010 Transplant Coordination database. Patients were evaluated by the Emergency Department, Neurology, Neurosurgery and/or Intensive Care physicians as appropriated; once a agreement was reached about the unrecoverable nature of the process and absence of effective treatment, Transplant Coordination Unit was activate to evaluate the patient as a potential organ donor. Clinical record and complementary tests were reviewed and an abdominal ultrasonography was ordered when appropriate. If no medical contraindications for donation were found a meeting with patient relatives was set to explain the fatal prognosis and the possibility of being admitted in Intensive Care with the objective of organ donation.

RESULTS. In 2010, nine patients were evaluated at the Emergency Department trough this detection track. Seven of them finally became organ donors, one was considered as medically contraindicated and in another family refuse to donate. All 7 donors had massive hemorrhagic cerebrovascular accidents with Glasgow Coma Score <4 points, Neurosurgeon was consulted in 3 occasions, mean age was 74.71 years (64–83). All evolved to brain death in the first 72 h after Intensive Care Unit admission and generated 2 valid livers and 6 valid kidneys; 3 donors did not generated valid organs.

CONCLUSIONS. This subgroup of patients should be evaluated for Intensive Care Unit admission as another path for expanding donor's pool. Transparency, exhaustive information and support to the family of potential donors are essential requisites of this process; as well as end-of-life care of the patient admitted with this objective.

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THE ROLE OF COMMUNITY HOSPITALS TO INCREASE ORGAN DONORS POOL: THE ANDALUSIAN EXPERIENCE

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INTRODUCTION. In recent years we are witnessing the stabilization in organ donation in Andalusia and Spain. The objective of The Spain National Transplant Organization (ONT) is to increase the donor pool, with initiatives like asystolic donation, expanded criteria donors, living-donor kidney transplantation, etc. In this context, community hospitals appear as a new source for increasing donation rates.

OBJECTIVES. To analyze the distribution of donation in the community hospitals in Andalusia and their impact on donation rate.

METHODS. We collected data from Andalusia donor database (SICATA) in the year 2010. We defined community hospital those without neurologist/neurosurgeon in the hospital staff and 100.000 average population.

Statistical analysis was performed using SPSS v18. U Mann–Whitney test was use for comparison of quantitative variables. For comparison of qualitative data, Chi square test was used.

RESULTS. Total donations in Andalucia in 2010 was 264, which result in a rate of 31.2 donors per million of population (pmp). 18 organ donations (6.8%) were in community hospitals. Andalusia generated 782 organs, 43 (5.5%) were in community hospitals and made possible 30 transplants (5.4%). The donation rate in Andalusia without the contribution of community hospitals is 29.2 donors pmp.

If we analyse the donor profile in the community hospitals:

- There were 3 donors with post-anoxic encephalopathy with a mean age of 23 years
- Four donors were older than 75 years.
- The mean age of donors with hemorrhagic stroke (13) in community hospitals is 66.5 years.

Organ donation comparison

	Andalusia	Community hospitals	Level 1 hospitals	p
Male	156 (59.1%)	9 (50%)	147 (59.8%)	0.41
Mean age	56.4 (dt 17.2)	59.2 (dt 18.8)	56.2 (17.1)	0.28
Mean organs per donor	2.96 (dt 1.2)	2.39 (dt 0.92)	3 (dt 1.27)	0.06
Mean not valid organs per donor	0.86 (dt 1)	0.76 (dt 0.83)	0.87 (dt 1)	0.70
All organs	782	43 (5.5%)	739	
Not valid organs	228 (29.2%)	13 (30.2%)	215 (29.1%)	0.72

CONCLUSIONS.

- In 2010 the presence of organ donation programmes in community hospitals of Andalusia has made possible 27 transplants. This has resulted in 5.5% of transplants performed.
- The organ donor profile in community hospital is not defined.
- The contribution of community hospitals in Andalusia has increased the donation rate from 29.2 to 31.2 donors pmp.
- With these results it seems reasonable extending our model to other countries.

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GRANT ACKNOWLEDGMENT. Andalusian Transplant Coordination.

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ORGAN DONATION FROM A MARGINAL DONOR—PATIENT WITH FULMINANT BACTERIAL MENINGOENCEPHALITIS

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INTRODUCTION. Limited number of cadaveric organs and growing number of patients with terminal organ failure demand from organ retrieval teams to look for such donors whose organ retrieval has until recently been contraindicated, mostly those with infectious diseases. This is the first case of successful organ retrieval from brain dead organ donor with confirmed bacterial meningoencephalitis in our country.

CASE REPORT. 46-year-old patient was admitted with GCS 15, Hunt-Hess 2–3. MR showed intraventricular haemorrhage in fourth chamber with blood in third and lateral chambers and subarachnoid haemorrhage. MSCT angiography showed an excess of contrast in projection of fourth chamber which was defined as venous angioma. After 2 days he became somnolent, GCS 11, and CT showed obstructive hydrocephalus. Urgent surgical insertion of external drainage system was performed, after which he had no neurological deficits. After 5 days lumbar puncture was done because of the fever. Biochemical findings were unsuspicious of meningitis as well as inflammation parameters. External drainage was removed after 7 days. After 2 days patients state worsened (no contact, responsive only to pain), with high leucocytes (22.6) and CRP (231.6) and spinal fluid finding suspicious of meningitis (cells 33300/3, proteins 25, glucose 0.6, lactate 19.6). Meropenem was started and *Acinetobacter* sp. reactive to meropenem was isolated from spinal fluid and 2 samples of hemocultures as well. Within 10 h patient worsened to GCS 6 and was intubated and mechanically ventilated. Right pupil became midriatic the next day and mannitol was administered. CT showed cerebral oedema. After 12 h signs of brain herniation occurred and brain death was confirmed using transcranial colour Doppler. Hemocultures taken same day were sterile, so, after obtaining consent, organ retrieval of heart, kidneys and liver was performed. Donor was hemodynamically stabile with low-dose noradrenalin. Autopsy showed pus deposits on meninges and purulent exudate in the subarachnoid space. All organ recipients had meropenem therapy continued and did not show signs of complications.

CONCLUSIONS. This is a case of fulminant meningoencephalitis causing worsening to brain death caused by extensive cytotoxic brain oedema in only 24 h. We decided to retrieve organs after second hemoculture samples were sterile. Meropenem, started empirically and afterwards confirmed by the antibiogram, was administered up to the retrieval. This case proves that infectious patients should also be considered as organ donors, with adequate microbiological diagnostics and antibiotic therapy, and sustaining hemodynamical stability.

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PK/PD of anti-infective drugs: 1032–1045

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AEROSOLIZED ANTIBIOTICS FOR PNEUMONIA IN ADULT CRITICALLY ILL PATIENTS: A SYSTEMATIC REVIEW

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INTRODUCTION. Nosocomial pneumonia remains the major cause of ICU-acquired infection [1]. A high proportion of late-onset ICU nosocomial pneumonia is caused by organisms, such as *Pseudomonas aeruginosa*, which can be extremely difficult to eradicate from the respiratory tract with systemic antibiotics despite in vitro antibiotic sensitivity [2]. Aerosolising antibiotics has appeal as a potential means of reaching target lung tissue in high concentration to facilitate eradication yet without causing systemic toxicity.

OBJECTIVES. The aim was to systematically review the literature for evidence from randomised controlled trials (RCTs) evaluating the effectiveness of aerosolized antibiotics in the treatment of pneumonia for patients in the Intensive Care Unit (ICU).

METHODS. Search of the Cochrane Central Register of Controlled Trials, EMBASE, MEDLINE and relevant reference lists. Data was collated and analysed using RevMan 5.1 software.

RESULTS. 5 relevant RCTs were identified. There were marked differences in patient populations, interventions and outcome measures. However, meta-analysis was possible for 2 outcome measures. With respect to clinical resolution of ventilator-associated pneumonia (VAP, 3 studies; n = 142), aerosolized therapy did not significantly improve outcome (OR 0.46, 95% CI 0.12–1.83, random effects model). 28-day mortality for ICU patients with lower respiratory tract infection (3 studies; n = 181; 94% patients with VAP) was also no better in the aerosolized therapy group (OR 0.97, 95% CI 0.51–1.86, random effects model). Data was inadequate to evaluate microbiological eradication.

CONCLUSIONS. On the basis of limited data from a small number of RCTs with very different methodology, there appears to be inadequate evidence to support the use of aerosolized antibiotics for pneumonia in unselected ICU patients.

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POPULATION PHARMACOKINETICS OF DORIPENEM IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Effective prescription of antibiotic therapy reduces mortality in critically ill patients. No data, specifically in critically ill patients, is available for the recently released carbapenem antibiotic, doripenem.

OBJECTIVES. The objective of this research was to describe the population pharmacokinetics of doripenem in a large cohort of critically ill patients and to subsequently use Monte Carlo simulations to describe optimised dosing strategies.

METHODS. Blood samples were obtained from critically ill patients that were prescribed doripenem clinically. Population pharmacokinetic modelling was undertaken using non-linear mixed effects modelling approach (NONMEM, version 6.1). Relevant patient covariates were incorporated into the model if they were considered clinically and statistically valid. Monte Carlo simulations were carried out using the full covariate model.

RESULTS. Thirty-one critically ill patients were enrolled. The median age was 58 (interquartile range 45–72) years; weight was 83 (66–92) kg and creatinine clearance (CrCL) was 141 (83–184) ml/min. A two compartment linear model with first order input best described the data. The population value for clearance (CL) was 15.6 L/h; volume of distribution (central; V1) was 7.3 L, intercompartmental clearance (Q) was 18.6 L/h, and volume of distribution (peripheral; V2) was 18.8 L. The covariates included in the final model were CrCL for CL, patient weight for V1 and patient weight for V2. Monte Carlo simulations support the use of 4-h infusions, to maximise achievement of target doripenem concentrations.

CONCLUSIONS. In this analysis, the first data on doripenem pharmacokinetics in a solely critically ill patient group is presented. This large cohort of patients demonstrated that patient renal function and body size are important considerations for dosing. Use of extended infusions in critically ill patients is supported by this analysis.

GRANT ACKNOWLEDGMENT. Dr Roberts is funded by a fellowship from the National Health and Medical Research Council of Australia (Australian Based Health Professional Research Fellowship 569917) and would like to acknowledge funding from National Health and Medical Research Council of Australia (Project Grant 519702) .

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HIGH REGIMEN OF CONTINUOUS INFUSION OF VANCOMYCIN IN SEPTIC PATIENTS

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INTRODUCTION. Vancomycin is often administered as a continuous infusion (CI) to treat severe infections caused by Gram-positive bacteria. However, sepsis can alter drug pharmacokinetics (PKs), and higher than recommended regimens have been proposed in this setting[1].

OBJECTIVES. The aim of this study was to evaluate the efficacy of a new regimen using high CI doses of vancomycin in critically ill septic patients.

METHODS. According to previous simulation PK analysis[1], we tested a new CI vancomycin regimen, including a loading dose (LD) of 35 mg/kg given as a 4-h infusion, followed by a daily dose adapted according to the creatinine clearance (CrCl), estimated by the Cockroft–Gault formula. Serum levels of vancomycin were measured at the end of LD, and 12, 24 and 48 h after the start of therapy. Dose adjustment was decided on drug concentrations at 12, 24 and 48 h. Adequate vancomycin concentrations were considered between 20 and 30 mcg/mL.

RESULTS. A total of 44 patients were included (30 male, age 57 ± 16 years; weight 74 ± 15 kg) in 4 months (January–April 2011). Vasopressors, mechanical ventilation and continuous renal replacement therapy were used in 50% (n = 22), 59% (n = 26), 20% (n = 9) of patients, respectively. Overall ICU mortality was 27%. Mean loading and daily doses were 2587 ± 525 mg and 1886 ± 1016 mg/day, respectively. Vancomycin concentrations were 49 ± 16 mcg/mL at the end of LD and then 26 ± 9, 23 ± 6 and 25 ± 7 mcg/mL at 12, 24 and 48 h, respectively. Adequate concentrations were found in 45% (20/44), 50% (18/36) and 64% (18/28) of patients, at 12, 24 and 48 h, respectively. Serum concentrations of vancomycin were above 30 mcg/mL in 29% (13/44) of patients at 12 h, 17% (6/36) at 24 h and 14% (4/28) at 48 h. Drug levels were 31 (18–58) mcg/mL when CrCl was <50 (n = 15), 26 (15–38) mcg/mL when CrCl was between 50–120 (=15) and 20 (16–31) mcg/mL when CrCl was >120 (n = 14) ($p < 0.01$) at 24 h.

CONCLUSIONS. Higher doses of vancomycin than recommended are needed to rapidly achieve therapeutic serum levels in septic patients. Adaption of this new regimen should be considered in patients with renal dysfunction to avoid drug accumulation or in patients with hyperfiltration to avoid underdosing.

REFERENCE. 1. Roberts et al. Vancomycin dosing in critically ill patients—robust methods for improved continuous infusion regimens. Antimicrob. Agents Chemotherapy. 2011. Epub ahead of print.

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BETA-LACTAM LEVELS IN OVERWEIGHT CRITICALLY ILL PATIENTS

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INTRODUCTION. Altered pharmacokinetics (PK) in critically ill patients can result in insufficient serum beta-lactam concentrations when standard dosages are administered. Obesity could further alter drug PKs in this setting.

OBJECTIVES. With the increasing number of overweight patients admitted to intensive care units (ICUs), we aimed to evaluate beta-lactam levels in this population.

METHODS. Retrospective observational study (January to December 2010). Beta-lactam levels were measured by high-pressure liquid chromatography (HPLC) in most of our ICU patients during working days. Samples for drug monitoring were taken twice during the elimination phase after bolus administration. This provided an estimated pharmacokinetics (ePK) and the calculation of the time spent above the MIC ($T > 4 \times MIC$). Patients were included if: (a) they were diagnosed with sepsis according to standard criteria, (b) their body weight exceeded 100 kg, (c) they received a broad-spectrum beta-lactam (ceftazidime or cefepime, CEFA; meropenem, MERO; piperacillin-tazobactam, PIP) and (d) drug levels were measured. Drug regimens were adapted to creatinine clearance, according to Cockroft-Gault formula. The adequacy of therapy was assessed by calculating $T > 4 \times MIC$ for "difficult-to-treat" Gram negative bacteria, such as *Pseudomonas aeruginosa*. For each drug, the optimal $T > 4 \times MIC$ was considered as: >50% for PIP; >70% for CEFA; and >40% for MERO. By simulation, we calculated the probability of achieving target $T > 4 \times MIC$ values when receiving increased dosages (ID), based on a proposed correction formula for weight[1].

RESULTS. We obtained 29 ePK (n = 17 for MERO; n = 6 for CEFA; n = 6 for PIP) in 23 patients (19 male; age 61 ± 12 years; weight 119 ± 18 kg). 5 of these ePK were measured in patients receiving higher than standard regimens (SR). When SRs were used, the number of patients who attained the target PK profile was 13 (44%): 2/6 for CEFA, 2/6 for PIP, and 9/17 for MERO. When ID were considered, simulations showed that 17 (58%) patients would have attained adequate concentrations: 3/6 for CEFA, 4/6 for PIP, and 10/17 for MERO. In patients receiving higher than standard regimens (8 g qid for PIP in 1; 2–4 g q6-8 h for MERO in 4), 4/5 (80%) patients attained adequate drug concentrations, while simulation for SR and ID resulted in inadequate concentrations for all of them.

CONCLUSIONS. This is a first report of beta-lactam levels in overweight, critically ill patients. Standard beta-lactam regimens resulted in inadequate serum concentrations in the majority of overweight critically ill patients when treating less susceptible bacteria strains. Using a correction formula for body weight did not significantly increase the adequacy of therapy. Even higher dosages should be considered in this population. Further studies are needed to determine optimal antibiotic regimens in overweight ICU patients.

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CONTINUOUS INFUSION OF VANCOMYCIN IN SEPTIC PATIENTS ON CONTINUOUS RENAL REPLACEMENT THERAPY

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INTRODUCTION. Continuous infusion (CI) of vancomycin is frequently used in critically ill patients to treat severe infections caused by Gram-positive bacteria. Recent recommendations suggest a loading dose of 15 mg/kg followed by a CI of 30 mg/kg of vancomycin (1), however this strategy has not been validated in patients with renal dysfunction. In this setting, the use of continuous renal replacement therapy (CRRT) can further alter drug concentrations.

OBJECTIVES. The aim of this study was to evaluate vancomycin levels during CI in septic patients on CRRT.

METHODS. Retrospective analysis of all patients admitted in the ICU from January 2008 to December 2010 in whom a vancomycin was given as a CI. Patients were included if they (a) were >18 years old, (b) had sepsis according to standard criteria, (c) received vancomycin for at least 48 h, (d) were concomitantly treated with CRRT. Demographics, microbiological and treatment data were collected, as well as characteristics of CRRT. Vancomycin levels are obtained daily in our Department. Drug concentrations were considered as adequate between 20 and 30 mcg/mL. Data are presented as mean ± SD.

RESULTS. During the study period, 85 patients (56 male; age 65 ± 15 years; weight 85 ± 24 kg) met the inclusion criteria. Median APACHE II and SOFA scores were 24 (20–29) and 11 (7–14), respectively. Seventy (82%) patients were treated with vasopressors, 71 (83%) with mechanical ventilation. The overall mortality was 59%. Forty-two patients were treated by continuous veno-venous hemodiafiltration (CVVDHF), and 43 by hemofiltration alone (CVVHF). Mean vancomycin doses were: 16.4 ± 6.4 (loading dose), 23.5 ± 8.9 (day1), 23.2 ± 7.4 (day2) and 23.3 ± 11.1 (day3) mg/kg, resulting in the blood concentrations of 24.8 ± 9.1 (day1), 26.3 ± 8.1 (day2) and 27.7 ± 9.3 (day3) mcg/mL, respectively. Forty-three patients (51%) had adequate drug concentrations on day 1, 17 (20%) had levels >30 mcg/mL and 25 (29%) <20 mcg/mL. Patients with CRRT intensity above 40 ml/kg needed higher daily regimens (27.8 ± 7.9 mg/kg) than others (19.1 ± 8.2 mg/kg for CRRT of 20 ml/kg and 23.8 ± 7.2 mg/kg for CRRT of 20–40 ml/kg, $p < 0.01$) to obtain similar drug concentrations.

CONCLUSIONS. In ICU septic patients treated with CI of vancomycin during CRRT, drug concentrations were adequate in most cases, despite the use of lower than recommended doses. The intensity of CRRT can influence vancomycin clearance and should be taken into account to adapt drug prescription.

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ACYCLOVIR TREATMENT IN THE CRITICALLY ILL; THE INFLUENCE OF CONTINUOUS VENOVENOUS HEMOFILTRATION ON SERUM LEVEL ACYCLOVIR

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AIMS. Continuous venovenous hemofiltration (CVVH) is commonly used in critically ill patients with renal impairment. As acyclovir is eliminated by renal excretion, patient's renal function or the use of CVVH will influence acyclovir levels. Little is known about the (therapeutic) serum levels of acyclovir during CVVH and possible dosing consequences. Toxic levels could lead to epidermal necrolysis, trombolicthrombocytopenic purpura and renal failure. Serum levels of acyclovir in patients with or without CVVH are studied.

METHODS. In a retrospective cohort study, we investigated acyclovir trough levels during the period January 2008 and February 2011. Subtherapeutic was defined as <0.5 mg/l, toxic levels >5.0 mg/l. Data was analyzed by SPSS 18.0.

RESULTS. 57 patients were treated with acyclovir intravenously. In 45 patients a total of 114 trough levels were collected. 16 of them underwent CVVH during acyclovir treatment. 17 levels were taken during CVVH (3 toxic), 68 samples were drawn from patients who did not receive CVVH during ICU treatment (9 toxic) and 29 of the samples were taken in patients that had received CVVH previously (not during; 6 toxic).

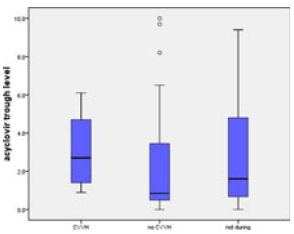

Fig. 1

Dosing was not different between groups ($p = 0.67$). One way ANOVA showed no significant differences between groups.

CONCLUSIONS. Analysis of our data shows that all groups of patients median trough levels were in therapeutic range without significant differences. Non-significant differences in the number of toxic serum levels were found between groups.

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EVOLUTION OF OSELTAMIVIR PLASMATIC CONCENTRATION IN THE TREATMENT OF PATIENTS WITH ARDS AND UNDER ECMO

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INTRODUCTION. Oseltamivir is licensed for viral infections caused by influenza A and B (75 mg twice daily orally for 5 days). Nevertheless since the pandemic flu of H1N1 in 2009 with high number of ARDS patients, the dose was increased to 150 mg twice daily for 10 days. Intestinal absorption in these critically ill patients could be altered, and the oxygenator membrane of ECMO could affect the biodisponibility of the drug.

OBJECTIVES. The aim of this study was to evaluate if the biodisponibility of oseltamivir was affected by the administration via the oral route and/or by the presence of the oxygenator membrane of the ECMO.

METHODS. With a treatment at recommended doses of oseltamivir lasting for more than 10 days, the persistence of a critical state and late positif H1N1 PCR was an indication to verify the plasmatic concentration to adjust doses or changing to IV route. Two systemic blood samples were taken before administration of oseltamivir one before oxygenator membrane and one after. In some case, one sample of blood was taken in the systemic circulation. This was done 6 times for 4 patients. The dosage of the active metabolite oseltamivir carboxylate was performed via the LC–MS/MS technic.

RESULTS. Median age of the 4 patients was 40.7 years [28–66]. One patient presented renal failure and had the highest systematic dosage (3113 ng/ml), the other patients had normal renal function. The median clearance was 110.5 ml/min [14–145]. One patient had moderate COPD, two were obese with a BMI above 30. In two cases, the concentration of oseltamivir were superior to recommended thresholds (N > 900 ng/ml) but the other were low.

Table 1

	Before oxygenator	After oxygenator	Systemic
Dosage 1 (ng/ml)	3,498	3,347	3,113
Dosage 2 (ng/ml)	296	282	318
Dosage 3 (ng/ml)	242	213	225
Dosage 4 (ng/ml)	1,430	1,420	
Dosage 5 (ng/ml)	142	55	
Dosage 6 (ng/ml)	373	330	

CONCLUSIONS. I n our study, plasmatic concentrations of oseltamivir did not seem to be influenced by the membrane oxygenator. Systemic biodisponibility seems to be very fluctuant probably due to the administration route via a nasogastric tube. A sure intravenous route is mandatory in those critical patients.

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IMPACT OF TWO DIFFERENT VANCOMYCIN DOSING REGIMES ON SERUM CONCENTRATIONS IN CRITICALLY ILL PATIENTS

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OBJECTIVE. To compare percentages of patients achieving serum vancomycin concentration (SVC) of 15–30 mg/L using two different dosing regimes of continuous vancomycin infusion (CVI).

MATERIALS AND METHODS. A cohort of ICU patients with normal renal function treated with CVI was studied. From 17 May 2008 to 13 March 2010 (P1), vancomycin was administered as a loading dose of 15 mg/kg over 2 h, followed by a CVI of 30 mg/kg/day (mean 2 g/day). Then, from 14 March 10 to 06 January 11 (P2), dosification was changed to a loading dose of 15 mg/kg over 2 h, followed by a CVI of 45 mg/kg/day (mean 3 g/day). SVC was monitored twice a week with the Fluorescence Polarization Immunoassay (FPIA). Clinical and laboratory data were collected and analyzed according to their nature.

RESULTS. 288 measurements of SVC were performed in 130 patients, 83 (64%) in P1 and 47 (36%) in P2. Groups were similar in age (41 ± 19 vs. 41 ± 19), APACHE II (17 ± 7 vs. 15 ± 6), $SOFA_{24\ h}$ (7 ± 3 vs. 7 ± 4), admission diagnoses, sites of infection, and lengths (days) of mechanical ventilation (20 [11–37] vs. 15 [7–26]) and hospital stay (24 [13–44] vs. 23 [11–50]). Differences between P1 vs. P2 were: (a) SVC 15–30 mg/L: 37 versus 66% ($p = 0.002$); mortality 39 versus 33% ($p = 0.6$); (b) SVC < 15 mg/L: 58 versus 30% ($p = 0.002$), mortality: 15 versus 7% ($p = 0.46$) All patients with SVC <15 mg/L had hypoalbuminaemia (<3.5 g/dL) During P1, in 69% of patients with SVC < 15 mg/L, vancomycin dosage was increased to 3 g/day, in 12% changed to linezolid, and in 19% withdrawn for no further need.

CONCLUSIONS. 1. SVC monitoring allowed the identification of patients in subtherapeutic ranges; 2. Compared to patients with standard vancomycin dose (2 g/day), significantly more patients with higher dose (3 g/day) achieved a SVC of 15–30 mg/L; 3. Hypoalbuminaemia was present in all patients with subtherapeutic vancomycin ranges; 4. Mortality was similar in both periods; 5. SVC measuring is a useful tool to adjust the dose of vancomycin in critically ill patients.

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POSTCARDIAC SURGERY MEDIASTINITIS TREATMENT WITH DAPTOMYCIN

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INTRODUCTION. Postcardiac surgery mediastinitis has an incidence of 1–2% and a mortality ranging between 8.6 and 40%. It remains a dreaded complication in cardiac surgery. Daptomycin, the first agent of a new antibiotic family, has a powerful bactericidal activity. It has been approved for the treatment of complicated skin and soft tissue infection caused by gram positive microorganisms, right sided endocarditis and bacteriemia by *Staph. aureus*.

OBJECTIVES. To evaluate the effectiveness and safety of high dose daptomycin therapy in postcardiac surgery mediastinitis.

METHODS. Ten patients diagnosed of postcardiac surgery mediastinitis between May of 2009 and November of 2010 were evaluated. They received daptomycin therapy at 10 mg/kg/day after surgical intervention. The etiology of the infection, associated complications, adverse effects and clinical outcomes were analyzed retrospectively.

RESULTS. 10 patients between 46 and 82 years old (6 women and 4 men) were diagnosed with mediastinitis after different types of cardiac surgery: coronary surgery (n = 4), valvular surgery (n = 5) and coronary and valvular surgery (n = 1). All of them received different antibiotic treatment after they were diagnosed of mediastinitis. Daptomycin therapy (10 mg/kg/day) were indicated after surgical intervention for mediastinitis, 2.6 days (mean value) from the beginning of the symptoms, except for one patient who was treated after 38 days of symptoms development. The signs and symptoms more frequently observed were fever, leukocytosis, respiratory rate >20, tachycardia and hypotension. The more often associated pathologies were diabetes mellitus, chronic renal failure, chronic obstructive pulmonary disease and congestive heart failure. Seven patients had a SOFA score ≥10. Mechanical ventilation was required in 8 of 10 patients. Consistent with the blood culture results *Staph. aureus* (n = 4) and *Staph. epidermidis* (n = 6) were isolated from the mediastinal culture in 6 patients, whereas the mediastinal culture was negative in 4 patients. Eight patients were clinically cured 29.6 days (average value) after initiation of daptomycin therapy. Two exitus were reported, both of them due to popymicrobial infections (by gram positive and gram negative microorganisms). This mortality was not associated with the antibiotic therapy. Seven patients were followed in OPAT with oral Linezolid. Intravenous daptomycin administration at 10 mg/kg/day was well tolerated.

CONCLUSIONS. Intravenous daptomycin therapy at 10 mg/kg/day is efficient and safe in the treatment of mediastinitis.

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CLINICAL EXPERIENCE WITH TIGECYCLINE IN INTENSIVE CARE UNIT

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INTRODUCTION. Tigecycline is a broad-spectrum bacteriostatic agent that has been used in serious infections due multidrugs resistant bacteria. Dose of Tigecycline is not clear in critically ill patients.

OBJECTIVES. We present our experience with Tigecycline in different doses (100 mg/day, 200 mg/day and sequential) in patients admitted in ICU.

METHODS. Observational and prospective study from August 2009 to December 2010. We evaluated demographic data, localization and severity of infection, response to treatment and mortality.

RESULTS. We included 37 patients with 44 episodes of infection. Eighteen were immunocompromised. Mean age 52 years. Twenty-three were men. Mean APACHE II score at admission was 18.7. The most common infection was pneumonia (23 cases), followed by urinary tract infection (6), intraabdominal (6), bronchitis (5), catheter-related bacteremia (2) and others (2). We documented the etiology of infection in 77% of cases: Enterobacteriaceae (27 cases), nonfermentative Gram-negative bacilli (10) and others (4). Bacteriemia 11% and polymicrobial infection 18%. Tigecycline dose was 200 mg/day (27 episodes), 100 mg/day (13) and sequential (4), which was used in combination with other antibiotics in 42 cases: carbapenems (16), colistin (12), beta-lactams (10), quinolones (5) and others (4). The infection-related mortality was 23% and its severity (severe sepsis or shock) was the main risk factor in univariate analysis ($p = 0.01$). In the comparative study of patients treated with doses of 100 and 200 mg/day no differences were found in baseline characteristics or severity of the infection. They were a high percentage of pneumonia in the group treated with 200 mg/day (59 vs. 23%, $p = 0.03$). The mortality in the group treated with 200 mg/day was 26 and 8% of 100 mg/day, although not statistically significant.

CONCLUSIONS. Tigecycline with anti-pseudomonal agents could be considered an effective treatment in critically ill patients with severe infections. More pneumonias were included in the 200 mg/day group. Higher mortality was observed in the group treated with 200 mg/day, although the difference was not statistically significant.

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HIGH DOSE TIGECYCLINE FOR TREATMENT OF SEVERE INFECTIONS IN UCI PATIENTS

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OBJECTIVE. To analyze our experience with Tigecycline 100 mg/12 h in severe infections in ICU patients.

METHODS. Observational study (August 2009 to December 2010). Demographic data, type and severity of the infection, and efficacy and security of Tigecycline were evaluated.

RESULTS. Twenty-one patients were included (12 males) mean age 51 years. Mean APACHE II on admission 18. Twelve were immunosuppressed.

Twenty-five infection episodes were evaluated. The most frequent infection was pneumonia (17) followed by urinary tract infection (2); bronchitis (2); intraabdominal infection (2); catheter related infection (1) and meningitis (1). The severity of the infection was classified as sepsis (10), severe sepsis (8) and septic shock (7). The most frequent microorganism was *K. pneumoniae* (11 cases) followed by *S. maltophilia* (4), *S. aureus* (3), *A. baumannii* (2), *S. marcescens* (2), and others (5).

In 24 episodes Tigecycline was used in combination with other antibiotics: carbapenems (11 cases), colistin (8), beta-lactams (6) and others (5).

In spite of a 68% of favorable clinical response, the related mortality rate was 38%.

During treatment thrombocytopenia was detected (mean platelet count of 68,000 cell/mm^3, with a range of 92,000–16,000) and one patient required a platelet transfusion. There were no major hemorrhagic complications led to treatment suspension. No other toxicities were recorded (hematological, hepatic or renal).

CONCLUSIONS. High dose tigecyclin in combination with other antibiotics is effective for the treatment of severe infections in ICU patients. More studies need to be done in order to determine it's hematological side effects.

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IS VANCOMYCIN MIC CREEP A WORLDWIDE PHENOMENON? ASSESSMENT OF S. AUREUS VANCOMYCIN MIC IN A TERTIARY UNIVERSITY HOSPITAL

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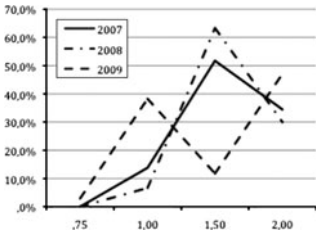
BACKGROUND. Glycopeptides are among the most widely used agents for the treatment of serious infections caused by Gram-positive bacteria, and vancomycin is the primary treatment for infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA). The association of vancomycin treatment failures with increased vancomycin minimum inhibitory concentration (MIC) is a well-recognized problem, especially with MICs in the upper range of the susceptible MIC interval ($\leq$2 mg/L according to Clinical and Laboratory Standards Institute). A number of single-centre studies have identified progressive increases in glycopeptide MICs for *S. aureus* strains over recent years—a phenomenon known as vancomycin MIC creep. It is unknown if this is a worldwide phenomenon or if it is localized to specific centers.

OBJECTIVES. The aim of this study was to evaluate MIC trends for isolates of MRSA to vancomycin over a 3-year period in a tertiary university hospital in Portugal.

METHODS. Isolates of MRSA from samples of patients at São Francisco Xavier Hospital from January 2007 to December 2009 were assessed. Etest method was used to determine the respective vancomycin MIC. Only one isolate per patient was included in the analysis.

RESULTS. 93 MRSA isolates were studied. The vancomycin MICs were 0.75, 1, 1.5 and 2 mg/L for 1 (1.1%), 19 (20.4%), 38 (40.9%), 35 (37.6%) isolates, respectively. During the 3 year study period, we observed a significant fluctuation in the rate of MRSA with a vancomycin MIC > 1 mg/L (2007: 86.2%; 2008: 93.3%; 2009: 58.8%, $p = 0.002$) (Fig. 1). No MRSA isolate presented a MIC above 2 mg/L.

CONCLUSIONS. We were unable to find in our institution data compatible to the presence of vancomycin MIC creep among MRSA isolates during the study period. This phenomenon seems not to be generalized; as a result each institution should systematically monitor MRSA vancomycin MIC over time.



Evolution of vancomycin MIC over a 3-year period

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SERUM VANCOMYCIN LEVEL IS THE PREPONDERANT PREDICTOR OF ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS TREATED WITH CONTINUOUS VANCOMYCIN INFUSION

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INTRODUCTION. Continuous infusion of vancomycin is proposed as a more convenient alternative to intermittent administration. However, the risk of developing acute kidney injury (AKI) during continuous vancomycin treatment is poorly examined, especially in the critically ill.

OBJECTIVES. We propose a model to predict AKI in ICU patients under continuous vancomycin infusion.

METHODS. 2-year retrospective study, recruiting all patients treated for at least 5 days with continuous infusion of vancomycin, adjusted to obtain a plateau vancomycin level between 15 and 25 μg/mL. Recorded variables were: age, gender, weight, serial serum creatinine levels, simplified acute physiology score (SAPS) 3, daily vancomycin plateau serum concentrations, exposure to potential nephrotoxic drugs or agents, and presence of underlying (diabetes) or acute (shock) risk factors for AKI. AKI was defined according to the Acute Kidney Injury Network classification as an increase in serum creatinine level of 0.3 mg/dL or a 1.5–2 times increase from baseline, whichever was greater, on at least two consecutive days during the period from initiation of vancomycin to 72 h after completion of therapy.

RESULTS. Multivariate logistic regression analysis identified vancomycin serum level ($p < 0.001$), weight ($p = 0.002$) and SAPS 3 ($p = 0.024$) as independent variables associated with AKI. The probability of AKI was calculated as $P = 1/1 + e^{-logit}$ with logit = $-6.54 + 0.055 \times$ SAPS $3 + 0.067 \times$ weight (kg) $- 5.888 \times 1$ (if vancomycin level <25 μg/mL) $- 3.178 \times 1$ (if vancomycin level <30 μg/mL). A higher logit value resulted in an increased probability of AKI. The highest logit was found to be associated with vancomycin levels exceeding 30 μg/mL The model permitted to predict AKI with 86.8% accuracy. However, when based solely on vancomycin levels, the addition of SAPS 3 and lean body weight did cause only a very modest increase (from 86.0 to 86.8%) of correctly predicted AKI.

CONCLUSIONS. Occurrence of AKI in critically ill patients treated with continuous infusion of vancomycin is largely determined by increased vancomycin serum levels.

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SURGERY IN INFECTIVE ENDOCARDITIS

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OBJECTIVES. To analyze clinical characteristics of patients with endocarditis requiring surgery at the first moment, when disease is diagnosticated

METHODS. Retrospective study of all patients in a tertiary hospital from Spain, which required admission to intensive care unit, with the diagnosis of infective endocarditis (Duke criteria modified) and which required surgery. We compilate demographic variables, clinical characteristics and complications. Data were analyzed using SPSS 17.0. Period: 5 years

RESULTS. We had 73 patients: 79% male, mean age 65.3 years. 21% smokers, 15.1% alcohol and 4% injection drug users. 45% hypertension, 16% diabetes. 46.6% had some form of previous heart disease, valvular disease in 27.4%. 15.1% had some degree of immunosuppression. 84% of patients had fever, 56%, general syndrome, 56.2% heart failure. Other symptoms were pain, altered level of consciousness, arrhythmia, neurological deficits, angor, musculoskeletal pain, syncope, hemoptysis, hemolytic anemia, shock. Blood cultures were positive in 82.2%. Most common germ, *Streptococcus* spp. (39.7%), followed by staphylococci aureus (16.4%). The most commonly affected valve is the aortic (50%), followed by the mitral (26%). In 69 of the 73 cases was performed transesophageal echocardiography. In 42.5% was observed any vegetation, in 26% unknown insufficiencies.

No distal emboli were identified in 58% cases, 11% embolism in more than one organ, splenic infarcts are present in 11%.

The first cause of admission to the ICU was post-operative control (54%), followed by respiratory failure and shock. 41% of patients required admission to the ICU before surgery. Antibiotics were given an average of 17.39 days before surgery. 82% of patients received combination therapy, 53% were treated with three drugs.

In 35% of cases surgery was urgent. 94% of patients underwent prosthetic valve replacement, only 2% was beyond repair. In 16% of cases reoperation was necessary, mainly for intractable bleeding. 56% of patients suffered postoperative shock, requiring vasoactive support for an average of 3.39 days. The average time of mechanical ventilation was 5.16. The 58% suffered from acute renal failure after surgery. 13% had a secondary infection during their stay in ICU and 6% severe ventricular dysfunction.

The average stay in ICU was 10.4 days. The average hospital stay was 36 days. The hospital mortality was 31.5%.

CONCLUSIONS. ICC refractory to medical therapy, valvular obstruction and perivalvular abscess are considered absolute indications for early surgery. The decision is difficult and should be individualized. This corresponds with the severity of our patients. Infective endocarditis is an entity with high morbidity and often unpredictable behavior. The patients requiring early surgery are more severe, cardiogenic shock frequently. The hospital mortality reaches a third of patients and mean hospital stay was prolonged. Further studies are needed to establish the best therapeutic.

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A GROUNDED THEORY EXPLORING PATIENTS' AND RELATIVES' USE OF INTENSIVE CARE DIARIES

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INTRODUCTION. Post intensive care unit (ICU) patients risk experiencing memory loss, delusions, anxiety, depression, and posttraumatic stress disorder (PTSD). Intensive care diaries have been kept for ICU-patients in the Scandinavian countries since the early 1990s to aide their psychological recovery. A positive effect of diaries has been found on anxiety, depression and PTSD[1]. More insight is needed to understand how diaries are used by patients and their close relatives.

OBJECTIVES. To explore how patients and relatives use diaries in the context of the illness trajectory.

METHODS. Our study had a qualitative multi-center design using in-depth semi-structured interview technique. The sites were a 9-bed general ICU and a 13-bed thoracic surgical ICU in two different regions of Denmark. A sample of 19 patients at 6–12 months post ICU-discharge and relatives to 13 of these patients, [n = 32]. The intervention was the provision of an intensive care diary and diary handover at 1 or 3 months post ICU-discharge. Grounded theory method was used to explore the use of diaries as a psychosocial process of recovery involving patients and relatives. Data were managed by NVivo software.

RESULTS. The core category was 'constructing the illness narrative', which was a process of narration embedded in our emerging theory of psychosocial recovery after critical illness[2]. The main categories within the patient perspective were information acquisition and gaining insight, and the main categories within the relative perspective were supporting the patient, supporting oneself, and negotiating access.

CONCLUSIONS. Intensive care diaries were useful to patients as well as their relatives. Patients need to construct their illness narrative, and diaries are among the sources they used. The patients' project was to combine various sources of information in a process of information acquisition, narration, and evolving insight progressing towards recovery. The relatives supported the patients' project, and also supported themselves by using the diary to uphold their own healing process. We recommend intensive care diaries as a low-tech, low-cost rehabilitative intervention for patients and relatives to help bridge the span from intensive care to recovery.

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GRANT ACKNOWLEDGMENT. The parent study was funded by the Lundbeck Foundation, Danish Health Insurance Foundation, Tryg Foundation, Aase & Ejnar Danielsen's Foundation, and Augustinus Foundation.

Diverse nursing topics: 1046–1059

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LIAISON NURSE (LN) ROLE DEVELOPMENT: INTENSIVE CARE UNIT (ICU) DISCHARGED PATIENTS FOLLOW UP (FU) DURING THE START UP PERIOD OF AN ACUTE CARE FACILITY

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INTRODUCTION. The ICU LN role was developed to provide support to patients (pts) and families during the ICU-ward transition, to liaise both staffs and, to assist ward nurses (WN) in complex care.[1] LNs were included in the nursing services when structuring a 207 beds acute care facility. This ongoing research started concurrently with the start up of the center. This work includes data from July 11th to October 31st, 2010.

OBJECTIVES. To describe LN interventions of care provided to ICU discharged pts and, to identify education interventions delivered to WN on charge of ICU discharged pts and ward pts needing complex care.

METHODS. Based on literature review and international consultation, two intervention frameworks for ICU LN were defined as FU, direct care (DC) and WN assistance and education. Experienced critical care nurses, with strong communication and education skills were appointed as LNs. A LN was always available. LNs were asked to: (a) assess ward pts transferred from ICU once per shift, (b) deliver pts and family support and (c) provide education to WNs when they requested. LNs registered every intervention they performed with pts and WN on charge of pts under FU. The LNs ended FU based on their clinical criteria and WN confidence on care. Documented nursing interventions were then grouped in categories and subcategories according to frameworks previously determined.

RESULTS. 107 pts were included in liaison FU; 46.8 yo average age (ranged 15–88); 100 pts (93.45%) discharged from ICU and 7 (6.5%) ward pts that needed complex care. 14 pts were readmitted in ICU due to: arrhythmia (1), stroke (1), deterioration of chronic conditions (2), brain edema (1), planned surgery (6), post-surgery bleeding (1), respiratory failure (1) and sepsis (1). There were four deaths (3 pts once readmitted in ICU and 1 after hospital discharge). During the study period LNs performed 1,677 interventions; 1,424 (84.91%) on DC and 253 (15.09%) on staff education. DC included nursing assessment (84.48%), patient and family education and emotional support (6.25%), patient safety (2.45%) and airway management (1.96%) among others. Staff education comprised teaching: nursing assessment (35.96%), care planning (30.83%), airway management (11.46%), body care and medication administration (9.88%), wound care, vascular devices and drainage management (8.69%), provision of patient education and family support (3.16%).

CONCLUSIONS. Nursing assessment, patient and family support are the most common interventions of ICU LNs. WNs need support in assessing pts, planning of care, and airway management. LNs facilitate ICU-ward transition providing expert care, assisting and educating WN.

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GRANT ACKNOWLEDGMENT. Authors express their gratitude to Prof. Ged Williams (Australia) and Dr Carlos Díaz (Med. Director) for their ongoing inspiration and support.

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NURSING STAFF COPING WITH THE DYING: COPING WITH EMOTIONS IN INTENSIVE CARE, PALLIATIVE AND ONCO-HEMATOLOGY UNITS

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INTRODUCTION. The research tries to find out what the repercussions are to the everyday working lives of nursing professionals. It examines how contact with death is experienced within the units where dying is a regular occurrence and is accompanied by the extensive suffering of both patient and family.

OBJECTIVES.

- to establish which emotions and attitudes are presented on nursing professionals.
- to construct a questionnaire with a Likert-type scale, that allows measurement of the nursing-staff attitudes prior to and after the death of a patient, pertaining to 4 categories: emotional responses, nursing interventions, resources and coping needs.
- to identify the potential needs for professionals to suitably cope with situations of terminal illness and death.

METHODS.

First Stage • The establishment of a qualitative study
- descriptive phenomenological design
- utilization of pre-established frameworks.

Second Stage

Study Participants: • defined by nurses and health care assistants who were employed at the time of the study—138 professionals. In total we collected 82 questionnaires.
- Socio-demographic and employment variables

RESULTS.

Construction of a Likert-type scale: a Likert-type scale was used for the questionnaire with a scale (1–5). When applying the Student's t-distribution, there were 18 items with a statistical significance $p < 0.05$, Cronbach's α 0.718, homogeneity index mean.

Nursing interventions: 73.2% maintained adequate communication with the family throughout the process of the dying patient, 53.7% preferred to accompany the patient throughout the dying process including death, 46.4% coped with the emotional and spiritual needs of the patient, 81.7% maintained a suitable communication with the dying patient, trying to respond to all questions.

CONCLUSIONS. The professionals agreed to have been feeling emotionally affected during the dying process of a patient, especially in the presence of therapeutic fierceness; when there is no consensus regarding interdisciplinary objectives; when an inadequate handling of communication exists; and when they witness bad control of the patients' symptoms.

A high percentage of professionals maintained a good communication with the patient and the family, as well as taking care of the comfort and the privacy of the patient. Only 53.7% preferred to accompany the patient throughout the process including his/her death, with a slightly lower percentage (46.4%) of professionals who claimed to be able to cope with the spiritual and emotional needs of the terminally ill patients. 56.1% of the participants claimed to have knowledge of palliative care, this percentage being reduced to 23.2% when reference was made to knowledge of communication and counselling skills.

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ATTITUDES OF LEGAL GUARDIANS OF VENTILATED ICU PATIENTS TOWARD THE PROCESS OF DECISION MAKING ASSOCIATED WITH INVASIVE NON LIFE-SAVING PROCEDURES

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INTRODUCTION. ICU patients frequently undergo non life-saving invasive procedures. When patient informed consent cannot be obtained, legal guardianship (LG) often from a close relative may be required by law.

OBJECTIVES. The objective of this descriptive study was to investigate the attitudes of LG of ventilated ICU patients regarding the process of decision making for invasive non life-saving procedures.

METHODS. Three questionnaires were administered: a demographic data questionnaire, the Family Satisfaction with ICU 34 Questionnaire (Heyland and Tranmer 2001) and the Attitudes towards the LG Decision Making Process questionnaire, developed by the authors. The study was conducted in general medical and surgical ICUs in two large Israeli medical centers. Questionnaires were delivered by the researcher after LGs′ appointment and informed consents verification.

RESULTS. The sample consisted of 64 LGs who were appointed with full family support. Participants were 49.2 (±11.22) years of age, 33 (51.6%) were males, most were married (n = 56, 87.5%), had high school (n = 24, 37.5%) or college (n = 19, 29.7%) education. Majority of the procedures performed were tracheotomies (n = 63, 98.4%). Most LGs preferred decisions to be taken by the medical staff after consulting with them (n = 42, 65.6%) and stated that decisions could be made without the need of a LG (n = 37, 57.8%). "Consistency" and "Understanding" of information got lower satisfaction percent than other parameters (only 67.2 and 68.7% respectfully). The majority of the LGs were not aware (48.6%, N = 30) or were not sure (37.5% N = 24) of the patients' preferences regarding invasive procedures.

CONCLUSIONS. The legal guardianship process entails difficulties especially in the fields of communication with the medical staff, support mechanisms for family members and difficulties in decision making for unconscious relatives. There is a need for communication improvement between the medical staff, and LGs especially in providing more consistent and understandable information.

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KEYWORDS. Legal guardian, patient relatives and families and surrogate decision making

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RASS SCORE, NURSING CARE RECORDING (NCR11) AND NURSE SELF-ASSESSED WORKLOAD. DATA FROM A RANDOMIZED PROSPECTIVE TRIAL OF NO SEDATION TO CRITICALLY ILL PATIENTS UNDERGOING MECHANICAL VENTILATION

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INTRODUCTION. Recent study have shown that a strategy with no sedation to critically ill patients reduce the time patients receive mechanical ventilation, decrease the time in intensive care and reduce the total hospital length of stay (1).

OBJECTIVES. We hypothesized that a strategy with no sedation was associated with a higher degree of nursing workload in the intensive care unit when the patients receives no sedation compared to standard care with sedation.

METHODS. Data was collected during the prospective randomised trial of 140 critically ill patients undergoing mechanical ventilation, randomly assigned to either no sedation versus sedation with daily wake up trail. Beside RAMSAY sedation score to adjust sedation in the sedated control group, patients were RASS scored on a daily basis (2). The Nurse: Patient ratio in the department is 1:1. Nursing workload was measured on daily basis with The Nursing Care Recording System (NCR11) (3). Nurses self-assessment of workload were measured on a daily basis using a numeric rating scale from 1 to 10.

RESULTS. 113 patients received mechanical ventilation for more than 48 h and were included in the statistical analysis. Data is reported for the first 7 days of hospitalization in ICU. The median RASS score was −0.25 in the no sedation group, compared to −2.00 in the sedated group, $P < 0.0001$. The NCR score was 17.5 in the no sedation group compared to 19 in the sedated group, $P < 0.0001$. The nurse's self-assessment of workload was not statistically different, 4 in each group (NS).

CONCLUSIONS. Critically ill patients undergoing mechanical ventilation receiving no sedation have a higher RASS score compared to sedated controls. Nursing workload was lower in the intervention group receiving no sedation, measured by the NCR scale. Self-assessed by the nurses there was no difference in workload between the sedation group and the no sedation group of critically ill patients undergoing mechanical ventilation.

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PREOPERATIVE AND POSTOPERATIVE EFFECTS OF PREOPERATIVE FASTING TIME ON PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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OBJECTIVES. The aim of this study was to determine the preoperative and postoperative effects of preoperative fasting time on patients undergoing laparoscopic cholecystectomy.

METHODS. Sixty seven patients, accepting to participate, in a training and research hospital, undergoing elective laparoscopic cholecystectomy between January and April 2011 were enrolled in this descriptive and cross-sectional study. State and Trait Anxiety Scale and Visual Analog Scale (VAS) were used to collect data about thirst, hunger, sleepiness, exhaustion, nausea and pain preoperatively, postoperative at second and eighth hours, which thereafter were analyzed statistically.

RESULTS. The mean age of the patients was 51.71 ± 14.44 years, 62.7% were women, 40.3% had chronic illness and 38.8% never smoked. Mean preoperative fasting time was 14.38 ± 3.41 h for food and 11.48 ± 3.95 h for drinks. Mean preoperative VAS scores were 3.63 ± 3.15, 2.99 ± 2.83, 2.70 ± 2.95, 2.16 ± 2.75, 0.67 ± 1.44, and 1.48 ± 2.72 respectively for thirst, hunger, sleepiness, exhaustion, nausea and pain. Thirty four percent of patients experienced low, 64.2% mild and 1.5% severe preoperative state anxiety. Nausea and pain VAS scores of patients fasting more than 12 h were significantly higher than the ones fasting less than 12 h ($t = -3.961$, $p < 0.05$ for food; $t = -2451$, $p < 0.05$ for drinks). Difference in mean hunger and thirst VAS scores preoperatively, at second and eighth hours (2.99 ± 2.83, 4.82 ± 3.21, 6.99 ± 2.50, 3.63 ± 3.15, 6.75 ± 2.80, 7.55 ± 2.22 respectively) were statistically significant ($p < 0.05$). Any significant relation between fasting time and anxiety or postoperative VAS scores was not observed in our study ($p > 0.05$).

CONCLUSIONS. Preoperative fasting time does not likely effect anxiety levels in patients undergoing elective laparoscopic surgery and hunger/thirst VAS scores tend to get higher by time.

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MORAL DISTRESS AND ASSOCIATIONS WITH AUTONOMY AND COLLABORATION IN ITALIAN INTENSIVE CARE NURSES

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INTRODUCTION. The incidence and severity of moral distress as well as issues of professional autonomy and nurse-physician collaboration have never been studied among Italian nurses.

OBJECTIVES. To explore: (a) the intensity and frequency of care-related moral distress, (b) potential associations with nurses' autonomy indices, nurse-physician collaboration, nurses' level of education, intention to resign and professional satisfaction among Italian Intensive Care (ICU) Nurses.

METHODS. Cross-sectional correlational design with a convenience sample of 962 Italian ICU nurses. Nurses' autonomy was assessed by the Varjus et al. scale, collaboration by the CSACD, and moral distress by the MDS.

RESULTS. Cronbach's alpha reliability coefficients were 0.72–0.89 for all scales and subscales employed. The reported intensity of moral distress was moderate to high (57.19 ± 16, scale range 0–84), whilst the frequency of morally distressing events was low to moderate (28.29 ± 12, scale range 0–84). The average composite moral distress score (accounting for frequency and intensity) was moderate (87.29 ± 45, scale range 0–336). The perceived autonomy level was above moderate (84.07 ± 14, scale range 18–108) and the satisfaction regarding collaboration on care decisions moderate (42.50 ± 12, scale range 7–70). Regarding all three dimensions of autonomy, i.e. Knowledge (27.41 ± 5, scale range 6–36), Action (28.43 ± 5, scale range 6–36) and Value (28.10 ± 6, scale range 6–36) base of autonomy, mean scores indicated above moderate levels. Significant associations were noted between the severity of moral distress and (a) nurse-physician collaboration ($r = -0.191$, $p < 0.001$), (b) Knowledge base of autonomy ($r = -0.092$, $p = 0.014$), (c) job satisfaction ($r = -0.144$, $p < 0.0001$), and (d) intention to resign ($r = -0.256$, $p < 0.0001$). The level of education was significantly correlated with collaboration, knowledge base of autonomy and autonomy ($p < 0.05$).

CONCLUSIONS. Italian ICU nurses do not appear to experience morally distressing situations very often, but the intensity of the distressing situations is rather high. Moral distress may contribute to low job satisfaction and intention to resign from post. Enhancing education, autonomy and collaboration may attenuate moral distress, increase job satisfaction and staff retention.

GRANT ACKNOWLEDGMENT. R&D EfCCNa.

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VITAL EXHAUSTION, ANXIETY AND PERSONALITY IN INTENSIVE CARE

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INTRODUCTION. The concept of vital exhaustion describes a condition characterized by decrease of energy, demoralization feelings and increase irritability, normally associated with predictive factor of cardiovascular disease. Not much is known about the relationship between vital exhaustion and work situations, and there are no references to studies that relate the nursing work environment in intensive care and vital exhaustion.

OBJECTIVES. The aim of this research was to study the association between vital exhaustion and anxiety and personality variables of nurses, considering the gender and length of service at ICU.

METHODS. We developed a descriptive correlational study, in 79 nurses at Intensive Care Units of the Hospitals of Alentejo and Algarve. The instrument of data collection comprised Demographic and professional characterization; Vital Exhaustion Scale, Inventory State-Trait Anxiety and Personality Inventory NEO-FFI 20.

RESULTS. The results of this study, don't showed statistically significant differences between the variables under review, including Vital Exhaustion, Anxiety, Personality, by gender and length of service at UCI. It is a mostly female population and for the service time interval with the largest representation is the lowest seniority in the ICU. It was observed that the subjects did not show higher average levels of vital exhaustion. The results showed that trait anxiety and state anxiety are significantly and positively associated with vital exhaustion.

CONCLUSIONS. The average values of anxiety that we found rather high, may partly contribute to explain the low levels of vital exhaustion of the participants. About the association vital exhaustion and personality, the results showed there is a significant positive correlation between neuroticism and of all vital exhaustion dimensions, being in turn conscientiousness significantly and negatively associated with all dimensions of vital exhaustion. These data suggest that low levels of neuroticism and high conscientiousness values identify themselves as protectors of vital exhaustion, which in part may also help explain the low levels of vital exhaustion in our subject.

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GRANT ACKNOWLEDGMENT. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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RECOVERY FROM SEVERE ILLNESS AND INJURY

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INTRODUCTION. Recovery is a phenomenon which could be seen as a process and as a condition, which reflects the quality of care provided. Therefore, knowledge of characteristics and signs of recovery is important for being able to provide optimal health care quality. Treatment and care aim to restore patients' health or well-being by curing or alleviating symptoms and suffering. It can be supposed that the development of knowledge and technology in nursing and medical care has influenced and improved the possibilities for patients' recovery.

OBJECTIVES. To describe the characteristic of recovery and to discuss the concept and phenomenon of recovery in the light of health and suffering based upon findings from previous research during a time period of 20 years.

METHODS. A hermeneutic approach was used when interpreting and analyzing findings from four previous research projects. These projects were conducted in 1985, 2004, 2005 and 2007. The meaning and the characteristics of recovery were identified. The identified characteristics of recovery were compared in order to identify similarities and diversities of critically ill patients′ recovery. The first study was based upon 304 interviews with patients using a semi-structured interview guide. The second comprised 15 patients who were interviewed 12 month after major surgical procedure and the third and fourth were follow-up studies including 76, respectively 153 patients who answered health related quality of life questionnaires.

RESULTS. Recovery as well as health has a subjective and an objective dimension. Alleviating of discomforts and symptoms was not enough even if it was important. Signs and characteristics of recovery will be outlined and described. The characteristics and signs of recovery were found to be the same in 1980s as in 2007.

CONCLUSIONS. The findings from this research can form the foundation for development of nursing care actions and interventions which might facilitate recovery from critical illness and injury.

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INTENSIVE CARE NURSES' EXPERIENCES OF USING PHYSICAL RESTRAINTS

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INTRODUCTION. The use of physical restraint in acute and critical care varies broadly between nations. The most commonly reported reasons for use of physical restraint in intensive care units are the attempt to reduce the risk of care/treatment interference by the patient and for protection of the patient against self-harm and other patients, caregivers.

OBJECTIVES. In this study, examining the nurses' experiences of using physical restrain in intensive care unit patients is aimed.

METHODS. The study was carried out as a qualitative design with 41 voluntary nurses employed in eight intensive care units of a research and training hospital. The data were collected using demographic characteristics form and a semi-structured interview form. Interviews with nurses were made individually and face to face. The data were evaluated by using Colaizzi's phenomenological data analysis method.

RESULTS. The average age of the 41 nurses in this study is 28.12 ± 12 (23–43), 68% of these nurses are bachelor. The average working year of these nurses is 6.78 ± 8.55 (1–25), and the average working year in intensive care unit is 3.85 ± 4.74 (1–16). When the intensive care unit nurses' statements related to using physical restraint are examined, 2 categories and 4 themes were identified. These categories were: 1. nurses' ethical distress, 2. Nurse–family interaction.

The themes of nurses' ethical distress category: 1. empathizing of nurses, 2. contradiction of benefit-futile.

The themes of nurse–family interaction: 1. showing reaction to using physical restraint and nurses, 2. point of common conclusion between nurse and family.

First, nurses indicated that they used physical restraints for benefit of patients, but when they assessed empathetically, they stated they felt uncomfortable about this situation. In patients who physical restraints were used, increase in agitation and ecchymosed ve oedema development are identified as being the common local. When nurses pause using physical restraint, because of patient's pulling their catheter and tube, and giving harm to nurses and other patients they stated they had to reutilize them. Nurses indicated that they had difficulty in taking permission from patient's relative to use physical restraint in unconscious patients.

CONCLUSIONS. It was determined that intensive care unit nurses had to use physical restraint to prevent agitated patient's giving harm to themselves and environment, suspending treatment and care, so at first they exposured the family's negative reaction, but finally developed a common attitude as a result of observation of the family and explanation of the nurses.

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POST-ICU FOLLOW-UP IN DENMARK: A PARADIGM MODEL FOR PATIENTS AND RELATIVES

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INTRODUCTION. Intensive care patients risk long term physical and psychological consequences after critical illness and intensive care. Intensive care aftercare has been offered as a few sites in the UK since the mid-1990 s (1) and various types of follow-up in conjunction with ICU-diaries has been seen in Sweden and Norway for the past decade (2, 3). Recently nine out of 48 ICUs in Denmark have started to offer intensive care follow-up. Little is known of the concept of Danish ICU follow-up clinics.

OBJECTIVES. To describe follow-up clinics at Danish ICUs.

METHODS. Observational study using semi-structured key-informant telephone interviews. Interviews were transcribed verbatim and data were managed by qualitative computer software package NVivo version 9. Thematic analysis was performed using focused coding of themes from the interview guide and open coding within each theme.

RESULTS. Although each outpatient clinic was developed locally, a paradigm model of ICU follow-up emerged. The model consisted of (1) ICU intervention such as patient diary, (2) step-down intervention such as visit from ICU-nurse, (3) patient and family information brochure, (4) follow-up visit at hospital 2–3 months post ICU-discharge including visit to ICU, (5) additional follow-up or telephone consultation with nurse at a later time.

CONCLUSIONS. Post ICU-patients and their family show interest in follow-up when it is offered as an optional service. If the follow-up clinic is framed as an integral part of intensive care more patients are apt to visit the outpatient clinic, which would pave the way for systematic registration of symptoms and problems of post-ICU patients and their close relatives.

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OBESITY ON THE ADULT INTENSIVE CARE. PREVALENCE AND NURSING IMPLICATIONS

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INTRODUCTION. The Body Mass Index (BMI), or Quetelet index, is a variable that expresses obesity. It is calculated on the basis of a patient's weight and height and its applicable to adults aged 18–80.

Obese patients, patients with a BMI of 30 or higher, have an increased morbidity on the ICU as evidenced by prolonged requirement for mechanical ventilation and intensive care admission length[1].

The prevalence of obesity increases every year in the Netherlands as it does in many other (European) countries. The VU medical center has registered obesity in the Patient Data Management System (PDMS) since the end of 2003.

In 2009 the prevalence of obese patients admitted to the adult Intensive Care unit was approximately 15.7%, well above the nation wide average of 11.8%.

Our focus is on the effect obesity has on human physiology and on its consequences for Intensive Care nursing.

OBJECTIVES. Providing care for the obese on the ICU requires specific and relevant information with regard to the challenges that are imposed on nurses. We provide background information and practical guidelines which can help optimize care for this population. We offer these in an easy-to-use aide which is available to all nurses on the Intensive Care ward.

METHODS. We analyzed the development of the prevalence of obesity on our ward and reviewed the challenges this imposed on our care for the obese. The relevant consequences are outlined against the background of recent literature to elucidate the implications of morbidity for the various physiological systems.

RESULTS. Our compact and easy-to-use aides present: 1. A tool for qualifying BMI. 2. A review of the maximum weight various beds, lifts, transport systems, scan- and operating tables can bear. 3. The effects of obesity for the following physiological systems:
• Circulatory • Respiratory • Gastroenterological • Dermatological (including wound care) • Pharmacological • Others (including psychological and social considerations) 4. The specific effects of obesity that can be seen during the monitoring of vital cardiopulmonary signs and mechanical ventilation. 5. Various nursing guidelines for obese intensive care patients. These are offered per system against background information with suggestions for possible nursing interventions.

CONCLUSIONS. Obesity continues to play a growing part in Intensive Care nursing and requires a specific approach. A compact aide provides nurses essential background information and the tools to do so.

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STUDYING ON DIFFICULTIES OF DAILY LIVING ACTIVITIES IN HOME CARE AFTER TOTAL HIP REPLACEMENT

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INTRODUCTION. Annually, many patients undergo total hip replacement surgery. Total hip replacement surgery can alleviate pain and restore function but is associated with risks and difficulties. Difficulties of daily living activities can be reduced through an effective home care.

OBJECTIVES. This descriptive study was performed to determine the situation of daily living activities and difficulties in these activities as experienced by the patient with total hip replacement and the caregiver during the post-discharge and home care.

METHODS. The study was carried out in an orthopaedic clinic at a hospital in Turkey. The study sample consisted of 36 patients who had undergone hip replacement surgery. A data collection form developed by investigators and the Katz Basic Activities of Daily Living (ADL) Scale were used to determine the situation of daily living activities and experienced difficulties by the patient and the caregiver.

RESULTS. The mean age of patients was 69.8-year-old (SD = 11.7). The relationship between patients and their primary caregiver was predominantly that of son and daughter (13 people; 36.1%). All patients have experienced still difficulties in activities of daily living at discharge. ADL scores for patients was increasing in 4–6th weeks, while the difficulties of caregivers was decreasing. However, the majority of patients could not succeed daily living activities such as bathing, toileting and transferring. There was a significant relationship among ADL scores before operation, at discharge and during homecare ($p < 0.05$).

CONCLUSIONS. It is suggested that the patient and caregiver should be educated for acquiring knowledge and skill for home care, a controlled process of home care should be implemented.

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THE FUTILITY OF CARE A PHILOSOPHICAL VIEW OF DARWINISM IN CRITICAL CARE AND THE SURVIVAL OF THE FITTEST A CONCEPT FORGOTTEN?

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INTRODUCTION. In the more than 200 years since Darwin′s birth advances beyond his understanding have been made in medicine and society but are the concepts he and his contemporary's first suggested then still relevant?

The general concept of Darwinism today is credited to Charles Darwin from his book The Origins of Species.[1] Survival of the Fittest[2] as a concept was credited to the philosopher Herbert Spence but is now associated with Darwin after he incorporated it into the books 5th edition published in May 1869.

OBJECTIVES. To discuss the futility of care in Critical Care.

METHODS. A wide ranging search of the literature for the futility of care.

RESULTS. In the 19th century the concepts expressed were regarded as an evolutionary and revolutionary philosophy about both biology and society. In the 21st century when considering this concept we do so more in its′ role in our increasing understanding of genetics and genomics but in terms of Critical Care in the 21st century has it more to do with survival of the patient who lives or is kept alive the longest?.

In the late 1980's Critical Care patients fell into 3 categories, post surgical, short term critically ill and the long term critically ill patient as a much smaller percentage. Since then the last 2 categories seem to have merged into 1 still with a short term element but now a much larger population of chronic critically ill patients as medical advances such as initial protocolized and standardized treatment reduces mortality[45].

Neil Campbell describes[3] a very personal event involving his family that includes the phrase "the distorted Darwinian competition for intensive care places".

As middle age continues into peoples 60s quality of life and functional health has improved dramatically but with co-morbidity's such as heart disease, obesity and metabolic syndromes increasing, the bodies reserves have not In practice this with the improved treatments and beds available is leading to patients surviving their initial insult but in doing so depleting their functional reserves and ends up with them remaining on the critical care unit for weeks if not months without hope of significant improvement and discharge within the hospital or eventually to home.

CONCLUSIONS. Are we in modern critical care practicing a twisted form of Darwinism and continuing care way beyond what might be best for the patient and doing instead what we feel is best for the relatives or ourselves.

Is this the future for critical care no longer survival of the fittest but survival at any and all costs?

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THE EFFECT OF A STRUCTURED REHABILITATION PROGRAMME FOR PATIENTS ADMITTED TO CRITICAL CARE

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INTRODUCTION. The negative effects of mechanical ventilation and the associated bed rest are well documented. To counteract these effects there has been an increasing move towards early rehabilitation on Intensive Care units (ICU), with some evidence suggesting shortened lengths of stay (LOS) in response to these interventions (1, 2). In 2008 a structured rehabilitation programme was implemented at CMFT with the aim of decreasing overall LOS and subsequently improve functional outcomes. This was in line with recent NICE guidance for critical illness which highlighted the importance of structured rehabilitation for patients admitted to critical care.

METHODS. All patients admitted >5 days and surviving to ICU discharge in a large UK based intensive care unit between 1st June and 30th September from 2007 to 2010 were included in the study. A more structured programme of rehabilitation was implemented at the beginning of 2008. This was achieved through structured and documented rehabilitation plans and weekly goal setting meetings, coupled with specific MDT training and education sessions. Primary outcome measures used were mean physical function at ICU discharge, assessed via the Manchester Mobility Score (MMS), with secondary measures of mean ICU and post ICU LOS. Baseline data was obtained retrospectively, with annual figures presented for the 3 years following the introduction of the rehabilitation programme. Data were analysed using Students t-test.

RESULTS. In the year prior to the introduction of the structured rehabilitation programme the mean MMS was 2.9, defined as being a hoist for transfers to the chair. In this year mean ICU and ward LOS for was 18.1 and 53 days respectively. Each year there was a significant improvement in all outcomes, with mean MMS increasing to 4.4 in 2010, suggesting the average patient was now standing or transferring to a chair. This was associated with significant reductions in both ICU ($p < 0.01$) and post ICU LOS ($p < 0.01$) for each of the years observed

Annual figures observed

	2007	2008	2009	2010
n	26	30	38	36
APACHE II	15.4	15.9	16.9	19.2
Mean MMS	2.9	3.3	4.0	4.4
Mean ICU LOS	18.1	17.5	15.2	11.9
Mean ward LOS	53.0	42.9	29.8	21.2

CONCLUSIONS. Structured programmes of rehabilitation can significantly increase the functional status of patients at ICU discharge. This improvement was associated with a significant reduction in both ICU and ward length of stay. This is at a time when patient acuity was observed to be higher with a yearly increase to APACHE II scores.

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FUNCTIONAL OUTCOME MEASURES ON DISCHARGE FROM INTENSIVE CARE: AN EVALUATION OF AN EXTENDED SEVEN DAY WORKING PILOT

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INTRODUCTION. Evidence suggests that on discharge from intensive care units (ICU) patients can have persistent functional impairment. Functional activity on ICU can be limited by various factors, including early access to a rehabilitative culture (1). Extended 7 day services have been shown to enable early physiotherapy intervention in the acute care setting (2).

OBJECTIVES. To compare functional outcome measures and rehabilitation treatments (Rehab Rxs) between a usual Monday to Friday, reduced weekend, (MF) physiotherapy service and a 7DW pilot.

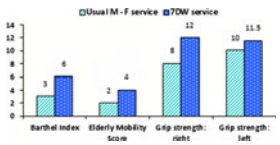
METHODS. Over 5 weeks during the 7DW pilot, all patients admitted to ICU who were invasively ventilated >48 h, survived ICU and transferred to a ward, were functionally tested on discharge from ICU. Outcome measures used were the Barthel Index score, Elderly mobility scale and dynamometer hand grip strength. All data collected was compared with that previously collected for a different project, with the same inclusion criteria, over 9 weeks during the usual MF service. Rehab Rxs were obtained from patient records.

RESULTS. ICU mortality for patients ventilated >48 h, was 27 and 34%, during the usual MF service and 7DW pilot periods, respectively. Participants characteristics are shown below.

Participant characteristics

	N	Males (%)	Median age (range) years	Median length of stay on ICU (range) days	Median length of time ventilated (range) days
7DW service	24	18 (75%)	69 (19–93)	12 (3–45)	5 (2–37)
Usual MF service	57	43 (75%)	62 (31–90)	9 (3–78)	5 (2–70)

Compared with the usual MF service, during the 7DW pilot a 54% and 362% increase in the average number of Rehab Rxs was seen on weekdays and weekends, respectively. The average number of Rehab Rxs per day (range) for the 7DW pilot was 11 (8.6–12) compared with 6 (1.8–8.4) for the usual MF service. All functional outcome measures improved during the 7DW pilot when compared with the usual MF service (Figure).



Comparison of functional outcome measures

CONCLUSIONS. A 7DW service afforded delivery of more consistent and increased rehabilitative interventions to patients on ICU. It is not possible to suggest that this increase was directly responsible for improved outcome measures seen during the 7DW pilot. However, this is a positive outcome with respect to the impact of extended physiotherapy services.

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EFFECTS OF MANUAL RIB CAGE COMPRESSIONS ON EXPIRATORY FLOW AND MUCUS CLEARANCE RATES

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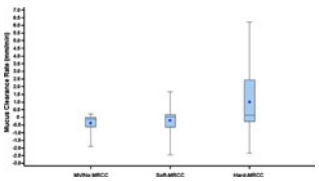
INTRODUCTION. Modulation of the expiratory flow, via manual ribcage compressions (MRCC), may improve mucus clearance via 2-phase gas–liquid mechanism. Nevertheless, there is paucity of research to corroborate effectiveness of the technique.

OBJECTIVES. In this study we determine whether the MRCC-associated increase of expiratory flow may enhance outward mucus clearance, during mechanical ventilation (MV).

METHODS. 8 healthy Large White-Landrace pigs (31 ± 2 kg) on volume-controlled MV and positioned in a model of the semi-recumbent position. After 12, 36, 60, and 80 h of MV a 1) soft MRCC applied at the end of the expiratory phase, and 2) a brief and hard MRCC, synchronized with the early expiratory phase, were randomly performed for 15 min. A 15-min period of MV with no intervention was carried out between steps. Respiratory flow rates were recorded during each step. Tracheal mucus velocity was measured through fluoroscopic tracking of radiopaque markers. The direction of the mucus movement was described by a positive vector (toward the glottis) or negative vector (toward the lungs).

RESULTS. Pigs were ventilated with a tidal volume and respiratory rate of 307 ± 31 and 18.3 ± 1.3/min, respectively. Peak expiratory flow during MV, soft-MRCC and hard-MRCC was 46.7 ± 9.6, 47.3 ± 5.6 and 61.5 ± 7.9 L/min, respectively ($p < 0.001$). Mean expiratory flow during MV, soft-MRCC and hard-MRCC was 7.95 ± 1.8, 12.85 ± 2.7 and 10.11 ± 2.8 L/min, respectively ($p < 0.001$). Overall, effects of MRCC on mucus clearance did not reach statistical significance ($p = 0.16$). However, as depicted in Fig. 1, we observed a trend of difference in favor of the hard-MRCC in the sub-analysis of mucus clearance rate following 2 days of MV ($p = 0.0594$).



CONCLUSIONS. Our data suggest that MRCC applied early and very briefly during expiration, significantly increases peak expiratory flow, and when mucus is progressively retained, as during prolonged MV, potentially improves outward mucus transport.

GRANT ACKNOWLEDGMENT. IDIBAPS, CIBERES, UB. DM and GLB contributed equally to this work.

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IS A SIMPLE BEDSIDE MOBILITY SCORE A USEFUL PREDICTOR OF LONG TERM OUTCOME IN CRITICALLY ILL ADULTS

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INTRODUCTION. The importance of early rehabilitation within critical care units has been increasingly recognised in recent times. Rehabilitation is however an ongoing process and it is important that for those patients who need it most it is continued on their return to the ward environment. Both NICE CG83 'Critical Illness Rehabilitation' and CG50 'Acutely ill patients in hospital' recommended some form of assessment and risk stratification be completed at critical care discharge to allow appropriate allocation of resources. As yet, no specific assessment tool exists to meet this aim.

OBJECTIVES. To assess if a simple bedside measurement tool for mobility, the Manchester Mobility Score, can be used as a predictor of long term outcome in patients discharged from critical care.

METHODS. All patients admitted to ICU for >5 days between 1st June and 31st December 2007 were eligible for inclusion in the study. A mobility score was designed by the physiotherapy team at Central Manchester Foundation Trust consisting of multiple rehabilitation stages patients go through during their stay on critical care. This ranged from passive limb exercises to active mobilisation, with rehabilitation documented on a daily basis. Long term data in terms of hospital mortality and ward length of stay were then analysed for each stage of rehabilitation to see if the level of mobility could be used as a predictor of long term outcome.

RESULTS. 83 patients were included in the data analysis. Both ward based LOS (Post ICU) and mortality decreased with improved levels of mobility at ICU discharge. This was statistically significant for both standing transfers and walking ($p < 0.001$).

Mobility status outcomes

	n	Ward LOS (Post ICU)	Mortality
Bed Bound	14	46.9	5 (26%)
Sitting on edge of bed	10	44.7	4 (29%)
Hoist Transfers	12	43.6	4 (25%)
Standing Transfers	25	31.1	4 (14%)
Walking	22	19.1	0

CONCLUSIONS. This data would suggest those patients who are bed bound or still require hoisting for transfers spend the longest time in hospital following discharge from critical care and carry the highest mortality risk and as such would benefit most from targeted rehabilitation. The Manchester Mobility Score would therefore be a useful tool in assessing patients at critical care discharge in line with recent NICE clinical guidance.

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ROBOTIC REHABILITATION FOR THE EARLY MOBILIZATION OF ICU PATIENTS

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INTRODUCTION. Intensive care unit (ICU)-acquired weakness is a major problem among critically ill patients and is responsible for significant long-term impairment. Several studies have indicated that early mobilization in the ICU is feasible and safe (1); it can also reduce the incidence of delirium and the duration of mechanical ventilation (2), and improve functional status at hospital discharge (3).

OBJECTIVES. We report on the feasibility of a new mechanical device that uses a tilt table with a robotic stepping system to allow leg movements and thus enables patients to simulate walking.

METHODS. We collected data from 49 sessions with this device in 29 patients, 6 of whom were receiving mechanical ventilation (on pressure support) and 5 were receiving vasopressor agents. Patients were placed on the table in the horizontal position (0°) and it was then raised by 20° increments every 5 min until 80°. Mobilization consisted of hip and knee flexion at a rate of 44-48 steps/min, reproducing a walk, and was started at 0° and maintained until 80°. During the procedure, we continuously measured heart rate (HR), blood pressure (BP), pulse oxygen saturation (SpO_2), respiratory rate (RR), thermodilution cardiac output (in 6 patients) and tidal volume (Vt, in 6 patients). Statistical analysis consisted of an analysis of variance for repeated measurements.

RESULTS. All patients completed the procedure. Only 1 adverse event was recorded (1 CVP line pulled out). All variables, except HR, which increased by 10% from 0° to 80°, remained very stable.

Results

	O°	20°	40°	60°	80°
HR (bpm)	96 ± 3	99 ± 3*	101 ± 3*	105 ± 3*	107 ± 3*
MAP (mmHg)	96 ± 3	90 ± 2	87 ± 2	87 ± 2	88 ± 2
RR (bpm)	27 ± 1	29 ± 1	29 ± 1	31 ± 1	32 ± 1
SpO_2 (%)	95 ± 1	96 ± 1	95 ± 1	95 ± 1	95 ± 1

* $p < 0.05$ vs. 0°

There was no change in Vt in the 6 patients treated by mechanical ventilation and no significant change in cardiac output was observed in the patients monitored with a pulmonary artery catheter.

CONCLUSIONS. "Robotic rehabilitation therapy" is feasible and safe in ICU patients. The use of this device allows patients to be positioned upright and mobilized early. Except for the 10% increase in heart rate, there were no significant changes in any measured variable, as the mobilization was primarily passive.

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CRITICAL ILLNESS POLYNEUROMYOPATHY AFFECTS MUSCLE STRENGTH AND FUNCTIONAL ABILITY AT HOSPITAL DISCHARGE

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INTRODUCTION. During the last decades, critical care medicine advanced rapidly, leading to an increased number of survivors. These ICU survivors often experience long term complication due to muscle dysfunction. Critical illness polyneuromyopathy (CIPNM) is increasingly recognized and associated with severe disability.

OBJECTIVES. The aim of this study was to assess the effect of CIPNM on functional ability, and muscle strength after ICU and hospital discharge.

METHODS. One hundredth forty four consecutive patients were evaluated and 20 patients (M 15, F 5) (age 54 ± 14 years) met the inclusion criteria, from who 16 discharged from hospital. The diagnosis of CIPNM was based on muscle strength measurement according to the Medical Research Council (MRC) of muscle strength. Ten patients were diagnosed with CIPNM within 48 h from ICU discharge (MRC 48 < 60). Muscle strength was evaluated with MRC and Hand-Grip dynamometer (HGD) every 7 days until their discharge from the hospital. The FIM scale (Functional Independence Measure) was used to evaluate the functional ability (18–126).

RESULTS. Patients with CIPNM had significantly lower MRC (30.5 ± 13 vs. 56 ± 4, $p < 0.001$) and HDG at ICU discharge (right 7 ± 5 vs. 23 ± 12 kg and left 13 ± 5 vs. 24 ± 12 kg, $p < 0.001$) and remained significantly lower until hospital discharge (44 ± 8 vs. 58 ± 3, $p < 0.001$ and HDG left 11 ± 2.5 vs. 24 ± 12 kg and right 11 ± 5 vs. 29 ± 10 kg, $p < 0.005$) respectively. FIM values on hospital discharge were significantly lower in patients with CIPNM (60 ± 26 vs. 94 ± 30, $p < 0.005$).

CONCLUSIONS. The patients who developed CIPNM had significantly inferior muscle strength at their ICU discharge which remained till their hospital discharge. Their functional ability was significantly impaired at the hospital discharge. Further studies are needed to evaluate the effect of these impairments on the quality of life of these patients and also to assess rehabilitation protocols for the CIPNM.

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AN AUDIT OF LIMITING FACTORS PREVENTING REHABILITATION ON ADULT INTENSIVE CARE

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INTRODUCTION. According to UK NICE guidelines (2009) rehabilitation of critical care patients should begin as soon as clinically possible. At the Royal Brompton Hospital, all patients on the Adult Intensive Care Unit (AICU) receive a comprehensive clinical physiotherapy assessment within 48 h to identify individual rehabilitation needs.

OBJECTIVES. To determine the most common reasons preventing the rehabilitation of patients whilst on AICU.

METHODS. Data collection took place in March 2011 for all patients not receiving rehabilitation. The data collection tool was completed daily and therapists were asked to select up to 3 main reasons why their patient did not receive rehabilitation for that day. Other information obtained included the Richmond Agitation Sedation Score (RASS) for sedated patients, Glasgow Coma Scale (GCS) for non sedated patients, medications (specifically cardiac and sedative agents) and cardio-respiratory observations.

RESULTS. During March, 190 assessments were audited. The number of episodes of rehabilitation was 127 (67%) leaving n = 63 (33%) not receiving rehabilitation and this was the data set for analysis.

Out of a total of 106 reasons given, the three most common for not rehabilitating patients were haemodymanic instability n = 23, sedation n = 21 and drowsiness n = 18. Of n = 63, 47 were ventilated and 16 were self ventilating.

Of the patients listed as having haemodymanic instability, median systolic and diastolic blood pressures were 106 and 60 and they also received up to 3 cardiac agents.

Patients not rehabilitated due to sedation had a median RASS of −4. The median RASS for all data sets was −2.

Patients not rehabilitated due to drowsiness had a mean average GCS of 8/11 if ventilated and 12/15 if self ventilating.

CONCLUSIONS. Overall the majority of patients on AICU received daily rehabilitation.

A close range of frequency was demonstrated within the 3 most common reasons for not receiving rehabilitation therefore the priority could not be determined.

Due to the large variability of data sets regarding haemodynamic stability it is difficult to determine its impact on rehabilitation.

The majority of those not receiving rehabilitation were ventilated with sedation stated as the most frequent reason. The median RASS for all data sets was −2. This may suggest sedation impairs active participation in rehabilitation.

Future research into sedation holds and the relationship with rehabilitation would be of benefit.

All patients classed as drowsy had a sub maximal GCS score. Further investigation into the effect of delirium on rehabilitation would be of interest.

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IMPACT OF LENGTH OF STAY AND MECHANICAL VENTILATION IN THE FUNCTIONAL STATUS IN PATIENTS ADMITTED AT INTENSIVE CARE UNIT

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INTRODUCTION. Patients requiring Mechanical Ventilation (MV) often have substantial weakness of the respiratory and limb muscles that further impairs their functional status and health-related quality of life.

OBJECTIVES. The aim of this study was to evaluate the impact of the length of stay and use of MV in the functional status.

METHODS. This is an observational, prospective and analytical study, performed at Santa Luzia Hospital, Brasília, Brazil. That included patients (>18 years) who were ICU discharge between July 1st to December 31th. We excluded patients transferred to another hospital and have not been evaluated by the physiotherapy team at discharge. Functionality was assessed at ICU discharge and at hospital discharge through FIM (Functional Independence Measure). The FIM is a tool for evaluating the disability of patients with functional restrictions of various origins. Its primary purpose is to assess quantitatively the burden of care demanded by a person to perform a series of motor and cognitive tasks of daily living. The following variables were considered: age, gender, APACHE II score, Length of Stay in ICU, Length of Stay in Hospital, duration of MV and FIM. Statistical analysis was performed normality test, independent samples *t* test and paired-samples *t* test, Mann–Whitney, Wilcoxon, Chi-square, Spearman correlate.

RESULTS. The sample consisted of 158 patients were admitted to the ICU, 30.6% used MV in ICU. The Length of Stay in ICU and in Hospital was higher among patients who received MV (LOS in ICU 28.3 ± 24.2 vs. 9.58 ± 16.5 days, $p = 0.001$; LOS in Hospital 37.6 ± 27.4 vs. 18.9 ± 28.6 days, $p = 0.001$). APACHE II was also higher in this group (13.9 ± 8.3 vs. 10.8 ± 6.57, $p = 0.02$). The functional status was lower in the group undergoing MV at ICU discharge (65.3 ± 37.5 vs. 89.2 ± 37.6, $p = 0.001$) and at hospital discharge (74.6 ± 41.9 vs. 94.3 ± 37.7, $p = 0.008$). There was negative correlation between the FIM and Length of Stay in ICU ($r = -0.50$), Length of Stay in Hospital ($r = -0.49$), APACHE II score ($r = -0.31$) and age ($r = -0.45$) with significant difference.

CONCLUSIONS. In this population was observed that patients submitted to MV have a lower functional status, and higher APACHE II, length of ICU and length of stay. The more severe patients, who were longer in ICU and required MV had lower functional independence at ICU discharge.

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SHORT-TERM IMPACT OF CRITICAL ILLNESS ON HEALTH-RELATED QUALITY OF LIFE

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INTRODUCTION. There has been a rising interest in Health Related Quality of Life (HRQoL) of patients after Intensive Care Unit (ICU) discharge as more patients survive after critical illness.

OBJECTIVES. The aim of this study was to evaluate changes in HRQoL of patients, at ICU discharge and hospital discharge as compared to premorbid values.

METHODS. 144 consecutive patients who had been discharged from the ICU were evaluated and 20 of them were eligible for the study (15 M/5 F; age 54 ± 14 years; APACHE admission score 14 ± 5; SOFA admission score 7 ± 2.6; length of stay in ICU 26 ± 24 days; duration of mechanical ventilation 20 ± 25 days). HRQoL was assessed with the Nottingham Health Profile (NHP) and the Euro-QOL questionnaire premorbidly, at discharge from the ICU and at discharge from the hospital.

RESULTS. HRQoL was significantly impaired at ICU and hospital discharge, evaluated by the NHP, as compared to premorbid values in energy (9 ± 24, 76 ± 36, 30 ± 36 respectively, $p < 0.001$), emotional reaction (22 ± 29, 59 ± 21, 48 ± 31, $p < 0.001$), and physical mobility domains (6 ± 23, 86 ± 31, 54 ± 33, $p < 0.001$). The level of pain tended to be higher (8 ± 25, 25 ± 37, 8 ± 22, $p = 0.052$) after ICU discharge, while sleep and social isolation did not differ significantly. The Euro-QOL visual analogue scale (VAS) was significantly lower after ICU (80 ± 22 vs. 53 ± 24 vs. 65 ± 21 respectively $p < 0.05$). The proportions of "no problems" in the dimension of mobility of EURO-QOL were: 89.5% versus 0 versus 20% and about self-care were 95 versus 0 versus 13%, respectively for the three different time periods of assessment ($p < 0.05$).

CONCLUSIONS. There seems to be a lower HRQoL after ICU discharge which persists at least until hospital discharge. Further studies are needed to evaluate how long this impairment remains after hospital discharge and to assess the effect of specific interventions aimed to improve HRQoL.

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RELEVANCE OF PHYSIOTHERAPY IN PEDIATRIC EMERGENCIES

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INTRODUCTION. Physiotherapists have an active role during in-hospital emergencies, performing bronchic hygiene maneuvers (BHM), mounting and adjusting the parameters of mechanical ventilation (MV) systems, patient positioning, cardiopulmonary resuscitation (CPR) assistance, tracheal intubation and extubation, etc. Proper equipment and a well trained team are essential in this context.

OBJECTIVES. To assess the perception of respiratory physiotherapy's importance in pediatric cardiorespiratory emergencies.

METHODS. This prospective, descriptive study, consisted of analyzing a questionnaire about the relevance of physiotherapy in emergency situations. Double proportion and Chi-square tests were used to compare variables, significances and statistic value, with a 0.05 (5%) confidence interval, being $P < 0.001$.

RESULTS. 109 questionnaires were filled, 43% by nurses, 30% by physiotherapists, 27% by doctors. The data demonstrated that the relevance of physiotherapy correlated with each answering professional. The role of physiotherapy in the "respiratory distress" and "non-invasive MV" settings was considered, respectively, "indispensable" by 76 and 94% of the answering physiotherapists, whereas the answer was "important" by 64 and 66% of the nurses and also by 83 and 52% of the doctors. Concerning the assigned procedures to physiotherapists, for the "CPR" and "tracheal intubation" settings the most frequent answers were mounting of the MV system, cannulae aspiration and adjustment of ventilatory parameters. In the "non-invasive MV" setting, mounting and adjusting the system was the main relevance. In the "apnoea" setting, positive pressure ventilation (PPV), parameters adjustment and patient positioning were the most frequent. In the "desaturation" setting, BHM, mounting and adjusting the system were most frequent. In the "respiratory distress" setting, BHM, patient positioning and parameters adjustment were the most frequent. There were 5 (4.58%) "of no importance" answers, by three doctors and two nurses.

CONCLUSIONS. 99% of the answering professionals considered the role of physiotherapy as "indispensable/imperative" or "important". Physiotherapists' main assignments were: BHM, mounting and adjustment of MV systems, acting, as members of the multiprofessional team, with procedures that help achieving faster and more efficient solutions for emergency situations. There are still few studies concerning the role of physiotherapists in cardiorespiratory emergencies, especially in Pediatrics.

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EXPLORING A ROLE FOR RESPIRATORY MUSCLE TRAINING IN FACILITATING WEANING FROM CHRONIC MECHANICAL VENTILATOR DEPENDENCY: A PRELIMINARY STUDY

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INTRODUCTION. Approximately 10% of patients admitted to intensive care units become chronically ventilator dependent (CVD), necessitating extended lengths of stay with poor quality of life[1,2]. Currently accepted practice standards guiding management of patients failing conventional weaning protocols are lacking.

OBJECTIVES. The objective of this study was to determine whether inspiratory and expiratory respiratory muscle training would facilitate weaning in these patients.

METHODS. A prospective two-phase single subject design was replicated across multiple volunteer subjects. Maximal inspiratory (MIP) and expiratory (MEP) pressures were measured daily until stabile in the baseline phase. Five replicate MIP and MEP measurements were obtained at residual volume and total lung capacity, respectively. The respiratory pressures recorded for each test session were the average of the three highest replicates obtained[3,4]. The subsequent intervention phase consisted of a training regimen of four sets of six repetitions of inspiratory and expiratory maneuvers, at 50% MIP and MEP respectively, performed three to five times weekly using a pressure threshold trainer. MIPs and MEPs were reassessed weekly during the intervention phase. The primary outcome was successful weaning from mechanical ventilation.

RESULTS. Seven subjects (five female), aged 50–91 years, ventilated for 17–99 days on enrolment participated. Individual baseline MIP and MEP ranged from 12–56 and 25–60 cmH_2O, respectively. Three subjects weaned from the ventilator in the baseline phase, three in the intervention phase and one remained CVD. At the time of weaning, MIPs and MEPs had improved in only one subject, remaining unchanged in five.

CONCLUSIONS. This respiratory muscle training study indicates that increases in respiratory muscle strength are not necessary to facilitate weaning from mechanical ventilation in some patients that are CVD. Respiratory muscle strength is not likely the sole determinant of ventilator dependence.

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GRANT ACKNOWLEDGMENT. Canadian Respiratory Health Professionals.

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THE ROLE OF PHYSIOTHERAPY IN POLYTRAUMATIC PATIENTS IN TERTIARY DAMAGE REDUCING

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INTRODUCTION. The attitude of polytraumatic patients in intensive care extended because of the clinical conditions and consequently the occurrence of several aggravation factors, by preventing their transfer to rehabilitation facilities. Also are added respiratory problems, feeding, etc., that do not allow execution of a good rehabilitation program.

OBJECTIVES AND METHODS. During 2008 and 2009 in the ICU who was assisted on the second day with physiotherapeutic procedures 386 patients with polytrauma, where dominant brain trauma. Ratio M:F 4.7:1, 318 M and 68 F, average age 32 ± 6. In the first place was the car accident trauma. Patients presenting the estimated cranial trauma, GCS 3–8 points, extremity trauma: long bone and pelvic fractures, patients with thoracic-abdominal and bone fracture polyintervent. Procedures continued until the end of the first year by physiotherapist technicians. After this time the patients with fractures and surgical polyintervent, interrupt the rehabilitation to continue it to their house.

RESULTS AND DISCUSSION. Physiotherapeutic procedures lasted 3 months for patients with brain trauma, 4 weeks for extremity trauma and surgical polyintervent. In post hospital period these procedures reached approximately 50% positive result in the first 6 months in brain trauma patients, while in patients with low extremity fractures and surgical polyintervent the rehabilitation was 88%. In brain trauma patients achieved positive results when physiotherapeutic procedures starts in the early days of admitted to ICU. With all the assistance and intensive care, we still have disability in relatively high level, while in the other patients results were optimistic. The drawbacks of our study are that there isn't a post hospital rehabilitation center, and we still have not a good cooperation with public health structures.

CONCLUSIONS. Physiotherapy starting on the second day to patients with polytrauma in ICU, we minimized tertiary damages as decubitus, paraarticulare calcification, muscular hypotrophy, urinary and pulmonary infections, etc., so we reduced disability.

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DESCRIPTIVE STUDY OF MECHANICAL VENTILATION ASSOCIATED PNEUMONIA IN A GENERAL INTENSIVE CARE UNIT

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OBJECTIVES. To describe the epidemiologic and microbiological characteristics of patients with ventilator-associated pneumonia (NAVM) in a general ICU.

METHODS. A descriptive prospective study performed since 2002–2010(data collection period: 3 months/year corresponding to the ENVIN study: National Surveillance Study of Nosocomial Infection).Were included all patients over 18 years admitted consecutively in a 13 beds general ICU with stay longer than 24 h. Variables: age, sex, need of urgent surgery, severity index (APACHE II), days in ICU, the incidence rate: NAVM rate/100 patients admitted and NAVM rate/1,000 days of Mechanical ventilation, mortality and microbiological variables as type of sample taken and microorganisms isolated. The data are expressed as percentage or media ± DE. Statistical analysis through λ^2 or *t* Student depending on the type of variable.

RESULTS. 1,306 patients were included, of then, 558 (43.73%) needed mechanical ventilation (VM). 72 episodes of NAVM were collected from 67 patients. The average age was 59.24 ± 15.18 years, 73% were male, 31.34% needed urgent surgery. The average stay was 28.43 ± 17.70 days, APACHE II at admission was 18.88 ± 7.66. Global mortality was: 43.28%. The incidence of NAVM was 5.5 NAVM/100 admitted patients and 11.20 NAVM/1,000 days of VM. The diagnosis was made with compatible clinical plus a new radiographic infiltrate in 86.11% of the cases, the extension of a previous infiltrate and clinical worsening in 12.5% and other clinical diagnostic criteria in 1.43%. Type of sample: 90% of the cases was made a blind bronchial aspirate a cut off $>10^6$ UFC/ML was considered significant, in 1.43% no samples were taken and 8.57% were obtained by bronchoalveolar lavage, lung biopsy or bronchial brushing. *A. baumannii* was isolated in 20%; 18.57% *P. aeroginosa*; 15.71% *St. aureus* methicillin resistant; 7.14% *St. aureus* methicillin sensible; 5.71% *E. cloacae;* 4.29% de *Aspergillus spp.* y 4.29% *E. coli*; in 13.89% etiologic diagnosis was not achieved and 11.1% were polymicrobial pneumonia. The most frequently isolated germ was *A. baumannii* in both early and late NAVM. When we analyzed patients by age group, those over 75 years were the smallest group (0.6%) but had longer ICU stay (33.89 ± 21.1), higher mortality (64.28%) but lower APACHE II at admission (15.6 + 6.11). Statistically significant differences were found when compared with the rest of the patients with pneumonia ($p < 0.05$). When comparing patients with NAVM against those who did not develop infection we found that patients had higher mortality (43.28 vs. 12.43%; $p < 0.001$), had younger age (59.24 ± 15.18 vs. 62.32 ± 8.48; $p < 0.05$), higher APACHE II (18.88 ± 7.66 vs. 16.11 ± 8.48; $p < 0.05$) and higher average stay (28.43 ± 17.7 vs. 5.92 ± 3.68; $p < 0.001$).

CONCLUSIONS. NAVM remains a disease that conditions high mortality in our ICU, extending the average stay. The group of older patients, though few in number, is the one that got worse results.

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INCIDENCE AND OUTCOMES OF VENTILATOR ASSOCIATED INFECTIONS: PROSPECTIVE COHORT STUDY

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INTRODUCTION. Ventilator associated pneumonia (VAP) is associated with considerable morbidity. However, data for ventilator associated tracheobronchitis (VAT) are sparse.

OBJECTIVE. To investigate prospectively the incidence and outcomes of ventilator associated infections.

METHODS. We studied prospectively all patients who received mechanical ventilation >48 h, in the general critical care unit of a tertiary hospital in Greece during a 21-month period. VAT diagnosis required Temperature (>38°C) or leukocyte count >12.000/mL or leukopenia <4.000/mL) (at least one of these) plus new onset/change of purulent endotracheal secretions. VAP diagnosis required the aforementioned criteria plus appearance of new and persistent pulmonary infiltrates on chest radiography. Microbiological documentation was based on the growth of microorganisms in bronchial aspirations (>100.000 cfu) or BAL (>10.000 cfu).

RESULTS. 236 patients were included; median IQR age was 61(45–72) years, APACHE II 17(13–20), SOFA 9(7–11). Thirty-five (14.8%) patients presented VAT, 78(33%) presented VAP and 123(52.1%) patients presented none of the two disorders (NP). There were no significant differences between VAT and VAP cases in terms of baseline characteristics (diagnosis, APACHEII, SOFA, respiratory compliance, PO_2/FiO_2, inflammatory markers). Patients with VAP had significantly higher SOFA score ($p = 0.04$) and CRP levels ($p = 0.02$) compared to NP; There were no significant differences in terms of baseline characteristics between VAT and NP. *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Staphylococcus aureus* and *Klebsiella pneum.* were most commonly isolated in both VAT and VAP. Patients who presented VAP had significantly ($p < 0.001$) longer ICU and hospital stay (days) [30(16–45) and 41(26–55)] compared to patients with VAT [21(15–36) and 37(23–50) or NP [11(5–26) and 23(11–43)]. ICU mortality in patients with VAP, VAT and NP was 35.8, 28.5, 3.2%, respectively and overall inhospital mortality was 51.2, 42.8 and 17%, respectively.

CONCLUSIONS. Incidence and microbiological pattern was similar in VAP and VAP in our cohort. Both VAT and VAP were associated with longer hospitalizations and increased crude ICU and inhospital mortality compared to NP.

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CONTRIBUTION OF INVASIVE APPROACH TO VAP PATIENTS MANAGEMENT

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INTRODUCTION. The best strategy for the diagnosis of Ventilator Associated Pneumonia (VAP) on intensive care patients is still a controversy point. Reliance on clinical strategy is over sensitive leading to over treating patients thus misusing antibiotics/increasing resistance, but delay to initiate therapy is associated with increased ICU mortality.

OBJECTIVES. This study aims to measure the impact of an Invasive approach of VAP diagnosis using bronchoalveolar Lavage (BAL).

METHODS. This retrospective study enrolled all VAP first episode patients admitted from the 1st August 2001 to 31 July 2009 ($n = 167$) to our mixed case ten bed ICU. VAP patients were selected according to ATS/IDSA Guidelines, 2005. We compared VAP patients submitted to BAL obtained by bronchofibroscopy (Invasive approach group [InvGr], $n = 77$) to patients that took semi-quantitative cultures of endotracheal aspirates (non-invasive approach group [NonInvGr], $n = 82$). Demographic and clinical data, including severity indexes and complications were collected from clinical registries. ICU mortality, ICU length of stay (LOS), length of ventilation (LOV), microbiological confirmation, appropriate antibiotherapy on first dosis (AAFD), De-escalation were considered endpoints for this study. SPSS for Windows was used for data analysis.

RESULTS. VAP patients mean [sd] age was 58.8 [16.5] years, 75.4% (126) were male. Mean [sd] SAPS II was 47 [13.5] and mean APACHE II was 17.4 [17.4]. Mean [sd] LOS was 27 [18.9] days, mean [sd] LOV was 25 [17.6] days. Diagnosis were as follows: Medical 71.3% (119), Scheduled surgery 3.6% (6), Non-scheduled surgery 25.1% (42). Early VAP type patients were 19.8% (33). De-escalation was achieved on 45.5% (30). There were no statistical differences between InvGr and NonInvGr regarding data presented above. Globally 74.2% (92) of AAFD, and Lower mortality on patients with AAFD (alive, 75.0% [69] vs. dead, 25.0% [23], $p < .05$). Bacterial confirmation was: InvGr 79.2% (61) vs. NonInvGr 69.5% (57). Only one pneumothorax was found on InvGr. Higher SOFA on day 0 on InvGr (RespS ≥3, InvGr 63.6% [49] vs. NonInvGr 46.3% [38], $p < .05$). Higher mortality found on InvGr (InvGr 36.4% [28] vs. NonInvGr 20.7% [17], $p < .05$).

CONCLUSIONS. Greater mortality on InvGr associated with respiratory severity on day 0 of VAP, this suggesting a selection bias—more severe patients for invasive technique approach. A low rate of complications was found on the InvGr. We found an acceptable rate of microbiological isolations in low respiratory tract cultures. The reliance on rapid gram stain results could have influenced our empiric therapy and partially justify low rate of de-escalation. No impact on mortality attributable to invasive technique.

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THE EPIDEMIOLOGICAL AND ECONOMIC IMPACT OF VENTILATOR ASSOCIATED PNEUMONIA IN A TERTIARY REFERRAL INTENSIVE CARE UNIT

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INTRODUCTION. Ventilator associated pneumonia (VAP) is a common and often severe nosocomial infection occurring in the intensive care unit (ICU). VAP has been associated with an increased morbidity, mortality and length of stay. National initiatives within the UK have been introduced with the aim of reducing VAP [1].

OBJECTIVES. The aims of this study were to: 1. identify the incidence of VAP in our 16 bedded tertiary referral ICU 2. assess the epidemiological profile 3. produce a cost analysis 4. provide a basis for future comparison.

METHODS. VAP was defined as a positive microbiological culture from the respiratory tract, with positive X-Ray changes in a patient who had been invasively ventilated for more than 48 h.

The study period considered all 743 patient admissions to the ICU between 1 April 2009 until 31st March 2010. Study patient demographics, ICU and hospital resource use were obtained from the Intensive Care National Audit and Research Centre database (ICNARC).

The mean national UK tariff for an ICU bed for the year 08/09 was adjusted for inflation and used as a basis for cost analysis.

RESULTS. There were 1,585 positive cultures during the study period, of these 296 were positive after 48 h invasive ventilation, and 160 had associated X-Ray changes and were therefore deemed to be a VAP. The VAP positive cultures were from 104 individual patients giving a unit VAP incidence of 14%.

Significant difference was not found in sex, age, BMI or APACHE 2 scores.

There was a direct relationship between the chance of acquiring a VAP and the number of days receiving ventilation, with a 55% chance of acquiring a VAP after 4 weeks and a 95% chance after 7 weeks.

Patients who developed a VAP had a statistically significant increase in the number of days requiring advanced ventilation, length of stay on the ICU and hospital. There was a non significant trend to increased mortality in the VAP group. Patients who developed a VAP were more likely to die as their age increased.

The group of patients who developed a VAP had a mean stay on ICU of 16.3 days longer, costing £24,776 more per patient and £2.5 million as a group.

CONCLUSIONS.

- VAP remains a common disease process in our intensive care unit, despite increased awareness, staff training and infection control procedures being implemented.
- Patients are more likely to acquire a VAP after 4 weeks ventilation independent of their age, although there is a direct correlation between the ages of the patients who then subsequently die.
- VAP is independently associated with an increased ICU and hospital length of stay and carries a significant financial burden because of this.

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IMPACT OF VENTILATOR ASSOCIATED PNEUMONIA (VAP) IN TRAUMATIC BRAIN INJURY PATIENTS

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INTRODUCTION. Ventilator associated pneumonia (VAP) in brain injury patients occurs commonly; however, few data are available to evaluate the effects of the infection on the prognosis. Brain injury may induce immunosuppression explaining why neurotrauma patients are at higher risk of developing early onset pneumonia.

OBJECTIVES. VAP is an important cause of morbidity following severe traumatic brain injury (TBI). Our objective was to describe the incidence, risk factors and evaluate the influence of VAP on the mortality and morbidity in patients with TBI. An additional goal was to define the relationship of VAP with nonneurological organ dysfunction.

METHODS. During a 2-year period (December 2008–December 2010) 123 patients with TBI and no other type of trauma requiring mechanical ventilation for more than 48 h and GCS ≤8 were studied, 78 males and 45 females. The mean age was 34 years but it ranged from 17 to 70 years. On admission to the intensive care unit (ICU) they had body mass index (BMI) 23 ± 7 kg/m^2 and APACHE II score 18 ± 4. Out of 123 patients the 28 (22, 7%) had co morbid medical illness (e.g. ischemic heart disease, arterial hypertension, diabetes mellitus, COPD, chronic renal failure).

RESULTS. VAP occurred in 33 (26, 8%) out of 123 TBI patients during their stay in intensive care unit (ICU). There was no difference in predominance as far as gender was concerned, VAP occurred in 21 (28%) males and in 12 (26%) females. Incidence of VAP was significantly associated to patients requiring longer duration of mechanical ventilation 14 days ± 2 and longer sedation duration 10 days ± 2. Patients with co morbid medical illness, higher age and VAP were associated with a significantly greater degree of nonneurological organ system dysfunction, though there was no difference in frequency of VAP development compared to the patients without co morbid medical illness. Although VAP was not associated with increased hospital mortality, patients who developed VAP had a longer duration of mechanical ventilation (24 vs. 8 days, $p < 0.0001$) and longer ICU lengths of stay (28 vs. 10 days, $p < 0.0001$)

CONCLUSIONS. The incidence of VAP in patients with TBI is high; however, its appearance does not affect the prognosis and does not seem to be associated with a significantly increased risk of mortality though increases the mechanical ventilation duration and the ICU length of stay. A single significant risk factor for nonneurological system dysfunction is co morbid medical illness.

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IS NON-STERILE PREPARATION OF ENDOTRACHEAL TUBES A POTENTIAL RISK FACTOR FOR VENTILATOR ASSOCIATED PNEUMONIA? A PROSPECTIVE STUDY

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INTRODUCTION. Ventilator associated pneumonia (VAP) is the commonest nosocomial infection seen on the intensive care unit. Whilst there is evidence supporting the use of an aseptic technique for procedures such as central venous cannulation [1] few studies have been published on the importance of sterility with regards to endotracheal tubes (ETT) [2].

In the United Kingdom most endotracheal tubes are lubricated before use. We investigated the potential for pathogenic bacteria to be transferred to the upper airway by non-sterile preparation of the ETT.

OBJECTIVES. To audit the sterility of endotracheal tube preparation and investigate potential contamination of the ETT with pathogenic bacteria when lubricated with non sterile gel.

METHODS. Patients requiring endotracheal intubation for elective or emergency surgery were identified and a swab of the ETT was taken after application of the lubricant gel and immediately prior to intubation. As far as possible staff preparing the ETTs were not made aware of the study and the tubes were swabbed out of sight. The swabs were cultured on blood agar plates and incubated for 48 h.

RESULTS. 30 ETTs were swabbed in total; 25 (83%) were elective surgical cases and 5 (17%) of the cases were emergency surgery/intubation. 20 (67%) of the ETTs were prepared immediately before use, 9 (30%) less than 1 h before and 1 was prepared 2 h before use.

18(60%) of these had been lubricated with aquagel from a pre-opened tube; 11 (37%) with sterile aquagel from a fresh sachet and one (3%) was not lubricated.

All 30 swabs showed no significant growth at 48 h.

CONCLUSIONS. This study found that whilst non-sterile preparation of the endotracheal tube is common practice (60% of ETTs in this study), it is not associated with the transfer of pathogenic bacteria into the respiratory tract and therefore unlikely to be a significant factor in the development of VAP.

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FACTORS ASSOCIATED WITH VAP DEVELOPMENT IN THE ICU PATIENTS

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INTRODUCTION. Ventilator-associated pneumonia (VAP) is the most common infection among intensive care unit (ICU) patients and is associated with increased morbidity, mortality and costs.

OBJECTIVES. The aim of this study was to evaluate the presence of known risk factors and the use of antibiotics in the development of VAP in a multidisciplinary ICU.

METHODS. Inclusion criteria were intubation <12 h prior to ICU admission or in the first 48 h thereafter. Exclusion criteria included: prior hospitalization in another ICU, ICU stay <48 h, brain death, age <18 years and pregnancy. We also documented the known risk factors for VAP; sedation depth (using the RAMSAY scale), cuff pressure, head-bed elevation, re-intubation, ventilator circuit changes, tracheostomy, the presence of levin, deep vein thrombosis and stress ulcer prophylaxis, three times weekly per patient. All antibiotics administered until VAP development were also recorded. Diagnosis of VAP was made by using standard clinical and laboratory data as well as CPIS score.

RESULTS. Two hundred and fifty two critically ill patients consecutively admitted to a multidisciplinary ICU, were prospectively studied (age 56 $\pm$ 19 years, males 70%, APACHE II score 15 $\pm$ 7, ICU mortality 34%). Fifty six of them (22%-VAP rate: 20/1000 ventilation days) developed VAP. Male gender ($p < 0.05$), neurotrauma ($p < 0.001$), b-lactames use ($p < 0.01$), the frequency of moisturizing devices use ($p < 0.02$) and the frequency with which Ramsay scale >4 was observed ($p < 0.001$), were significantly associated with the development of VAP. A multivariate logistic regression analysis revealed significant associations for Ramsay score (OR: 1.04, $p < 0.002$) and neurotrauma (OR: 10.5, $p < 0.02$) with VAP development.

CONCLUSIONS. These results indicate that several risk factors for VAP do apply for the cases under study and that the incidence of VAP is relatively high. Therefore, the implementation of preventive strategies and the reinforcement of VAP bundles can result in beneficial effects to the appearance of VAP in the ICU.

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VENTILATOR ASSOCIATED PNEUMONIA AND ADHERENCE TO A HIGH IMPACT VENTILATOR CARE BUNDLE-AN OBSERVATIONAL STUDY

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INTRODUCTION. Ventilator associated pneumonia (VAP) remains an important cause of morbidity and mortality for patients in intensive care units throughout the world. VAP has been shown to prolong ICU length of stay by up to 9 days [1] with commensurate increases in cost per episode. Studies in North America and Europe have demonstrated incidences of VAP ranging from 9 to 27% [2, 3]. Despite the importance of VAP there is a lack of published data from institutions in the United Kingdom.

OBJECTIVES. We aimed to establish the incidence of VAP in our institution, and the degree of compliance with our ventilator care bundle. We hoped to identify patients at particular risk of acquiring VAP, and targets for future improvements in care.

METHODS. This observational study took place in one of the two intensive care units of a major London teaching hospital over an 8 week period. All patients on this 13 bed unit were screened on a daily basis. All mechanically ventilated patients were included. A modified version of the United States' Centers for Disease Control criteria for VAP diagnosis was used to perform a daily assessment of each patient. Compliance with each of the eight components of a ventilated-patient care bundle was also recorded.

RESULTS. A total of 47 patients were included in the study, with a median age of 61 years. 481 ventilator-days were examined. During the period of surveillance 14 episodes of VAP occurred in 13 patients. 27.7% of patients suffered at least one episode of VAP. Prolonged ventilation (>5 days) and immunocompromised were associated with increased risk of VAP acquisition. Overall compliance with the elements of the ventilator care bundle was high at 94%, however adherence to 2 individual elements, circuit management and sedation holding, was found to be low at 87 and 82% respectively. In a majority (87%) of cases in which a pathogen was isolated gram negative organisms were causative.

CONCLUSIONS. We conclude that, in our unit at least, VAP remains a stubborn problem despite the introduction of a ventilator care bundle. In light of our findings we have identified 4 areas for future attention. These are: (1) review of sedation use, (2) improvement of ventilator circuit management, (3) scrutiny of steroid use, (4) introduction of an endotracheal tube with subglottic suctioning capability.

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VENTILATOR-ASSOCIATED PNEUMONIA AT A TERTIARY-CARE CENTER IN A DEVELOPING COUNTRY: CHARACTERIZATION OF A INTENSIVE CARE UNIT OUTBREAK OF IMIPENEM-RESISTANT ACINETOBACTER SPP

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INTRODUCTION. The first warning about multidrug resistant Acinetobacter spp was in a hospital outbreak reported in New York in 1991. *Acinetobacter boumannii*, an aerobic gram-negative bacterium that can cause infections in critically ill patients, are often due to limited treatment with resistant antibiotics [8–10]. During last few decades this organism is considered as a nosocomial pathogenic organism, merely in critically ill patients in the intensive care units (ICU) all over the world.

OBJECTIVES. Today multidrug resistant *Acinetobacter* spp. are seen all over the world. In this study in a tertiary referral hospital in Iran, we tried to evidence the multi-drugs resistant ventilator-associated pneumonia (VAP) with *Acinetobacter* spp.

METHODS. In a prospective descriptive study, all patients admitted to Masih Daneshvari Hospital's ICU, between April 2008 and June 2010, who were under mechanical ventilation who had resistant ventilator-associated pneumonia (VAP), were evaluated. The data, including demographic, clinical and microbiological results, using statistical software SPSS version 16 was studied and classified.

RESULTS. 14 patients were admitted in the intensive care unit (ICU). The mean age was 50/5, the range was 20–96 years. Six patients were male (42/9%). Median of hospitalization was 53 days, the range of 15–135 days, median of hospitalization before admission to ICU was 2/5 day that range was from 0 to 27 days. Median days of bacterial isolation were 18 days, the range of 5–30 days. The underlying diseases in 12 patients (85/7%) patients were observed. 6 patients (42/9%) patients were admitted in ICU after surgery. 8 patients (57/1%) had been admitted due to another medical problem like pneumonia, heart disease or malignancy. All patients were resistant to Imipenem.

Four patients suffered from complications during hospitalization, as three cases of acute renal failure. Treatment outcome in 7 cases (50%) were death. No deaths after 28 days of follow-up were observed.

CONCLUSIONS. It seems that, with a nosocomial resistant strain of *Acinetobacter* spp. it remains as a health problem for clinical practitioners worldwide and because of limited treatments for these patients, hospital infection control, would play a determining role in preventing nosocomial infection.

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THE PNEUX™ PNEUMONIA PREVENTION SYSTEM AND THE INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA

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INTRODUCTION. Ventilator Associated Pneumonia's (VAP's) are common hospital acquired infections worldwide, with rates between 10 and 20% dependent on case mix [1]. VAPs affect morbidity, mortality and have cost implications for health services. Techniques like oral decontamination [2] and ventilator care bundles [3] have shown improvements in VAP rates. Another practice is the use of the PneuX VAP Prevention System (Venner Medical, Singapore) which incorporates an ETT with subglottic secretion drainage in combination with a tracheal seal monitor.

OBJECTIVE. To assess the PneuX systems effectiveness in preventing VAPs.

METHOD. We conducted a retrospective review of all patients in our Critical Care Department intubated using the PneuX system. Local practice had dictated that the use of the system was at the discretion of the attending Intensivist for those patients expected to be ventilated for ≥72 h. This included those with either a primary intubation or an elective exchange of ETT with the PneuX system. All patient records were reviewed for the presence of VAP for the time period whilst the PneuX system was in situ and up to 48 h post removal, using the Johanson Criteria [4]. Additionally, CPIS [5] scoring at 48 h was performed post hoc in patients who had remained intubated with PneuX system, and had available data to enable complete CPIS scoring.

RESULTS. 48 patients over 11 months were assessed with a total of 3,982 h of PneuX system use. Mean duration of use was 82.9 h (range 3.6–344 h). The VAP rate for this cohort of patients was 6.25% (n = 3).71% of patients had a standard ETT exchanged to the PneuX system. CPIS scoring identified 3 patients from the available 24 complete datasets, with a CPIS score of ≥6 without a pre existing pneumonia. CPIS scoring corroborated the Johanson Criteria in two of the three patients initially identified with VAP.

CONCLUSIONS. For this cohort of patients the PneuX system produced a lower rate of VAP than the data published in epidemiological and randomised controlled trials. These results in combination with other small scale studies are promising and further investigation into the use of the PneuX system including a randomised controlled trial may be of potential benefit.

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GRANT ACKNOWLEDGMENT. PneuX VAP Prevention systems were provided by Intavent Direct.

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INCIDENCE OF VENTILATOR ASSOCIATED PNEUMONIA IN A MIXED GENERAL AND NEURO INTENSIVE CARE UNIT IN THE UNITED KINGDOM BASED ON CLINICAL PULMONARY INFECTION SCORE (CPIS)

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INTRODUCTION. Ventilator-associated bacterial pneumonia (VAP) is an important intensive care unit (ICU)-acquired infection in mechanically ventilated patients. VAP is defined as pneumonia occurring more than 48 h after the initiation of mechanical ventilation [1]. The occurrence of VAP increases patient mortality to an estimated 20–55% and increases the duration of hospital stay by approximately 6 days [2].

OBJECTIVES. The aim of the study was to evaluate the incidence of ventilator-associated pneumonia in a mixed general and neurosurgical intensive care unit in the United Kingdom based on clinical pulmonary infection score (CPIS).

METHODS. A retrospective audit of patients intubated and mechanically ventilated for more than 48 h in the year 2009. The data was accumulated using ICNARC (Intensive care national audit and research centre) database and patient paper records.

The data was analysed using clinical pulmonary infection scoring system in the diagnosis of ventilator associated pneumonia (VAP). The patient was diagnosed as having a VAP if the score was 6 or above.

RESULTS. It is a 10 bedded unit in a tertiary teaching hospital. There were 538 patients admitted to the Intensive care unit in the year 2009. 429 patients were intubated and 154 were intubated for more than 48 h. 21 patients were excluded for following reasons: Died <72 h—9 patients, Transfer from other hosp—8 patients Notes missing—4 patients. The number of patients included were 133 in this audit. The number of patients positive as per clinical pulmonary infection scoring system were 40. It gives an incidence of VAP of *30.76%*. The breakdown of VAP patients are as follows:

Neurosurgical patients	18 (Number of pts)	Acute pancreatitis	1
Post emergency abdominal aortic aneurysm repair	6	Pulmonary embolism	1
Post emergency laparotomy	6	Lung abscess	1
Pneumonia (worsening)	3	Chronic lymphatic leukaemia	1
Acute renal failure	2		
Chronic obstructive airway disease	1		

The common organisms found were
Haemophilus influenzae—11 pts
Staphylococcus aureus—8
Candida albicans—5
Escherichia coli—5
Methicillin resistant *Staphylococcus aureus*—4
Pseudomonas aeruginosa—3
Several of the patients had multiple organisms and other organisms

CONCLUSIONS. The retrospective audit of intubated patients in mixed general and neurosurgical patients revealed VAP incidence rate of 30.76%. It also revealed two groups of patients with higher incidence of VAP. They were neurosurgical and post laparotomy. The higher risk patients for VAP should be closely monitored for VAP development and receive aggressive management.

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A COMPARATIVE STUDY IN VENTILATION ASSOCIATED PNEUMONIA (VAP) IN NEUROCRITICAL ILLS VERSUS NON-NEUROCRITICAL ILLS: INITIALS RESULTS

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INTRODUCTION. Ventilation associated pneumonia (VAP) is the most frequent nosocomial infection among mechanically ventilated patients in intensive care units (ICUs). Some algorithms have been developed to evaluate the VAP's incidence, such as the level pulmonary infection score (CPIS) in patients submitted in mechanical ventilation (MV) after 48 h.

OBJECTIVES. The aim of the study was compare the differences of variables of CPIS between non-neurocriticals and neurocriticals ills.

METHODS. A prospective observational study developed from September–December/2010 in three adult-ICUs in patients with age >18 age, divided in 2 groups: neurocriticals (G1) and non-neurocriticals (G2) in three adult-ICUs from our Institution during the period of MV >48 h. The CPIS score were calculated with of the variables (body temperature, lung X-Ray, Leukograms, PaO_2/FiO_2 ratio and tracheal secretion) during the ICUs diary routine considering VAP CPIS >6 points. The APACHE II score, risk of death, days of MV, admission diagnostic, complications and length of stay was observed. The test *t* Student was used to analyse the data being $p < 0.05$ statistically significant.

RESULTS. Fifth four patients male (48.1%) and female (44.4%) in two groups: G1:27 non-neurologicals ills with average age 52.8 ± 19.8 age, the APACHE II average were 15.9 ± 3.3 points and risk death average: 10.3 ± 1.6. About the average of days in MV: 34.4 ± 24 days, the admission diagnostic were hemorrhagic-Stroke (40.7%) and arterial systemic hypertension (SAH) in 66.5% of the patients was the principal comorbidy. The countdown CPIS average showed 3 ± 1.2 points. In G2:27 neurologicals ills with average age 56.8 ± 16 age, the APACHEII average: 14.7 ± 3 points and risk death average: 9.8 ± 2.5. The average days of MV showed 23.3 ± 17.6 days, the acute respiratory injury were the major prevalence of admission diagnostic with average of 48.1% and the principal comorbidy were Diabetes Mellitus and chronic obstructive pulmonary disease (COPD) (14.8%). The average countdown of CPIS was 2.9 ± 1.1 points. In relation of recidives the G1:5.1 ± 1.5 × G2:3.7 ± 2 times ($p = 0.05$). The groups until this period, these variables of study had not show statistics significances but the time of tracheostomy in G1 × G2 (25 ± 23 × 4.9 ± 9 days) showed significance ($p = 0.000$). The length of stay total average in G1 × G2 showed 63.8 ± 48.3 × 36.4 ± 28.9 days ($p = 0.001$).

CONCLUSIONS. There were not differences on CPIS score between the groups, but the days in MV suggests increased of consequences in neurocriticals ills.

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GOOD AGREEMENT OF SEMIQUANTITATIVE CULTURE OF BLIND ENDOTRACHEAL ASPIRATE WITH QUANTITATIVE CULTURE OF BRONCHOALVEOLAR LAVAGE FLUID IN PATIENTS WITH SUSPECTED VENTILATOR-ASSOCIATED PNEUMONIA

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INTRODUCTION. Quantitative cultures (QC) of broncho-alveolar lavage fluid (BALF) are considered as microbiological gold standard to confirm or refute a clinical suspicion of ventilator-associated pneumonia (VAP). For organizational and financial reasons however, microbiological documentation in VAP is frequently done by semiquantitative cultures (SQC) of blind endotracheal aspirate (BETA). Varying levels of agreement have been found between both techniques.

OBJECTIVES. We evaluated concordance between SQC and QC of BETA in intubated patients, and of BALF and BETA cultures in patients with suspected VAP. We postulated that SQC of BETA would be an acceptable surrogate for QC of BALF.

METHODS. In 61 episodes of suspected VAP, QC of BALF (3 pooled aliquots of 20 cc saline) were compared with SQC of BETA obtained within 24 h before bronchoscopy. For QC, specimens were diluted 1/10 in sterile 0.9% saline and vortexed; 10 µL was inoculated on blood and Mc Conkey agars and spread homogenously in three directions. Pathogens were counted and reported: 1 CFU × 1000 = number of bacteria/mL. For SQC, specimens were washed in sterile 0.9% saline to minimize contamination; 10 µL was used for inoculation of agar. Semiquantitative scoring was derived from streaking and diluting the specimen in three segments, and was scored as few (+−) for less than 10 colonies, light (+), moderate (++) and heavy (+++) growth when moderate to heavy growth was observed in first, second and third streaks respectively. In case of several pathogens, the numbers of the different pathogens were reported separately. Commensal flora was not taken into account. To define the cut-off in SQC most accurately corresponding with 10^4 colony forming units (CFU)/ml in QC, 105 parallel SQC and QC of 105 BETA were compared. BALF and BETA were considered qualitatively concordant if both identified the same pathogens or if both were negative, and quantitatively concordant if both identified the same pathogens above a defined threshold.

RESULTS. The main pathogens isolated in suspected VAP were *Pseudomonas aeruginosa* (39%), *Klebsiella* spp. (17%), *Enterobacter* spp. (17%) and *Serratia* spp. (17%). BALF and BETA were **qualitatively** concordant in 56/61 (92%): negative in 29/56 (52%), monomicrobial in 20/56 (36%) and polymicrobial in 7/56 (13%). To evaluate quantitative concordance, the threshold for a positive SQC of BETA was chosen as ≥+, since this cut-off had a PPV and a NPV of 98 and 92% respectively for QC >10^4 CFU/ml. BALF and BETA were **quantitatively** concordant in 51/61 (84%): negative in 40/51 (78%), monomicrobial in 10/51 (20%) and polymicrobial in 1/51 (2%). On the level of the individual pathogen identified in >10^4 CFU/ml in BALF, PPV and NPV of >+growth in SQC of BETA was 81 and 87%, respectively.

CONCLUSIONS. This study suggests that, in our center, SQC of BETA is an acceptable surrogate for QC of BALF for microbiological documentation of VAP.

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THE ROLE OF TRANSVERSUS ABDOMINIS PLANE BLOCKS FOR ANALGESIA IN POST OPERATIVE CRITICAL CARE PATIENTS

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INTRODUCTION. Transversus abdominis plane (TAP) blocks involve introduction of local anaesthetic into the area between the internal oblique and transversus abdominis muscles to relieve pain from the abdominal wall. Use of this technique in the operating theatre has increased over the last 4 years. Challenges exist to the application of this technique in the critically ill, and wide spread applicability has not been reported.

OBJECTIVES. We aimed to carry out a "Plan Do Observe Act" cycle to assess the feasibility of routinely using TAP Blocks to improve comfort levels in post-operative patients in a critical care unit.

METHOD. All patients were older than 18 years and post elective or emergency abdominal surgery (colorectal, vascular, gynae-oncology, upper gastrointestinal or urology cases), and in level 2 or 3 critical care beds of a university teaching hospital. Neuraxial analgesia had either not been used or had failed. Information collected comprised demographics, surgery performed, analgesia being used, ventilator dependence, simplified pain scores pre and post block (None—mild—moderate—severe) and procedural details. Blocks were performed by consultant anaesthetist—Intensivists or by supervised specialty doctors. Use of ultrasound or landmark technique, volume and strength of local anaesthetic used were as per operator preference, and uni- or bilateral blocks dictated as per surgery Pain scores and analgesia usage were assessed at 90 min post TAP block.

RESULTS. 32 blocks performed over a 15 week period (2 days of week only) 31 performed under Ultra sound 1 performed by landmark technique Consultants performed 14 and supervised trainees performed 18 40–60 ml (Total) of 0.25–0.375% Levo-bupivacaine were used as per maximum safe dose of drug. Complications encountered: 0% Patients experiencing reduced pain scores: 90% Patients with reduced analgesic requirements: 60% Patients extubated post block: 12 (Median Time 90 min)

CONCLUSIONS. Regular use of TAP blocks in surgical critical care is associated with a very high degree of success, and possibly negligible complications. Requirements are modest—namely access to a suitable ultrasound scanner and experience in the technique. They are ideally suited to reducing parenteral opioid doses, particularly where epidurals are contraindicated or unsuccessful, and as part of optimum analgesia and sedation regimes, assisting in reducing ventilator dependence or length of unit stay. They are widely applicable with few contraindications. TAP blocks are now regularly used in our intensive are unit.

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CRITICAL CARE AUDIT OF LAPARASCOPIC ASSISTED OESOPHAGECTOMY PATIENTS, COMPARING EPIDURAL AND PARAVERTEBRAL CATHETERS

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INTRODUCTION. The post-operative analgesic regime for laparoscopic-assisted oesophagectomy patients in our hospital has recently changed from thoracic epidurals to paravertebral catheters with a seemingly detrimental effect on the quality of analgesia.

The use of thoracic epidurals with *open* oesophagectomy operations has been shown to provide the most satisfactory analgesia and to reduce the incidence of both fatal and nonfatal respiratory complications. Their use has also been reported to improve the bowel microcirculation, and to prevent anastomosis insufficiency and leak.

There is very little data supporting use of thoracic epidurals in laparoscopic assisted oesophagectomies. Zingg et al. [1] in a recent observational study concluded that thoracic epidural anaesthesia should be administered in minimally invasive oesophagectomies as the relative risk for pulmonary morbidity was positively influenced.

The aims of the audit were to compare the post-operative pain and course of patients with epidurals and those with paravertebral catheters post laparoscopic oesophagectomy.

METHODS. The Clinical Information System was searched for all elective oesophagectomies between 1/1/10 and 1/12/10. The electronic records were then analysed and a database created.

OBJECTIVES. The following audit standards were set: a) There should be no pain on arrival to critical care (100%) b) There should be no vasopressor use in the first 24 h (100%) c) There should be no hospital acquired pneumonia (HAP) (100%)

RESULTS. Thirty-six patients who had laparoscopic assisted oesophagectomy operations between 1/1/10 and 1/12/10 were audited. Sixteen had epidurals, nineteen had paravertebral catheters and one had neither. a) There should be no pain on arrival to critical care (100%)—Epidural 13/16 (81%); Paravertebral catheters 0/19 (0%) ($p < 0.0001$) b) There should be no vasopressor use in the first 24 h (100%)—Epidural 12/16 (75%); Paravertebral catheters 17/19 (89%) ($p = 0.38$) c) There should be no HAP (100%)—Epidural 13/16 (81%); Paravertebral catheters 14/19 (74%).

CONCLUSIONS. Not one patient in the paravertebral catheters group was pain free on admission to intensive care compared with 81% of patients who had thoracic epidurals. Pain scores were also statistically significantly much higher in the paravertebral group. The use of vasopressors and rates of HAP were relatively low in both groups, fairing well against the high audit standards. There does not seem to be any particular advantage or disadvantage to either technique in terms of length of stay, fluid input, pulmonary consequences or death.

The audit was presented at a multiprofessional meeting and practice was altered. All patients are now offered a thoracic epidural if there are no contraindications.

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SEDATION OF PEDIATRIC PATIENTS UNDERGOING MAGNETIC RESONANCE IMAGING

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INTRODUCTION. Pediatric patients undergoing magnetic resonance imaging (MRI) often require sedation to minimize motion artifacts.

OBJECTIVES. We present a database of patients describing the medications administered, patient demographics, and adverse events.

METHODS. All sedation information was maintained in a computerized database. Chloral hydrate (per os or per rectum, 50 mg/kg/dose), midazolam hydrochloride (intravenously (iv), 0.1–0.2 mg/kg/dose), and propofol 1% (iv, 2 mg/kg/dose), or combination of the latest were used. Time required sedating, adverse events, and failed sedations were recorded. Monitoring comprised respiration rate, heart rate and oxygen saturation continuously throughout the procedure. Equipment and medication for resuscitation was ensured. Adverse events and failed sedations were compared between sedation regimens by using Fisher exact test.

RESULTS. Between October 2009 and March 2011, 184 patients were sedated (98 males and 86 females), mean age 2 years (min 0.02 max 15). 161 (87.5%) patients were sedated with chloral hydrate with successful rate of sedation 89%. 23 (12.5%) patients had intravenous sedation, with no failure reported ($p = 0.22$). 2 patients sedated with combination of midazolam and propofol presented with respiratory arrest needed respiratory resuscitation and hemodynamic changes required medical intervention respectively (RR 0.11 95% CI 0.077–0.17, $p = 0.01$). All patients sedated with intravenous agents were administered oxygen regardless of oxygen saturation. 22 patients (13.6%) sedated with chloral hydrate had oxygen administered after oxygen desaturation.

CONCLUSIONS. Intravenous agents are more effective and efficient than chloral hydrate for sedating children for MRI but their use is associated with a greater incidence of adverse events. Physicians who provide sedation to pediatric patients undergoing MRI should ensure magnetic-compatible monitoring and resuscitation equipment in the area of imaging.

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GRANT ACKNOWLEDGMENT. not applicable.

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DELIRIUM ON A TERTIARY ICU USING CONFUSION ASSESSMENT METHOD (CAM) AND THE RICHMOND AGITATION SCORING SYSTEM: A FEASIBILITY STUDY

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INTRODUCTION. Intensive Care patients have an estimated tenfold increased risk for the development of delirium in comparison to the in-patient hospital population; in these patients, delirium is an independent predictor of increased mortality and hospital stay, and increased cost of treatment.

OBJECTIVES. This audit aims to determine the point prevalence of delirium on an ICU, the practical ease of using bed side tests to diagnose the condition and reviews local contributing factors.

METHODS. Patients on a 24 bed intensive care unit were each assessed thrice daily using the CAM-ITU assessment tool over a 2-week period. The assessor documented the results on 475 separate assessments made during this period.

RESULTS. Data analysis suggests that 13% of assessments were positive for detecting delirium, whilst 58% were negative for detecting delirium. A further 29% of episodes could not be assessed. The majority of "CAM unable to assess" episodes were due to sedation scores of RASS-4 (97 separate assessments—20.4% of the total). A greater majority of patients experience episodes of hypo-active delirium than hyper-active delirium.

The total number of patients included in the study was 37; the average length of stay was 11.5 days. 24% of these patients experienced delirium at a point in their ICU admission, though only 3 (8.1%) of these experienced delirium for a prolonged length of time (on 3 separate days). Half of all patients experiencing delirium had received an iv infusion of sedation within 12 h, and half of patients experiencing delirium received anti-psychotic medications on that same day.

The most widely used antipsychotics was chlorpromazine (24 episodes of use), clonidine (11) and haloperidol (6).

CONCLUSIONS. CAM-ICU is a useful and easy way to screen for delirium. It should be introduced on all ICU's in the trust. Education for medical and nursing staff to detect (hypo-active) delirium is essential. Restriction of contributing factors such as sedation and opiods in the elderly and other high risk groups.

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EVALUATION OF DEXMEDETOMIDINE FOR LONG-TERM SEDATION IN CRITICAL CARE

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INTRODUCTION. Dexmedetomidine (Dex) is a selective α_2-adrenergic agonist. Dex was approved for short-term ICU sedation for up to 24 h in 2000 in the US and in 2004 in Japan. In August 2010 Dex was first approved for long-term infusion in Japan. Although Dex has many advantages compared with benzodiazepines or propofol, i.e., high quality sedation without delirium, minimal respiratory depression and opioid-sparing effect, there are few reports regarding acute tolerance, withdrawal phenomena or other side effects related to long-term infusion. We evaluated the clinical features of Dex when it was administered for more than 7 days.

METHODS. We retrospectively investigated 35 patients who were sedated with Dex for more than 7 days in the Intensive Care Unit of Hamamatsu University Hospital. Every patient suffered from severe sepsis following burn, trauma, pneumonia or highly invasive surgery. Dex was infused up to 1.0 μg/kg/h to achieve Richmond Agitation Sedation Scale (RASS) between 0 and −3. Fentanyl or propofol was additionally infused when analgesia or hypnosis was not sufficient with Dex alone. Other sedatives (haloperidol or midazolam) or analgesics (remifentanil) were administered depending on the clinical requirements.

In order to evaluate the appearance of acute tolerance, the maximum Dex infusion rate and requirement of fentanyl or propofol were compared on the 1st, 4th, 7th, 10th and 14th days. Agitation (RASS ≥2), hypertension (increment MAP ≥40 mmHg) or tachycardia (increment HR ≥50 bpm) that appeared within 6 h following discontinuation of Dex was considered a withdrawal symptom. Appearance of bradycardia (HR <50 bpm), hypotension (MBP <50 mmHg), atrio-ventricular block or coronary vasospasm during Dex infusion were recorded as possible side effects. Data regarding acute tolerance were analysed using ANOVA with Scheffé's test. $P < 0.05$ was considered statistically significant.

RESULTS. Median (minimum–maximum) Dex infusion days were 11 (7–78). Twenty-two and 14 of patients were administered Dex for more than 10 and 14 days, respectively. Dex infusion rate and requirement of fentanyl or propofol were not different on the 1st, 4th, 7th, 10th and 14th days. We did not observe any withdrawal symptoms (agitation, hypertension and tachycardia) in any of the patients. Although coronary vasospasm was not observed, two post cardiac surgery patients showed second-degree atrio-ventricular block that required artificial pacing on the first day. Although 10 events of bradycardia and 9 hypotension events were observed, all events were treated successfully by dopamine or norepinephrine infusion, or artificial pacing, and the incidence of events was not increased with the duration of Dex infusion.

CONCLUSIONS. Long-term Dex infusion did not show acute tolerance or withdrawal symptoms, and did not increase the incidence of cardiovascular side effects. Dex revealed has potential to be the primary sedative in critical care.

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SHOULD BENZODIAZEPINE SEDATION FOR CRITICALLY ILL PATIENTS BE DELIVERED BY INFUSION OR BOLUS? A SYSTEMATIC REVIEW

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INTRODUCTION. Sedation is one of the most fundamental interventions performed on ICU. The majority of units in the UK still use benzodiazepines for long-term sedation [1]. Conventionally, this is delivered by continuous infusion as it provides cardiovascular stability and is more convenient. However, continuous infusion is associated with accumulation, over-sedation and its associated complications.

Intermittent injection risks under-sedation associated with pain, anxiety, ventilator dysynchrony, hypertension, tachycardia increased risk of removal of invasive and unplanned extubation requiring re-intubation.

OBJECTIVES. Review of evidence on benzodiazepine sedation delivered by infusion compared to bolus.

METHODS. Medline search (1988–2010) for papers comparing sedation by infusion compared to bolus using relevant outcome measures.

RESULTS. There were no papers that directly compared the same drug given by continuous infusion and bolus.

3 RCTs studied: lorazepam bolus versus midazolam infusion [2], diazepam bolus versus midazolam infusion [3], analgesia only vs. infusion of many sedatives [4]. One paper was an observational study [5] and studied a variety of drugs.

Ref [2] demonstrated decreased Mechanical Ventilation (MV) (148 vs. 79 h) and Length of ICU Stay (LOS) (9.6 vs. 7.2 days) in bolus sedated patients ($p \leq 0.001$) similar to RCT [4] which showed increased MV-free time in patients receiving solely analgesia ($p = 0.0191$). In Ref [3] the intermittent Diazepam group spent more hours under-sedated (12 vs. 0 h; $p = 0.01$) but there was no difference in time to sedation target or time spent over-sedated. In Ref [5], patients receiving continuous sedation had increased duration MV (148 h vs. 79 h; $p \leq 0.001$) and left ICU and hospital later, (9.6 vs. 7.2 days and 19.4 vs. 13.8 days, $p = 0.001$). There was no difference in mortality in any study but numbers are small. An increase in delirium was seen in patients receiving analgesia alone [4].

CONCLUSIONS. More well conducted trials are required to improve assess whether benzodiazepine sedation should be delivered by bolus or infusion. Current data may suggest that bolus has advantages over infusion but adverse effects may limit its usefulness.

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IMPROVEMENTS IN SEDATION PRACTICE WITH 24 HOUR INTENSIVIST LED CRITICAL CARE: SEDATION PRACTICE FOLLOWING THE MERGER OF A GENERAL AND A CARDIAC INTENSIVE CARE

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INTRODUCTION. Glenfield General Hospital had two Intensive Care Units; a General and a Cardiac Unit. The Cardiac Unit did not have 24 h Intensivist cover. Patient care was surgically led. As part of a planned reconfiguration the units merged, providing 24 h Intensivist led care. Sedation practice in the cardiac unit was thought to not meet hospital guidelines. An audit examined sedation practice before and after the merger.

OBJECTIVES. To evaluate compliance with recommendations from the Society for Critical Care Medicine[1], the Surviving Sepsis Campaign[2] and the United Kingdom Department of Health[3]. Specifically: Identify mode of sedation and appropriateness of agents Examine sedation score recording Evaluate depth of sedation Adherence with daily sedation holds Examine the sedation score at which sedation is restarted

METHODS. Data was collected premerger (22/6/9–5/7/9) and post merger (6/9/10–19/9/10) daily for patients sedated >24 h. The delivery mode, sedative agent, duration of usage, sedation score and documentation/compliance with sedation holds was recorded.

RESULTS.

Results summary table

	Cardiac ICU premerger	General ICU premerger	Combined unit post merger
Total number of patients	10	6	10
Patient episodes	49	10	42
Sedation as continuous infusion (%)	100	100	100
Sedative: propofol, midazolam, Ongoing hold	21, 15, 13	5, 5, 0	29, 13, 0
Sedation score documented (%)	82	90	100
Mean sedation score	−5	−1	−3
Sedation hold (%)	37	50	38
Reason for non-compliance documented (%)	8	40	96
Sedation score recorded on restarting sedation (%)	66	80	100

CONCLUSIONS. Premerger data showed areas of non-compliance in the Cardiac unit, while patient numbers in the General unit were too low to draw conclusions. Areas of weakness were the long-term sedative choice, recording of sedation score and depth of sedation. There was poor compliance with the conduct and documentation of sedation holds. After the merger performance improved. Documentation of sedation score and holds was markedly better. Depth of sedation improved, but should be optimised. Sedation hold compliance may appear to remain an issue. However, there was a documented reason a hold was not appropriate in most cases. Intensivist led care has improved sedative practice. Further improvements are needed.

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DELIRIUM IN INTENSIVE CARE UNIT IN A DISTRICT GENERAL HOSPITAL; KNOWLEDGE AND ATTITUDE

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INTRODUCTION. Delirium is commonly encountered (incidence of 15–80%) [1, 2] in critically ill patients. It is an independent predictor of mortality at 6 months and is associated with a longer Intensive Care Unit (ICU) length of stay in ventilated patients [2]. There is an increased pre-disposition to neuro-psychological impairment following discharge from ICU.

OBJECTIVES. This study assesses the recognition and management of delirium in an ICU, in order to provide targeted education.

METHODS. A structured questionnaire based on the UK Clinical Pharmacy Association guidance [3], was administered to Intensive care professionals (n = 45; Doctors 31%, nurses 69%) working in this district general hospital ICU.

RESULTS. Seventy three percent respondents rated their knowledge of delirium as average. 49% were aware of a delirium scoring system (CAM-ICU 36%, Intensive care delirium screening check list 9%, Delirium detection score 4%).

The following were identified as indicators of delirium: agitation (93%), paranoia (80%), withdrawn (53%), disorientation (91%) and inattention (60%). Pre-disposing factors to delirium were identified as alcohol (100%), hypoxaemia (91%), metabolic causes (93%), drug interactions (84%) and cerebro-vascular disease (89%). The summary of responses for the drugs thought to cause delirium is shown in Table 1.

Table 1

Drug	Responses indicating that the drug causes delirium (n = 45) (%)
Opiates	93
Benzodiazepines	80
Amitriptyline	47
Steroids	36
Furosemide	22
Phenytoin	22
Beta Blockers	16

93% felt it was important to identify and treat organic causes and 89% felt it was important to involve family and carers in patient care. 58% of the respondents would use haloperidol as first line drug for the treatment of delirium and 40% benzodiazepines.

CONCLUSIONS. Although the majority of pre disposing factors were recognised, the recognition of hypoactive delirium was decreased as compared to hyperactive delirium. The regular use of standardized delirium scoring systems needs to be encouraged amongst staff in an ICU. Targeted educational sessions have been arranged for all staff dealing with critically ill patients.

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CLINICAL IMPORTANCE EARLY POSTOPERATIVE COGNITIVE DYSFUNTION (POCD) AFTER MAJOR ABDOMINAL AND ORTHOPEDIC OPERATIONS

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INTRODUCTION. Postoperative cognitive dysfunction with different frequency occurs in patients of all ages. Risk factors for POCD are: advanced age, preexisting dementia and depression, consuming alcohol, type and emergency operation, type of anaesthesia, anticholinergic drugs and others.

OBJECTIVES. Aim of study was to determine the frequency, predictive factors and clinical significance early postoperative cognitive dysfuntion (POCD) after major abdominal operations in general endotracheal anaesthesia and major orthopedic operations in spinal anaesthesia, in different age categories of patients.

METHODS. A prospective study included 40 patients who underwent major abdominal and orthopedic operations. They were divided into two groups. First group of 20 patients was operated in OET anaesthesia (O group) due major abdominal operations (esofagectomy, gastrectomy, pancreatectomy, pancolectomy, hepatectomy). Second group was operated in spinal anaesthesia (S group) due major orthopedic and reconstructive operative intervention (implantaio total hip and knee protesis, reposition and osteosynthesis complicated fracture). Cognitive function was examined 24 h before and during the 6–8 h, 66–72 h after surgery on the basis of Abbreviated Mental Test Score—AMTS and Mini Mental State Examination—MMSE score. AMTS < 7 and MMSE < 23 indicates early POCD.

RESULTS. Median age in O group was 67 years (56–80) and in the second S 76 years (69–86). The average duration of surgery in the first group was 4.5 h and in another 4 h. Frequency early POCD was higher in O group. AMTS < 7 and MMSE < 23 was found in 10 patients (50%) 6 h after OET and in 4 patients after 72 h. Occurence of POCD is significant if the maintenance of anesthesia using sevoflurane. In S group significant cognitive deficits on the day of surgery was found in 7/20 patients and after 72 h in 5/20. The average age of the patient with cognitive disfunction after surgery, from both groups is 71 years (70–86). Significantly greater blood loss was observed in patients with POCD in both groups.

CONCLUSIONS. Early POCD after major abdominal and orthopedic operations is a significant clinical phenomenon. Age over 60 g. is an important predictive factor for POCD. Major abdominal operations associated with fluctuations in hemodynamic and large displacements of circulatory volume due to blood loss were also statistically significant causes of POCD. General anaesthesia represents a statistically significant predictive factor for POCD in relation to spinal anesthesia. Major abdominal operations are significant predictive factor for POCD.

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INCIDENCE AND RISK FACTORS OF DELIRIUM IN CRITICALLY ILL PATIENTS AFTER MAJOR ABDOMINAL SURGERY

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INTRODUCTION. During recent decades, success of the surgical treatment is defined not only by the absence of postoperative complications and mortality rates, but also by the quality of life of a patient after surgery. Delirium is a common and deleterious complication in critically ill patients after surgery.

OBJECTIVES. The purpose of this study was to determine the incidence, risk factors and outcomes of delirium in critically ill patients after major abdominal surgery.

METHODS. All patients ($n = 80$) undergoing major abdominal surgery from January 2010 to January 2011 were investigated prospectively. The diagnosis of delirium was made based on the Diagnosis and Statistical Manual of Mental Disorders. The patients were grouped into two according to the presence (group I) or absence (group II) of delirium. Data on pre-, per- and postoperative factors, and the adverse outcomes were analysed.

RESULTS. 32 patients (40%) developed delirium. The patients who developed delirium were older (68 $\pm$ 17 vs. 60 $\pm$ 15 years, $p = 0.05$), had a longer operation time (5 $\pm$ 1 vs 4 $\pm$ 2 h, $p = 0.015$) and hospital stay (11 $\pm$ 9 vs .7 $\pm$ 5 days, $p = 0.019$). The morbidity and mortality rates were not significantly different between the groups (77 vs. 46%; 10 vs. 1%, respectively). The causative factors in the development of delirium were older age, longer operation time, abnormal serum chemistry values of sodium, potassium, calcium and glucose, hypoalbuminaemia, the presence of the postoperative respiratory distress and infection and blood transfusion ($p < 0.05$).

CONCLUSIONS. Delirium is associated with adverse outcomes including a longer hospital stay, and increased morbidity and mortality rates. The identification, detection and elimination of these risk factors are recommended.

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EFFICACY AND SAFETY OF INTRAVENOUS MIDAZOLAM AS CONTINUOUS SEDATION IN MECHANICAL VENTILATED PATIENTS AFTER LIVER TRANSPLANTATION

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INTRODUCTION. Liver transplantation as a major operation may incur instability of respiratory system and circulation system. Sedation may worsen the unstable status. There are few studies about efficacy and safety of Intravenous Midazolam as continuous sedation in mechanical ventilated patients after liver transplantation.

OBJECTIVES. To evaluate the effect and safety of midazolam for sedation in ventilation patients after liver transplantation.

METHODS. 42 cases were admitted and infused by continuous midazolam (first 0.1 mg/kg, then 0.05–0.15 mg/kg/h maintaining). To observe the change of Ramsay score, blood pressure, pulse, SpO_2, breath frequency, and airway pressure, plateau pressure, peak pressure.

RESULTS. All cases get a excellent sedation level after midazolam infusion (Ramsay score 3–5), breath rate decreased to 20.5 $\pm$ 5.2 breath/min compared with 27.6 $\pm$ 9.2 breath/min before ($P < 0.01$). MAP decreased 6.5 $\pm$ 2.3 mmHg compared with baseline after 1 min, but soon rised up to baseline, CO and CI had no difference. Plateau pressure, peak pressure decreased significantly compared with baseline ($p < 0.01$).

CONCLUSIONS. Continuous midazolam infusion have an good effect for long-term sedation in ventilation patients with liver transplantation. Also can be good to coordination between patients and mechanical ventilation.

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RISKY ALCOHOL INTAKE DIFFICULT SEDATION IN MECHANICALLY VENTILATED PATIENTS. EXPERIENCE OF 8 SPANISH INTENSIVE CARE UNITS (ICUS)

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OBJECTIVES. To evaluate the effect of previous history of risky alcohol intake (RAI), illegal (IPI) or prescribed (PPI) psychotropic intake on ICU sedation and outcome of mechanically ventilated (MV) patients.

METHODS. All patients consecutively admitted in 8 spanish ICUs from 15 November to 15 December 2007 were prospectively followed until death or ICU discharge. Demographic data and previous history of RAI, tobacco, IPI, PPI were recorded at admission. Type, duration and complications of sedo-analgesia procedures as well as outcome variables were recorded in all patients receiving MV >24 h. Statistical significance level $p < 0.05$.

RESULTS. A total of 119 (25.2%) patients (82 males; age 57.0 $\pm$ 17.9 years; APACHEII 18.8 $\pm$ 7.2) were admitted due to medical (53.8%) surgical (34.4%) and trauma (11.8%) cause and received MV >24 h. Thirty-three (27.7%), 30 (25.2%), 18(15.1%) and 9 (7.6%) of them had history of RAI, tobacco, IPI and PPI respectively. ICU length-of-stay (LOS) was 13.1 $\pm$ 11.6 days and 33 patients died (27.7%). Patients received MV a median of 138; 25–75% IQR:221 h (69.7% MV >72 h; $n = 83$) and sedation time (ST) was 83.0; 25–75% IQR: 157 h (60.5% ST >72; $n = 72$). Midazolam ($n = 56$; 77.8%) and Morphine ($n = 46$; 63.9%) were the preferred agents for ST >72 h ($p < 0.05$) and Propofol ($n = 30$; 63.8%) was most used for ST < 72 h. Double sedation (56.7% vs. 28.1%), Sedation failure (40% vs. 5.6%) and deprivation (46.7% vs. 11.2%) was most frequent in RAI patients than in no-RAI patients ($p < 0.01$). RAI patients had also longer sedation ($p < 0.002$), MV ($p < 0.001$) and ICU-LOS ($p < 0.02$) times. Multivariate analysis identified RAI, IPI and ST >72 h as independent risk factors for sedation failure and deprivation.

CONCLUSIONS. Previous history of alcohol abuse difficult sedation in MV patients making necessary the use of more aggressive sedation strategies.

Critical reflections on cardiac output assessment: 1097–1109

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HAEMODYNAMIC EFFECTS OF A RECRUITMENT MANEUVER IN PATIENTS WITH DIASTOLIC DYSFUNCTION

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INTRODUCTION. Left ventricular (LV) diastolic dysfunction (DD) is related to alterations of myocardial diastolic properties involving both relaxation and filling which can precede alterations of LV systolic function. In ICU DD may be often under diagnosed and cause unexpected consequences especially during rapid changes of haemodynamic conditions.

OBJECTIVES. Aim of this preliminary observational study is to assess the impact of a lung recruitment maneuver (RM) in patients affected by DD.

MATERIALS AND METHODS. 11 patients mechanically ventilated for ARDS were enrolled. Inclusion criteria were: age >18-year old; absence of systolic dysfunction (EF >55%) and valvular abnormalities; MAP >60 mmHg with minimum hemodynamic support (norepinephrine £ 0.1 mcg/kg/min); absence of ICH, pneumothorax, massive emphysema, right ventricular failure, and arrhythmias. Pulsed-wave (PW) Doppler has been performed in the apical 4-chamber view to obtain mitral inflow velocities and to evaluate peak early filling (E-wave), late diastolic filling (A-wave) velocities, the E/A ratio and the deceleration time (DT). After echocardiography evaluation a RM was performed (40 cm H_2O airway pressure for 30 s). Most Care system (PRAM method) was used to monitor hemodynamic parameters (HR, MBP, CO, SVR, dp/dt) at T0 (before starting RM) and at the end of the RM T30. A beat-to-beat analysis was performed to evaluate hemodynamic variations occurring during the whole RM. Patients have been divided into two groups according to the presence/absence of DD. ANCOVA method, combining variance analysis and linear regression, has been used to evaluate all data variations in time, and to compare their trends in the two groups. A $p < 0.05$ has been considered significant.

RESULTS. Group 1 (no DD, n = 5) was basally characterized by: age mean 56.8-year old (range 45–65); E/A ratio 1.3 (1.13–1.65); DT <240 ms; CO 4.6 l/min, HR 65 b/m, MAP 80 mmHg, SVR 1,299, dp/dt 0.68; Group 2 (DD, n = 6): age 81-year old (77–87); E/A ratio 0.71 (0.51–0.79); DT >240 ms; CO 4.7 l/min; HR 67 b/m; MAP 78 mmHg, SVR 1252, dp/dt 1.09. During the RM CO decreased significantly in Group 2 at 15" (4.7 l/min to 3.5 l/min; $p = 0.001$) losing its significance at 30" (4.15 l/min), while in Group 1 we observe an increased CO at 30" (4.9 l/min; $p = 0.019$). MAP significantly decreased at 15" in both groups (80–74 mmHg and 78–68 mmHg, in group 1 and 2, respectively) restoring basal levels at 30" (78 and 75 mmHg, respectively). SV decreased quite significantly in group 2 at 15" (70–56 ml, $p = 0.056$), as dp/dt (1.09–0.8), restoring basal level at 30". No significant changes in SVR were observed.

CONCLUSIONS. Generally RM caused significant but usually transient haemodynamic parameters alterations, which are increased in presence of DD, especially during the first 15". DD is common in elderly patients and has to be known just to prevent unexpected consequences in performing important ICU practices.

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EFFECTS OF NOREPINEPHRINE-DRIVEN CHANGE IN ARTERIAL BLOOD PRESSURE ON FOUR DIFFERENT CONTINUOUS CARDIAC OUTPUT SYSTEMS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Pharmacological alterations of the arterial blood pressure waveform (ABPW) can affect arterial pressure-based cardiac output systems (APCOs) independently of stroke volume. We assessed the: 1) effect of the increase in ABP during a norepinephrine 'double-pump' manoeuvre (NEDP) on APCOs and trans-pulmonary thermo-dilution (TPTDCO); 2) agreement between TPTDCO and four APCOs (PiCCO, LiDCO, PRAM, Vigileo v03.02.pic).

METHODS. TPTDCO was performed in fifteen ICU patients before, during and after NEDP. The same ABPW, was used by each APCOs to calculate CCO.

RESULTS. During NEDP, TPTDCO did not change significantly from baseline [median %(IQR)], [4.5%(−0.9 to 13.4)].

Only Vigileo demonstrated a significant increase in CCO, [17.4% (6.7–34.0)]; $p < 0.001$.

Bland–Altmann analysis (TPTDCO-CCO) during NEDP showed a [bias (L/min), limits of agreement (LOA)] of [0.3 (−2.8 to +2.2)] for LiDCO; [0.3 (−2.9 to +3.6)] for PiCCO; [−0.3 (−5.3 to +4.8)] for PRAM; 0.4 (−2.3 to +3.2) for Vigileo.

The percentage error was unacceptable for all systems: (35.1% LiDCO, 42.7% PiCCO, 75.4% PRAM, 37.7% Vigileo).

Only PiCCO and LiDCO had low PE at baseline (16.3 and 14.5%, respectively) compared to PRAM (97.2%) and Vigileo (57.4%).

CONCLUSIONS. ABPCOs fail to track TPTDCO during NEDP. This suggests that uncalibrated systems are unreliable during changes in vascular tone and reactivity and that calibrated systems need to be re-calibrated with significant changes in tone.

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EFFECT OF PERIPHERAL VS. CENTRAL ARTERIAL LOCATIONS ON COSTATUS MEASURED CARDIAC OUTPUT AND BLOOD VOLUMES

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INTRODUCTION. Novel COstatus system (Transonic Systems Inc, NY, USA) allows for routine measurement of cardiac output (CO) and blood volumes (BVs) using an extracorporeal AV loop connected between the in situ arterial and central venous catheters in the ICU patients. It is based on ultrasound dilution technology and uses isotonic saline as an indicator. COstatus measured BVs include: TEDVI (blood volume in the heart chambers); and CBVI (blood volume in heart, lungs and large vessels) [1].

OBJECTIVES. To investigate the effect of peripheral (radial) versus central (femoral with tip possibly in iliac artery) arterial sampling site on COstatus measurements.

METHODS. Thirty-two adult ICU patients (75 ± 12.8 kg) with sepsis were studied per the approved protocol. All patients had a central venous catheter and catheters inserted in femoral and radial arteries. Femoral arterial catheter was 20 cm long with the tip possibly in the iliac artery.

First measurements were performed when blood was withdrawn from the femoral arterial catheter (20 cm). Then AV loop was reconnected to radial arterial catheter. The procedure of reconnection took 10–15 min. Blood was circulated through the AV loop at 10–12 ml/min from the artery to the vein for 6–8 min and isotonic saline (30 ml) was injected into venous side of the AV loop for CO status measurements. All measurements that were performed within 20 min were included for statistical analysis without any exclusion.

RESULTS. A total of 86 averaged measurements sets were compared between two arterial locations.

Comparing CO and blood volumes measurements

CO status Measurement	CO (L/min)	TEDV (ml)	CBV (ml)
Femoral catheter (20 cm) (Mean ± SD)	8.6 ± 2.3	760 ± 200	1580 ± 411
Radial catheter (Mean ± SD)	8.3 ± 2.1	740 ± 180	1890 ± 430
Bias	0.28	13	−320
% Error (2SD/Mean)	14.9	25	31

CONCLUSIONS. CO and TEDV showed good agreement considering the fact that no data was eliminated based on hemodynamic conditions. CBV measured from the peripheral arterial catheter is significantly larger than that obtained from the 20 cm femoral arterial catheter due to longer mean transit time of the indicator. Manufactures need to address this issue.

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THE CLINICAL SIGNIFICANCE OF CARDIAC OUTPUT MEASUREMENT IN PATIENTS WITH PERSISTENT SHOCK: PRELIMINARY RESULTS OF A RANDOMIZED TRIAL

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INTRODUCTION. The measurement of cardiac output (CO) by means of different invasive methods has been for long time the corner stone in the haemodynamic monitoring of patients with persistent shock. However, the benefit provided by CO assessment has been challenged by some recent clinical trial showing no advantages in the outcome of critically ill patients associated to the use of invasive methods for cardiovascular monitoring.

OBJECTIVES. The aim of this study was to verify whether CO measurement, in addition to standard cardiovascular monitoring, may improve clinical outcome in patients with persistent non-haemorrhagic shock admitted to intensive care unit (ICU).

METHODS. Patients with persistent shock admitted to an ICU of a University Hospital were assigned randomly to two groups for cardiovascular monitoring: group NORMAL, including the measurements of central venous pressure and haemoglobin O_2 saturation in superior cava and group HIGH, where measurement of cardiac output by means of trans-cardiac or trans-pulmonary thermodilution in addition was added to the previous parameters. Persistent shock was defined as the persistence of a mean arterial pressure (MAP) <65 mmHg associated to a base excess <−5 mM and/or a serum lactate >2.0 mM after an adequate fluid therapy and the use of vasopressors >6 h. Patients with end-stage liver disease, ongoing bleeding, age <18 years and indications for end-of-life treatment were excluded. The clinical protocol for patients haemodynamic management was well defined for the two groups. De-shocking time, defined as the time period from randomization to a MAP >65 mmHg without use of vasopressors for at least 12 h, need of renal replacement therapy (RRT), ICU length of stay (LOS) and mortality were collected in each patients.

RESULTS. Age, gender, SAPS II and type of admission of the 21 patients included in group NORMAL were very similar to those of the 21 patients in group HIGH. De-shocking time in NORMAL group (4.6 ± 4.0 days) was shorter ($p < 0.05$) than in HIGH group (8.0 ± 6.5 days) and, similarly, the need of RRT was lower ($p < 0.05$) in NORMAL (19%) than in HIGH (48%) patients. In NORMAL patients ICU LOS (11 ± 10 days) and mortality (33%) were slightly lower ($p > 0.05$) than in HIGH patients (15 ± 20 days and 48%).

CONCLUSIONS. The above preliminary data indicated that CO measurement, in addition to standard cardiovascular monitoring, does not seem to reduce the duration of the vasopressor, the occurrence of renal failure and the mortality of patients with persistent non-haemorrhagic shock admitted to intensive care unit (ICU).

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PRECISION OF THE TRANSPULMONARY THERMODILUTION MEASUREMENTS

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INTRODUCTION. We wanted to determine the number of cold boluses injections that is necessary for achieving an acceptable level of precision for measuring cardiac index (CI), indexed global end-diastolic volume (GEDVi) and indexed extravascular lung water (EVLWi) by transpulmonary thermodilution.

METHODS. We included 91 hemodynamically stable patients (age 59 [25–75% interquartile range: 39–79] years, SAPSII 57[39–79], 56% under norepinephrine) who were monitored by a PiCCO2 device. We performed five successive cold saline (15 mL, 6°C) injections and recorded the measurements of CI, GEDVi and EVLWi.

RESULTS. Considering the total of 455 measurements, the coefficient of variation (CV, calculated as standard deviation divided by the mean of the five measurements) was 7 [5–11]%, 7 [5–12]% and 7 [6–12]% for CI, GEDVi and EVLWi, respectively. If results of two bolus injections were averaged, the precision ($2 \times CV/\sqrt{}$ number of boluses) was 10[7-15]%, 10[7-17]% and 8[7-14]% for CI, GEDVi and EVLWi, respectively. If results of three bolus injections were averaged, the precision dropped below 10%, i.e. the cut-off that is generally considered as acceptable (8 [6–12]%, 8 [6–14]% and 8 [7–14]% for CI, GEDVi and EVLWi, respectively). If two injections were performed, the least significant change, i.e. the minimal change in value that could be trusted to be significant, was 14 [10–21]%, 14 [10–24]% and 14 [11–23]% for CI, GEDVi and EVLWi, respectively. If three injections were performed, the least significant change was 12 [8–17]%, 12 [8–19]% and 12 [9–19]% for CI, GEDVi and EVLWi, respectively, i.e. below the 15% cut-off that is usually considered as clinically relevant.

CONCLUSIONS. These results support to inject at least three cold boluses for obtaining an acceptable precision when transpulmonary thermodilution is used for measuring CI, GEDVi and EVLWi.

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PRECISION OF CARDIAC OUTPUT MEASUREMENT USING LITHIUM CHLORIDE

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INTRODUCTION. Before monitoring continuous cardiac output (CO) with the LiDCO-plus system, continuous cardiac output must be calibrated with a bolus injection of lithium chloride. The error of measurement with lithium chloride cardiac output measurement is scarcely explored.

OBJECTIVES. We evaluated cardiac output values with lithium calibration in 12 cardio surgical patients before and after a fluid loading procedure with 500 ml Voluven (in 30 min).

METHODS. In twelve sedated, hemodynamically stable cardio surgical patients, three cardiac output calibrations with 0.3 mmol lithium chloride were performed over a period of 15 min. After fluid loading (FL), the lithium bolus cardiac output measurements were repeated. We calculated standard deviation (SD) and coefficient of variation (Cv) of these cardiac output values. Cv is calculated as (SD/CO) and expressed in percentages.

RESULTS. Before fluid loading, the averaged cardiac output was 4.27 ± 0.29 L/min with a coefficient of variation of 7.18 (range 0.41–19.9)%. After a fluid loading step of 500 ml Voluven the averaged cardiac output value was 5.83 ± 0.52 L/min with a coefficient of variation of 8.42 (range 1.56–21.5)%. The coefficient of variation for single lithium cardiac output using all cardiac output measurements was 7.79%. The expected Cv for repeated series of three measurements is 4.2 ($7.18/\sqrt{3}$) and 4.9 ($8.42/\sqrt{3}$)% respectively.

CONCLUSIONS. The average coefficient of variation for single measurements of lithium cardiac output (LiDCO-plus system) was 7.79% (range 7.18–8.42%).

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SHOULD WE USE ONE OR A SERIES OF LITHIUM CALIBRATION MEASUREMENT IN THE CALCULATION OF CARDIAC OUTPUT?

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INTRODUCTION. Before monitoring continuous cardiac output (CO) with LiDCO-plus system, the cardiac output must be calibrated with a bolus injection of lithium chloride. The number of lithium bolus-based cardiac output measurements that is required for calibration is unknown.

OBJECTIVES. We evaluated lithium cardiac output calibration in 12 cardio surgical patients before and after a fluid loading procedure using 500 ml Voluven (in 30 min).

METHODS. In 12 sedated, hemodynamically stable cardio surgical patients, three lithium cardiac output measurements were performed over a period of 15 min. For every measurement a bolus of 0.3 mmol lithium chloride was administered. Before and after fluid loading (FL), the first CO measurement (calibration procedure) and the averaged CO with three bolus measurements were compared using a paired T test.

RESULTS. Before fluid loading, the difference in absolute values of cardiac output between the first measurement with lithium and calculated average of three bolus measurements was 0.28 (range 0.02–0.81) L/min, $p = 0.001$. After fluid loading this calculated difference was 0.47 (range 0.08–1.56) L/min, $p = 0.003$. We did not observe any side effects of this serial calibration procedure.

CONCLUSIONS. In general, when using LiDCO-plus continuous cardiac output measurement, for an adequate value of cardiac output, a series of three bolus cardiac output measurements are necessary for calibration.

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PULMONARY ARTERY CATHETERS (PAC) IN THE ADULT INTENSIVE CARE UNIT (ICU)

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INTRODUCTION. The use of pulmonary artery catheters (PAC) in critically ill patients is controversial. Clinical trials on PAC have not shown any significant benefits in terms of mortality or length of hospital stay [1]. Its use may however be associated with an increased incidence of arrhythmias, infections, thrombotic complications, increased use of inotropes, vasodilators and high ICU cost.

OBJECTIVES. The aim of our audit is to determine the appropriateness of its use and associated complications in our ICU.

METHODS. Our clinical information system (MetaVision, iMDSoft) database was queried. Between January 2007 and August 2010, consecutive patients who had a PAC inserted, were identified. The respective patient's notes were examined to ascertain diagnosis, indications, complications of insertions, number of inotropes before and after PAC, treatment changes made and patient's outcome. The standards were based on the Royal College of Anaesthetist's guidelines on central venous cannulations [2]. Categorical data is expressed as number and percentage. Normally distributed data expressed as median (IQR).

RESULTS. There were 81 PAC insertions identified. The median age of patients was 69 (IQR 19). Sixty six percent ($n = 51$) of patients had PACs inserted for septic shock. Sixty-four percent ($n = 52$) of PACs were inserted within 24 h of admission signifying an early intervention. Eighty-four percent ($n = 68$) of patients had some form of change made to their treatment such as addition and/or titration of inotropes, fluid challenges following the initial PAC recordings. No complications occurred in 88% ($n = 71$) of patients. Difficulty in floating and arrhythmias occurred in 1% of patients respectively. PACs were removed in 85% ($n = 69$) of patients within 3 days of insertion. Sixty percent ($n = 48$) of patients did not survive to 28 days, although mortality could not be directly attributed to the use of PACs.

CONCLUSIONS. The use of PACs in our ICU does not seem to be associated with any serious complications. It is however imperative to say that 15% ($n = 12$) had it in situ for more than 3 days and the maximum length of time before catheter removal was 9 days. It has been recommended that all catheters should be removed within 3 days. Given the current available evidence, although PAC is the gold standard cardiac output monitor, its use should be considered on an individual case by case basis. There is growing competition from non-invasive cardiac output monitoring such as PICCO and oesophageal doppler with equivalent benefits and this maybe considered before PAC.

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FEMORAL ACCESS FOR TRANSPULMONARY THERMODILUTION: A PROSPECTIVE RE-EVALUATION OF CORRECTION-FORMULAS FOR GEDI, CI AND ELWI

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INTRODUCTION. The usefulness of transpulmonary thermodilution (TPTD) for measurement of cardiac index (CI), global end-diastolic volume index (GEDVI) and extra-vascular lung water index (EVLWI) has been demonstrated in a number of studies. Usually TPTD is performed by indicator injection via the jugular or subclavian vein. If superior vena cava access is not feasible, *femoral* access can be used for TPTD. However, a recent study demonstrated significant overestimation particularly of GEDI and—to a lower extent—of CI and ELWI due to the additional volume of V. cava inferior participating in the indicator dilution in case of femoral injection. This study provided correction formulas for GEDIfem, ELWIfem and CIfem based on data from 48 TPTDs in 24 patients [1]. To the best of our knowledge, these findings have not been re-evaluated.

OBJECTIVES. Therefore, it was the aim of our study to compare GEDI, CI and CI derived from TPTD via femoral access and their corrected values derived from the correction formulas to GEDI, CI and ELWI derived from jugular injection in 36 pairs of triplicate TPTD measurements in 16 patients equipped with both femoral and jugular venous access due to dialysis catheters (V. fem. 11; V. iug. 4) in addition to CVC.

METHODS. Subsequent measurement of TPTD-derived GEDI, CI and ELWI derived from indicator-bolus infection via V. iug and V. fem.

RESULTS. Patients characteristics: 5 female, 11 male, age 61 ± 14 years.
$GEDI_{fem}$ and $GEDI_{jug}$ were significantly correlated ($p < 0.001$; $r = 0.83$), but significant different (1083 ± 224 vs. 855 ± 150 ml/sqm; $p < 0.001$). Bland-Altman analysis demonstrated a bias of 228 ± 130 ml/sqm (limits of agreement: −25 and +481 mL/m^2; percentage error 26%) which was significantly ($p = 0.036$) reduced by applying the above-mentioned correction formula to −28 ± 68 ml/sqm (limits of agreement: −105 and +201 mL/m^2; $GEDI_{fem\text{-}corrected}$ 832 ± 129 ml/sqm, percentage error 26%). Similarly CI_{fem} (4.67 ± 1.37 L/min sqm) was significantly higher than CI_{jug} (4.38 ± 1.31 L/min sqm; $p < 0.001$). By contrast $CI_{femcorrected}$ (4.31 ± 1.3 L/min sqm) derived from the correction formula was not different ($p = 0.655$) to CI_{jug}. $ELWI_{fem}$ (12.5 ± 4.5 ml/kg) was slightly higher than $ELWI_{fem\text{-}corrected}$ (11.5 ± 3.9 ml/kg; $p < 0.001$) and $ELWI_{jug}$ (11.8 ± 3.9 ml/kg; $p = 0.057$).

CONCLUSIONS. Our data confirm that TPTD using femoral venous access results in marked overestimation of GEDI compared to $GEDI_{jug}$ which can significantly reduced by the correction formula provided by Saugel et al.. This also applies—to a minor extent—for CIfem and ELWIfem.

REFERENCE. (1) Saugel, Huber et al., Crit Care. 2010;14:R95.

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MARKERS OF ANAEROBIC METABOLISM ARE BETTER THAN CENTRAL VENOUS OXYGEN SATURATION FOR DETECTING WHETHER HEMODYNAMIC RESUSCITATION WILL REDUCE TISSUE HYPOXIA

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INTRODUCTION. The goal of increasing cardiac output in circulatory failure is to reduce tissue hypoxia, what occurs if oxygen consumption (VO_2) increases in response to an increase in oxygen delivery (DO_2). We compared the ability of central venous oxygen saturation ($ScvO_2$) and markers of global anaerobic metabolism to predict whether a fluid-induced increase in DO_2 results in an increase in VO_2.

METHODS. In fifty-one patients (62 ± 15-year old, SAPSII = 64 ± 18, mean arterial pressure = 64 ± 22 mmHg, 86% receiving norepinephrine) with an acute circulatory failure (82% from septic origin), we measured cardiac index, O_2- and CO_2-derived variables and lactate before and after a 500 mL saline volume expansion.

RESULTS. Volume expansion increased cardiac index ≥15% in 49% of patients. DO_2 significantly increased (+32 ± 16%) in these patients. In 56% of the patients of these "fluid-responders", an increase in $VO_2 \geq 15\%$ occurred (+38 ± 28%, "VO_2 responders") while in the remaining ones ("VO_2 non responders"), VO_2 did not change significantly. Compared to VO_2 non responders, VO_2 responders were characterized by a significantly higher baseline $ScvO_2$ (70 ± 15 vs. 64 ± 4%, respectively) and a higher lactate (5.5 ± 4.0 vs. 2.0 ± 0.6 mmol/L, respectively). The ratio of the veno-arterial carbon dioxide tension difference ($P(v\text{-}a)CO_2$) over the arterio-venous oxygen content difference ($C(a\text{-}v)O_2$) was significantly correlated with lactate at baseline ($r = 0.56$). The $P(v\text{-}a)CO_2/C(a\text{-}v)O_2$ ratio significantly decreased only in VO_2 responders after volume expansion. An increase of $VO_2 \geq 15\%$ in response to the increase in DO_2 was not predicted by $ScvO_2$ at baseline but by a high baseline lactate and a high $P(v\text{-}a)CO_2/C(a\text{-}v)O_2$ ratio (areas under the ROC curves: 0.680 ± 0.11, 0.940 ± 0.05 and 0.910 ± 0.06, respectively).

CONCLUSIONS. $ScvO_2$ did not allow detecting whether an increase in DO_2 resulted in a beneficial improvement in VO_2. By contrast, markers of anaerobic metabolism such as lactate and the $P(v\text{-}a)CO_2/C(a\text{-}v)O_2$ ratio, predicted the fluid-induced improvement in VO_2 with reliability. This suggests that the latter indicators should be considered instead of $ScvO_2$ for starting hemodynamic resuscitation.

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COMPARISON OF TWO ALGORITHMS OF HEMODYNAMIC MANAGEMENT IN SEPTIC SHOCK

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INTRODUCTION. Since several mechanisms may contribute to circulatory failure in septic shock, hemodynamic assessment and monitoring is key to guide acute therapy. Recommendations have been published as part of the Surviving Sepsis Campaign (SSC) which proposed the following therapeutic algorithm: fluid administration if central venous pressure (CVP) <12 mmHg, then norepinephrine administration if mean arterial pressure (MAP) remains <65 mmHg and finally dobutamine infusion if the MAP remains low and superior vena cava venous oxygen saturation (ScvO2) is <70% in the absence of anemia. The aim of our study was to compare the SSC recommendations to our strategy based on hemodynamic assessment using transesophageal echocardiography (TEE).

METHODS. The study was conducted between October 2009 and June 30, 2010 in 2 intensive care units (ICU). Patients with septic shock were included if mechanically ventilated and no contra-indication to TEE examination. Hemodynamic management was guided by information obtained by the on-line interpretation of TEE examination performed 3–6 h after ICU admission. Hypovolemia was defined as a collapsibility index of the superior vena cava (ΔSVC) >36%, left ventricular systolic dysfunction as a fractional area change (LVFAC) <45% and vasoplegia was diagnosed in the absence of these two situations. The investigators who performed TEE had no access to the values of CVP and $ScVO_2$ which were obtained by a nurse. The Cohen's Kappa test (κ) was used to assess the diagnostic agreement between the algorithm based on TEE examination and that derived from the SSC.

RESULTS. During the study period, 47 patients were included (mean age: 65 ± 12 years; male: 30; SOFA: 9 ± 3; SAPSII: 55 ± 17). Overall mortality in ICU was 32%. Hypovolemia was identified during TEE examination in 8 patients (17%) (ΔSVC 41 ± 6% vs. 13 ± 4% after blood volume expansion, $p < 0.05$), whereas CVP was <12 mmHg in 22 patients (K: 0.30; CI [0.19–0.80]). Left ventricular dysfunction was depicted by TEE in 14 patients (30%) (LVFAC 21 ± 8% versus 43 ± 9% after dobutamine, $p < 0.01$), but only 4 of these patients had a $ScVO_2$ <70% (K: 0.24; CI [0.17–0.64]).

CONCLUSIONS. This study confirms the discrepancies observed between TEE-guided hemodynamic management and standard recommendations of the SSC, especially for the diagnosis of hypovolemia and LV systolic dysfunction at the acute phase of septic shock.

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CO_2 VENOARTERIAL DIFFERENCE HAVE RELATION WITH CARDIAC OUTPUT BUT NOT WITH HEMOGLOBIN OR OXYGENATION

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INTRODUCTION. Venous O_2 saturation (SvO_2) has been used to guide the resuscitation of critically ill patients, especially early stage. When SvO_2 is decreased it is likely that the patient is hemodynamically unstable. The clinician must differentiate when SvO_2 is decreased by a cardiac output, hemoglobin or oxygenation. Venoarterial CO_2 difference ($DvaCO_2$) could identify patients whose venous saturation is low due to low cardiac output, regardless of hemoglobin levels and oxygenation.

OBJECTIVES. Correlate Dva CO_2 between cardiac output, hemoglobin, oxygen saturation arterial and venous.

METHODS. Using the formula of Niviere [1] was calculated venoarterial CO_2 difference. Cardiac output was measured by Vigilance system Edwards catheter. The measuring of hemoglobin, arterial and venous oxygen saturation by GEM 4000 CO-oximeter. Correlation between $DvaCO_2$, cardiac output, arterial and venous oxygen saturation and hemoglobin by Pearson test.

RESULTS. Measurements Were Performed in 73 Patients with diverse disease (postoperative revascularization, valvular and septic shock). The Pearson correlation between venoarterial CO_2 difference and venous O_2 saturation ($r = -0.4$, $p > 0.002$ CI −0.59 to −0.21) shows that venoarterial difference does not correlate between the levels of hemoglobin ($r = 0.14$, $p = 0.2$, confidence interval (CI) −0.087 to 0.30), or blood arterial and venous saturation oxygen ($r = -0.04$, $p = 0.7$, CI −0.27 to −0.18 and −0.12, $p = 0.31$ CI −0.34 to 0.11, respectively). In the group of SvO_2 low value the venoarterial difference correlated with low cardiac output levels set to <2.5 L/min/m^2 with $r = -0.6$ $p = 0.004$ with a CI of −0.88 to −0.05, in the subgroup of cardiac output >2.5 L/min/m^2 the correlation with venoarterial difference was −0.39 with a $p = 0.018$, CI −0.6 to −0.07.

CONCLUSIONS. In presence of Low SvO_2, venoarterial CO_2 difference could differentiate patients who require optimize hemoglobin, oxygen, or cardiac output. If the venoarterial difference is elevated the most appropriate option would be the use of inotropes, whereas if the difference is low, most correct option would improve hemoglobin and/or oxygenation. This proposal must be analyzed in future studies and stablish the cutpoints for the best accuracy.

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COMPARATIVE EVALUATION OF CARDIAC OUTPUT AND ITS VARIATIONS BY SIX MONITORS IN SURGICAL INTENSIVE CARE UNIT

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INTRODUCTION. Cardiac output (CO) is a key perfusion parameter to guide hemodynamic optimization. Many methods are available ranging from invasive to strictly noninvasive with focuses on pulse contour analysis VIGILEO® Monitor 3rd generation (Edwards Life Sciences) and Mostcare® (Vygon Lab); Doppler techniques: transesophageal Doppler (TODop Deltex®) or supra-sternal Doppler (USCOM®); transthoracic Echo-Doppler (TTE Vivid®), dye clearance: thermodilution by pulmonary arterial catheter (PAC; TOD; Edwards Life Sciences).

OBJECTIVES. To compare five cardiac output techniques to the reference TTE method, which allows accurate measurement of ascending aortic flow section and of velocity time integral of aortic pulsed wave Doppler signal to measure CO.

METHODS. Patients requiring invasive blood pressure and hemodynamic therapeutic intervention were prospectively included in one center study.

TTE aortic diameter was measured in parasternal long axis view at the aortic leaflets and velocity time integral measured using five apical view averaged on five cardiac cycles to obtain CO values. TOD CO was measured only when the PAC insertion was decided by the physician in charge. TODop, USCOM®, Mostcare® and VIGILEO® were performed in all patients. Each value was the average of 5 successive cardiac cycles with 3 consecutive measurements. Each patient could have been measured several times.

RESULTS. 61 patients (61 ± 22 years; sex ratio 30 m/31w; SOFA 8.5 ± 4) were investigated allowing to obtain 555 measurements. Diagnosis: sepsis (n = 31), brain injury (n = 19), and others (n = 11). 8 patients had the six methods (75 measurements), 38 patients had five techniques (271 measurements), 19 patients had four techniques (141 measurements). TTE was possible for 56 patients (5 were non echogenic), USCOM® (44 patients), TODop (48 patients), Vigileo® (59 patients) and Mostcare® (61 patients). The median CO by TTE was 5.14 l/min [4.35–6.23]. CO variations after therapeutic interventions were also recorded with TTE, Mostcare®, Vigileo® and TOD. Concordance rate for CO variation of 0.5 l/min in TTE was 73% with Mostcare®, 70% with TODop and 51% with Vigileo®

The table shows the correlations & Bland & Altman test for CO and its variations.

Linear correlation and Bland and Altman test

Technics	Patients/ measurements	Linear correlation	Bias/ Agreement (2SD)
TTE vs Mostcare	56/469	Mostcare = 1.963 + 0.583 TTE; R = 0.625	0.26/2.2
TTE vs USCOM	34/270	USCOM = 1.484 + 0.785 TTE; R = 0.573	−0.25/3.2
TTE vs Swan	10/72	Swan = 2.11 + 0.841 TTE; R = 0.676	−1.24/3.4
TTE vs TODop	31/259	TODop = −0.046 + 1.029 TTE; R = 0.620	−0.11/3.3
TTE vs Vigileo	40/337	Vigileo = 2.62 + 0.666 TTE; R = 0.435	−0.83/3.8
Δ TTE vs Δ Mostcare	31/37	ΔMostcare = −0.033 + 1.033 Δ TTE; R = 0.758	0.02/0.5
Δ TTE vs Δ TODop	31/37	ΔTODop = 0.146 + 0.6 ΔTTE; R = 0.524	−0.04/1.18
Δ TTE vs Δ vigileo	31/37	ΔVigileo = 0.425 − 0.243 ΔTTE; R = 0.236	0.14/1.78

CONCLUSIONS. The best correlation with ETT CO (slope close to 1, 0 intercept), was obtained with TODop, but with a large agreement. Mostcare had the best correlation with the best agreement for dynamics tests, suggesting a good accuracy.

Tracheostomy: 1110–1122

1110

A SURVEY OF CURRENT AIRWAY PRACTICES ON AUSTRALASIAN INTENSIVE CARE UNITS

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INTRODUCTION. Airway management and the care of indwelling airway devices are key aspects of the safe care of critically ill patients. Recent studies have revealed a worrying incidence of airway related complications in critical care areas and that the affected patients are likely to suffer an adverse outcome [1–2]. Recent guidelines have been published promoting safe care of tracheostomies [3].

OBJECTIVES. To elucidate current practice in airway management and the care of indwelling airway devices in adult intensive care units (ICUs) in Australasia.

METHODS. We conducted a survey of all 186 ICUs in Australia and New Zealand. A standardised questionnaire was developed to address five key areas of airway management: capnography usage; care of tracheal tubes (TTs); care of tracheostomy tubes; difficult or failed intubation; training and medical staffing.

RESULTS. One-hundred and eighty-one ICUs agreed to take part in the study (97% response rate), of which 171 care for adult ventilated patients. Regarding capnography, it is routinely used by 151 ICUs (88%) for intubation and by 110 ICUs (64%) for continuous monitoring of ventilated patients. Seventy-three ICUs (43%) do not have a protocol for the repositioning of TTs and 102 ICUs (60%) permit staff members with no specific airway training to reposition TTs. Regarding tracheostomy care, only 26 ICUs (15%) display an immediately visible sign at the bedside containing details of the tracheostomy and of those ICUs that care for post-operative laryngectomy patients, only 7 (10%) have a visible sign to alert that the patient has had a laryngectomy. Only 22 ICUs (13%) have a specific algorithm for the dislodgement or displacement of tracheostomies and 109 (64%) collect data about these events. Fourteen ICUs (8%) have a specific policy for the management of patients with a difficult airway, whilst only 10 (6%) use a visible sign to denote patients with difficult airways and 22 (13%) display a difficult/failed intubation algorithm. In Australia and New Zealand, 67 ICUs (39%) do not have a doctor exclusively assigned to the unit. Coverage by anaesthesia/airway trained doctors is continuous in only 25 (15%) ICUs.

CONCLUSIONS. Current airway practice is varied but overall suboptimal in the ICUs of Australia and New Zealand.

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DYSPHAGIA FOLLOWING TRACHEOSTOMY IN CRITICAL ILL PATIENTS

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INTRODUCTION. Prolonged ventilation and tracheostomy increase the risk of upper airway injury and laryngeal protective reflexes impairment. Dysphagia can lead to aspiration of oral secretions or food, pneumonia and even death.

OBJECTIVES. The aim of this study was to determine the incidence of swallowing disorder in critical patients who require tracheostomy for prolonged mechanical ventilation and research the incidence of nosocomial pneumonia in these patients.

METHODS. We performed a unicentric longitudinal descriptive study, including all patients who require tracheostomy for prolonged mechanical ventilation, since January 2006 until October 2010. Excluding patients previously diagnosed of dysphagia, neurologic or neuromuscular pathologies. We researched the number and type of respiratory infections associated; as well as the diagnosis and treatment of swallowing dysfunction secondary to artificial airway (Evans blue dye modified test), including APACHEII score as mortality predictor. Statistical analysis was performed with SPSS 15.0 and STATA 9.0S. Univariate analysis using the unpaired Student t test was performed for continuous variables and Pearson test with Yates correction for categorical variables. Statistical significance was set at p value <0.05.

RESULTS. A total of 124 tracheostomized patients were included during the study period. 62.25% of the patients were men, with a mean age average 62.55 (±13.5) years; the APACHEII average was 18.8 (±7.38). Most frecuent reasons for initial intubation included acute respiratory failure in 46.7% and digestive pathology 25%, including septic shock and severe acute pancreatitis; 37 patients required reintubation 29.83%. The average time of use of mechanical ventilation was 27.3 (±7.4) days. Tracheostomy was performed by day 14.7 (±6.4). Respiratory infections rate during hospital admission was 2.13 (±1.34). 42.7% of first respiratory infection is recorded as ventilator associated pneumonia; 95% of subsequent infections are also recorded as such Evans blue dye modified test was performed in 60 patients, 31 of them 51.66% were diagnosed of dysphagia secondary to artificial airway (glottic-subglottic disorder). Intensive care stay average was 37 días (±8.34). Inhospital mortality rate was 29.8% (37 patients). After statistical analysis, it was observed that patients with dysphagia presented a significant delay in their intensive care discharge (p = 0.0002). There was not statistical association between swallowing disorder and nosocomial pneumonia incidence.

CONCLUSIONS. Real incidence of dysphagia and swallowing disorder secondary to artificial airway, it is not yet well determined; in our series 51.6% of tracheostomized patients studied had this complication. Relationship with infectious processes, morbidity and mortality will be the subject of a new study.

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THE PREVALENCE OF TRACHEAL STENOSIS FOLLOWING PERCUTANEOUS DILATATIONAL TRACHEOSTOMY: A MAGNETIC RESONANCE IMAGING STUDY

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INTRODUCTION. Tracheal stenosis is a recognised late complication of percutaneous dilational tracheostomy (PDT), tending to occur ≥3 months following the initial tracheostomy [1, 2]. The problem of sub clinical stenosis has not been fully recognised and discriminating between symptoms due to airway stenosis and those from residual symptoms following critical illness remains difficult. The use of MRI to detect tracheal stenosis has only been reported from a single study of 9 asymptomatic patients [3].

OBJECTIVES. To investigate prevalence of sub clinical tracheal stenosis following PDT using Magnetic Resonance Imaging (MRI).

METHODS. Asymptomatic patients were randomly selected from the critical care tracheostomy database. All patients underwent PDT with the Ciaglia Blue Rhino Percutaneous Tracheostomy Introducer set (Cook Medical). Following informed consent all patients underwent MRI scanning using Siemens 1.5T Avanto scanner. We used a T2 weighted coronal scan with 5 mm slices and T1 flash sagittal 3D volume scan with 1 mm slices. Multiplanar reformats were constructed from the volume scan in the axial and coronal plane. All sequences included the trachea from the inferior border of the cricoid cartilage to the carina. The images were reviewed by a single consultant radiologist, with antero-posterior and lateral measurements reported at the narrowest section of the trachea at or above the stomal level.

RESULTS. We have scanned 24 patients, their median age was 59 years (IQR: 54–71 years). They had a median of 4 days invasive positive pressure ventilation before PDT and spent a median of 9 days with tracheostomy in situ (range 4–53 days). 2 cases of asymptomatic tracheal stenosis (8.3%) were detected. Both cases had a significant reduction in the lateral diameter of the trachea, measuring 6 mm and 8 mm laterally respectively with preserved antero-posterior dimension 19 mm and 14 mm respectively. The median measurements for the patients without stenosis were 18 mm (IQR 16–21 mm) antero-posteriorly and 17 mm (IQR 15–18 mm) lateral diameter.

CONCLUSIONS. We report a sub-clinical tracheal stenosis rate of 8.3% which is in keeping with other published rates using differing detection modalities. This is the largest case series of patients using MRI as the detection modality and we confirm its efficacy in detecting sub-clinical tracheal stenosis.

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GRANT ACKNOWLEDGMENT. ICS (UK).

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ULTRASOUND GUIDED PERCUTANEOUS TRACHEOSTOMY IN ICU

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INTRODUCTION. Percutaneous tracheostomy is commonly performed in critical care units. Over recent years, due to its polyvalence, technical improvements and noninvasive nature, ultrasound is increasingly used in clinical practice in critical care.

OBJECTIVES. The purpose of this study was to evaluate the feasibility and the safety of ultrasound-guided percutaneous tracheostomy (PCT) in ICU.

METHODS. Prospective, bicentric study in surgical and medical critical care units. Forty critical care patients requiring PCT were enrolled. The following data were collected: age (years), body mass index (BMI), SAPS II, hospitalization diagnoses, duration of mechanical ventilation before completion of PCT (days), indication for tracheostomy, palpable anatomical findings, ultrasound data, installation time (minutes), tracheostomy time, difficulty of ultrasound-guided PCT assessed by a simple numerical scale range from 1 (easy) to 5 (impossible), complications. Data are expressed as median (percentiles) or number (percentage).

RESULTS. The median age was 59 (26–52) years. The total procedure time was 22 (16–29) min with a mean ultrasound location time of 10 (7–15) min and a mean tracheostomy time of 10 (8–15) min. Ultrasound guided PCT was easy to performed in 82% of cases The puncture site was changed in 58% (n = 23) of cases, because of a concealed thyroid and/or pretracheal vessels (n = 16, 40%), or deviated trachea (n = 7, 18%). Complications were technical (6 punctures of the tracheal tube cuff (15%), 2 multiple punctures (5%)), intra-procedural (1 case of desaturation (SpO_2 <90%) (3%), 1 case of bleeding >5 ml controlled by compression (3%), 2 cases of hypotension (5%)), post-procedural (1 skin infection of the puncture site (3%), 1 minor bleed from the puncture site (3%) 1 cricoid fracture (3%), 1 tracheal ring fracture (3%), 2 granulomas (5%)). All patients enrolled underwent ultrasound-guided PCT with no surgical conversions or deaths.

CONCLUSIONS. Ultrasound-guided PCT is feasible with a low complication rate. Ultrasound improves the understanding of neck anatomy, prevents vascular puncture, and helps guide insertion of the tracheostomy.

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PROGNOSIS OF MECHANICALLY VENTILATED PATIENTS WHO REQUIRE A TRACHEOTOMY

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OBJECTIVE. To analyze the prognosis of tracheotomy in a heterogeneous sample of mechanically ventilated patients.

MATERIALS AND METHODS. Data from a base of 1,661 mechanically ventilated patients from a multicenter study of 13 ICU conducted over a period of 2 years. Variables: Acute Physiology and Chronic Health Evaluation II (APACHE II) and Sequential Organ Failure Assessment (SOFA) in the first 24 h of ventilation, age, sex, reason of mechanical ventilation, length of mechanical ventilation, need of reintubation, noninvasive ventilation before endotracheal intubation, duration of mechanical ventilation before tracheotomy, ICU mortality and ward mortality.

RESULTS. 26.9% (n = 446) of patients were tracheotomized. Of them, 69% were men (n = 307). Age 62 ± 15 years, APACHE II: 20.6 ± 7.3, SOFA total: 8.4 ± 3.2. The reason of ICU admission was: Medical 62.6% (n = 279), Surgical 26.7% (n = 119), trauma 9.2% (n = 41), acute coronary syndrome 1.6% (n = 7). The duration of mechanical ventilation before tracheotomy was 13.5 (r: 0–51) days. Differences between tracheotomized and not tracheotomized patients are shown in Table I.

TABLE I DIFFERENCES BETWEEN TRACHEOTOMIZED AND NO

	Tracheotomized patients (n = 446)	Not tracheotomized patients (n = 1.215)	p
ICU admission diagnosis			
Médical	279 (63%)	777 (64%)	NS*
Surgical	119 (26.7%)	313 (26.1%)	NS*
Trauma	41 (9.2%)	102 (8.4%)	NS*
ACS	7 (1.6%)	23 (1.9%)	NS*
Reintubation (<48 h)	88 (19%)	56 (4.6%)	<0.001*
NIMV failure prior to EIT	73 (16.4%)	129 (10.6%)	0.002*
Duration VM (days)	25 (2–165)	6 (1–72)	<0.001**
UCI mortality	107 (23%)	356 (29%)	<0.001*
Ward mortality	58 (13%)	50 (4.1%)	<0.001*

CONCLUSION. Tracheotomy is a technique frequently performed in intensive care units in patients undergoing prolonged mechanical ventilation. In our series the rate of reintubations and NIV failure is higher among patients tracheotomized. In-UCI mortality is lower in tracheostomized patients unlike ward mortality.

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PREDICTORS OF TRACHEAL STENOSIS FOLLOWING PERCUTANEOUS DILATATIONAL TRACHEOSTOMY

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INTRODUCTION. Tracheal stenosis is a late complication of the percutaneous dilatational tracheostomy (PDT) that often remains undetected. Dyspnoea, swallowing difficulties and reduced effort tolerance have all been described [1] but their predictive utility is unknown. A forced expiratory volume in 1 s (FEV1) to peak expiratory flow (PEFR) ratio ≥10 has been shown to discriminate between patients with chronic upper airway obstruction and those with chronic lower airway obstruction or normal subjects [2].

OBJECTIVES. 1. To identify any correlation between symptoms and the presence of tracheal stenosis. 2. To determine if complicated PDT insertion predispose to tracheal stenosis. 3. To determine the effectiveness of spirometry as a screening tool for detecting tracheal stenosis following PDT.

METHODS. Patients were randomly selected from the critical care tracheostomy database having undergone PDT ≥3 months previously. Following informed consent patients had magnetic resonance imaging (MRI) for the detection of tracheal stenosis. Demographic data, presence of coexisting respiratory disease and current symptoms were collected. FEV1 and PEFR were obtained using Micromedical Ltd, microloop spirometer, the best of 3 readings used to calculate FEV1/PEFR ratio. Information on complicated insertion and duration of cannulation were obtained from the tracheostomy database.

RESULTS. 22 out of 24 asymtomatic patients in the study have complete data sets. The type and frequency of symptoms is shown in Fig. 1.

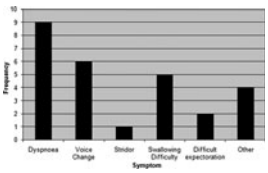

Fig. 1 Symptoms following PDT

There was no correlation between any of the above symptoms and the presence of tracheal stenosis on magnetic resonance imaging (MRI) scanning. There may be a correlation between multiple tracheal puncture at insertion and tracheal stenosis. Taking a FEV1/PEFR ratio ≥10 as predictor of upper airway obstruction, there was no correlation with tracheal stenosis.

CONCLUSIONS. The commonly reported symptoms or the FEV1/PEFR ratio (Empey index) are not predictive of sub clinical tracheal stenosis in this series of patients. Complicated insertion may predict tracheal stenosis and might justify further follow-up of such patients.

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GRANT ACKNOWLEDGMENT. ICS (UK).

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TRACHEOSTOMIES: RISK FACTORS ASSOCIATED TO ICU READMISSION

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INTRODUCTION. Tracheostomy is a common procedure in mechanically ventilated ICU patients linked to a prolonged hospital stay. ICU readmissions in these patients have been linked to worse outcomes.

OBJECTIVES. To identify those factors associated to ICU readmission in patients with tracheostomy.

METHODS. Longitudinal, prospective study in a medical-surgical ICU for adult patients between 16- and 88-year old performed from 2002 up to 2010. Demographic data, ICU admission main diagnosis, tracheostomy and ICU readmission reasons and mortality were collected. Categoric variables are expressed as frequencies and percentages, and continuous variables as mean and SD (SD) when data followed a normal distribution, or as medians and interquartile (25th-75th percentile) range when distribution departed from normality. The percentages were compared using the Chi-square test, the means by the t test, and the medians by the Wilcoxon's test. In order to identify risk factors that had an independent association to ICU readmission those variables that showed statistical significance in the univariate analysis were introduced in a multivariate logistic regression analysis. A retrospective variable selection based on the Akaike information criterion was performed. The resulting model was summarized as p-values and 95% CI. Statistical significance was set at $p < 0.05$. The data were analyzed using PASW statistical software (version 18.0, SPSS, Chicago IL).

RESULTS. Percutaneous technique was performed in nearly all of 501 tracheostomized patients. Main reasons for tracheostomy were mechanical ventilation difficult weaning 238 (48%) and low level of consciousness 189 (38.1%). Fifty-seven of them (11.3%) required ICU readmission and the two main reasons for it were airway obstruction due to an increase amount of secretions in 29 (47.5%) patients and pneumonia in 10 (16.4%) patients. Risk factors independently associated to ICU readmission were mechanical ventilation difficult weaning due to an increase amount of secretions OR: 2.61 (CI 95%:1.355; 5.025); p = 0.004 and length of intubation OR: 1.038 (CI 95%:1.001; 1.076); p = 0.046. There was not statistically significant mortality differences between readmitted and no readmitted ICU patients (p = 0.764).

CONCLUSIONS. The risk factors independently associated to ICU readmission were mechanical ventilation difficult weaning due to an increase amount of secretions and the length of intubation.

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TRACHEOSTOMY IN OUR INTENSIVE CARE UNIT: 2003–2010

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INTRODUCTION. The percutaneous dilatational tracheostomy (PDT) technique appears to be a safe and the most common method of performing a tracheostomy (TQ) in intensive care unit (ICU).

OBJECTIVES. To study the characteristic of patients undergoing TQ and the timing.

METHODS. A single-centre, prospective evaluation of all tracheostomy performed in an adult mixed surgical and medical ICU between January 2003 and December 2010 was done. Patient characteristic data undergoing TQ and intraoperative complications were recorded; all patients were followed up for a hospital discharge.

RESULTS.

Results

Patients admitted in ICU/tracheostomized	6.081/123 (2%)
Exitus/support life limitations	60 (50%), 42 in ICU and 18 in words/43%-Survivors 15%
Patients with mechanical ventilation >48 h	943 (13% with TQ)
Age (year)/APACHE II/Female–male	68 (14.3)/23 (7,504)/62-61
Reason for ICU admittance	Pneumonia 54 Coma 18 PCR 13 Peritonitis 21
Reason for tracheostomy	Difficult weaning 102 (83%) Encephalopathy 14 (12%) Pharyngeal anomalies 7 (6%)
Complications	12 (10%): 4 bleeding, 3 oxygen desaturation, 4 infections, 1 pneumothorax
Days to PDT insertion from initial tracheal intubation	21 (16–24)
Days from TQ to ICU discharge/to hospital discharge	19 (12–32)/33 (21–51)
Patients excanulated/days from TQ to excanulation	57 (43%)/11 (19.5)

The mean days of mechanical ventilation were 38
Surgical tracheostomy (ST) was performed in 9.8% patients
Patients discharged from hospital with TQ were 21

CONCLUSIONS. PDT appear to be a relatively safe technique. The most common reason to performed it is difficult weaning.

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SAFETY AND COMPLICATIONS OF PERCUTANEOUS DILATATION TRACHEOSTOMY (PDT) IN A GROUP OF ICU PATIENTS WITH DUAL ANTIPLATELET THERAPY

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INTRODUCTION. Percutaneous dilatational tracheostomy (PDT) is one of the most commonly performed intervention in patients requiring long-term mechanical ventilation in ICUs. In patients with myocardial infarction dual platelet inhibition is a standard medication after PCI and stent implantation.

OBJECTIVES. The safety and complications of percutaneous dilatation tracheostomy (PDT) in a group of ICU patients with dual antiplatelet therapy (ASS + Clopidogrel) was studied.

METHODS. During the study period (July 2007 to July 2010), 56 PDT were performed. Of these 15 (26.7%) patients (group 1) received a dual platelet inhibition (ASS + clopidogrel). 41 patients without dual platelet inhibition were screened for group 2.
The collection of data included patient age, sex, circumstances of ICU-admission, SAPS II and CRUSADE-Bleeding score and duration of MV prior to the PDT. Coagulation parameters (PTT, INR, platelet count) on the day of procedure until 48 h post PDT were determined. Bleeding complications were classified as major (i.e., significant drop of hemoglobin requiring transfusion or surgical intervention) or minor. The application of red cell packages, bleeding complications, airway problems, pneumothorax, tracheal injuries, abortive procedure were noted and patients were followed until death, tube removal or transport to another facility.

RESULTS. Despite the platelet dysfunction and often elevated INR and PTT in our patients, the actual number of bleeding complications related to PDT were minimal. We found 3 patients in Group 1 and 5 patients in group 2 who were in need of interventions (prolonged pressure dressing/local endobronchial application of epinephrine) due to prolonged bleeding. The PDT was aborted for one patient (group 2) because of failed tracheal punction. One Patient (group 2) died during the procedure after perforation of the posterior tracheal wall with consecutive pneumothorax and myocardial depression.

Study population and outcome data

Variable	dual anti-platelet therapy (n = 15)	control (n = 41)
Age (years)	70.8 ± 7.9	65.1 ± 13.2
SAPSII	36.0 ± 8.4	35.3 ± 9.8
CRUSADE-SCORE	50.3 ± 17.7	45.4 ± 18.3
death	0	1
aborted procedure	0	1
Major-Bleeding	0	0
Minor-Bleeding	3	5
atelectasis by bronchus occlusion	2	0
Red packed cells Transfusion	5	11

Decrease of Haemoglobin-Values 48 h post-PDT and application of red packed cells were not different between both groups. Beyond the above-noted bleeding episodes, few other complications were noted. Interestingly 2 patients in the dual platelet inhibition group showed atelectasis caused by a large endobronchial thrombotic mass.

CONCLUSIONS. Our data suggest the incidence of bleeding is low in patients with dual platelet inhibition. However, occult bleedings leading to atelectasis, should beware of.

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TRACHEOSTOMY IN INTENSIVE CARE—REALITY OF A PORTUGUESE MIXED CASE ICU

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INTRODUCTION. Surgical Standard Tracheostomy (ST) was described in 1909 and is used in critical patients requiring prolonged mechanical ventilation. Percutaneous Tracheostomy (PCT) has been established as a more simple and safe procedure and is a bedside technique. Strategy to decide optimum time for tracheostomy (TC), either ST or PCT on ICU patients is still a controversy point.

OBJECTIVES. This study aims to describe our practice and to measure the impact of tracheostomy on outcome of ICU patients.

METHODS. This retrospective study enrolled all patients admitted from the 1st August 2001 to 31 July 2010 to our mixed case ten bed ICU and submitted to tracheostomy (n = 170). Demographic and clinical data, including severity indexes, ICU and Hospital Mortality, ICU length of stay (LOS), Length of ventilation (LOV), complications from TC and one year follow-up data were recorded from clinical registries. We compared TC patients to a control group of patients ventilated mechanically for more than 12 h and not submitted to TC (n = 2019). Subgroup analysis for timing on TC and type of TC used (ST Vs PCT) was performed. SPSS for Windows was used for data analysis.

RESULTS. From a total of 2731 patients 170 undertook TC. When compared to control group they had no significant differences regarding age and ICU outcome. But they exhibit significant differences: TC group showing higher SAPS II, APACHE II, ICU LOS, LOV and worse Hospital outcome. Table 1 and 2 show comparison of TC and control group. Regarding subgroup analysis, early TC group (less than 13 days) showed significant worse outcome on one year follow-up. ST 65.9% (112) and PCT 34.1% (58). Minor bleeding [78.1% (25)] was the most frequent early complication and Stenosis and Fistula [50% (8)] were the most severe late complications. There were no deaths attributable to TC, either ST or PCT.

TABLE 1 CONTROL GROUP VS. TRACHEOSTOMY GROUP

Demographic/ICU variables	Control (n = 2019)		TC Group (n = 170)		p
	Mean	SD	Mean	SD	
Age (years)	59.9	16.6	62.5	14.0	
APACHE II	16.7	6.9	19.0	6.7	.000
SAPS II	44.4	14.8	50.5	14.4	.000
ICU LOS	7.9	7.8	29.3	20.9	.000
LOV	6.4	7.1	25.7	32.4	.000

TABLE 2 CONTROL GROUP VS. TRACHEOSTOMY GROUP

Demographic/ICU variables	Control (n = 2019)		TC Group (n = 170)		
	n	%	n	%	p
Gender Male	1254	62.1	120	70.6	.028
ICU Outcome dead	427	21.1	35	20.6	
Hospital dead	525	26.0	69	40.6	.000
Diagnosis Medical	1175	58.2	131	77.1	.000

CONCLUSIONS. TC on ICU patients, either ST or PCT is a safe procedure. On our series there seems not to be advantage on early TC approach to ICU patients. Higher hospital mortality rate on TC group was associated to higher severity score indexes, SAPS II and APACHE II at admission. No impact on mortality was found to be attributable to TC technique.

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EARLY VS LATE TRACHEOSTOMY IN OUR INTENSIVE CARE UNIT: 2003-2010

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INTRODUCTION. Spanish Unicentric study about the characteristics of early percutaneous tracheostomy (TQ) versus late one in the Intensive Care Unit (ICU)

OBJECTIVES. To stablish the main characteristics of the patients in which we performed early versus late TQ.

METHODS. A single-centre, retrospective with 123 patients traqueostomized in a medical and surgical ICU in Palma de Mallorca, Spain. We define early TQ as the one performed before the 14th day of orotracheal intubation (OI) and late TQ as the one performed after the 14th day OI. Evaluated the following variables: cause of admission in ICU, cause of TQ, length of stay in ICU, days of TQ and outcome (discharge from ICU and hospital discharge).

RESULTS. We analyzed 123 traqueostomized patients from 2003 to 2010

Results

Results	Early TQ	Late TQ
Number of patients	26	97
Male	50%	50%
Female	49%	51%
Age	64	69
APACHE II	23	23
Exitus	61%	45%
Support vital limitation	53%	40%

Days

Days	EARLY TQ	LATE TQ
Days in ICU	17.5	44
Days in hospital	44.9	66.6
Days from TQ to discharge of hospital	22.5	33
Days from TQ to excanulation	9.7	11.7

Indications for TQ

Indications for TQ	Early TQ (%)	Late TQ (%)
Failed weaning (102p)	9.8	90.1
Encephalopathy (14p)	85.7	14.28
ORL disfunction (12p)	58.3	41.7

CONCLUSIONS. In our study the most frequent reason to perform an early TQ was encephalopathy and to performed late TQ was prolonged weaning. We found a significant reduction in length of stay in UCI, hospital and in days from TQ to excanulation and hospital discharge in the early TQ group but it associated more mortality, probably related to increased support vital limitation.

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1121

EARLY PERCUTANEOUS TRACHEOSTOMY IN ICU—OBSERVATIONAL STUDY

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INTRODUCTION. The percutaneous technique revolutionised the way tracheostomy is done in ICU because it's easier, safer, and what's equally important, it can by done at patient's bed. The indication for tracheostomy in ICU (surgical or percutaneous) is prolonged mechanical ventilation. Typically tracheostomy is done between day 7–10 from the beginning of hospital stay. There is lack of papers showing relevant benefits of performing early tracheostomy—up to 48 h after admission to ICU.

OBJECTIVES. The aim of this study is to investigate whether early percutaneous tracheostomy performed in 48 h of admission to ICU will improve treatment results. Treatment results were analysed based on: mortality, number of ventilator-associated pneumonia, shorter stay in ICU and shorter hospital stay.

METHODS. In our 7 bed ICU department we hospitalise 250–300 patients annually. Till the end of 2003 tracheostomy was done only surgically. Since 2004 tracheostomy has been done percutaneously using technique described by Griggs in 1991. Rare cases of surgical tracheostomies have not been analysed. Between 2004–2007 percutaneous tracheostomy was done in 403 patients in day 7 of hospitalization and 38 early percutaneous tracheostomies in 48 h. Close investigation of those 38 cases showed better evolution. Therefore, from 2008 till the end of February 2011, early percutaneous tracheostomy in 48 h of hospitalization, was performed in 401 patients using technique described by Griggs. The following variables were analysed: number of ventilator-associated pneumonia, number of days in ICU, number of days in hospital, mortality. Statistical analysis was done using t Student test for qualitative variables and χ^2 test for quantitative variables. Follow up analysis has not been performed.

RESULTS. Results are show in Tables 1, demographic data; and 2, final results below.

TABLE 1 DEMOGRAPHIC DATA

	Tracheostomy in day 7	Tracheostomy in 48 h	p
Age	53	53	ns
Apache score	23	23	ns
Surgical patients	150/403 (37.2%)	147/401 (36.6%)	ns
Medical patients	253/403 (62.8%)	254/401 (63.3%)	ns
PaO_2/FiO_2	187.5	189	0.9
Procedure complications	2/403 (0.49%)	1/401 (0.24%)	ns

TABLE 2 FINAL RESULTS

	Tracheostomy in day 7	Tracheostomy in 48 h	p
VAP	121/403 (30%)	58/401 (14.4%)	<0.05
Days in ICU	7	3.5	<0.05
Days In hospital	18	12	0.7
Mortality	44%	36%	<0.05

CONCLUSIONS. Statistically significant were: 1. Lower number of VAP in patients with early percutaneous tracheostomy. 2. Number of days in ICU was shorter in early percutaneous tracheostomy group. 3. Mortality was 12% lower in patients with percutaneous tracheostomy performed in 48 h of hospitalization.

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GRANT ACKNOWLEDGMENT. Team of ICU.

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EARLY VS LATE PERCUTANEOUS TRACHEOSTOMY IN AN PORTUGUESE REFERRAL PUBLIC HOSPITAL INTENSIVE CARE UNIT

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INTRODUCTION. Percutaneous tracheostomy (PCT) is becoming the preferred method for bedside tracheostomy tube placement in the ICU and has many indications in ICU patients, mainly prolonged mechanical ventilation/weaning difficulties and airway protection in comatose patients.

OBJECTIVES. The aim of this study is to analyse the timing and indications for PCT in our ICU patients and ICU survival.

METHODS. Retrospective descriptive study through review of medical records of 65 patients with tracheostomy at 8-bed mixed ICU in 3 year period (January 2006 until December). We reviewed their age, gender, APACHE II score, length of ICU stay, ventilation time before and after PCT and ICU survival. Patients were stratified in 3 groups, based on PDT timing and data was treated using the Mann–Whitney test.

RESULTS.

Table 1

PDT timing	≤7 days	>7 days	>14 days
Prolonged mech vent	N = 6	N = 25	N = 17
Airway protection	N = 1	N = 33	N = 25
ICU stay days	17.4	47.05	55.4
Ventilat. days prior PCT	4.8	20.96	24.81
Ventilat. days after PCT	2.8	12.81	16.28
ICU Mortality	N = 2 (3.07%)	N = 14 (21.54%)	N = 12 (18.46%)

The results presented are in mean values.

CONCLUSIONS. The indications for PCT in our ICU were prolonged mechanical ventilation (N = 26) and airway protection in comatose patients (N = 39). The median age was 65 years, the APACHE II and the SAPS II were respectively 24.98 and 53 and the overall ICU survival rate was 75.38%. Early tracheostomy (≤7 days) was associated with less ventilation days after tracheostomy. Their length in ICU was shorter and they had a higher ICU survival rate but these data is limited by the small size sample of the early tracheostomy group. There was no significant difference between the 2 groups of late tracheostomy in the analyzed variables.

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ANGIOPOIETIN-2 LEVELS AS PREDICTORS OF OUTCOME IN MECHANICALLY VENTILATED PATIENTS WITH ACUTE LUNG INJURY

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AIM. Angiopoietins are an important group of endothelial growth factors that modulate angiogenesis, as well as vascular remodeling. The aim of this study was to investigate the value of circulating as well as epithelial lining fluid (ELF) Ang-2 levels as predictors of outcome in mechanically ventilated patients with acute lung injury/ARDS.

METHODS. 53 consecutive patients with ALI/ARDS, ventilated according to NIH protocol, were enrolled within 48 h of recognition of ALI/ARDS. All patients underwent BAL upon enrolment. Angiopoietin-2 concentration was prospectively determined in plasma as well as in epithelial lining fluid (ELF), using urea as an endogenous dilution marker. The primary outcome was mortality at 28 days, while secondary outcomes included non-pulmonary organ-failure-free days and ventilator-free days over the 28 days after enrollment.

RESULTS. ELF angiopoietin values was statistically significant different between patients survivors and non-survivors (Wilcoxon sign rank test = 3.4, $p < 0.0001$). Plasma angiopoietin values were statistically significant higher in patients with indirect injury to the lung compared to those with direct injury (Wilcoxon sign rank test = 4.9, $p < 0.001$), but were not different between survivors and non-survivors. SOFA scores was positively correlated with lung injury score (Pearson's correlation coefficient = 0.31, p-value = 0.02) and plasma angiopoietin (Spearman's correlation coefficient = 0.30, $p = 0.03$). Lung injury score was positively associated with ELF/plasma angiopoietin levels (Spearman's = 0.76, $p < 0.001$) and negatively associated with plasma protein C (Spearman's = −0.24, $p = 0.04$). There was no statistically significant association between plasma and ELF angiopoietin values (Spearman's correlation coefficient = −0.09, $p = 0.5$). Ventilator free days as well as days without organ failure besides lung were statistically significant associated only with age and PAI-1 antigen in plasma in the univariate analysis.

CONCLUSION. Our findings suggest that Ang-2 levels may be increased in the alveolar compartment of patients with acute lung injury and this might be associated with increased mortality.

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CT FINDINGS AS PREDICTORS OF OUTCOME IN ARDS

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) is characterized by increased diffuse alveolar damage which can be perpetuated by organized pneumonia revealed in a CT scan as diffuse or consolidation patterns. On the other hand, Pulmonary hypertension (PH) has been associated with ARDS outcome. Pulmonary artery dilation (PAD) >3 cm. Right atrium/left atrium (RA/LA) ratio >1 and Right ventricle/left ventricle (RV/LV) >0.9 have been proposed as CT determinants of PH and associated with mortality in pulmonary embolism; they have been suggested as mortality predictors in ARDS too.

OBJECTIVES. To determine if CT indexes suggestive of PH can predict mortality of ARDS.

METHODS. Retrospective observational study of pulmonary or mixed ARDS patients admitted to the ICU from June to December 2010. We selected 31 patients by pairing 15 survivors with 16 non-survivors with similar demographics. PAD, RA/LA and RV/LV were obtained as well as tomographic findings.

RESULTS. 31 patients with pulmonary or mixed ARDS were included: 16 men (51%). Mean age: 73 ± 12 years, APACHE II score: 17 ± 6 & SOFA: 8 ± 3 without difference between survivors and non-survivors: age 72 ± 15 & 74 ± 10, APACHE II 16 ± 7 & 19 ± 6, SOFA 8 ± 3 & 8 ± 3 respectively. Ground glass opacities were revealed in 50% of survivors and 18% of non-survivors ($p = 0.0001$), consolidation in 7% of survivors and 25% non-survivors, $p = 0.0001$. According to involved regions, 53% of survivors were affected in lateral areas 53% followed by diffuse changes (33%) versus non-survivors which had lateral disease in just 18.8% with half of the patients with diffuse pattern. Reticular opacities were present in 40% of non-survivors and only in 20% of the survivors $p = 0.08$. PAD >3 cm was reported in 81% of non-survivors whereas only in 50% of survivors ($p = 0.0001$). RA/LA ratio >1 was found in 75% of non-survivors versus 60% of survivors ($p = 0.035$). RV/LV ratio in both groups was similar.

CONCLUSIONS. The presence of consolidations, PAD >3 cm and RA/LA ratio >1 may be associated with mortality in ARDS patients whereas ground glass opacities are associated with better prognosis.

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INCIDENCE, INTENSIVE CARE, AND PROGNOSIS OF STATUS ASTHMATICUS IN DENMARK: A NATIONWIDE COHORT STUDY

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INTRODUCTION. Status asthmaticus (SA) is an acute life-threatening condition. Studies have shown increased incidence rates and symptom severity at hospital admissions, but data have been limited to pediatric populations [1], included readmissions [2, 3], or been based on single intensive care units (ICUs) [2, 3]. A nationwide study of patients of all ages is needed to better understand the epidemiology of SA.

OBJECTIVES. To examine the incidence rate of hospitalizations with SA, the characteristics of SA patients admitted to Danish ICUs, and their prognosis.

METHODS. We used the Danish National Registry of Patients (DNRP) covering all Danish hospitals to identify all patients with any first-time SA diagnoses (ICD-10 code J46) in Denmark during the 2005–2009 period. Patients previously diagnosed with chronic obstructive pulmonary disease (COPD) were excluded, because acute exacerbation of COPD may be hard to distinguish from SA. We obtained data from the DNRP on ICU admissions, treatment with mechanical ventilation (MV) and non-invasive ventilation (NIV), and comorbidity level based on the Charlson Comorbidity Index. We obtained demographic information and vital status from the Danish Civil Registration System, calculated incidence rates and estimated 30-day and 1-year mortality by using the Kaplan–Meier method.

RESULTS. During 2005–2009, 1,616 patients were hospitalized with SA in Denmark. After exclusion of 179 patients with COPD, 1,437 remained for analysis. The mean incidence rate was 52.7 per 1,000,000 person-years (PY), being remarkably higher for children (370.9 and 139.5 per 1,000,000 PY for age 0–1 and 2–14 years, respectively) and marginally higher for males than females (55.9 respectively 49.4 per 1,000,000 PY). A total of 119 patients (8.3%) were admitted to an ICU. These were primarily young (26.1% <2 years) or aged over 40 (44.5%) and had more comorbidity than non-ICU patients. However, 85.7% of ICU patients and 94.5% of non-ICU patients had no comorbidity. There were slightly more males in both groups. MV or NIV was required by 51 (42.9%) and 24 (20.2%) of the ICU patients, respectively. Eight patients (33.3% of those receiving NIV) received both NIV and MV. Thirty-day mortality was higher among patients admitted to an ICU [9.3% (95% CI 5.2–16.1%)] compared with other SA patients [0.7% (95% CI 0.4–1.3%)]. One-year mortality was 11.9% (95% CI 7.2–19.3%) among ICU patients and 1.7% (95% CI 1.1–2.5%) among non-ICU patients.

CONCLUSIONS. There were few status asthmaticus hospitalizations in Denmark during the period. The majority of patients in our study population were children and had no comorbidity. As expected, the mortality was higher among patients that had been admitted to an ICU.

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PULMONARY HYPERTENSION IN PATIENTS WITH SICKLE CELL DISEASE IN EASTERN PROVINCE OF SAUDI ARABIA

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INTRODUCTION. Sickle cell disease (SCD) is an autosomal recessive disorder and the most common genetic disease in the world. The burden of disease of SCD is high in Saudi Arabia with approximately 4% of the people are homozygous for SCD. Pulmonary artery hypertension (PAH) is defined as mean pulmonary artery pressure >25 mmHg at rest or >30 mmHg during exercise, with normal pressure being 15 mmHg.

OBJECTIVES. The aim of this study was to evaluate the prevalence Pulmonary Hypertension in SCD patients from Eastern province of Saudi Arabia.

METHODS. This was a retrospective study involving 32 SCD patients admitted to King Fahad Hospital Hofuf between January and May 2008 for different etiologies. Clinical features, CBC, Hb-electrophoresis, G6PD activity, cultures, chest X-ray, arterial oxygen saturation, blood transfusion rates, cardiac ejection fraction and pulmonary hypertension were studied.

RESULTS. Mean age of patients is 26 years presenting to hospital with range from 17 to 50 years of age. Ejection fraction of patients with mean was 64, 56 with a range from 52 to 72. Pulmonary artery pressure measured with 2D echo had a mean of 36.93 mmHg with range from 25 to 79 mmHg. 22 patients had mild pulmonary hypertension (up to 44 mmHg), 6 had moderate pulmonary hypertension (45–74 mmHg), and 2 had severe pulmonary hypertension (≥75 mmHg).

CONCLUSIONS. Genetic studies suggest that the sickle cell mutation has arisen on at least four separate occasions in Africa and as a fifth independent mutation in Saudi Arabia or India. The pathophysiology of sickle cell disease is essentially similar in these different areas although the frequency and severity of complications may vary between areas. Pulmonary hypertension in SCD patients in Eastern province of Saudi Arabia is relatively common with less significant severity and morbidity.

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THE COPD AND ASTHMA OUTCOME STUDY (CAOS) SCORE AS A PROGNOSTIC OUTCOME MEASURE IN THE MANAGEMENT OF ACUTE EXACERBATIONS OF COPD

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INTRODUCTION. Predicting the outcome of patients with exacerbations of COPD reveals that clinicians can be variable and pessimistic.

OBJECTIVES. In a prospective service evaluation we reviewed the performance of the CAOS protocol (1) in a UK district general hospital as a proposed means to support management decisions in escalating therapy to respiratory high care (RHC) or ITU.

METHODS. Seventeen patients were considered. Assessing clinicians were blinded to the calculated CAOS estimated risk of death. These values were evaluated against hospital and 90-day mortality.

RESULTS. The group median (inter quartile range) CAOS risk estimates were 54.4% (31.8–63.4). Five patients in the escalation group were admitted to ITU with CAOS risk scores of 21–63.4%. Their hospital mortality was 1/5 (20%), 3 month overall mortality 1/5 (20%). 13 patients received care on RHC. CAOS risk scores ranged from 11.2 to 84.2%, hospital mortality rate was 1/13 (8%), 3-month mortality 3/13 (23%). 2 patients assessed for escalation of care (CAOS scores 54.4 and 88.6%) only received ward based therapy, survived to discharge, but subsequently died during the 3-month-follow up period. The median (IQR) CAOS risk score for the six fatalities was 61.2% (59–79).

CONCLUSIONS. Clinicians are embroiled in a complex prognostic task when making gatekeeping decisions. This small study shows the CAOS score can play a role in supporting management decisions as a standardised objective prognostic estimation when coupled to clinical acumen.

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1128

LONG-TERM OUTCOME OF SURVIVORS OF ACUTE RESPIRATORY DISTRESS SYNDROME (ARDS) DUE TO PANDEMIC 2009 INFLUENZA A (H1N1) VIRUS INFECTION: THE RESPIFLU STUDY

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INTRODUCTION. No data exist on the long term outcomes of survivors of ARDS due to pandemic 2009 H1N1 virus infection.

OBJECTIVES. One-year after intensive care unit (ICU) discharge, we evaluated lung function, muscle strength, psychological impairment and quality of life of survivors of ARDS due to the pandemic 2009 H1N1-virus infection according to the use or not of extracorporeal lung support (ECLS), using the need for ECLS as a surrogate for ARDS severity.

METHODS. ARDS survivors were selected from the French registry of critically ill patients with 2009 H1N1 infection when they had previously been healthy without known risk factors for that infection, except pregnancy and/or moderate obesity (BMI ≤35 kg/m^2). All were evaluated 1 year after ICU discharge: lung function was assessed with standard pulmonary-function tests; alveolar-arterial O_2 gradient was measured during a stress test; health-related quality of life (HRQoL) was evaluated with the short form health survey (SF-36); symptoms of anxiety, depression and post-traumatic stress disorder (PTSD) were also assessed. The 12 patients with ECLS were compared to 25 without.

RESULTS. Patients' clinical characteristics at the time of H1N1 infection were similar for both groups, except that patients with ECLS had longer median [IQR] mechanical ventilation duration, respectively: 36 [18–61.5] versus 13 [8.5–21] days than those without ECLS ($p = 0.001$). The median [IQR] ECLS duration was 10 [7.75–19.5] days. At 1 year, for the groups with ECLS and without, respectively, 50 and 40% reported significant dyspnea on exertion; 83 and 64% had returned to work. All patients had normal muscle strength. Lung function test results were near normal and similar for both groups, whereas 75% of the patients with ECLS and 64% of those without had decreased diffusion capacity across the blood-gas barrier (assessed as DL_{CO}, $p = 0.49$ for between-group comparison). For both groups, stress-test results showed diminished but comparable exercise capacities, and their alveolar-arterial O_2 gradients at maximum exercise were similar. SF-36-assessed HRQoL was lower for both groups than for a sex- and age-matched population, but without between-group difference. Patients with ECLS or without, respectively, had symptoms of anxiety (50 and 56%) and depression (28 and 28%), and were at risk for PTSD (41 and 44%).

CONCLUSIONS. One year after ICU discharge, survivors of ARDS due to 2009 H1N1 infection had minor lung disabilities and diffusion capacities across the blood–gas barrier was decrease for a majority. Most had lower HRQoL, reported anxiety and/or depression, and were at risk for PTSD. ECLS use for the most severely ill patients was not associated with worse long-term lung disabilities, QoL or psychological impairment.

GRANT ACKNOWLEDGMENT. Supported by a grant from the Institut de Microbiologie et Maladie Infectieuse, INSERM, and Ministère de la santé, programme hospitalier de recherche clinique.

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AN AUDIT OF MORTALITY IN PATIENTS WITH ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) RECEIVING NON INVASIVE VENTILATION (NIV) BETWEEN 2005 AND 2010 IN A UK CENTRE

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INTRODUCTION. Non invasive ventilation (NIV) has been an effective treatment modality for patients presenting with hypercapnic respiratory failure for the last 15 years in 2001 a large teaching hospital in the North of England launched a 24 h physiotherapy led NIV service. This audit presents data from 2005 to 2010.

OBJECTIVES. To benchmark practice, namely mortality, against published data.

METHODS. Data was prospectively collected between 2005 and 2010 for all patients referred for NIV.

RESULTS. Over a 5-year period 488 hypercapnic COPD patients were offered treatment with NIV. Overall mortality by intention to treat was 12.5% and for actual treatment was 7.9%. Mortality was significantly higher in the 2009–2010 cohort than in earlier years (Figs. 1, 2). Mortality was significantly higher in the 28% who had a mixed respiratory and metabolic acidosis than in the 72% with a respiratory acidosis (16 vs. 6%, $p < 0.001$). Mortality was significantly higher in the 29% who presented with a pH <7.25 than in the 71% with pH between 7.25 and 7.35 (21 vs. 9%, $p = 0.001$).

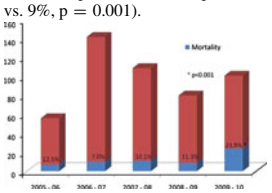

Fig. 1 Mortality in NIV patients on intention to treat basics

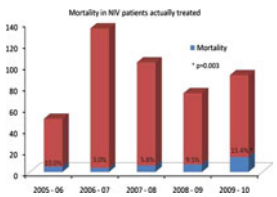

Fig. 2 Mortality in NIV patients actually treated

CONCLUSIONS. Mortality rate on an actual treatment basis is in line with published data (5–10%). This is very acceptable given that these patients were treated on a respiratory ward without additional staff. The higher mortality in 2009–2010 may be a consequence of the H_1N_1 flu pandemic. Overall mortality is greater in patients with initial pH <7.25. Patients with uncomplicated hypercapnic respiratory failure had a lower mortality rate than those with a mixed clinical presentation.

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1130

IMPACT OF BIOMARKERS TO PREDICT SHORT-TERM MORTALITY IN PATIENTS WITH SEVERE ACUTE DYSPNEA

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INTRODUCTION. Acute dyspnea is frequent clinical presentation in emergency. Identification of patients at higher risk of short-term mortality remains difficult. Biomarkers may help the clinician in prognostic assessment in this specific clinical setting.

OBJECTIVES. To assess the 28-day prognostic value of NT B type Natriuretic peptide (NTProBNP), cardiac troponin I (Tn), C-reactive protein (CRP), procalcitonin (PCT) and new biomarkers: Mid-regional Pro-Atrial natriuretic peptide (ProANP), Mid-regional Pro Adrenomedullin (ProADM), Pro Endothelin (ProET) and Copeptin (CP) in patients with severe acute dyspnea.

METHODS. We designed a prospective study of patients admitted in the Emergency Department (ED) and in Medical Intensive Care Unit (ICU) in a University Hospital. Inclusion criteria were acute dyspnea with $SpO_2 \leq 92\%$ and/or respiratory rate (RR) ≥ 25 b/min. Patients with obvious myocardial infarction or pneumothorax were excluded. All clinical and biological data were recorded and biomarkers sampled. Univariate and multivariate analysis of risk factors of D-28 mortality was assessed using logistic regression. The prognostic impact of biomarkers was assessed individually (ROC analysis) and taking into account other prognostic clinical and biological covariates.

RESULTS. 384 consecutive patients (57.3% male, med age 72 years) were enrolled. The D-28 mortality was 19.79%. The final diagnosis was: sepsis 136 (36.9%), acute heart failure 84 (21.9%), exacerbation of COPD 46 (11.9%), pulmonary embolism 20 (5.2%), others 93 (24.2%). All biomarkers were significantly associated with 28-day mortality AUC-ROC (p value): PCT 0.69 ($<10^4$), CRP 0.60 (0.008), NTpro BNP 0.71 ($<10^4$), Tn 0.71 ($<10^4$), Pro-ANP 0.71 ($<10^4$), Pro ADM 0.74 ($<10^4$), Pro ET 0.65 (0.0001), CP 0.73 ($<10^4$). Best threshold of new biomarkers based on ROC analyses were: Pro-ANP 356 pmol/l, Pro ADM 2.23 nmol/l, Pro ET 102 pmol/l, CP 138 pmol/l. Even after adjustment on clinical and biological prognostic factors, biomarkers add prognostic information AUC-ROC (p value): PCT 0.814 (0.035), CRP 0.809 (0.094), NTpro BNP 0.827 (0.014), Tn 0.841 (0.0003), Pro-ANP 0.822 (0.01), Pro ADM 0.812 (0.015), Pro ET 0.807 (0.142), CP 0.817 (0.011). In septic population, we did not find a significant predictive value for PCT and CRP.

CONCLUSIONS. In this specific population of patient with acute dyspnea in emergency setting, median value of biomarkers were higher in the 28-day decedents. After adjustment on prognostic clinical biological covariates, all biomarkers tested improved the predictive power of mortality in our model except for ProET and CRP. Further analysis about the optimal cutpoints of new biomarkers and the prognostic value with a multimarkers approach is ongoing.

GRANT ACKNOWLEDGMENT. Grenoble University hospital and Brahms Diagnostic.

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EXPIRATORY FLOW-VOLUME CURVE AND OUTCOME IN COPD PATIENTS RECEIVING INVASIVE MECHANICAL VENTILATION

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INTRODUCTION. Expiratory flow-volume (EFV) loops contains information on respiratory mechanics and is continuously displayed at the screen of ICU ventilators.

OBJECTIVES. To investigate the relationships of EFV profile to patient outcome in COPD patients under invasive mechanical ventilation.

METHODS. A prospective study in our 14-bed medical ICU on COPD patients who received invasive mechanical ventilation for acute respiratory failure. Within the 24 h after intubation, airflow and airway pressure were measured. Mechanical ventilation was performed in volume controlled mode with standardized settings, on zero end-expiratory pressure. Three EFV profiles were defined according to the angle of the slope of the flow-curve during the last 50% of the expiration: (1) angle >75°, (2) $40° < \text{angle} \leq 75°$, (3) angle ≤40° (1). Resistance and compliance of the respiratory system were assessed from the interrupter technique and the change in end-expiratory lung volume of the mechanical breaths above the relaxation volume was measured (ΔFRC). Patients were followed up to hospital discharge. The main end-point was hospital mortality. The secondary end-points were ICU mortality, length of ICU stay, duration of invasive ventilation, number of intubation, oxygen and non invasive ventilation at the hospital discharge.

RESULTS. From March 1 2009 to May 31 2010, 275 patients received invasive mechanical ventilation of whom 38 were included. Profile 1 was not observed, profile 2 identified in 15 patients (40.5%) and profile 3 in 22 patients (59.5%). Patients in the profile 3 group had significantly greater ΔFRC and tissue resistance than in the profile 2 group for similar tidal volume and inspiratory flow. There was a significant negative correlation between the angle and resistance, compliance and ΔFRC. The hospital fatality rate was not significantly different between profiles 2 and 3, and also for ICU mortality. The hospital length of stay was significantly greater in profile 3 than in profile 2 group, median [IQR]: 46 [24–62] versus 17 [10–25] days ($P = 0.005$). There was a not significant trend towards greater ICU length of stay (20 [8–38] vs. 8 [6–17] days, $P = 0.08$) and intubation duration (14 [6–31] vs. 5 [3–13] days, $P = 0.061$) in the profile 3 than in the profile 2 group. The rate of non invasive ventilation use at the ICU discharge was higher in the profile 3 than in the profile 2 (27.3 vs. 0%, $P = 0.032$). The rate of re-intubated patients (40.9 vs. 13.4%, $P = 0.073$) and of oxygen (40.9 vs. 13.4%, $P = 0.073$) and non invasive ventilation administration at the hospital discharge (22.7 vs. 0%, $P = 0.06$) tended to be higher in the profile 3 than in the profile 2 group.

CONCLUSIONS. Profile 3 is the most common EFV profile observed in COPD patients receiving invasive mechanical ventilation in ICU. It is associated with worsened respiratory mechanics and higher morbidity.

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1132

PROGNOSTIC VALUE OF THE EXTRAVASCULAR LUNG WATER INDEX AND PULMONARY PERMEABILITY VASCULAR INDEX IN PATIENTS WITH SEVERE SEPSIS

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INTRODUCTION. Extravascular lung water index (EVLWI) and pulmonary vascular permeability index (PVPI) could be valuable clinical indicators of severity and treatment of acute lung injury (ALI) in patients with severe sepsis. Both markers are measured by transpulmonary thermodilution.

OBJECTIVES. We are presenting results of prospective, nonrandomized control trial of 2 years duration conducted at Department of anesthesiology, reanimatology and intensive care at Zagreb University Hospital Center. We investigated prognostic value of EVLWI, PVPI and their connection to physiologic indexes of lung injury in patients with severe sepsis.

METHODS. Study was conducted from February 2008 to April 2010. Severe sepsis patients group included 36 patients (22 male, age 48 ± 11 years/14 female, age 45 ± 9 years) undergoing major abdominal surgery with clinical and laboratory confirmed severe sepsis and ALI. Severe sepsis was defined according to international criteria. Control group included 36 patients (20 male, age 46 ± 12 years/16 female 42 ± 9 years) undergoing elective abdominal surgery without clinical and laboratory severe sepsis signs. EVLVI and PVPI were determined in both groups using PiCCO monitoring (Dräger Infinity R PiCCO Smart Pod TM 2005). The 4F arterial thermodilution catheter (Pulsiocath PV2014L16N) was placed in the femoral artery using Seldinger technique. Measurements were recorded twice daily/7 days. Simultaneously, oxygenation ratio (PaO_2/FiO_2), lung compliance, lung injury score (LIS), daily fluid balance and albumin levels were assessed. All patients were mechanically ventilated. APACHE II score was 47.4 ± 3.6. Circulatory instable patients had vasoactive support and SOFA scores. Data were compared using Student's t test and χ^2 test. The correlations were estimated using Pearson's coefficient. $P < 0.05$ was statistically significant.

RESULTS. 16 test group patients (44.3%) died before day 28. There was no significant statistical difference in EVLWI and PVPI between test and control group during first 72 h. Average EVLWI at baseline was 11 ± 4 ml/kg and PVPI was 2.2 ± 0.37. After day 3 EVLWI and PVPI in nonsurvivors was significantly higher than in the survivors (14.3 ± 3.8 vs. 9.2 ± 2.1 ml/kg; $P = 0.001$ and 3.12 ± 0.89 vs. 1.84 ± 0.52; $P = 0.01$). EVLWI was correlated to LIS ($r = 0.49$ and $r = 0.41$; $P < 0.05$) and to PaO_2/FiO_2 ($r = -3.9$ and $r = -0.48$: $P < 0.05$). No correlation was found between EVLWI, lung compliance and fluid balance. Higher PVPI correlated with decrease in serum albumin.

CONCLUSIONS. Dynamics of the EVLWI and PVPI could predict prognosis of patients with severe sepsis. PVPI is more accurate indicator than EVLWI and correctly reveals the degree of pulmonary vascular permeability and serum albumin levels. EVLWI and PVPI reduction in early treatment period was associated with a better prognosis.

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1133

CLINICAL CHARACTERISTICS AND SURVIVAL IN HAEMATOLOGICAL PATIENTS ADMITTED TO AN INTENSIVE CARE UNIT

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OBJECTIVE. To describe the clinical characteristics of haematological patients admitted to an intensive care unit (ICU) at a tertiary hospital, and assess survival to follow-up of survival to discharge from the of ICU, from the hospital and at 6 months.

METHODS. Retrospective observational study of all haematological patients admitted to a medical-surgical ICU over an 18-month period. Data from the ICU admission and also from the 48 h in the haematology ward (HW) before ICU admission were collected. Intensive care outcome and post-ICU survival were also recorded. We defined the respiratory failure index (RFI) in the haematology ward as RFI = 5 − $SatO_2/FiO_2$ [$SatO_2$ = oxygen saturation by pulse oximetry (%); FiO_2 = inspired oxygen fraction (%)]. Using this RFI, 0 represents the lowest delivery of O_2 and the best saturation, and 5 represents the highest delivery with the worst saturation.

RESULTS. The study included 19 men and 8 women (age 52.5 ± 16.1). SAPS II (Simplified Acute Physiology Score) was 46.9 ± 25.9. Baseline diagnoses and disease stages differed greatly among patients. The length of HW before ICU admission was 20.6 ± 15.0 days. Main syndromic diagnosis at ICU admission was: acute respiratory failure (21), shock (5) and liver failure (1). 15 of 27 patients (56%) had neutropenia (<1.0 × 109/L) at ICU admission. We did not find significant differences between patients who had received an allogenic transplant and those who had not in terms of days before ICU admission, SAPS II, need for mechanical ventilation (MV) or outcomes. The overall mortality was: 52% (14/27) in ICU, 67% (18/27) in hospital and 70% (19/27) at 6-months. ICU mortality in patients who were supported by any type of MV was 70% (12/17), compared with 20% (2/10) in those who did not need MV ($p = 0.011$). Only four patients were ventilated exclusively with non invasive mechanical ventilation; one of them died at ICU. There were no statistically significant differences in SAPS II between groups (51.6 ± 30.5 vs. 40.3 ± 16.9, MV vs. no-VM, respectively, $p = 0.301$). Ventilated patients had a higher RFI in HW (2.8 ± 1.2 vs. 1.3 ± 0.9, $p = 0.005$) than non-ventilated patients. The area under the ROC curve for RFI to predict MV support was 0.819 ($p = 0.009$). RFI showed a sensitivity 75% and specificity 78% with threshold on IRI >1.85.

TABLE 1 MAIN CLINICAL VARIABLES GROUPED BY OUTCOME

	HR (bpm)	MAP (mmHg)	RR (bpm)	FiO_2 (%)	RFI	Length of HR stay (days)
Hematology ward (HW)						
Exitus in ICU (14/27)	107 ± 18	87 ± 14	27 ± 8	50 ± 26	2.8 ± 1.2	11.8 ± 8.7
Alive at ICU discharge (13/27)	117 ± 21	87 ± 23	30 ± 8	40 ± 26	1.9 ± 1.4	16.1 ± 15.6
P	0.199	0.958	0.389	0.317	0.090	0.376

	MV	Days on MV	Neutropenia at admission (<1.0 x 10^9/L)	RRT	Hyperbili-rubinemia (n = 18)	Length of ICU stay (days)
Intensive care unit (ICU)						
Dead in ICU (14/27)	12/14 (85.7%)	7.6 ± 11.5	9/14 (64.3%)	2/14 (14.3%)	4/8 (50%)	9.0 ± 11.2
Alive at ICU discharge (13/27)	5/13 (38.5%)	1.7 ± 3.6	6/13 (46.2%)	1/13 (7.69%)	3/10 (33.3%)	5.2 ± 4.7
P	0.011	0.089	0.343	0.586	0.387	0.271

Values expressed as media and standard deviation (95%).
HR heart rate (beats per minute), *MAP* mean arterial pressure, *RR* respiratory rate (breaths per minute), *RFI* respiratory failure index, *MV* mechanical ventilation, *RRT* renal replacement techniques

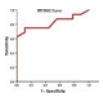

Fig. 1 ROC curve for respiratory failure index

CONCLUSION. Our findings suggest that prompt admission to ICU (with less impaired arterial oxygenation) could prevent the need for MV and could reduce associated mortality in patients with haematological malignancies.

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ARDS: CHARACTERIZATION, EVALUATION OF VENTILATORY VARIABLES AND OUTCOME IN AN INTENSIVE CARE UNIT

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INTRODUCTION. Acute respiratory distress syndrome (ARDS) remains a major problem in critically ill patients and contributes to mortality and morbidity in the intensive care environment [1]. Despite recent randomized controlled trials, the benefit of protective ventilation strategy for survival remains controversial [2]. It is extremely important to evaluate the ventilatory variables at the onset of ARDS to identify possible predictors of mortality.

OBJECTIVES. To characterize the patients with a clinical diagnosis of ARDS admitted in a general Intensive Care Unit (ICU).

METHODS. We conducted a retrospective study including 22 patients, over 18 years old, admitted in the ICU by medical condition with primary ARDS (using American-European Consensus Conference criteria) from 1 January 2009 to 31 December 2010. We analyzed age, sex, SAPS II, diagnosis on admission and microbiological agents. Ventilation modes, PaO_2/FiO_2 ratio, PEEP and tidal volume were evaluated at 24, 48 and 72 h.

RESULTS. From 22 patients, 15 (68%) were male. The mean age was 47.4 ± 15.3 years (range 21–82 years). The mean SAPSII was 34.2 ± 15.8 points. The most prevalent diagnosis was H1N1 influenza pneumonia (8 of 22 patients). Ten patients had septic shock. The mean ICU length of stay was 13.3 ± 10.9 days (range 3–43 days). The mean total day on mechanical ventilation was 12 ± 10.1 days (range 3–42 days). Volume assist/control ventilation was the most used mode (19–86.3%). The mean tidal volume was 8 mL/kg (range 7–10, calculated from actual body weight) and mean PEEP was 11.3 ± 3.9 cmH_2O (range 5–20). The PaO_2/FiO_2 ratio improved significantly at 72 h compared to admission ($p < 0.0001$). The mortality rate at ICU was 13.6%.

CONCLUSIONS. Despite of high tidal volume used in these patients the mortality rate wasn't higher than that one published in protective ventilation studies.

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TIME COURSE OF METABOLIC ACTIVITY AND CELLULAR INFILTRATION IN A MURINE MODEL OF ACID-INDUCED LUNG INJURY

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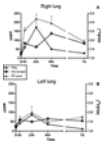
INTRODUCTION. ALI/ARDS are characterized by an acute and a late phase, during which the acute inflammatory response can progress to a fibroproliferative process.

OBJECTIVES. The purpose of the study was to validate a method for the in vivo PET monitoring of lung inflammation in a previously developed murine model of ALI [1] and to explore the potential relationship between the inflammatory process and the late fibrotic evolution.

METHODS. HCl (0.1 M) was instilled (1.5 ml/kg) into the right lung of mice. A group of mice underwent a micro-CT scan 1 hour (h) after lung injury and a series of [^{18}F]FDG-PET (6, 24 and 48 h and 7 days after injury). After 21 days respiratory static compliance was measured and lung tissue was collected to measure the OH-proline content (collagen deposition). Other four groups underwent micro-CT and micro-PET scans at different time points each and immediately sacrificed to assess arterial blood gases and histology in relation with PET-derived data.

RESULTS. We showed a rapid recruitment of PMNs and macrophages into the damaged lung 6 h after injury, with a peak after 24 and 48 h, respectively. [^{18}F]FDG signal, as inflammation marker, showed similar time course and a significant correlation with the number of inflammatory cells recruited. Mice sacrificed 21 days after the surgery showed a correlation between reduced respiratory static compliance and high PET signal 7 days after lung injury. PET signal correlated also with the OH-proline content.



Values were expressed as mean ± SEM (n = 4–5/group).

CONCLUSIONS. PET imaging may be a useful tool to monitor longitudinally and non-invasively the efficacy of anti-inflammatory strategies in experimental model of ALI/ARDS. The persistence of the [^{18}F]FDG signal is associated with an alteration of the lung mechanical properties, possibly due to the fibrotic evolution of injury promoted by the inflammatory infiltrate.

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1136

GAS EXCHANGE, TRANSPULMONARY PRESSURE AND STRESS INDEX IN PATIENTS WITH ACUTE RESPIRATORY DISTRESS SYNDROME: EFFECT OF THREE DIFFERENT STRATEGIES OF POSITIVE END EXPIRATORY PRESSURE SELECTION

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INTRODUCTION. There are different methods to set positive end expiratory pressure (PEEP) in patients with acute respiratory distress syndrome (ARDS).

OBJECTIVES. To compare gas exchange and lung mechanics between 3 methods of PEEP selection: ExPress trial [1], best compliance of the respiratory system (Crs) approach [2] and FiO_2/PEEP table of ARDSnet study [3]

METHODS. 12 ARDS patients were evaluated within the first 48 h of mechanical ventilation (MV). MV was set as follows: tidal volume (Vt) 6 ml/kg, FiO_2 of 1 and respiratory rate to maintain pH >7.10. Patients were ventilated in random order for 20 min with PEEP according to ExPress increased recruitment strategy (A), the best Crs approach (B) previously obtained during a derecruitment manoeuvre and, ARDSnet PEEP/FiO_2 table (C) . Flow, Vt, airway (Paw), esophageal and transpulmonary (Ptp) pressures and Stress Index (SI) were registered with a Fluxmed Monitor (MBMed, Argentina) and arterial blood gases were obtained at the end of each period. Pressure measurements were recorded after 2 s of expiratory and inspiratory pause. Comparison between PEEP strategies was performed with ANOVA for repeated measurements and Bonferroni's test was used for post-hoc analysis.

RESULTS. Mean age and APACHE II were 64 ± 15 years and 24 ± 7. The table shows results from ANOVA test.

Gas exchange and lung mechanics

	ExPress (A)	Crs (B)	ARDSnet (C)	ANOVA P
PEEP (cmH_2O)	17.4 ± 0.69	11.8 ± 0.54	8.36 ± 0.51	<0.001
pH	7.32 ± 0.2	7.32 ± 0.2	7.32 ± 0.2	0.56
$PaCO_2$ (mmHg)	40.0 ± 2.0	38.9 ± 2.1	38.9 ± 1.9	0.190
PaO_2/FiO_2 (mmHg)	276.8 ± 39.3	239.9 ± 40.4	173.1 ± 32.0	0.002
Static compliance (ml/cmH_2O)	31.0 ± 1.78	38.5 ± 2.99	36.2 ± 2.94	<0.001
Paw inspiratory (cmH_2O)	29.8 ± 0.11	22.1 ± 0.72	19.3 ± 1.13	<0.001
Ptp expiratory (cmH_2O)	5.4 ± 0.99	2.3 ± 0.79	0.1 ± 0.94	<0.001
Ptp inspiratory (cmH_2O)	13.8 ± 1.19	9.2 ± 1.10	8.0 ± 1.20	<0.001
Stress index	1.05 ± 0.16	1.00 ± 0.17	0.97 ± 0.16	<0.001

Post-hoc analysis: highest PEEP was selected with A ($P < 0.001$), while C was associated with the lowest values ($P < 0.001$). PEEP selection according to A and B resulted in better oxygenation than C ($P = 0.015$ and $P = 0.007$, respectively). Static compliance was lower with A setting compared with B ($P = 0.001$) and C ($P = 0.018$). Expiratory Ptp were significantly different between all strategies, with lowest values for C. SI was higher with A compared to B ($P = 0.027$) and C ($P = 0.001$), while it was not different between these two approaches.

CONCLUSIONS. PEEP selection according to ExPress, best Crs and ARDSnet resulted in different gas exchange and respiratory system mechanics in a group of ARDS patients. ExPress setting resulted in better oxygenation and higher expiratory Ptp while the static compliance was lower and the SI was higher, suggesting that at least in some cases this may be associated with overdistention. On the other hand, ARDSnet table PEEP was associated with lower PaO_2/FiO_2 ratio and expiratory Ptp that might be related to derecruitment.

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THE INFLUENCE OF COLLAPSE AND RE-VENTILATION OF LUNG ON THE DEVELOPMENT OF PULMONARY EDEMA

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AIMS. This study was to clarify the influence of collapse and re-ventilation of lung on the development of pulmonary edema in rabbit.

METHODS. Animals were randomly assigned to one of three groups: Sham group receiving two lung ventilation (n = 14), Collapse group receiving collapse of right lung (n = 14), Reventilation group receiving collapse of right lung for 3 h followed by reventilation of collapsed right lung for 3 h (n = 14). The lung of rabbits were ventilated with 50% oxygen through the tracheostomy. Right main bronchus was secured by thoracotomy in all animal. Collapse and reventilation were performed using by bulldog forcep. Mean arterial pressure, heart rate, arterial oxygen tension, peripheral blood leukocyte and platelet counts were recorded at 0, 1, 2, 3, 4, 5 and 6 h after the start of experiment. The wet to dry (W/D) weight ratio of lung, lung injury score and leukocyte counts, percentage of polymorphonuclear leukocyte (PMNL), concentration of albumin, and interleukin-8 (IL-8) in bronchoalveolar lavage fluid (BALF) were measured 6 h after the start of experiment in both lung.

RESULTS. W/D weight ratio of lung, lung injury score and leukocyte counts, percentage of PMNL, concentration of albumin and IL-8 in BALF were significantly increased in both lung of reventilation group. And the degree of increases more significant in right than left lung.

CONCLUSIONS. These findings suggest that reventilation of collapsed lung causes the bilateral pulmonary edema in rabbit mainly by activating neutrophil and IL-8 responses, which may play a central role in non cardiogenic pulmonary edema.

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TRANSPULMONARY PRESSURE AND DEAD SPACE VENTILATION DURING A DERECRUITMENT MANEUVER IN PULMONARY ARDS PATIENTS

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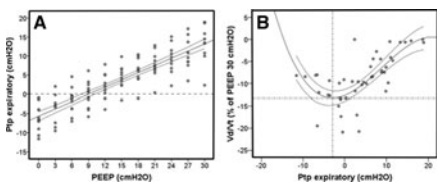
INTRODUCTION. Positive end expiratory pressure (PEEP) associated with the best compliance of the respiratory system during a derecruitment maneuvers can be used for PEEP selection in patients suffering from acute respiratory distress syndrome (ARDS).

OBJECTIVES. To describe changes in transpulmonary pressure (Ptp) and dead space/alveolar ventilation ratio (Vd/Vt) during a derecruitment maneuver performed in a group of patients with ARDS due to severe pneumonia.

METHODS. Eleven patients ventilated in volume-controlled ventilation with 6 ml/kg of tidal volume were included. After a recruitment maneuver (40 cmH_2O of PEEP during 40 s), PEEP was decreased from 30 to 0 cmH_2O by steps of 3 cmH_2O every 3 min. Airway (Paw), esophageal (Pes) and Ptp (Paw-Pes) pressures were acquired at each step using an expiratory and an inspiratory pause of 2 s. In eight subjects, arterial and expired PCO_2 were available for Vd/Vt calculation. Linear and curve estimation regression analysis between mechanics and Vd/Vt were performed. The PEEP value where expiratory Ptp became negative was extrapolated from individual data.

RESULTS. A significant correlation was found between PEEP and expiratory Ptp (Fig. A, R^2 0.74, $P < 0.001$). Expiratory Ptp became negative in all patients when PEEP decreased below 8.9 ± 5.2 cmH_2O. Inspiratory Paw and Ptp also showed a significant linear correlation (R^2 0.76, $P < 0.001$). Vd/Vt was 0.67 ± 0.06 with 30 cmH_2O of PEEP. A J-shape relationship between Vd/Vt and PEEP was observed during derecruitment with a maximal reduction of 14.7 ± 4.5% from baseline (PEEP 30 cmH_2O). Expiratory Ptp_s, PEEP and Vd/Vt best fitted a in a cubic regression model (R^2 0.531, $P < 0.001$ for Ptp and R^2 0.696, $P < 0.001$ for PEEP). The inflection point of expiratory Ptp-Vd/Vt regression equation corresponded to a Ptp of −2.95 cmH_2O (Fig. B).



CONCLUSIONS. During a derecruitment maneuver both inspiratory and expiratory Paw and Ptp showed a good correlation. All patients had negative expiratory Ptp when PEEP was decreased below a variable threshold value (8.9 ± 5.2 cmH_2O). Vd/Vt showed a J-shape relationship with PEEP and expiratory Ptp. These results suggest that in pulmonary ARDS patients low PEEP selection may induce negative Ptp which may increase the risk of alveolar collapse and cyclic opening and closing of alveolar units. On the other hand, high PEEP may stress lung tissue reducing units' perfusion.

1139

STATIC IS LESS INJURIOUS THAN CYCLIC LUNG DEFORMATION: PRELIMINARY EXPERIMENTAL OBSERVATIONS

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INTRODUCTION. Unphysiological deformation (strain) can injure the healthy lung [1].

OBJECTIVES. To clarify whether risks differ when lungs are exposed to mainly cyclic (tidal volume, Vt) or static (positive end-expiratory pressure, PEEP) strain.

METHODS. Fifteen healthy pigs (21 ± 2 kg) were mechanically ventilated for up to 54 h with Vt and PEEP variably set to ensure the same global lung strain (gas volume inflated = 2.5 × functional residual capacity). PEEP contribution to global strain ranged between 0% (pure cyclic strain) and 75% (mainly static strain) as initially estimated from expiratory pressure–volume curves and later verified by computed tomography. Injury was defined as lung weight gain (edema formation) and early death.

RESULTS. Main results are shown in Table [median (IQR)]. One animal could not initiate the study protocol due to major hemodynamic impact of high (75%) PEEP.

Kruskal–Wallis and Chi-square tests

	Strain due to PEEP ≈ 0%	Strain due to PEEP ≈ 25%	Strain due to PEEP ≈ 50%	Strain due to PEEP ≈ 75%	p
n	4	3	3	4	
Global strain	2.6 (2.5–2.6)	2.5 (2.4–2.7)	2.4 (2.4–2.8)	2.5 (2.4–2.6)	0.91
Vt (ml)	900 (638–1,075)	650 (594–688)	700 (588–700)	235 (218–250)	0.03
PEEP (cmH_2O)	0 (0–0)	4 (4–6)	8 (7–10)	20 (19–20)	0.006
Lung weight gain (g)	334 (255–396)	101 (−23 to 182)	358 (158–382)	−7 (−46 to 14)	0.04
Early deaths (%)	4 (100)	1 (33)	0 (0)	0 (0)	0.01

CONCLUSIONS. When a high global strain is applied to healthy lungs, static seems to be less injurious than cyclic deformation.

REFERENCE. 1. Gattinoni et al. Eur Respir J Suppl. 2003.

GRANT ACKNOWLEDGMENT. Funded in part by GE Healthcare.

1140

A VENTILATORY MANOEUVRE TO IDENTIFY AND ESTIMATE AIRWAY CLOSURE IN AN ANIMAL MODEL OF ACUTE LUNG INJURY USING COMPUTED TOMOGRAPHY

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INTRODUCTION. Airway closure (AC) defined as the closure of conducting airways can lead to uneven distribution of ventilation and atelectasis and may play an independent role in ventilator induced lung injury (VILI).

OBJECTIVES. The aim of the study is to test a ventilatory manoeuvre to identify AC in an animal model of Acute Lung Injury (ALI) by using computed tomography (CT).

METHODS. 4 pigs were mechanically ventilated and underwent saline washout lung injury. Baseline ventilatory settings were VT 8 ml/kg, F_iO_2 0.25 and PEEP 15 cmH_2O. Just before the first CT PEEP was set to 5 cmH_2O and driving pressure (DP) to the lowest level to determine a stable saturation for 4 min ventilation, VT thus being reduced to approximately 5 ml/kg. F_iO_2 was then turned to 1 and CT scans were acquired at a fixed transverse plane from time 0 to minute 4 of uninterrupted ventilation. Static images of the whole lung during an end-expiratory (EEHM) and an end-inspiratory hold maneuver (EIHM) were collected. This experimental phase was named LDP_{air}. After recruitment each pig was ventilated for 10 min with baseline ventilatory settings using F_iO_2 1. The entire CT protocol was repeated with low DP but with F_iO_2 of 1. This experimental step was named LDP_{oxygen}. EEHM, EIHM and dynamic images of three respiratory cycles at time 0, 60 and 240 s were analyzed. Each image was divided in ten isogravitational levels (level 10 = most dependent). For each level mean gas content and Hounsfield distribution were calculated.

RESULTS. At baseline LDP_{oxygen} mean gas content decreased from 0.0012 ml at level 1 to 0.00004 ml at level 10; LDP_{air} gas content decreased from 0.0012 to 0.0003 ml from level 1 to 7 and remained constant at 0.00044 ± 0.0002 ml from level 8 to 10. After 4 min of ventilation in LDP_{air} the dependent part of the lung showed no atelectasis (Fig. 1) whereas intermediate parts had become atelectatic; in LDP_{oxygen} both the intermediate and dependent parts of the lung showed formation of atelectasis. These findings are interpreted as AC in dependent regions, promoting atelectasis if previous ventilation had been with F_iO_2 1 but not with F_iO_2 0.25.

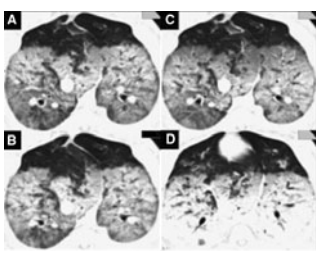

Fig. 1 End-expiratory CT scan of a representative animal previously ventilated with FiO_2 25% at time 0 (**a**) and after 4 min ongoing ventilation with pure oxygen (**b**) the same CT level at time 0 (**c**) and 4 min later keeping FiO_2 constant with 100% (**d**)

CONCLUSIONS. By using ventilatory manoeuvres consisting of low tidal airway pressures and gas with varying F_iO_2, widespread AC with subsequent alveolar collapse could be demonstrated in a porcine lavage model. This suggests that AC may be more important in causing lung collapse in ALI than hitherto thought of.

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VENTILATOR-INDUCED LUNG INJURY AND LIPOPOLYSACCHARIDE-INDUCED INFLAMMATION INCREASE SUSCEPTIBILITY TO TRALI IN A MURINE MODEL

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INTRODUCTION. Transfusion-related acute lung injury (TRALI) is an important entity in the critically ill, contributing to adverse outcome. The pathogenesis is thought to involve a 'two hit' mechanism, in which the clinical condition may increase susceptibility to the occurrence of TRALI. Specific risk factors however, are largely unknown.

OBJECTIVES. To determine whether the presence of ventilator-induced lung injury (VILI) and sterile inflammation can act as a 'first hit' in the development of TRALI, requiring less antibody for a TRALI reaction to occur.

METHODS. TRALI was induced in BALB/c mice by infusion of different concentrations MHC-I antibodies. Controls received isotype antibody. In one experiment mice were pre-treated with an intraperitoneal injection of 0.1 mg/kg lipopolysaccharide (LPS), resulting in an inflammatory condition. In a separate experiment, mice were mechanically ventilated and VILI was induced by applying high (15 ml/kg) tidal volumes, whereas controls received low (7.5 ml/kg) tidal volumes 3 h prior to the induction of TRALI. Broncho-alveolar lavage fluid (BALF) was obtained and the wet-to-dry ratio of the lung and lung-body ratio were determined as a measure of lung edema.

RESULTS. In VILI, infusion of 4.5 mg/kg of MHC-I antibodies resulted in an increase in wet-to-dry ratio ($p < 0.01$) and pulmonary neutrophil influx ($p < 0.01$) compared to isotype controls, whereas these effects were absent after infusion of 4.5 mg/kg MHC-I antibodies in the low tidal volume ventilated controls. In mice pretreated with LPS, the infusion of 2.0 mg/ kg MHC-I antibodies already resulted in lung injury, which was even worse, compared to mice receiving 4.5 mg/kg MHC-I antibodies (lung–body ratio mean difference 1.69×10^{-3}, $p < 0.05$ and BALF-cell count mean difference 60.14, $p < 0.05$).

CONCLUSIONS. In the presence of VILI, a lower amount of MHC-I antibodies is needed to induce lung injury compared to low tidal volume ventilated controls. In the presence of LPS-induced inflammation, susceptibility to TRALI is even more apparent. We conclude that both VILI and sterile inflammation may be risk factors for acquiring a TRALI reaction. We hypothesize that the frequent presence of VILI and inflammation in the critically ill may account for higher TRALI incidences compared to general hospital populations.

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TLR4 LIGAND S100A8/A9 MEDIATES (VENTILATOR-INDUCED) LUNG INJURY

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INTRODUCTION. Mechanical ventilation (MV) causes lung injury through activation of innate immune responses. Animal studies demonstrated MV to induce Toll-like receptor (TLR) four dependent pulmonary inflammation, which points towards an important possible role for endogenous TLR4 ligands during MV. S100A8/A9 proteins are damage-associated molecular patterns that are released with sterile tissue injury and induce inflammation via TLR4.

OBJECTIVES. To determine pulmonary TLR4 expression in patients on MV and to determine the role of S100A8/A9 proteins in ventilator-induced lung injury and acute lung injury (ALI).

METHODS. TLR4 gene expression by human respiratory epithelial cells was analyzed in lung brushes obtained from patients ventilated for 5 h during elective surgery. S100A8/A9 levels were measured in BALF of patients with and without ALI. The role of S100A9 was further investigated using knock-out (KO) and wild-type (WT) mice, which were intranasally exposed to LPS (0.25 mg/kg) to induce lung injury. Subsequently, the animals were randomized to a low tidal volume (LV_T) or a high V_T (HV_T) ventilation strategy for 5 h. Non-ventilated mice served as control. Endpoints of lung injury were: wet/dry ratio, total protein, pulmonary cyto- and chemokine levels, neutrophil influx, and lung histology scores.

RESULTS. MV upregulates mRNA expression levels of TLR4 in human lung tissue. Furthermore, S100A8/A9 levels in BALF of patients with ALI were significantly higher compared to patients without ALI. A similar increase in S100A8/A9 levels was observed in LPS-induced lung injury in mice. HV_T MV amplified lung injury and increased the release of S100A8/A9. Lung injury in LPS challenged S100A9 KO mice was significantly reduced compared to WT mice.

CONCLUSIONS. MV in the human setting modulates TLR4 expression in the lung and S100A8/A9 levels in BALF are increased in patients with ALI. S100A8/A9 enhances inflammation in a two-hit model of LPS-induced lung injury combined with injurious ventilation settings.

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INFLUENCE OF TIDAL VOLUME ON INTRA-PULMONAL PRESSURES DURING ACUTE LUNG INJURY

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INTRODUCTION. Acute Lung Injury (ALI) and the Acute Respiratory Distress Syndrome (ARDS) result in a high morphologic heterogeneity of respiratory tissue with varying air-filled alveolar structures [1, 2]. It remains still unclear whether regional differences of compliances lead to local pressure gradients. Moreover, the impact of high and low tidal ventilation in both healthy and acutely injured lungs on regional pressure curves is also unknown.

OBJECTIVES. The aim of the study was to systematically measure static and dynamic pressures (SP, DP) in vivo in different regions of healthy and acutely injured lungs.

METHODS. After the approval by the responsible governmental institution the study was performed in a porcine model ($n = 12$) according to the Helsinki declaration for the use and care of laboratory animals. The pigs were anaesthetized, ventilated ($FiO_2 = 1.0$, PEEP 5 mmHg, volume-controlled) and randomized into three groups: LT-ALI (experimental lung injury, tidal volume 6 ml/kg), HT-ALI (experimental lung injury, 12 ml/kg) and control group CO (healthy, 6 ml/kg). ALI was induced by surfactant depletion as described previously [1]. The measurements of pressures were performed with two sensors (Sensortechnics Inc., Puchheim, Germany) via connected 1 mm thick flexible PVC tubes. For the determination of several intra-bronchial measuring positions, an electromagnetic tracking technique, NDI Aurora (Northern Digital Inc., Radolfzell, Germany), was used [3]. Measurements were carried out at the beginning (Baseline), after induction of ALI and 1 h afterwards.

RESULTS. DP and SP were recorded synchronously; their difference is proportional to the kinetic energy (KE). During the plateau phase and the expiration, a relevant increase of the KE could be seen. Differences between varying measuring points and groups were determined. In the LT group, the KE increases during ALI compared to BL by trend ($p = 0.08$). More distal measuring points showed a slower pressure increase. In addition, partly an intrinsic PEEP occurred.

CONCLUSIONS. Even in healthy lungs, measured pressure courses depend on the region examined. Moreover, local heterogeneities due to ALI lead to further impact on pressure ratios. Potentially theses heterogeneities are originated from compensating flows like Pendelluft or from sudden (de-) recruitment of lung areas.

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GRANT ACKNOWLEDGMENT. The study was supported by a research grant from the "Deutsche Forschungsgesellschaft (DFG)".

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BENEFICIAL EFFECTS OF POLY(ADENOSINE DIPHOSPHATE-RIBOSE) POLYMERASE INHIBITOR ON RAT SEPTIC ACUTE LUNG INJURY MODEL

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INTRODUCTION. In endotoxemia, acute lung injury (ALI)/acute respiratory response syndrome (ARDS) frequently occurs. ALI/ARDS is a serious disease and inflammatory cytokines are related to this disease. On the other hand, poly(adenosine diphosphate-ribose) polymerase (PARP) enhances nuclear factor (NF)-κB dependent transcription of inflammatory cytokines. Therefore, inhibition of PARP may improve septic ALI/ARDS by blocking NF-κB dependent transcription of inflammatory cytokines.

OBJECTIVES. To determine whether PARP inhibitor, 3-aminobenzamide, could attenuate lung injury in rat septic ALI model.

METHODS. Male Sprague-Dawly rats were anesthetized with intraperitoneal injection of pentobarbital. A tracheostomy was performed and rats were ventilated at V_T 10 ml/kg with 5 cmH_2O PEEP. The right carotid artery was catheterized for blood sampling and continuous blood pressure measurements. Rats were divided into 3 groups; (1) control group ($n = 8$), (2) lipopolysaccharide (LPS) group ($n = 12$): LPS (16 mg/kg) in 0.5 ml normal saline was administered by using an intratracheal nebulizer, (3) LPS + 3-aminobenzamide group ($n = 12$): LPS (16 mg/kg) in 0.5 ml normal saline was administered by using an intratracheal nebulizer, followed by intra-arterial injection of 3-aminobenzamide (10 mg/kg) in 0.5 ml normal saline. Hemodynamics, arterial blood gas, and plasma lactate levels were measured at 0, 1, 2, 3, and 4 h. The mRNA expression of interleukin (IL)-1β and IL-6 in lungs and kidneys were measured. Wet/dry ratio of lungs was also measured.

RESULTS. LPS induced hypotension, metabolic acidosis, hypoxemia, pulmonary edema and mRNA expression of cytokines in lungs and kidneys. The treatment with 3-aminobenzamide increased blood pressure and attenuated metabolic acidosis, hypoxemia, pulmonary edema, and mRNA expression of cytokines in lungs and kidneys in rat septic ALI model.

CONCLUSIONS. These findings suggest that pharmacological inhibition of PARP by 3-aminobenzamide reduces inflammation in lungs and kidneys and attenuates lung injury in rat septic ALI model.

GRANT ACKNOWLEDGMENT. Grants-in Aid for Scientific Research from the Ministry of Education, Science, and Culture of Japan.

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EFFECTS OF PROTECTIVE VENTILATION AND PERMISSIVE HYPERCAPNIA ON VENTILATOR-INDUCED LUNG INJURY IN RATS

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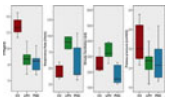
INTRODUCTION. Mechanical ventilation in Acute Lung Injury (ALI) may exacerbate the existing injury, resulting in Ventilator-Induced Lung Injury (VILI). Lung-protective ventilation (LPV) and permissive hypercapnia (PHC) have been proposed to attenuate VILI in comparison to conventional ventilation (CV) [1].
OBJECTIVES. To determine the exact role of LPV or PHC in protecting the lung from VILI.
METHODS. After receiving ethical approval, male Sprague–Dawley rats were anesthetized, paralyzed and received a tracheostomy. ALI was induced by intratracheal instillation of HCl (pH 1.35) followed by mechanical ventilation at a tidal volume (VT) of 8 ml/kg; PEEP 5 cmH_2O; respiratory rate (RR) set to achieve $PaCO_2$ 40–55 mmHg. After 1 h, the rats were randomized to receive CV, LPV or PHC (n = 10 each). In the *CV group*, RR was reduced to 60% of baseline level, VT was increased to achieve $PaCO_2$ 40–55 mmHg; in the *LPV group*: VT remained at 8 ml/kg, and RR was set to achieve $PaCO_2$ 40–55 mmHg; in the *PHC group*, VT was 8 ml/kg but RR was reduced to achieve $PaCO_2$ 60–70 mmHg (Fig. 1).
RESULTS. After 4 h of ventilation, the mean arterial pressure and cardiac index were similar in all groups. As specified by the model there were no differences in pH between CV and LPV groups; but pH in the PHC group was significantly lower. Accordingly, $PaCO_2$ was significantly higher in PHC group than CV and LPV groups (Table 1). Compared to CV, the lung wet/dry ratio was significantly lower in the LPV group but not the PHC group (Table 1).
CONCLUSIONS. LPV may be more therapeutic for VILI attenuation than PHC, possibly by maintaining physiological pH and reducing pulmonary edema.
REFERENCE 1. Laffey JG, et al. Intensive Care Med. 30:347–56.
GRANT ACKNOWLEDGMENT. Canadian Institutes of Health Research, Dalhousie University Faculty of Medicine



Box plots of tidal volume (VT), respiratory rate, minute ventilation and plateau pressure after 4 h of conventional ventilation (CV), lung-protective ventilation (LPV) or ventilation with permissive hypercapnia (PHC).

	MAP (mmHg)	CI_BSA (L/min)	pH	$PaCO_2$ (mmHg)	PaO_2 (mmHg)	Wet/dry ratio	QS/QT
CV	116 ± 29	2.3 ± 0.7	7.29 ± 0.14	52.1 ± 8.6	222 ± 134	8.6 ± 1.9	0.26 ± 0.21
LPV	134 ± 40	2.2 ± 0.4	7.32 ± 0.12	48.3 ± 8.9	279 ± 111	6.9 ± 1.9#	0.22 ± 0.18
PHC	121 ± 36	1.9 ± 1.0	7.15 ± 0.14*	74.6 ± 16.6*	196 ± 121	7.8 ± 1.9	0.32 ± 0.26

Mean arterial pressure (MAP), cardiac output indexed to body surface area (CI_BSA), pH, arterial CO_2 and O_2 ($PaCO_2$ and PaO_2), wet/dry lung ratio, and shunt fraction after 4 h of CV, LPV or PHC. *$p < 0.05$ versus others, #$p < 0.05$ versus CV.

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UNLOADING FROM WORK OF BREATHING DOES NOT ATTENUATE VENTILATOR ASSOCIATED LUNG INJURY

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INTRODUCTION. Mechanical ventilation may be live-saving for patients with ALI and ARDS. Ventilator associated lung injury (VALI) may be attenuated by lung-protective ventilation settings, but the influence of preserved spontaneous breathing on VALI is not well understood.
OBJECTIVES. To investigate whether differences in the work of breathing (WOB) related to increasing amount of spontaneous breathing support have an influence on VALI.
METHODS. After approval by the institutional Animal Care Committee male Sprague–Dawley rats were anesthetized, sedated with continuous infusion of remifentanil and tracheotomized. ALI was induced by instillation of hydrochloric acid (0.2 M, pH 1–2) and allowed to develop for 1 h of controlled ventilation (V_t 8 ml/kg; PEEP 5 cmH_2O; respiratory rate (RR) set to achieve $PaCO_2$ 40–55 mmHg). Animals were randomized to controlled (CMV), Assist (A/C) or Pressure Support ventilation (PS) with ΔP of 100% (PSV100), 60% (PSV60) or 20% (PSV20) of previous CMV and ventilated until death or 4 h, whichever occurred first. Five animals in CMV, three in A/C, three in PSV100, four in PSV60 and seven animals in PSV20 died prematurely and data from the last recording were analyzed. WOB was calculated from 10 s recordings as $\int P*f/VE$ (with P_{tp} for WOB_{total}, P_{aw} for $WOB_{ventilator}$ and P_{es} for WOB_{rat}), PTP as $\int P_{es}*RR$. Absolute values are reported. VALI was determined by the Diffuse Alveolar Damage Score (DAD) as described previously. Wet/dry-ratio of the lung was used as surrogate for lung edema.
RESULTS. Groups showed no differences at baseline. WOB_{tot} increased significantly ($p < 0.001$) from 0.46 ± 0.20 to 0.95 ± 0.48 J/l for all animals. WOB_{rat} increased in all groups but CMV, and correlated with the reduction in mechanical support. WOB_{vent} correlated positively with the amount of mechanical support. WOB_{rat} and WOB_{vent} correlated with r = −0.503 (p = 0.0003). WOB_{rat} and PTP showed a strong correlation (r = 0.742; $p < 0.0001$). PTP correlated inversely with w/d-ratio (r = −0.305; p = 0.037) and with DAD (r = −0.4693; p = 0.0494). With increasing WOB_{vent} the mean arterial pressure (r = −0.3899; p = 0.0074) and heart rate (r = −0.3211; p = 0.0261) decreased.

Work of breathing

Group	WOB_{tot} (J/l)	WOB_{vent} (J/l)	WOB_{rat} (J/l)	PTP (cmH_2O s min^{-1})
CMV				
BL	0.504 ± 0.258	0.526 ± 0.266	0.051 ± 0.034	27.42 ± 22.80
End	0.748 ± 0.549	0.734 ± 0.471[de]	0.076 ± 0.104[cde]	28.09 ± 45.30[cde]
A/C				
BL	0.438 ± 0.145	0.457 ± 0.180	0.045 ± 0.040	26.05 ± 18.39
End	0.837 ± 0.423*	0.613 ± 0.569[e]	0.260 ± 0.244*[de]	139.11 ± 79.48*
PSV100				
BL	0.511 ± 0.227	0.489 ± 0.221	0.037 ± 0.026	44.32 ± 40.86
End	1.024 ± 0.533*	0.366 ± 0.332	0.713 ± 0.406*[a]	157.90 ± 144.14[a]
PSV60				
BL	0.388 ± 0.193	0.437 ± 0.197	0.065 ± 0.044	41.30 ± 32.64
End	0.997 ± 0.338*	0.151 ± 0.150*[a]	0.977 ± 0.379*[ab]	188.76 ± 74.13*[a]
PSV20				

Table ezzzzzz continued

Group	WOB_{tot} (J/l)	WOB_{vent} (J/l)	WOB_{rat} (J/l)	PTP (cmH_2O s min^{-1})
BL	0.448 ± 0.172	0.459 ± 0.179	0.057 ± 0.048	28.31 ± 20.75
End	1.110 ± 0.530*	0.053 ± 0.074*[ab]	1.082 ± 0.547*[ab]	204.06 ± 92.28*[a]

$p < 0.05$ compared to: *baseline; [a]CMV; [b]A/C; [c]PSV100; [d]PSV60; [e]PSV20

CONCLUSIONS. Analysis of WOB in a physiologic rodent model of ALI is possible and provides sustainable results. Unloading from the WOB does not attenuate VALI but worsens hemodynamic compromise in acid-aspiration induced ALI.
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GRANT ACKNOWLEDGMENT. This study was supported by grants from Dalhousie University and the Nova Scotia Lung Association

Nutrition: 1147–1157

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EARLY ENTERAL NUTRITION IN POSTOPERATIVE CARDIAC SURGERY IN PATIENTS WITH HEMODYNAMIC FAILURE: PRELIMINARY RESULTS

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INTRODUCTION. Early enteral nutritional support (EENS) in critically ill patients after cardiac surgery with hemodynamic failure is controversial due to the potential risk of gastrointestinal complications, particularly bowel ischemia, and the difficulty to reach the nutritional target.
OBJECTIVES. To assess the safety and the efficacy of EENS, performed according to the protocol of enteral nutrition of our Intensive Care Service.
MATERIALS AND METHODS. Prospective observational descriptive trial in a surgical intensive care unit in a tertiary care university hospital during 9 months. It includes cardiac surgery patients with hemodynamic failure (need of vasoactive support with at least moderate doses and/or mechanical circulatory support (MCS: IAoBP or ECMO) that required more than 24 h of mechanical ventilation. Variables (var.) collected were: descriptive var., hemodynamic daily assessment (lactate, cardiac index, amine doses, mean arterial pressure), efficacy var. (days of nutritional support, volume and calories delivered, attainment of a nutritional goal previously calculated 25 kcal/kg of ideal body weight, reached 96 h after the beginning of nutritional support), and safety variables (abdominal distension, high gastric aspirate volume, vomiting and regurgitation, diarrhea, bronchial aspiration). A descriptive analysis was performed (mean [m] ± standard deviation, P50 ± [ICR] or %).
RESULTS. 387 patients were admitted in this period of time. 22 (5.6%) met the inclusion criteria. 50% male. $_m$age: 59.5 ± 15.6 years. $_m$EuroSCORE: 8.57 ± 2.56. $_m$SAPS II 37.5 ± 8.48. $_m$SOFA 7.53 ± 2.56. $_m$time of cardiopulmonary bypass 128.48 ± 58 min. $_m$Cardiac index 2.23 ± 0.6 l/min/m^2. 81.82% required vasoactive support with at least two amines in the first 48 h, 17.2% required MCS and 68.2% met criteria of early multiorgan dysfunction. Mortality was 13.6%. Enteral Nutrition days per patient: 10.8 ± 8.6. Volume delivered: P50 1195 cc. Energy delivered: P50 1215 kcal. The nutritional goal was reached in 77.2% of the cases. No case of mesenteric ischemia was detected. The most common complications detected, such as abdominal distension (9.5%) followed by diarrhea (7%).
CONCLUSIONS. In our experience, EENS in critically ill cardiac surgery patients with hemodynamic failure is possible, safe and not associated with serious complications. In 77% of patients the nutritional goal was reached.
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EARLY ENTERAL NUTRITION IN INTENSIVE CARE UNIT

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INTRODUCTION. In the last few years early enteral nutrition (EEN) has become an important part of treatment in Intensive Care Unit. In spite of unquestionable advantages of enteral nutrition, early introduction of nutrition after injury is still being discussed.
OBJECTIVES. The aim of this study was determining whether early enteral nutrition based on standard diets causes lower number of complications, lower mortality, shorter hospital stay and lower cost of treatment of critically ill patients
METHODS. In retrospective study two groups of Intensive Care Unit (ICU) patients were compared. There were 114 patients included in control group (CG) where hospital diet was introduced late (5th–7th day of treatment). Study group (SG)—212 patients, were the patients of the same ICU after implementation of algorithm based on earliest possible introduction of standard diets enterally. Statistical analysis was performed using multifactorial logistic regression. Differences were statistically significant for $p < 0.05$.
RESULTS. The results are presented in the table below

Final results

	Study group (SG)	Study group (SG)	Control Group (CG)	Control Group (CG)	p
Incidence	Present	Absent	Present	Absent	
Mortality	86	126	64	50	0.0101
Complications of wound healing	4	208	12	100	0.00129
Ventilator associated pneumonia (VAP)	24	188	29	85	0.00171
Gastrointestinal bleeding	2	210	21	91	0.000001
Acute renal failure	4	208	23	91	0.000001
Sepsis	23	189	31	83	0.00028

CONCLUSIONS. (1) Implementation of nutritional standard based on earliest possible enteral nutrition based on balanced diet has led to 15% decrease in mortality in ICU as compared to control group without such a standard. (2) Early enteral nutrition of critically ill patients has led to shortening of hospital stay by 3.5 days. (3) Algorithm of nutritional treatment implemented for ICU patients has led to reduced number of such complications as: acute renal failure, gastrointestinal bleeding, sepsis, ventilator associated pneumonia, complications of wound healing. (4) Change of nutritional standard in ICU patients has reduced the cost of hospitalization.
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GRANT ACKNOWLEDGMENT. Team of ICU.

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AUDIT OF ENTERAL FEEDING INITIATION AND PROTOCOL COMPLIANCE IN INTENSIVE CARE

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INTRODUCTION. Establishment of enteral feeding in ICU patients is crucial in the adequate nutritional care of the critically ill. A current study plans to compare enteral & parenteral feeding in these patients.

OBJECTIVES. Concerns regarding successful establishment of enteral feeding on our ICU led to an audit being undertaken comparing current practice to our protocol target & audit standard, of 1 ml/kg/h.

METHODS. A retrospective audit was conducted using data interrogation from the Innovian® Patient Data Management System used on our ICU.

RESULTS. Over a 5-day stay, 1,572 feed events where identified. Daily enteral feed rates where recorded in a Microsoft® Excel Spreadsheet and analysed using StatPlus®:mac LE. The data was not normally distributed, therefore median and interquartile range are shown.

Daily enteral feed rates

Median feed rate (IQR)	0.17 (0.08–0.36)	0.50 (0.28–0.81)	0.56 (0.31–0.92)	0.65 (0.35–0.90)	0.73 (0.40–0.94)
Min. feed rate	0.01	0.01	0.02	0.03	0.02
Max. feed rate	0.78	1.29	1.41	1.36	1.33
Median calories/ patient/day	0.17 (0.08–0.36)	0.50 (0.28–0.81)	0.56 (0.31–0.92)	0.65 (0.35–0.90)	0.73 (0.40–0.94)
On TPN (n)	15	17	14	17	16

Establishment of enteral feed to target failed to be achieved in any cases on day 1, 17% on day 2, 19% on day 3, 17% on day 4, and 21% on day 5 (mean compliance 11% over 5 days). 90% of target was achieved in no cases on day 1, 20% on day 2, 26% on day 3, 24% on day 4, & 28% on day 5. Subgroup analysis from 37 patients was performed to determine why full enteral feed failed to be established. 11 patients (30%) did not receive any enteral nutrition within the first 24 h. 21 patients (57%) did not have feed increased at 4 h, although 13/21 (62%) of these patients were compliant for a protocol lead increase. 25 patients (68%) did not have a subsequent increase, 18/25 (72%) of them should have received an increase. 6/14 patients (42%) eligible for a further increase in feed did not receive it. Protocol lead initiation of prokinetic therapy was delayed in several cases: 3 receiving it within 12 h and 1 receiving it in 39 h, although 90% received prokinetics within 24 h. Protocol compliance occurred in 3/37 patients (8%).

CONCLUSIONS. This audit demonstrates that practice fell below the audit standard. Existence of a rigid protocol does not necessarily lead to high compliance. Reasons include: lack of/contraindication to NGT insertion; surgical instructions regarding feed, deviating from the protocol; inappropriate feed reduction; failure to increase feed again in 4-hourly increments, significantly affecting time taken to full feed. Additionally, ideal feed calculations were not accurately performed leading to under and overfeeding. Suggestions for improvement include: further education of staff regarding the importance of establishment of adequate nutrition; addition of metoclopramide as an automatic, prn, prescription; addition of a "nutrition" plan on ICU admission; & consideration of early parenteral nutrition for patients who are likely to have multiple feed interruptions.

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NATIONAL AUDIT OF NUTRITIONAL SUPPORT IN INTENSIVE CARE ON BEHALF OF THE SCOTTISH INTENSIVE CARE SOCIETY AUDIT GROUP

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INTRODUCTION. Nutrition is an important aspect of therapy for adult critically ill patients and is gaining more importance in the minds of intensive care physicians. Inadequate calorie intake has been shown to correlate with increasing intensive care length of stay and infection complication rates. The European Society for Clinical Nutrition and Metabolism (ESPEN) recommend that enteral nutrition (EN) should be initiated within 24 h of admission unless contraindicated (unless they are expected to be on full oral diet within 3 days). Where EN is contraindicated they advocate commencing parenteral nutrition (PN) within 48 h.

OBJECTIVES. To establish current practice for nutritional support for critically ill patients.

METHODS. We performed a prospective case note audit of all level 2 and 3 patients admitted to ICUs across Scotland during a 2-week period in November 2010. Data was collected regarding any nutritional support that was provided during the first 96 h of admission.

RESULTS. 18 ICUs responded and data was collected from 290 patients. Of these 97 (33.4%) received oral diet, 1 had oral diet supplemented with EN (0.3%), 99 patients received EN only (34.1%), 14 patients received EN and PN (4.8%), 19 patients received PN only (6.6%) and 55 patients received no nutrition (18.9%). The mean time to commence feeding was 17.5 ± 2.5 h. Mean calorie intake as a percentage of the patient's daily requirement for day 1 was 20.7 ± 4.9%, day 2 45.8 ± 5.9%, day 3 49.8 ± 7%, and day 4 50.7 ± 7.5%. 148 patients were expected to manage an oral diet within 3 days, however, only 95 patients (64.2%) managed this. After commencement of feeding there were 74 documented interruptions. Of these the commonest were extubation (31.1%, average duration 5.3 h), theatre (14.9%, average duration 8 h), NG dislodged (13.5%, average duration 6.5 h), vomiting (8.1%, average duration 6.9 h) and large aspirates (5.4%, average duration 22.3 h). The commonest causes for contraindication to enteral nutrition were surgical request (41.7%), GI tract not functional in addition to surgical request (21.7%) and GI tract not functional (33.3%).

Interruptions to feeding

Cause	Frequency of interruption (% of total interruptions)	Average duration of interruption (h)
Extubation	23 (31.1%)	5.3
Theatre	11 (14.9%)	8
NG dislodged	10 (13.5%)	6.5
Vomiting	6 (8.1%)	6.9
Large aspirates	4 (5.4%)	22.3

CONCLUSIONS. Within the Intensive Care environment it is possible to closely monitor the delivery of nutrition and ensure adequate intake, however, this audit suggests that we are falling short of targets. Delay in initiating nutrition, increased time to achieve target calorie prescription and interruptions in feeding all contribute to an inadequate nutritional intake. This could be improved by adopting a more aggressive approach with earlier feeding starting at target rate, accepting higher gastric residual volumes, and with the early use of prokinetics.

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DESCRIPTIVE ANALYSIS OF NUTRITIONAL MANAGEMENT OF ACUTE PANCREATITIS IN INTENSIVE CARE UNIT

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INTRODUCTION. The exact timing of oral nutrition and the type nutrition have not as yet been subjected to randomized prospective trials. In general, oral intake of limited amounts of calories is usually initiatedwhen abdominal pain has subsided such that parenteral narcotics are no longer required, abdominal tenderness has markedly decreased, nausea and vomiting have ceased, bowel sounds are present, and the overall assessment of the physician is that the patient has improved. In the patients with acute pancreatitis is very important the nutrition, because are patients with high matabolism.

OBJECTIVES. We want to analyze by a nutritional point of view the management of patients admitted to our ICU unit with a diagnosis of acute pancreatitis (AP).

METHODS. We studied patients with acute pancreatitis admitted to our ICU from January 2000 to December 2009. We analyze the route of nutrition (enteral vs parenteral), delayed start of this, time to reach the full dose of enteral nutrition (EN), days of parenteral nutrition (PN) and the percentage of gastric intolerance.

RESULTS. 128 patients (68% male, mean age 60 ± 14 years) were admitted to our unit during the study period with the diagnosis of AP. Biliary etiology was the most frequent (48.4%). The mean APACHE II scale was 16.4 and the mean Ramson scale was 4.54. The mean length of stay of our patients was 16.5 ± 21.4 days and mortality was 28.1%. Only in 14 patients EN was started in the first 72 h after admission: 3 had gastric intolerance and 9 also need PN. 49.2% of patients received EN during admission and 79.7% PN. The mean delay of onset of NE was 174.2 ± 157.2 h, and the NP 0.8 ± 1.1 days. Patients receiving PN for a mean of 13.7 ± 16.8 days. Only 18.5% of patients receiving EN had problems with digestive tolerance.

CONCLUSIONS. Despite current recommendations, in only 10.9% of patients EN was started within 72 h of admission. In our unit, 79.7% of patients with AP received PN, since their ICU admission. The patients with EN had the low level of intolerance (<20%), hence we should try it in more patients.

REFERENCE. 1. Toouli J, Brooke-Smith M, Bassi C, Carr-Locke D, Telford J, Freeny P, et al. Guidelines for the management of acute pancreatitis. J Gastroenterol Hepatol. 2002;17(supp 1):S15–39.

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AN AUDIT OF THE EFFICACY OF AN ENTERAL FEEDING PROTOCOL IN ACHIEVING A MINIMUM INTAKE OF 60% CALORIE REQUIREMENTS TO PATIENTS IN THE INTENSIVE CARE UNITS (ICU) AT ST. GEORGE'S HOSPITAL (SGH), LONDON

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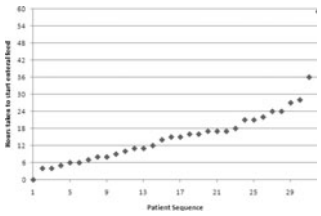
INTRODUCTION. Patients in ICU unable to feed by mouth should receive nutritional support, preferably enterally. It is important to start feed early, ideally within 12–24 h of admission to ICU. A target of >60% of normal calorie requirements has been suggested as adequate [1]. SGH protocol is that feed should be started within 6 h of admission and increased incrementally until target feed rate of 65 ml/h (1,560 kcal day) is reached.

AUDIT OBJECTIVE. To assess the feeding protocol in SGH's ICUs by; Investigating calories delivered via enteral feeding to the patients in the ICUs at SGH, versus with a target of 60% of their calculated daily requirements. Noting time post admission to the ICU for feeding to be started and which factors cause delays.

METHOD. Prospective observational audit of adult patients who received enteral feeding in the General, Neurosurgical and Cardiothoracic ICUs at SGH between 3 November 2010 and 1 December 2010. Patients on parenteral nutrition were excluded. Patients were followed for the first ten full days of their admission, unless death, discharge from the unit or permanent discontinuation of feed occurred sooner.

DATA COLLECTED. Calories of feed delivered, if feed was stopped, the length of time and reason for doing so. Demographics of patient age, pre-admission height and weight, body mass index (BMI). Volume of propofol infused. Individual calorie requirement was calculated using the formula; 25 kcal/kg/day, up to a BMI of 27. If BMI >27, requirement was calculated as if it was 27. The target intake = 60% calculated requirements.

RESULTS (N = 32). Feeding was delayed >6 h in 26/32 patients (81.2%). Average delay was 15.8 h (0–59 h). Delay in insertion of a naso-gastric tube was the main reason feeding was delayed (14/26 patients not fed by 6 h). Versus target of 60% of requirements 15/32 (47%) did not achieve it with enteral feeding. Adding calories obtained from propofol, this decreases to 11/32 (34%).



Time taken to commence enteral feeding

CONCLUSIONS. The enteral feeding protocol at SGH fails to meet a 60% intake target in almost half (47%) of patients audited.
Placing NG tubes earlier may improve the number of patients reaching target calorie intake. This has been proposed as part of the ICU admission bundle at SGH.

REFERENCE. 1. Arabi YM, et al. Permissive underfeeding and intensive insulin therapy in critically ill patients: a randomized controlled trial. Am J Clin Nutr. 2011;93(3):569–77.

GRANT ACKNOWLEDGMENT. No funding was sought for this audit.

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FOOD FOR THOUGHT? A PROSPECTIVE AUDIT OF PRESCRIBED VERSUS DELIVERED ENTERAL NUTRITION IN A LARGE MIXED-SPECIALTY INTENSIVE CARE UNIT

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INTRODUCTION. Ensuring delivery of adequate nutrition to critically ill patients can be challenging. Observational data describing an association between inadequate feeding and poor clinical outcome exists [1, 2]. We present an audit of current practice with recommendations aimed at improving initiation and delivery of enteral nutrition.

METHODS. We conducted a prospective audit of 50 consecutive admissions to intensive care at the Royal London Hospital. Data collected included: time delay in commencing enteral feeding, reason for delay, calculated nutrition requirement (according to ESPEN guidance [3]), actual daily calorific and protein delivery and reasons for failure to achieve a target of 80% of calculated daily requirement. All patients were followed up for 14 days or intensive care discharge.

RESULTS. Of the 50 patients admitted during the study period, 20 patients were excluded (5 never enterally fed, 7 received enteral feeding <24 h, 5 surgical request to delay feeding, 2 on parenteral nutrition, and 1 receiving palliative treatment). Average delivery of daily requirement was 68%. Fasting for theatre accounted for 37% of stated reasons for failure to deliver daily feed target. Average time of delay to initiation was 15.5 h. Lack of surgical decision on feeding was the major reason for delays over 24 h.

CONCLUSION. The average time of delay to initiation of enteral feeding has improved compared to a previous audit (15.5 versus 18.5 h) and falls well within the recommended 24 h [3]. Delivery of enteral nutrition over subsequent days however fell short of our 80% target. We recommend the introduction of the enhanced delivery protocol proposed by Heyland [4] where feeding rates are recalculated if feed is stopped, ensuring missed feed is subsequently replaced. This allows "catching up" of daily prescribed volumes. Guidelines for appropriate fasting for surgical interventions have also been introduced.

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JEJUNAL FEEDING ASSOCIATED WITH IMPROVED NUTRIENT DELIVERY COMPARED WITH GASTRIC FEEDING IN PATIENTS RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION

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INTRODUCTION. Enteral nutrition, whilst the preferred method of feeding critically ill patients, has been associated with inadequate nutrient provision in patients receiving extracorporeal membrane oxygen (ECMO) [1].

OBJECTIVES. To compare protein and energy delivery in patients receiving veno-venous (vv) ECMO fed via the gastric or jejunal route.

METHODS. This was a retrospective observational case series approved as a clinical audit. Patients were included if they underwent VV ECMO support. Data obtained included demographics, route of enteral nutrition and daily energy and protein intake. The daily energy and protein intake are expressed as a percentage of the daily nutritional targets. Nutritional targets were estimated by the dietitian using 25–30 kcal/kg and 1.2–1.5 g protein/kg and based on each patient's ideal body weight. Enteral feeding was commenced and increased in accordance with the ICU feeding protocol. The route of feeding was decided by the attending clinician. All data were collected electronically (ICIP, Philips). Feeding was considered 'adequate' if intake met 90–110% of estimated target. Descriptive statistics, the Mann–Whitney *U* or Chi-square tests were used where relevant (IBM SPSS, NY, USA). Results are presented as median and interquartile range.

RESULTS. Seven patients met the inclusion criteria. One patient received gastric feeding exclusively whilst four patients received jejunal feeding exclusively. Two patients were commenced on gastric feeding but were changed to jejunal feeding following intolerance as defined by large gastric residual volumes despite prokinetic therapy (>300 mL aspirate for 72 h). Gastric feeding was undertaken for a total of 26 days whilst jejunal feeding was undertaken for a total of 71 days.

TABLE 1 PATIENT DEMOGRAPHICS

Male:female	5:2
Duration ECMO (days)	10.0 (8.0–10.0)
LOS (days)	34.0 (18.0–49.0)
Outcome (deaths)	2
Age (years)	39.0 (29.0–40.0)
BMI	26.0 (21.0–32.0)
Estimated energy requirements (kcal/day)	1,800 (1,600–2,100)
Estimated protein requirements (g/day)	83.0 (70.0–90.0)

TABLE 2 NUTRIENT DELIVERY AND ADEQUACY OF FEEDING

	Gastric	Jejunal	p value
Energy Intake (as % of target)	78.5 (34.0–94.0)	105 (96.0–107.5)	<0.001
Number of days when energy intake adequate[a] (%)	10 (38.5)	58 (81.7)	<0.001[§]
Protein Intake (as % of target	70.5 (0.0–88.0)	106 (93.0–109.5)	<0.001
Number of days when protein intake adequate[a] (%)	6 (23.1)	55 (77.5)	<0.001§

[§]Chi-square statistics used

[a]Intake between 90 and 110% of estimated target

CONCLUSIONS. In this case series, jejunal feeding was associated with a greater proportion of days where energy and protein intake was adequate. Daily estimated nutritional requirements were met using jejunal feeding though not with gastric feeding. These results encourage the development of prospective randomised controlled trials addressed at this question.

REFERENCE. 1. Lukas, et al. Crit Care Resusc. 2010;2(4):230–4.

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POSTOPERATIVE NUTRITIONAL SUPPORT IN LUNG TRANSPLANT AS MORTALITY PREDICTOR

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INTRODUCTION. In transplant receptors nutritional situation is a complication determine factor, being related to a greater number of infections and a worse outcome.

OBJECTIVE. To analysed previous and post lung transplant nutritional situation and to determine the role of nutritional support in lung patients mortality.

METHODS AND MATERIAL. Lung transplant receptors from January 2000 to December 2010 in a tertiary hospital were included. Previous lung transplant (LT) nutritional situation was study, based on biochemical (Albumin, prealbumin, transferring, cholesterol, lymphocytes and Protein C) and biometrical parameters (body mass index (BMI)). Post transplant nutritional support (Enteral nutrition, Parenteral nutrition, Mix nutrition), complications rates, infections and mortality were recorded.

RESULTS. 221 transplants were included, age was 50 ± 13.9 (13–69 years). 87 were double lung transplant, 136 single lung transplants (59 right lungs and 75 left lungs). Previous lung diseases were 31.2% emphysema, 28.1% fibrosis and 9.5% cystic fibrosis. 33.5% were under long corticoid therapy previous lung transplant. Biochemistry parameters previous lung transplant are shown in Table 1. Post transplant 142 patients needed nutritional support: 62 EN, 17 PN, 41 mix nutrition, 21 oral supplements. Cystic fibrosis patients and double lung transplants receive more nutritional support, 80.9 and 90%, respectively. Long time mechanical ventilation happened in 42.1%, pulmonary infection in 16.3% and non infectious lung complications in 24.4%. Renal failure occurred in 11.3%. ICU length of stay was 16, 6 days, median 8 days (range 2–180 days) and ICU mortality was 12.7%. Patients treated with parenteral nutrition (total or mix) presented more complications and higher mortality than those nourished by enteral or oral nutrition ($P < 0.001$). Patients with normal BMI showed higher mortality than those with BMI higher than 25.5 and lower than 18 (p:NS).

Nutrition parameters previous lung transplant

	Media ± SD	Median	Range
Albumin (3.5–5 g/dL)	4.4 ± 0.5	4	2.8–5.8
Prealbumin (18–40)	24.2 ± 8	24.2	8.18–47.9
Transferrin (200–400)	236.9 ± 54	230	117–483
Cholesterol (<220)	201.8 ± 51.1	203	77–384
Lymphocytes	2,308 ± 986.3	2,215	480–6,150
BMI (18–25)	24.2 ± 5.4	23	13–48

CONCLUSIONS. Parenteral nutrition support increase postoperative complications and mortality in lung transplant patients. In general patient's nutrition situation previous transplant surgery was adequate.

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HOW AFFECTS ENTERAL NUTRITION IN INTENSIVE CARE, DOES REALLY INCREASE COMPLICATIONS?

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INTRODUCTION. Early EN has been associated to a lower complication rates, lower ICU length of stay and lower mortality, but not in all studies. Some recent studies found a relationship between enteral nutrition and an increase in pulmonary and urinary infection. Anyway in ESPEN guidelines EN keeps being recommended as a first choice in critical care patients.

OBJECTIVE. To study if EN is related to a higher complication rates or mortality.

MATERIALS AND METHODS. Retrospective study realized in a tertiary hospital general critical care unit. Patients admitted from January 2009 to December 2010, under mechanical ventilation and nourished by enteral nutrition were included. Patients who received Parenteral nutrition at any point of their ICU stay were excluded. Demographic data, past medical history and admission disease was recorded. Complications during ICU stay, infectious and non infectious, and ICU mortality was study. Statistic analysis was done with SPSS 19.001.

RESULTS. 525 pt were included, median age 57.6 ± 16.1 (median 60, range 14–85 years). 232 (46.4%) were neurocritical care patients, respiratory 30%, 14% traumatic and 13.7% septic shock. 24.8% had previous hypertension, 24.8% diabetes mellitus, 8.2% alcoholic habit, 7.4% lymphoma and 7.2% chronic pulmonary disease. Enteral nutrition was started in the first 18.1 ± 12.4 h (median 15 h, range 0–73 h). In adjusted analysis, comparing complications in patients nourished before and after 24 h, we found that Critical Care Polyneuropathy (2.7 vs 8.2%; $p = 0.020$) and multiorgan failure (3.6 vs. 8.2; $p = 0.041$) was more frequent in those nourished after 24 h. We did not found any differences in mortality, either other complications.

CONCLUSIONS. (1) Early enteral nutrition it was based on ESPEN guidelines. (2) Early enteral nutrition was related with lower rates of multiorgan failure and critical care polyneuropathy.

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IMPACT OF NOT MONITORING GASTRIC VOLUME IN MECHANICALLY VENTILATED PATIENTS RECEIVING EARLY ENTERAL FEEDING: A MULTICENTER RANDOMIZED TRIAL

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INTRODUCTION. Monitoring of residual gastric volume (RGV) to prevent nosocomial pneumonia is standard practice in mechanically ventilated patients receiving early enteral nutrition (EN). However, few data are available to support this practice. RGV measurement is neither standardized nor validated, and recent studies failed to associate RGV with ventilator associated pneumonia (VAP) [1].

OBJECTIVES. To test the hypothesis that not monitoring of RGV is not associated with increased rates of VAP, as compared to monitoring of RGV.

METHODS. We designed a multicenter, randomized trial involving mechanically ventilated patients receiving early EN. Patients received nasogastric feeding within 48 h after intubation. Patients were randomly assigned to one of two groups: monitoring of RGV (RGV group), and not monitoring of RGV (Not-RGV group). Continuous 24-h nutrition was started at the rate required to deliver a daily amount of 20–25 kcal/kg. Intolerance was defined as RGV >250 ml/6 h or vomiting in the RGV group and as vomiting in the Not-RGV group. In both groups, intolerance was treated with erythromycin (250 mg IV/6 h) and a delivery-rate decrease to the previously well tolerated rate when intolerance to EN was still observed despite erythromycin treatment. Patients with clinically suspected VAP (new and persistent or progressive infiltrates on the chest radiograph with at least two of the following criteria: peripheral leukocytosis >10,000/mm^3, or leukopenia <4,000/mm^3, and body temperature $\geq$38.5 or $\leq$35.5°C, and purulent tracheal aspirates) underwent fiberoptic bronchoscopy with protected distal bronchial sampling. The diagnosis of VAP was confirmed when the quantitative culture of the protected distal bronchial sample was positive at $\geq 10^3$ cfu/ml. The primary outcome was the rate of patients with VAP. Secondary outcomes included rates of vomiting and mortality.

RESULTS. 450 were included in the NUTRIREA study in a 9 months period. Inclusions were achieved in March 2011. Results will be presented for the first time at the ESICM congress.

CONCLUSIONS. The NUTRIREA study included 450 patients in a randomized multicenter trial designed to assess the impact of RGV monitoring in mechanically ventilated patients receiving early enteral feeding.

REFERENCE 1. Poulard F, Dimet J, Martin-Lefevre L. Impact of not measuring residual gastric volume in mechanically ventilated patients receiving early enteral feeding. A prospective before–after study. J Parenter Enter Nutr. 2010;34(2):125–30.

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