CARDIOLOGY

P1 Door-to-balloon time in patients undergoing primary angioplasty and therapeutic decision on acute myocardial infarction

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Objectives: In the treatment of acute myocardial infarction (MI), the time delay to achieve reperfusion of the infarction-related artery has been linked to survival rates. Primary or direct angioplasty has been found to be an excellent means of achieving reperfusion in acute ST-elevation MI compared to thrombolytic therapy in randomized trials. However, no mortality benefit of primary angioplasty over thrombolysis was observed in several registries, in which delays in performing primary angioplasty were longer. Our objectives were to evaluate the door-to-balloon time (DBT) in our institution and investigate its relationship with clinical and prognostic variables.

Methods: We studied, retrospectively, 67 patients submitted to primary angioplasty, from January 1999 to November 2000. We divided our patient population into two groups. Group A (GA) included patients with DBT less than 120 min and group B (GB) patients with DBT greater or equal to 120 min. We evaluated several clinical variables, such as left ventricular ejection fraction (LVEF) on their first echocardiogram during hospitalization, admission Killip classification, in-hospital length of stay (LOS) and major cardiovascular events (MACE) during hospitalization and up to 6-month follow-up (in 23 patients).

Results: The median DBT was 132 min and the mean was 165 min, with a standard deviation of 137 min for all the cases. We had 32 patients in the GA and 35 patients (52%) in the GB. We observed four in-hospital deaths, all in GB. The mean LVEF was 53.1 ± 9% in GA and 46.1 ± 13% in GB ($P = 0.059$). Admission Killip class greater than 1 was noted in three patients of each group. The in-hospital LOS was similar for both groups (GA = 8.35 ± 4 and GB = 8.33 ± 4 days; NS). In-hospital events occurred in eight patients of GA (25%) and seven patients of GB (20%; NS). Only five follow-up events occurred during the first 6 months, three events in GA patients and two in GB patients (NS).

Conclusion: DBT greater than or equal to 2 h are common and in our population it occurred in more than half of the primary angioplasties. Greater than 2 h DBTs were associated with a trend to larger left ventricular dysfunction early after MI. Monitoring and measures to reduce DBT are crucial for the potential prognosis improvement offered by primary angioplasty and for the broadening of its use in the management of acute MI.

P2 Primary angioplasty versus streptokinase in elderly patients with acute myocardial infarction

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Because only a few studies about acute myocardial infarction (AMI) include elderly patients, we compared outcomes of patients aged 70 years or older with AMI who underwent thrombolysis or primary angioplasty treatment.

Methods: From April 1995 to June 1999, 64 patients within 12 h of symptom onset and no contraindications for thrombolytic therapy were randomized in two groups. Group I (32 patients, 20 men) submitted to an infusion of 1.5 million units of intravenous streptokinase (SK) and group II (32 patients, 17 men) to primary angioplasty (PA). Primary end-points included incidence of death, reinfarction, stroke, or readmission after 6 months follow up. Baseline characteristics of the two groups did not show significant differences.

Results: Clinical results are shown in the Table. The success rate (residual stenosis less than 50% and TIMI 3 flow) in group II was 86%. Group I patients were 1.5 times more likely to have combined end-points (95% CI 0.89–2.40; $P = 0.21$).

Conclusion: These findings suggest that in elderly patients eligible for thrombolytic therapy, primary angioplasty and SK were safe. The two methods of reperfusion were comparable according to these end-points during the follow up. The delay to perform primary angioplasty may be one of the causes of these findings.

Table

	SK ($n = 32$)	PA ($n = 32$)	P
Pain onset–presentation (min)*	180 (90/360)	180 (120/291)	NS
Presentation–treatment (min)*	45 (22/60)	105 (70/175)	0.0002
Reinfarction/stroke/readmission (%)	2/0/5 (22)	6/1/1 (25)	NS
Death 6 months (%)	12 (37.5)	6 (19)	0.16
Combined end-points (%)	18 (56)	12 (37.5)	0.21
Complications from catheter (%)	5/27 (19)	9/32 (28)	0.54
Treatment (clinic/revasc)	16/16	7/25	0.036
Time of hospital (days)*	8 (2/16)	8 (6/15)	NS

*Data presented are median (25^{th}, 75^{th} centiles).

P3 Long distance aeromedical transport post myocardial infarction

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Background: Long distance aeromedical transport of patients post myocardial infarction (MI) occurs with increasing frequency. Despite the benefits of early transport, there are potential risks. Data documenting the frequency of complications are lacking, and guidelines for aeromedical transport post MI are nonexistent.

Objective: To determine the safety of long distance aeromedical transport post MI and identify risk factors associated with transport-related complications.

Methods: Analysis of data from a retrospective study of long distance aeromedical transports performed by Montreal-based Skyservice Lifeguard transport service. (A manuscript describing this study has been accepted for publication in the journal *Aviation, Space, and Environmental Medicine*.) For patients transported by Lear Jet air ambulance post MI, potential risk factors examined included age, gender, Killip class, revascularization procedures, and status at time of transportation (days since admission, chest pain free interval, intravenous medications, and oxygen use).

Results: A total of 51 patients were transported by air ambulance during the study period. There were no major complications. Minor inflight complications (ie chest pain, desaturation, or hypotension) occurred in 10% of patients and resolved rapidly with onboard medical intervention. Univariate and multiple logistic regression analysis of the potential risk factors will be presented.

Conclusion: Long distance aeromedical transport post MI may be safely performed with a low incidence of minor complications that are easily manageable inflight. Delaying transport 48–72 h after resolution of chest pain reduces the incidence of complications. Practice guidelines for long distance air ambulance transport of post-MI patients need to be established.

P4 Age-related trends in prehospital delay time interval and reperfusion therapy in patients with ST elevation acute myocardial infarction

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Background: The literature states that age relates to prehospital delay time interval from acute symptom onset to emergency department admission. Several studies indicate that patients of advanced age are more likely to experience delayed reperfusion therapy after hospital presentation. This study aims to assess time to treatment differences between patients under 75 years old and elderly patients.

Methods: Prospective study of 116 admissions with ST elevation acute myocardial infarction (STEAMI) who received primary percutaneous transluminal coronary angioplasty (PTCA) treatment for STEAMI in a tertiary hospital over a 2-year period (March 1999–March 2001). Prehospital delay time (ΔT1) was measured, as well as time between hospital presentation and establishment of reperfusion therapy (ΔT2) and time between initial puncture and balloon insufflation in a cardiac catheterization laboratory (ΔT3). Epi-info 6.0 software was used to perform statistical analyses.

Results: Among a cohort of 116 patients, 70.6% were men; the mean age was 64.8 ± 13 years and 24.2% were over 75 years old. Mean ΔT1 in patients under 75 years old was 218.3 min and in patients over 75 years old was 212.8 min ($P = 0.6$). Mean ΔT2 in younger patient was 52.1 min and in advanced-age patients was 54.1 min ($P = 0.6$). Mean ΔT3 in patients under 75 years old was 25.5 min and in elderly was 20.8 min ($P = 0.5$).

Conclusion: Prehospital delay time interval was similar between elderly patients and patients under 75 years. Time to establishment reperfusion therapy and time to treatment with primary PTCA was not different among these patients. The more rapid treatment of appropriate elderly patient with STEAMI probably reduces mortality rates.

P5 Comparison among bilevel noninvasive mechanical ventilation, continuous positive airway pressure and oxygen in the treatment of cardiogenic acute pulmonary edema

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Objective: To compare the efficacy of bilevel noninvasive ventilation (NIV), continuous positive airway pressure (CPAP) and oxygen (O_2) to prevent orotracheal intubation (OI) in cardiogenic acute pulmonary edema (CAPE).

Methods: In a prospective study, 51 patients (21 male) with CAPE were randomized into three groups of treatment, 6 min after the arrival at the Emergency Unit. Cardiac and respiratory rates, arterial blood pressure and the peripheral oxygen saturation were determined at later randomization moment, 10, 30, 60 min later. Arterial blood samples were collected at the 0, 30, 60 min. Oxygen was applied by face mask with inspiratory fraction (FiO_2) of 50%; CPAP and NIV were applied by face mask using BiPAP ST/D 30® with FiO_2 of 50% and initial expiratory pressure or initial CPAP of 10 cmH_2O and initial inspiratory pressure of 16 cmH_2O, both titrated according to necessity.

Table

	PaO_2/FiO_2			RR			SAP			DAP		
Min	NIV	CPAP	O_2	NIV	CPAP	O_2	NIV	CPAP	O_2	NIV	CPAP	O_2
0	148±75†	167±47†	212±45	35±8	37±8	39±7	139±32	164±44	167±45	76±19*	99±30	102±27
10	–	–	–	29±6†	29±8†	36±9	127±24	142±34	155±42	70±16*	83±24	95±22
30	228±103	238±104	261±104	26±5†	25±7†	31±7	118±21*	139±30	147±23	67±10†	76±21†	95±14
60	221±100	273±134	250±125	24±5	24±5	28±6	121±24	128±24	146±29	70±16†	71±22†	91±14

DAP, diastolic arterial pressure; RR, respiratory rate; SAP, systolic arterial pressure.*$P<0.05$ NIV versus O_2 and CPAP; †$P<0.05$ NIV and CPAP versus O_2.

Results: OI was significantly lower in the group with expiratory pressure support (NIV 1/17 plus CPAP 2/17, total of three intubations in 34 cases) when compared to O_2 group (5/15; $P<0.05$).

Conclusion: NIV decreased cardiac and respiratory work more rapidly than CPAP and O_2. Our data suggest that CPAP and NIV are effective in preventing OI in CAPE.

P6 Propranolol kinetics in patients submitted to cardiac surgery with cardiopulmonary bypass

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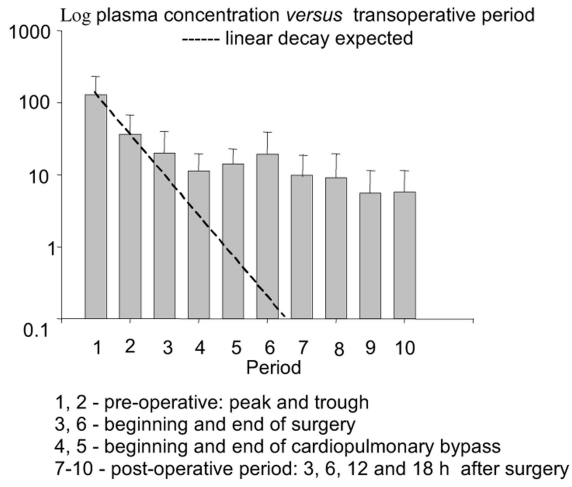
Introduction: Propranolol plasma levels and pharmacokinetics (PK) may be altered by cardiopulmonary bypass (CPB). Propranolol kinetic disposition was investigated in patients submitted to myocardial revascularization with mild hypothermic cardiopulmonary bypass (HCPB).

Methods: Fifteen patients receiving propranolol pre- (30–120 mg/day) and postoperatively (5–10 mg/day) were evaluated. Propranolol plasma levels were measured before, during and after surgery using high-performance liquid chromatography. PK modelling based on one compartment open model was applied to data obtained after drug administration (propranolol, tablets) 1 day before surgery and at the first postoperative day.

Results: Plasma curve decay represents logarithmic transformation of plasma concentrations before, during and after surgery, presented in the Figure. Pre- and postoperative PK modelling showed a prolongation of biological half-life ($t_{1/2}\beta$) from 3.2 to 10.2 h ($P<0.01$), increases of volume of distribution (Vd/F) from 3.5 to 7.7 l/kg ($P\leq0.05$) and reduction of plasma clearance from 15.8 to 9.1 ml/min.kg ($P\leq0.05$).

Discussion: Plasma levels indicate propranolol mobilization, probably due to stress and surgical trauma, since the beginning up to the end of hypothermic cardiopulmonary bypass. The influence of HCPB on pharmacokinetics of propranolol was demonstrated by the three times prolongation of $t_{1/2}\beta$ and Vd/F increased by two times. Additionally, plasma levels increase could be justified by plasma clearance reduction.

Figure



1, 2 - pre-operative: peak and trough
3, 6 - beginning and end of surgery
4, 5 - beginning and end of cardiopulmonary bypass
7-10 - post-operative period: 3, 6, 12 and 18 h after surgery

Conclusion: An accumulation of propranolol might be expected in patients submitted to cardiac surgery with hypothermic cardiopulmonary bypass and lower doses of this drug could be required during the postoperative period.

P7 Prognostic value of treadmill stress testing in patients admitted to the emergency room with chest pain

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Background: Treadmill stress test (TST) is an easily available, inexpensive and well-studied tool for the diagnosis of coronary artery disease. However, very few studies have been done to determine the prognostic value of TST in patients seen in the emergency room with chest pain and unclear diagnosis.

Methods: A total of 1060 consecutive patients were evaluated in our Chest Pain Unit using an algorithm that determines the pretest probability of acute myocardial infarction (AMI) or unstable angina (UA) based on chest pain characteristics and admission ECG. Patients with unclear diagnosis were submitted to a systematic strategy of serial ECG and CKMB determinations (0–3–6–9 h). TST was indicated for those in whom AMI or high-risk UA was ruled out. Of the 677 eligible patients 268 (40%) underwent TST (150 within 12 h post-admission) and constitute the study sample that was followed for 1 year (age 51.8 ± 12.1 years, males 70%).

Results: TST was positive for myocardial ischemia in 22% of 82 patients initially classified as intermediate probability of AMI/UA, and in 9% of 186 patients classified as low probability ($P=0.004$). Cardiac events (death, AMI, UA, revascularization) occurred in 20.6% of 34 patients with positive TST, 0.5% of 191 patients with negative TST and 7% of 43 patients with nondiagnostic TST (submaximal heart rate not achieved; $P=0.0000$). Diagnostic accuracy of a positive or nondiagnostic TST for cardiac events: sensitivity 91%, specificity 74%, positive predictive value 13%, and negative predictive value 99%. Likelihood ratio of a positive or nondiagnostic TST was 3.5 and a negative TST was 0.1. Multivariate logistic regression analysis disclosed a positive or nondiagnostic TST as the strongest predictor of cardiac events (OR 19; $P=0.0006$) followed by ischemic ST or T changes on the admission ECG (OR 5.7; $P=0.04$).

Conclusion: Patients with chest pain and unclear diagnosis on admission in whom AMI or high-risk UA were ruled out can be safely and accurately risk stratified by immediate TST. Patients with negative TST can be safely discharged, but those with a positive or nondiagnostic TST need further evaluation due to an elevated rate of cardiac events.

P8 A prospective analysis of complications related to the use of glycoprotein IIb/IIIa inhibitors in acute coronary syndromes

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Background: Glycoprotein IIb/IIIa inhibitors (GPI) are potent antiplatelet agents, with promising results in the treatment of acute coronary syndromes, independently of reperfusion strategies, but with a concerning hemorrhagic profile.

Objectives: To analyze an initial experience with the use of abciximab and tirofiban associated to percutaneous coronary interventions (PCI) and their effect on morbidity and mortality, and the relationship with technical, demographic and therapeutic variables.

Materials and method: We studied 70 patients (65 abciximab and five tirofiban). Forty-seven men (mean age 62.7 ± 12.9 years) and 23 women (68.8 ± 9.7 years; $P=0.049$) were analyzed according to diagnosis, risk factors, hemoglobin and platelet count, bleeding, duration of sheath maintenance and mortality.

Results: Diagnoses were acute myocardial infarction (AMI; 42 patients), unstable angina/non-Q-wave AMI (27 patients) and stable angina (1 patient), with seven deaths with a higher mean age (77.4 ± 4.0 versus 63.6 ± 12.3; $P<0.001$). We observed strong correlations between mortality and mean hemoglobin levels ($P<0.00001$) and mean platelet count ($P=0.013$) after PCI. There were 25 hematomas that correlated with longer time of sheath maintenance ($P=0.009$). Other bleeding complications were retroperitoneal hematoma (two patients), hematuria (one), pseudoaneurysm (one), oral bleeding (three), hematemesis (two), hemoptysis (two) and hemopericardium (two). Patients who died had ≥2 vessels disease, left ventricle dysfunction, five patients used intra-aortic balloon counterpulsation and six received hemotransfusion.

Conclusion: Higher morbidity correlated with increased time of sheath maintenance and higher mortality correlated with hemoglobin and platelet depletion, although this could be due to more bleedings induced by GPI or due to the severity of clinical presentation.

P9 Long-term prognostic value of C-reactive protein in unstable angina

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Background: C-reactive protein (CRP) has been consistently correlated with cardiovascular events in patient with unstable angina (Biasucci LM *et al*: *Circulation* 1999, **99**:855–860) and even in healthy individuals.

Objective: To analyze the relationship between CRP levels in patients hospitalized due to unstable angina and major adverse cardiac events during a 2-year follow up.

Population and method: We prospectively studied 22 consecutive patients admitted to our Coronary Care Unit between October 1997 and December 1997, and who had at least two CRP measurements. Admission and highest values were selected for statistical analyses. Follow up was made through phone calls to patients, relatives or assistant physicians, and end-points were death or readmission due to cardiovascular events. Patients were divided in two subgroups according to a CRP level cutoff ≤1 mg%. Survival free of events was analyzed by Kaplan–Meyer method, and log-rank test was applied for comparison between curves.

Results: See Table.

Table

	Admission levels		Highest levels	
Events	CRP ≤1	CRP >1	CRP ≤1	CRP >1
Survival	80%	80%	100%	71%
Survival free of events	56%	40%	87%*	36%*

*Log-rank, $P=0.04$; others NS.

Conclusion: Elevated CRP levels in patients admitted due to unstable angina can predict cardiovascular prognosis during a 2-year follow up. As only highest values correlated with worst outcomes, it seems reasonable that two or more measurements should be done during hospitalization.

P10 Aggressive therapy for non-ST elevation acute coronary syndromes is highly effective

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Background: Therapeutic approach of non-ST-elevation acute coronary syndrome with glycoprotein IIb/IIIa inhibitors and early coronary angiography (CA) with immediate angioplasty (ACTP), when feasible, has been proposed as a very effective strategy.

Objectives: To review demographic data, risk factors, myocardial necrosis markers, C-reactive protein, clinical stabilization with therapy and in-hospital outcome of patients admitted due to unstable angina (UA) or non-Q-wave acute myocardial infarction (nQwAMI).

Materials and method: Retrospective analysis was conducted of 43 consecutive patients, 70% of whom were male, mean age 65 ± 13 years, 54% with UA and 46% with nQwAMI. Student's *t* test and Kruskal–Wallis (KW) tests were used.

Results: There was a higher prevalence of UA among men (63%) and of nQwAMI among women (69%; $P=0.05$). Braunwald's class IIIB2 was recognized in 86% of the UA group. From the nQwAMI group, 38% were Killip class >1. There were no differences in risk factors, except for the presence of hyperlipidemia (UA 74% versus nQwAMI 38%; $P=0.02$). Major interventions are summarized in the Table.

Table

	CA	Normal CA	ACTP	Stent	CABG
UA (%)	91	5	44	64	17
NQwAMI (%)	70	13	30	100	20
P	0.07	NS	NS	NS	NS

Abciximab was used in 15% of patients (UA 66%, nQwAMI 34%). In-hospital outcomes are as follows: mean length of stay, UA 6 ± 5 days, nQwAMI 7 ± 7 days. Of UA patients 13% evolved to AMI. Two deaths occurred (one UA patient and one nQwAMI patient). Median CKMB mass and cardiac troponin were higher in nQwAMI group (10 versus 1.5 and 0.9 versus 0.5, respectively, and both $P<0.001$ KW). No difference in C-reactive protein was detected.

Conclusion: Aggressive therapy for non-ST-elevation acute coronary syndromes combining abciximab, early angiography and angioplasty with stents resulted in a favorable in-hospital outcome in high-risk patients, with a short length of stay.

P11 Features and markers of mortality of hospital patients that use intra-aortic balloon pump

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Background: Intra-Aortic Balloon Pump (IABP) use has been proposed in cardiogenic shock, but cannot improve mortality alone. Preoperative criteria use of IABP can improve outcome and cost in heart surgical patients.

Objective: Description and analysis of demographic, clinical, surgical features of surviving and nonsurviving IABP patients.

Development and method: An observational and retrospective study was conducted between April 1998 and December 2000. Thirty-nine of 56 IABP users could be analyzed in two groups (group A comprised survivors and group B nonsurvivors), comparing gender, age, ventricular function, hemodynamic compromise state, surgical or percutaneous treatment, moment of IABP installation (pre- or postintervention). Statistical technique was Student's *t* test and χ^2 test.

Results: There were 15 patients in group A and 24 in group B. There were no statistical differences between following variables: age, gender and ventricular function. There were statistical differences between the following variables: shock – group A 53.3%, Group B 87% ($P=0.017$); and surgical treatment – group A 80%, group B 41.6% ($P=0.019$). In the surgical subgroup we found preoperative IABP implantation in 83.3% of group A patients and 30% of group B patients ($P=0.016$). Analyzing group B, we found four out of 14 patients in percutaneous subgroup treatment with favorable coronary anatomy for heart surgery that was not performed by clinical decision; four out of 10 in surgical subgroup treatment had Duke University Criteria of preoperative IABP implantation that was not performed by surgical staff decision.

Discussion: This small retrospective study suggests the importance of preoperative IABP implantation in high-risk patient and one advantage for IABP impact in mortality for surgical strategy.

P12 Hemorrhagic complications during percutaneous coronary interventions: prospective analysis of 270 cases

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Objectives: To analyze the incidence of hemorrhagic complications related to interventional coronary percutaneous procedures and associations with different variables: interventional techniques, demographic data and pharmacological adjuvant treatment.

Materials and method: A total of 270 patients (183 men and 87 women, mean age 62.6 ± 12.5 years and 71.8 ± 10.6, respectively; $P<0.00001$) underwent 270 percutaneous coronary procedures. The following data were registered and correlated to vascular complications: diagnostic coronary angiography, percutaneous coronary angioplasty (PTCA), clinical features (diagnosis, coronary risk factors), antithrombotic therapy, activated coagulation time (ACT), sheath diameter and manipulation of puncture site.

Results: There were 45.7% with a diagnosis of unstable angina, 40.8% with acute myocardial infarction and 11.3% with stable

angina. Smoking was observed in 49% of men and 19% of women ($P=0.001$). No significant statistical differences were observed in relation to other variables. Incidence of hematomas (HMT) was higher among women before ($P=0.01$) and after ($P=0.04$) sheath removal, associated with higher platelet depletion ($P=0.004$) and higher heparin dose (HD; $P=0.04$), but not with hemoglobin reduction ($P=0.08$). Among patients with HMT, HD was higher ($P=0.04$), stents were more used ($P=0.02$), larger sheaths ($P=0.015$), and more prolonged initial ACT ($P=0.04$), sheath maintenance ($P=0.005$), ASA ($P=0.04$) and ticlopidine therapy ($P=0.003$), and hemodynamic instability (HI; $P=0.005$). There was no correlation between abciximab and HMT.

Conclusion: Higher incidence of HMT was detected among women and was associated with older age, higher HD, higher Hb and platelet depletions, larger sheath diameter, larger time of sheath maintenance, use of ASA/ticlopidine, ACT and HI. Initial diagnosis, risk factors, procedure duration and use of abciximab did not correlate with HMT.

P13 Cardiac arrest in ICU: the Ultstein method results in general intensive care

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Objective: Despite the high incidence of cardiac arrest (CA) in ICU, this situation is poorly notified and analyzed, not only in ICU but also in other clinics. Most registrations refer to out-of-hospital or emergency units CA and their causes, initial rhythm and prognosis are very distinct from CA in ICU. Ultstein method is a model of CA notification recommended by American Heart Association (AHA) and Brazilian Society of Cardiology. Our objective is to describe the first results of Ultstein method in our ICU.

Methods: Ultstein forms notifying CA between April 1999 and January 2000 were analyzed. Doctors or nurses involved in the resuscitation efforts filled out the forms.

Results: We registered 55 cases from 146 CA occurred in 539 ICU admissions. Mean APACHE II score was 23.93, with 45.75% of mortality risk. The most frequent causes were metabolic disturbances (29.2%), shock (25.5%), hypoxemia (23.5%), cardiac ischemia (10.9%), brain death in organ donors (7.2%), pulmonary embolism (1.8%) and unknown (21.8%). The recognized rhythms were asystole (47.3%), bradycardia followed by asystole (29.1%), pulseless electrical activity (18.2%) and ventricular fibrillation or pulseless ventricular tachycardia (5.4%). Despite good initial results, the follow-up evaluation demonstrated that only 10.9% of the patients were discharged from hospital. After 6 months, 50% were alive but none of them was alive after 1 year. The other patients (90.1%) died during the admission period. The main cause of these deaths was multiple organ dysfunction (57.1%), followed by brain death (28.6%, including the organ donors), cardiac ischemia (8.2%) and respiratory disease (6.1%).

Conclusion: Intrahospital CA notification is important to allow a comparison with those that occur outside the hospital. Moreover, it allows us to know how CA is managed and how we can optimize the patient assistance.

P14 The client with chest pain in the emergency unit: educational strategy concerning early signals and symptoms in acute myocardial infarction

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Background: The emergency unit is a scenario of the development in cardio-preventive strategies, and emergency professionals should be prepared to instruct patients as to the early signals and symptoms of such diseases. We should take advantage of this opportunity window to initiate an educational strategy aiming the early identification and significance of these warning signals, as well as the likely procedures and diagnostic examinations that may be carried out during the in-hospital period, focusing on the patient's better satisfaction and understanding.

Objective: To evaluate the quality of the information provided to the client under observation in the chest pain unit.

Materials and method: This is a pilot study in which an educational video tape about AMI presenting early signals and symptoms, diagnostic examinations and healthy life habits. The video tape was shown to 20 clients under observation in the Chest Pain Unit and afterwards a questionnaire was provided.

Results: A total of 20 patients were interviewed; 60% ($n=12$) were male and 40% ($n=8$) female; 100% ($n=20$) considered that the explanation on the video was clear and met their expectations; 35% ($n=7$) would like to obtain further information besides that provided; and 55% ($n=11$) felt less apprehensive and 5% ($n=1$) felt more apprehensive.

Conclusion: The educational strategy by means of audiovisual resource has been implemented and evaluated in developed countries. Implementing and evaluating this strategy in Latin American countries, where we find great sociocultural discrepancy, has been a challenge in the effort to improve the contentment of the patient admitted to emergency units.

P15 Acute atrial fibrillation (AAF) in cardiac surgery postoperative period: evaluation of pre- and perioperative factors associated with its higher incidence

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Background: Some pre- and perioperative factors have been associated with a high incidence of AAF in cardiac surgery postoperative period. Advanced age, longer surgery time, mitral valve surgery and stopping β-blockade have been described.

Objective: To evaluate some pre- and perioperative factors in order to identify those patients with higher probability for postoperative AAF.

Patients and method: A total of 227 adult patients consecutively admitted in postoperative period were prospectively followed. Clinical and surgical variables were collected and then compared between patients who developed AAF in postoperative period and those who did not. Statistical techniques were Student's *t* test and Fischer test.

Results: The mean age in the two groups were significantly different (69.9 years in AAF patients and 62.6 years in non-AAF patients; $P<0.01$). The AHA/ACC mortality and stroke indexes were higher in AAF patients ($P<0.01$ and $P<0.001$, respectively). Water retention on the first postoperative day was higher in AAF patients ($P<0.01$). Euroscore and Cleveland scale were higher in AAF group ($P<0.001$ for both indexes). Left atrial size, body mass index, AHC/ACC mediastinitis scale, Goldman index, surgery time, extracorporeal circulation time, aortic clamping time, peroperative water intake, diabetes, chronic obstructive pulmonary disease, left ventricular function, MODS and SOFA indexes were not statistically different in the two groups. AAF incidence was higher in mitral valve postoperative period when compared to post-revascularization period, but it has not met statistical significance.

Conclusion: Advanced age, AHA/ACC mortality and stroke indexes, Euroscore and Cleveland scale, and water retention on the first postoperative day were shown to be predictors for AAF in cardiac postoperative period. As few patients have undergone mitral valve surgery, it was not possible to detect statistical difference in AAF incidence between these patients and those who have undergone myocardial revascularization.

P16 The electrocardiogram as a predictor of right ventricular dysfunction in patients with pulmonary embolism

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Introduction: Right ventricular dysfunction (RVD) is considered to indicate poor prognosis in patients with pulmonary embolism (PE). The electrocardiogram (ECG) is a low-cost, widely avaible method that may show changes associated with right ventricular strain secondary to PE.

Objectives: To evaluate the prevalence of ECG changes in patients with PE and its importance as a diagnostic tool in the diagnosis of RVD.

Patients and method: Data were collected from a cohort of 202 patients (84 men) enrolled in a multicenter prospective registry study of PE. The mean age was 70.9 ± 13.8 years. Patients were admitted to hospital between January 1998 and January 2001. The diagnosis of PE was confirmed if patients fulfilled at least one of the following criteria: (1) pulmonary artery thrombus visualization by pulmonary arteriography, helicoidal angiotomography, magnetic resonance or echocardiography; (2) high probability pulmonary scintigraphy; and (3) venous duplex scan with thrombus visualization and clinical signs and symptoms of PE. The ECG and transthoracic echocardiogram (TTE) were performed in 190 patients. RVD was established by TTE subjective analysis of the right ventricle contractive function. Abnormal ECG was considered to be indicative of right bundle branch block, $S_1Q_3T_3$ pattern, negative T wave from V1 to V4, or right AQRS axis deviation.

Results: ECG was abnormal in 33% of patients and TTE analysis showed RVD in 38%. In this latter group of patients 49% presented with at least one ECG change. At least one ECG change was found in 23% of patients without RVD ($P<0.0001$). The accuracy of ECG for the diagnosis of RVD was: sensitivity 49%, specificity 77%, positive predictive value 57% and negative predictive value 71%. The likelihood ratio of a positive test was 2.1 and of a negative test was 0.6.

Conclusion: When transthoracic echocardiography is not available, ECG may be useful to exclude right ventricular dysfunction in patients with PE.

P17 Arterial hypotension at admission as a right ventricle dysfunction marker in patients with pulmonary embolism

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Introduction: Arterial hypotension is considered a poor prognostic factor in patients with pulmonary embolism (PE), and has been correlated with right ventricle dysfunction (RVD). In case of haemodynamic instability, thrombolytic treatment is frequently indicated.

Objective: To evaluate the relation between arterial hypotension and RVD in patients with PE.

Patients and method: Data were collected from a cohort of 202 patients (84 men) enrolled in a multicenter prospective registry study of PE. The mean age was 70.9 ± 13.8 years. Patients were admitted to hospitals between January 1998 and January 2001. The diagnosis of PE was confirmed if patients fulfilled at least one of the following criteria: (1) pulmonary artery thrombus visualization by pulmonary arteriography, helicoidal angiotomography, magnetic resonance or echocardiography; (2) high probability pulmonary scintigraphy; and (3) venous duplex scan with thrombus visualization and clinical signs and symptoms of PE. Arterial hypotension was considered if systolic arterial blood pressure was below 90 mmHg, at admission. The transthoracic echocardiogram (TTE) were performed in 193 patients and the RVD was established by subjective analysis of right ventricle function.

Results: Arterial hypotension was present in 40 (21%) and the TTE showed RVD in 73 (38%). Arterial hypotension was detected in 21 (29%) patients in RVD group versus 19 (16%) patients in the group without RVD ($P=0.03$). The diagnostic accuracy of arterial hypotension regarding RVD was measured as follows: sensitivity 29% and specificity 84%, with a positive predictive value of 52.5% and negative predictive value of 66%. The likelihood ratio of positive test was 1.82 and the likelihood ratio of negative test was 0.85.

Conclusion: Arterial hypotension is not a good marker of RVD in patients with PE.

P18 Basic life support education for first year health students at UNISUL

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Background: In Brazilian medical schools a basic life support (BLS) education curriculum is a rarely found through the graduate period. When it exists, length of training is very short and limited to theoretical contents. Besides, for the first 2 or 3 years medical education is exclusively directed to basic science.

Objective: To implement a BLS educational program for dentistry and medical school, based on theoretical/practical approach following the American Heart Association standards for BLS training.

Design: A 60-h course was designed encompassing BLS and basic care of trauma patients. The contents are divided in theory and practice in a balanced basis. BLS contents are developed in 12 h including adult, children and babies. Appropriated manikins are used for each scenario.

Setting: Cardiopulmonary resuscitation laboratory at Universidade do Sul de Santa Catarina.

Subjects: Medical and dentistry first-year students.

Experience: For the last 2 years we have developed this program with a very intense participation of most students. Dentistry alumni have also demonstrated interest and an excellent performance.

Main results: We found a great deal of enthusiasm among most of our students and many of then have been working as volunteer educators of BLS for high school students in another program linked to this experience. Through this time we have concluded that this idea is feasible and stimulating as it brings the students to a useful content for them and the community where they live.

Conclusion: A BLS education program for dentistry and medical school first-year students is viable and should be put into practice in other universities and in many other countries.

P19 GRACE (the Global Registry of Acute Coronary Events): the real world side of the cardiovascular clinical practice in acute coronary syndromes

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Introduction: Data on clinical efficacy can be obtained from randomized trials; however, data truly reflecting the clinical practice on acute coronary syndromes (ACS) may only be acquired through registries.

Objectives: To collect, analyze and disseminate data on the ACS management during the hospital phase, and to evaluate the causes of suboptimal outcomes for improving health care.

Method: GRACE is an multinational, prospective, cross-sectional study, conducted in 14 countries (three continents), evaluating demography, treatment, diagnosis, procedures and outcomes in ACS patients.

Results: See Table.

Conclusion: There were higher proportions of female patients in Brazil and World groups, a higher proportion of patients in the STEMI group received aspirin, fewer patients received β-blocker in the UA group at HIAE, and more patients received LMWH, cardiac catheterization and PCI at HIAE. Also, there were substantial differences in the treatments, procedures, and death rates among the three ACS. Based on these preliminary results we may optimize the clinical practice aiming at improving cardiovascular outcomes.

Table

	Site: HIAE (n=296)			Cluster: Brazil (n=1355)			World (n=11,543)		
Types of ACS	STEMI	NSTEMI	UA	STEMI	NSTEMI	UA	STEMI	NSTEMI	UA
n	76	681	46	364	269	691	3419	2893	4397
Female (%)	27			37			34		
Median age (years)	67			64			66		
Aspirin (%)	92	84	75	96	93	88	93	89	88
β-blocker (%)	58	51	42	63	62	64	64	65	66
LMWH (%)	83	94	84	39	44	37	41	51	46
PCI (%)	67	41	25	50	26	17	40	28	18
Cardiac cath (%)	91	76	65	79	63	49	55	53	42
Death (%)	3	10	9	12	10	6	7	6	4

P20 Artifacts related to lucigenin chemiluminescence for superoxide detection in a vascular system

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There is a growing interest in the pathophysiology of processes involving vascular cell injury and redox signaling, particularly with superoxide generation. Lucigenin chemiluminescence has been extensively used as a method to assess superoxide production and its underlying enzymatic mechanisms in many biological systems, the most studied one being the vascular NAD(P)H oxidase. Recent evidence suggests substantial limitations of this probe because of artifactual superoxide generation. To investigate if lucigenin concentration could affect the detection of vascular NAD(P)H oxidase activity we performed studies with lucigenin chemiluminescence, oxygen consumption and electron paramagnetic resonance (EPR) spectroscopy for superoxide generation detection with vascular homogenates and different concentrations of lucigenin (5, 50 and 250 μM). The NAD(P)H oxidase blocker diphenylene iodonium (DPI, 20 μM), SOD (500 IU/ml), catalase (500 IU/ml) and the electron acceptor NBT were also used to characterize lucigenin behavior in a vascular system.

Our data showed that lucigenin alone, with 5 μM, induced a 2-fold increase in oxygen consumption, while with 250 μM oxygen consumption increased 5-fold. Superoxide generation, assessed by EPR spectroscopy, also increased progressively with 5, 50 and 250 μM lucigenin. These effects were particularly enhanced by addition of NADH, but occurred also with NADPH. Chemiluminescence studies showed that with 5 and 50 μM lucigenin there is greater NADPH induced signal than NADH, while 250 μM lucigenin yields a 1.5-fold greater signal with NADH than with NADPH. Furthermore, all NADPH-driven luminescent signals were inhibited by SOD, DPI, and NBT, as well as NADH-driven luminescence with 5 μM lucigenin. On the other hand, with lucigenin 250 μM, NADH-driven luminescence could not be blocked by SOD or DPI, but was completely inhibited by NBT. Catalase did not show any inhibitory effect on NADPH-induced luminescence, but inhibited 30% of NADH-driven signals.

In conclusion, lucigenin even at low doses undergoes redox-cycling reactions, which are favored by NADH generating artifactual superoxide. Furthermore, it is possible that lucigenin acts as a direct electron acceptor from vascular enzymatic sources other than the superoxide-generating NAD(P)H oxidase, and detects also hydrogen peroxide generated by a vascular NADH oxidase.

P21 Macrophage migration inhibitory factor (MIF), C-reactive protein (CRP) and C3a serum levels following coronary artery bypass graft surgery (CABG)

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Introduction: MIF was first described in the late 1960s as a T lymphocyte derived product implicated on random migration of macrophages. In the last decade it has been 'rediscovered' as a pituitary hormone as well as a macrophage product in response to stress. Experimental models have demonstrated correlation between MIF administration and inflammatory reaction. Additionally, anti-MIF treatment was associated with clear improvement of survival in certain models. As CRP, C3a and other substances with inflammatory properties, MIF has been studied specifically in the infectious setting. Results of these studies are extrapolated but not frequently applied to surgical trauma models. Trauma related to CABG in the noninfectious setting could promote sequential alterations on serum levels of CRP, C3a and MIF.

Methods: Thirty-seven consecutive patients undergoing CABG had serum levels of MIF (measured by sandwich ELISA), CRP and C3a (measured by nephelometric technique) determined at anesthesia induction and 3, 6 and 24 h after the end of cardiopulmonary bypass (CPB). Patients operated in the emergency setting, in the course of acute illness, and those with missing samples or data were excluded. Multiple organ dysfunction score (MOD) was registered until 96 h postoperative. Applying analysis of variance (ANOVA) for repeated measures, we tested sequential variability along observed moments. Bonferroni test determined differences between measurements.

Results: In this series, it was noted a relatively homogeneous distribution concerning to organ dysfunction at 72 h postoperative (MOD = 2.98 ± 1.7). Serum levels of C3a (mg/dl) presented a slight, but significant decrease from 116 ± 5.46 at baseline to 91.19 ± 4.55 at 3 h, and 93.97 ± 5.91 at 6 h post-CPB ($P < 0.05$). CRP (mg/dl) showed a progressive increase until 24 h postoperative, from 1.57 ± 0.41 at baseline to 3.24 ± 0.72, 4.01 ± 0.65 and 11.23 ± 1.04 at 3, 6 and 24 h post-CPB, respectively ($P < 0.05$). MIF (ng/ml) also progressively increased from 162.94 ± 16.51 at baseline to 287.80 ± 35.14 at 6 h post-CPB, decreasing thereafter ($P < 0.05$).

Conclusion: Alterations in C3a levels were not impressive, although statistically significant, acutely after CABG. In contrast, MIF and CRP serum levels showed a remarkable increase associated with CABG. Our results may implicate MIF as a new and useful marker for response to CABG-related trauma.

SEPSIS AND SHOCK

P22 Apoptosis of vascular cells in culture and reactive oxygen species generation following exposure to plasma of septic patients

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The inflammatory response that occurs in sepsis has been related to the presence of cytokines, and also other soluble factors such as fas and fas-l, which can induce apoptotic cell death of endothelial cells. Also, it can result in endothelial dysfunction, with microvascular thrombosis and activation of the coagulation cascade. These events involve the transduction of extracellular stimuli by reactive oxygen species (ROS; $O_2^{\bullet -}$, H_2O_2) that result in activation of intracellular signaling pathways like MAPKinases. We sought to evaluate the effect of soluble factors present in plasma of septic patients in rabbit endothelial (REC) and vascular smooth muscle cells (RASM) in culture, by assaying for apoptosis with a TUNEL detection method. Also, we assessed NAD(P)H oxidase production of ROS in these plasma samples and in REC and RASM homogenates after incubation with plasma, as assessed with the lucigenin 5 μM chemiluminescence technique.

Septic plasma showed ROS generation when incubated with NADPH but not with NADH (51.44 ± 21.18 and 8.90 ± 4.04 versus 7.77 ± 2.60 and 1.8 ± 0.99 cpm $\times 10^3$/mg/min, NADPH and NADH versus controls, respectively; $n = 5–3$). When incubated with homogenates of REC or RASM in the presence of both NADH or NADPH, septic plasma caused a 2- to 3-fold increase in ROS generation versus healthy control plasma ($n = 5–3$). Thus, septic plasma lead to apoptosis of REC and RASM, abrogated by a SOD mimic and NAD(P)H oxidase inhibitor DPI. Intrinsic NADPH oxidase ROS production was detected in the septic plasma. It also enhanced the NAD(P)H oxidase ROS production in REC and RASM homogenates. These data suggest that in sepsis there is a possible link between ROS production and vascular cell apoptosis.

Table

	TUNEL + cells/field	*P* versus control
REC + healthy control plasma ($n = 3$)	7.0 ± 1.5	–
REC + septic plasma ($n = 3$)	42.8 ± 11.7	<0.05
RASM + healthy control plasma ($n = 3$)	0.7 ± 0.7	–
RASM + septic plasma ($n = 3$)	33.0 ± 13.3	<0.05
REC + septic plasma + SOD mimic 20 μm ($n = 3$)	6.7 ± 1.8	NS
RASM + septic plasma+ SOD mimic 20 μm ($n = 3$)	3.0 ± 3.0	NS
REC + septic plasma + DPI 20 μm ($n = 3$)	6.0 ± 1.7	NS
RASM + septic plasma + DPI 20 μm ($n = 3$)	1.0 ± 0.6	NS

P23 Cardiovascular function during acute normovolemic hemodilution (ANH) with hydroxyethyl starch or Ringer's lactate

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Purpose: Our objective was to study the cardiovascular function in canines that underwent progressive normovolemic hemodilution using two different solutions.

Methods: Under general anesthesia using etomidate and isoflurane, and with controlled ventilation, 2 animals were submitted to progressive ANH with either hydroxyethyl starch (HES, $n = 10$) or Ringer's lactate (RL, $n = 10$) solution on a ratio of 1:1 or 1:3, respectively. A Swan–Ganz catheter, echocardiography and eletrocardiography were used in the assessment of the cardiovascular function. The hemodilution was monitored with sequential measurements (20 min) of the concentration values of hemoglobin and hematocrit, while the cardiovascular function for the different variables were studied. Data were evaluated through ANOVA ($P < 0.05$).

Results: The final hemoglobin concentration for the HES was 4.0 (± 1.2) g/dl and 3.0 (± 1.0) g/dl for the RL. Heart rate and blood pressure did not change. The cardiac output and cardiac index increased in both groups during the hemodilution procedure; however, the RL group data had a lower value than was statistically significant at the end of the study period. The systemic and pulmonary vascular resistance decreased in both groups. The pulmonary capillary wedge pressure and central venous pressure reached higher values in both groups during ANH.

Conclusion: The study demonstrated that the cardiovascular variables deteriorated along with the reduction hemoglobin; nevertheless, the echocardiography data obtained would suggest that the use of HES allowed better cardiac contractility during prolonged periods of time over in lower levels of hemoglobin.

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P24 Role of biocompatible IV infusion pumps in hemodynamic instability

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Biocompatibility is defined as the ability of a material or equipment to perform without inducing a clinically significant response. We started using an IV infusion pump calibrator (BIOTECH) in 1999 for quality control. Very soon we observed that some peristaltic IV pumps presented with a phasic variation of flow, although the average flow was well calibrated (and used to be categorized as so). Theoretically, this could have a clinically significant impact in the delivery of vasoactive drugs with fast and short action, such as nitroprusside or norepinephrine. We tested three different brands of pumps, two peristaltic (A, $n=10$; and B, $n=13$) and one syringe pump (C, $n=5$) at a flow of 50 ml/min for 20 min. The average flow was 48.5 ± 3.4 ml/min, 51.6 ± 0.4 ml/min and 52.6 ± 2.0 ml/min, respectively ($P<0.001$). We measured the highest and the lowest peak flow in each graph and calculated the maximum percent variation ([max–min]/average flow): 26 ± 7%, 28 ± 7% and 9 ± 3%, respectively ($P<0.001$). During the 20 min of observation, the number of phases (plus and minus peaks) was 13.2 ± 2.5, 8.9 ± 4.5 and 16.8 ± 3.0, respectively ($P=0.002$). Therefore, pump type B had the highest variation with phases that lasted longer. The most extreme case was a type B pump, which showed a 32% variation in flow (from 62 to 46 ml/min) with plateaus lasting for up to 4 min and 27 s. In conclusion, IV infusion pumps may have phasic flow variations with long-lasting plateaus that could have an impact on the delivery of vasoactive drugs, possibly worsening hemodynamic instability.

P25 Acetylcholine can totally reverse alterations in microvascular blood flow that occur in patients with septic shock

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Introduction: We recently observed, using an orthogonal polarization spectral (OPS) imaging device, that microvascular blood flow is altered in patients with sepsis. We hypothesized that these alterations may be reversed by acetylcholine (ACH).

Methods: We used an OPS device (Cytoscan A/RII; Cytometrics, Philadelphia, USA) with a 5× magnitude to explore the sublingual area in 11 patients with septic shock and 10 healthy volunteers. In each case, five sublingual areas were recorded for later analysis. Septic patients also received topical application of ACH 10^{-2} M. Five representative sequences of 20 s were analyzed semiquantitatively: vessel density was defined as the number of vessels crossing three horizontal and three vertical lines; flow was defined as continuous, intermittent, and absent. The vessels were then separated into venules and capillaries using a 20 μm cutoff value. Data from the five areas were averaged and analyzed by Kruskall–Wallis and Wilcoxon tests. Data are presented as median (percentiles 25–75).

Results: See Table.

Conclusions: Microcirculatory alterations in patients with septic shock can be reversed by topical ACH, suggesting that these alterations are primarily due to an increased vasomotor tone.

Table

	Patients with septic shock		
	Base	ACH 10^{-2}	Healthy volunteers
Total, n/mm	4.9 (4.1–5.7)	6.0 (4.7–6.4)*	5.4 (5.4–6.3)*
Proportion of vessels perfused, %	83 (77–96)	99 (98–100)*	98 (97–99)*
Proportion of venules perfused, %	100 (100–100)	100 (100–100)	100(100–100)
Proportion of capillaries perfused, %	44 (24–60)	94 (77–96)*	94 (92–95)*
Absent flow (capillaries), %	29 (8–44)	1 (0–3)*	3 (2–5)*
Intermittent flow (capillaries), %	24 (19–38)	8 (3–19)*	5 (3–6)*

*$P<0.01$ versus base.

P26 Inflammatory peritoneal cell profile in distinct models of peritoneal injury

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Objective: To evaluate the dynamics of the acute peritoneal inflammatory response, based on characteristics of peritoneal cell populations, in the setting of peritoneal primary and secondary injuries resulting from sepsis.

Design: Experimental study using distinct models of sepsis to evaluate peritoneal inflammation.

Setting: Research laboratory at Federal University of Santa Catarina.

Subjects: Female Swiss mice.

Interventions: Animals were infected through intravenous (iv) or intraperitoneal (ip) injections of *Escherichia coli* in the following concentrations LD_0, LD_{50} and LD_{100}, while control animals received no intervention prior to sacrifice. Samples of peritoneal exudate were obtained at 4, 8, 12 and 24 h intervals after inoculation and submitted to flow cytometry analysis.

Measurements and main results: We found an early and intense growth in peritoneal cell population following ip injury. Granulocytes are the predominant cells in this process and correlate with mortality. LD_{100} group shows a reduction in this population at 12 and 24 h. There is an absolute and relative reduction in the macrophage cell population at 4, 8, 12 and 24 h. Following iv injury, peritoneal residents cell pattern does not suffer major modification, except for the 24 h LD_0 group, in which granulocytes and lymphocytes increase and macrophages decrease.

Conclusions: This model suggests that, following *E coli* peritoneal challenge in mice, when a marked and maintained grow in the gralulocyte population occurs, it is associated with survival. Also, a reduction on the migration of this population, or its destruction, indicates uncontrolled systemic inflammation and death. Macrophage migration would be linked to the initiation of the specific immune response, and its population is not correlated with survival outcome.

P27 Impaired production of IFN-γ and TNF-α but not IL-10 in whole blood of septic patients

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Background: Underlying disease (UD) is an important variable associated with outcome in sepsis, but its role in inflammatory response has not been evaluated.

Methods: We studied the ability of LPS and killed Gram-negative bacteria (GNB) to induce TNF-α and IL-10, and of PHA to induce IFN-γ, in whole blood from septic patients ($n=20$), patients with matched UD and without sepsis ($n=20$), and healthy volunteers ($n=20$).

Main results and conclusions: We found a decreased production of TNF-α and IFN-γ in septic patients, while the production of IL-10 was not different in the three groups. Production of IFN-γ and TNF-α in whole blood from patients without sepsis were higher than in septic patients, yet lower than in healthy controls. Downregulation of TNF-α production in septic patients, although not restricted to, was more pronounced with LPS than with GNB. Infection itself and UD are involved in the regulatory mechanisms of inflammatory response.

P28 Influence of EDTA and heparin on lipopolysaccharide binding, internalization, and cell activation, evaluated at single-cell level in whole blood

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Background: The use of whole blood (WB) for studying the LPS-induced cellular activation preserves the milieu in which LPS-cell interaction occurs *in vivo*. However, information at single-cell level using this system is lacking. In this study we evaluated the LPS-binding, internalization, and cell activation, in WB, using flow cytometry. The influence of heparin or EDTA as anticoagulant was also addressed.

Method: Blood samples were obtained from healthy donors in EDTA and/or heparin tubes. Biotinilated LPS (LPSb) was used to evaluate cell binding and internalization of LPS in WB. Cells were surface stained with appropriate antibodies and LPSb was detected by the addition of streptavidin-red 670 or -APC. LPS-induced cell activation was evaluated by expression of surface activation markers and detection of intracellular TNF-α.

Results: LPSb bound promptly to monocytes. In EDTA-treated blood membrane-bound LPSb decreased after 60 min of incubation, reaching background levels after 240 min. In contrast, membrane-bound LPSb remained detectable in heparinized blood in a high proportion of the cells. LPS induced TNF-α and enhanced the expression of HLA-DR in monocytes, and induced the expression of CD69 in T and B lymphocytes. Induction of TNF-α in monocytes and, to a lesser degree of CD69 in lymphocytes, was more efficient in heparinized-blood.

Conclusion: LPS binding was not influenced by anticoagulants, while internalization seems to occur at earlier stages with EDTA. Cellular activation was better obtained with heparin.

P29 Do plasma cytokine levels correlate with survival in septic patients?

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Introduction: The presence of circulating bacteria or bacterial products, such as endotoxin, leads to systemic release of cytokines, a hallmark of septic shock. Proinflammatory cytokines (tumor necrosis factor [TNF]-α, interleukin [IL]-1, IL-8, IL-6, and interferon-γ) are postulated to play a major role in the pathogenesis of the syndrome. A lot of study show that the presence of circulating cytokines has been found in patients with documented bacteremia or with signs of sepsis, often correlating with the severity of disease. The aim of the present study was to measure these inflammatory mediators (TNF-α, IL-6, IL-10 and nitric oxide) in different phases of septic patients, polytrauma and health volunteers to demonstrate that these mediators play a role in the pathogenesis of sepsis but do not serve as a prognostic marker.

Methods: Patients: the study sample included 19 patients with pulmonary sepsis; eight critically ill patients suffering from major tissue injury due to polytrauma, admitted in the medical intensive care unit; and 16 healthy controls. The criteria for inclusion in the group with sepsis were according to criteria of American College of Chest Physicians/Society of Critical Care Medicine Consensus. All septic patients were monitored using a pulmonary artery catheter (93A-431-75F Baxter) and the sepsis phases were separated using the hemodynamic criteria. This study was approved by the ethical council of the Hospital. Informed consent was obtained from all patients or next-of-kin. The samples were obtained in the Hospital Municipal Miguel Couto and the Hospital Universitário Clementino Fraga Filho (HUCFF).

Measurements of TNF-α, IL-6, IL-10 and nitric oxide concentrations: after inclusion criteria, blood samples (5 ml) were collected into sterile tubes containing disodium ethylenediaminetetra-acetic acid (EDTA). Plasma was separated by centrifugation, aliquoted, and frozen (–20°C) until assayed for cytokines. Plasma TNF-α, IL-6, IL-10 and nitric oxide concentrations were measured by enzyme-liked immunosobent assay (ELISA; Pharmingen, San Diego, USA) according to the manufacturer's instructions.

Results: We noted that there were no difference in the measurements of interleukin in the different phases of septic patients and no difference with the polytrauma group and the healthy volunteers. There were no correlations with release of interleukin and the antibiotic used in septic patients. The only measurement that had correlation with the severity of the sepsis was the IL-6, in the phase D that corresponds with septic shock.

Conclusion: Our findings contradict those from a number of earlier studies that correlated severity of sepsis and plasma levels of cytokines. Moreover, the chances of detecting elevated cytokine levels during severe infections are limited by their half -lives. Both TNF and IL-6 may decline despite persistence or even increased severity sepsis. When cytokines were first discovered, it was generally assumed that their presence in the circulation signaled pathology. As we noted, there is a considerable interindividual variation in cytokine production. Age, gender, or pre-existing disease could be the explanation of these variations. Despite cytokines play a role in the pathogenesis of sepsis, their measurement does not serve as a marker of infection disease and does not discriminate the severity of the inflammatory infectious response.

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P30 The role of circulating DNA in sepsis

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Introduction: The identification of the early steps of the response trigged by free DNAs on normal cells may elucidate questions concerning the pathophysiology of some diseases. Small amounts of plasma free DNA have been observed both in healthy individuals and in patients with various diseases such as systemic lupus erythematosus, viral hepatitis and cancer. This study demonstrates that septic patients also release DNA in plasma at levels higher than polytraumatic patients, who also have an inflammatory response to trauma. *In vitro* studies of protein profile of normal leukocytes in response to a short exposure to DNA purified of bacteria, protozoa (*T cruzi*), human DNA (HeLa cells) and to a synthetic unmethylated CpG motif, demonstrated that free DNA is able to modify the protein profile of the blood cells. Understanding how free DNA act as a signal between cells is important for knowing how DNA orchestrates immune responses in sepsis and other diseases. The role of lipopolysaccharide in the physiopathology of sepsis is clearly recognized, but additional effort will be needed to clarify the sepsis puzzle.

Methods: The study sample included 19 patients with pulmonary sepsis; eight critically ill patients suffering from major tissue injury due to polytrauma, admitted in the medical intensive care unit; and 16 healthy controls. The criteria for inclusion in the group with sepsis were according to criteria of American College of Chest Physicians/Society of Critical Care Medicine Consensus. This study was approved by the ethical council of the Hospital. Informed consent was obtained from all patients or next-of-kin. The samples were obtained in the Hospital Municipal Miguel Couto and the Hospital Universitário Clementino Fraga Filho (HUCFF).

Plasma DNA purification: DNA was extracted from plasma by a method adapted from Federov *et al* [1] and amplified by PCR of K-ras. Quantification of the amount of DNA was estimated with ethidium bromide fluorescence.

Acknowledgement: The research was supported by CNPq, CAPES, FINEP, FAPERJ, FUJB and Pronex.

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P31 Severity stratification of septic shock according to noradrenaline requirement

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Introduction: Septic shock (SS) is associated with 50% mortality. Severity is usually estimated from indexes of MODS, but hemodynamic dysfunction, despite its main role, has traditionally been underscored. The aim of this study was to test a severity classification for SS according to noradrenaline (NA) requirements.

Method: An algorithm for hemodynamic treatment in SS, which established NA as the initial vasoactive drug (followed by dobutamine or adrenaline as required), was followed prospectively in all SS patients from December 1999 to August 2000. We evaluated APACHE II and SOFA scores, maximum values for C-reactive protein (CPR) and lactate, hemodynamic profiles, and renal, respiratory and hepatic dysfunction. Patients were classified in three groups according to the maximum NA requirement: mild, NA <0.1 μg/kg/min; moderate, NA 0.1–0.3 μg/kg/min; and severe, NA >0.3 μg/kg/min.

Results: Results are expressed as mean ± SD (Table).

Table

	Mild ($n=15$)	Moderate ($n=17$)	Severe ($n=24$)	P
Age years	64.4 ± 20.6	62.8 ± 14.1	58.5 ± 14.5	NS
Sex (F/M)	5/10	9/8	14/10	NS
APACHE II	15.2 ± 6	13.7 ± 7	20.8 ± 6.2	†‡
Max SOFA	6.8 ± 3.3	7.5 ± 3.3	11.9 ± 3	†‡
Max lactate mg/dl	3 ± 2.1	2.6 ± 1.7	7.5 ± 3.9	†‡
Max CRP mg/dl	27.8 ± 13.5	29.1 ± 8.1	26.7 ± 12.5	NS
Days in MV	4 ± 4.2	7.2 ± 9.7	5.2 ± 4.7	NS
Max creat mg/dl	1.7 ± 0.6	2.9 ± 3.2	2.3 ± 1.4	NS
Mortality (%)	3 (20%)	4 (23.5%)	17 (70.8%)	†‡

$P<0.05$ *mild versus moderate; †moderate versus severe; ‡mild versus severe.

Conclusion: Noradrenaline requirement >0.3 μg/kg/min is associated with high mortality in SS. Based on these results, a new and strong criterium for severe septic shock is proposed. We also showed the feasibility of applying a predefined algorithm for hemodynamic treatment.

P32 The effects of small-volume hypertonic saline and large-volume lactated Ringer's solutions on intra-abdominal blood loss after spleen rupture or iliac artery tear

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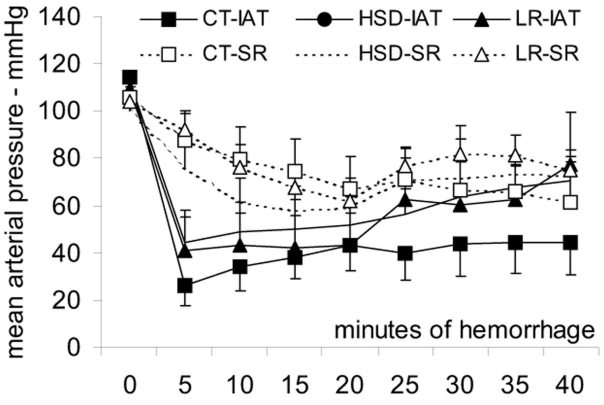
Introduction: Prehospital fluid resuscitation, before hemorrhage control, of hypotensive trauma victims sustaining blunt or penetrating abdominal trauma is highly controversial, largely due to concerns related to increased blood loss or rebleeding.

Objective: In two separate studies, simulating blunt or penetrating abdominal trauma, we tested the hypothesis that prehospital fluid resuscitation could provide hemodynamic benefits despite increased intra-abdominal bleeding, which was directly measured after a spleen rupture or an iliac artery tear.

Methods: Anesthetized dogs (17 ± 2 kg) were submitted to two distinct models of uncontrolled intra-abdominal hemorrhage. Suture lines were placed either around the spleen or through the left common iliac artery, and exteriorized. After abdominal closure, splenic rupture with hilar vascular injury (SR, $n = 30$) or a 3-mm iliac arterial tear (IAT, $n = 18$) was produced by pulling the exteriorized line, and animals were randomized into three groups 20 min later: lactated Ringer's (LR), 32 ml/kg over 15 min; 7.5% NaCl/6% Dextran70 (HSD), 4 ml/kg over 4 min; or controls (CT), no fluids.

Results: Both HSD and LR treatments restored cardiac output, while in controls it remained reduced. No significant differences occurred in blood loss (ml/kg) between CT and treated animals after IAT (CT 48 ± 6; HSD 42 ± 2; LR 49 ± 1), or SR (CT 38 ± 4; HSD 43 ± 5; LR 42 ± 5).

Figure



Conclusion: No fluid infusion during intra-abdominal bleeding resulted in a low blood flow state, while resuscitation with both HSD and LR produced hemodynamic benefits without increased blood loss.

P33 Compensatory increases in cardiac output and SMA blood flows prevent splanchnic hypoperfusion during moderate isovolemic hemodilution in dogs

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Introduction and objective: Intraoperative acute isovolemic hemodilution has been used to decrease the need for homologous blood transfusion. Decreased arterial oxygen content and total oxygen delivery to tissues promote a compensatory increase in cardiac output, related to the hemodilution-induced decrease in viscosity and/or vasodilatation, preserving tissue oxygen delivery. Regional blood flow distribution may vary widely between and within organs. Splanchnic hypoperfusion, particularly at the intestinal mucosal region, has been implicated in systemic inflammatory response and multiple organ dysfunction. We evaluated systemic and splanchnic oxygen-derived variables during a moderate acute isovolemic hemodilution to test the hypothesis that hemodilution may promote gastric mucosal acidosis, despite an apparent adequacy of global markers of oxygen delivery and consumption.

Methods: Eleven anesthetized mongrel dogs (16.7 ± 0.8 kg) were monitored with a Swan-Ganz catheter (cardiac output, cardiac filling pressures, mixed venous blood samples and lactate), an aortic catheter (mean arterial pressure and blood sampling), a portal vein catheter (portal lactate and blood gas), transit time ultrasonic flow probe (SMA blood flow) and a gas tonometer ($PgCO_2$ and PCO_2 gap). The animals were randomly assigned into two groups: controls (CT), no hemodilution; and acute isovolemic hemodilution (HD), induced by blood withdrawal (20 ml/min) with a simultaneous infusion of hydroxyethyl starch 6% in saline solution to a target hematocrit of 25 ± 3% for 30 min. The animals were then followed for 60 min.

Results: Hemodilution promoted significant decreases in hemoglobin, hematocrit, and pulmonary and systemic vascular resistances, and significant increases in cardiac output and in SMA blood flow. No significant differences between groups were detected on mean arterial and pulmonary artery pressures, oxygen delivery and extraction, PCO_2 gap, and systemic and portal vein PCO_2, pH and lactate.

Conclusion: Moderate isovolemic hemodilution induced decreases in hemoglobin and hematocrit; however, the associated compensatory increases in cardiac output and regional blood flows prevented splanchnic hypoperfusion in this experimental model.

NEPHROLOGY

P34 Impact of treatment modality, biochemical parameters and apoptosis on polymorphonuclear cell (PMN) function in patients with renal failure

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It has been suggested that PMN apoptosis is increased in dialysis patients and may contribute to cellular dysfunction. We investigated the effect of treatment modality and biochemical parameters on PMN apoptosis and function. Blood was drawn from 17 controls, 17 patients with chronic renal failure (CRF; creatinine clearance 28 ± 14 ml/min/1.73m^2), 10 hemodialysis (HD) and 11 CAPD patients. Upon collection, whole blood aliquots were incubated in RPMI-1640 with propidium iodide (PI)-labeled *S aureus* (*SA*), PMA, fMLP or LPS for 30 min. Cells were then stained with DCFH-DA and analyzed by flow cytometry, in order to quantify phagocytosis and H_2O_2 release by PMN. After separation by gradient centrifugation, PMN were stained with Annexin-V and PI in order to quantify apoptosis by flow cytometry. The results were correlated with blood levels of urea, creatinine, bicarbonate, albumin and PTH. Results are presented as means ± SD.

Among CRF and HD patients, there was an inverse correlation between apoptosis and *SA*- ($r=0.62$, $P=0.01$ and $r=0.89$, $P=0.02$, respectively) and LPS-stimulated H_2O_2 release ($r=0.68$, $P=0.005$ and $r=0.61$, $P=0.058$, respectively). No biochemical parameters correlated with apoptosis or cellular functions. In summary, PMN apoptosis contributes to cellular malfunction in uremia, but does not account for all the dysfunction. Hence, it is possible that other uremic toxins affect cell performance independently of apoptosis.

Table

	Controls	CRF	HD	CAPD	*P**
Apoptosis, %	9.0 ± 5.6	19.8 ± 16.8†	13.6 ± 9.3	6.4 ± 4.0	0.01
Phagocytosis, %	83.8 ± 7.5	79.2 ± 16.9	49.9 ± 28‡	86.4 ± 7.1	<0.0001
H_2O_2 release, MFI					
SA-stimulated	357 ± 123.4	357.6 ± 30.6	90 ± 41.7‡	570.4 ± 41.5	0.012
LPS-stimulated	44.6 ± 16.4	50.9 ± 30.0	48.5 ± 27.2	56.4 ± 33.1	0.77
PMA-stimulated	110.6 ± 81.6	95.9 ± 93	37.7 ± 25‡	152.9 ± 79.6	0.023
fMLP-stimulated	131.9 ± 75.7	72.9 ± 55.5	41.2 ± 16.4‡	189.2 ± 141.1	<0.001

MFI, mean fluorescence intensity. *ANOVA; †$P<0.05$ versus controls and CAPD; ‡$P<0.05$ versus other groups.

P35 Secular trends in the survival of patients with dialytic acute renal failure (ARF) in an intensive care unit (ICU)

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In 1997, we started performing CVVH/HD in our ICU, which allowed us to improve the metabolic control of our dialysis patients. We sought to investigate the trends in mortality rates of ARF patients treated in our ICU from January 1992 to December 1998. The APACHE II score and risk of death of all patients ($n=10723$, age 61 ± 18 years, 62% males) and of patients with ARF submitted to dialysis therapies ($n=256$, age 61 ± 18 years, 70% males) are shown in the Table.

In 1998, for the first time, the mortality in the ARF population was lower than the expected mortality (risk of death). Comparing the 1992–1996 period with 1997–1998, there was no reduction in the expected mortality (49% versus 44%; $P=0.46$), but there was a significant reduction in the ICU mortality (62% versus 48%; $P=0.04$). This improvement in survival could be due to an overall improvement in our standards of care or in the dialytic therapy.

Table

	1992	1993	1994	1995	1996	1997	1998
Patients with dialytic ARF	34	22	27	39	38	55	41
APACHE II score	24.5	25.9	27.6	25.9	26.6	25.4	24.7
Risk of death (%)	45	51.2	52.4	47.1	53.3	43.7	44.7
ICU mortality (%)	67.6	59.1	66.7	53.8	63.2	52.7	42.5
All patients	1343	1432	1428	1545	1691	1589	1695
APACHE II score	13.7	13.3	14.3	14.3	14	14.3	11.3
Risk of death (%)	19.7	18.7	19.3	19.3	19.3	20.3	14.7
ICU mortality (%)	11.3	11.3	10.7	10	9.3	9.3	8

P36 Efficacy of hemodiafiltration on the outcome of renal and respiratory failure of leptospirosis

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Introduction: A comparison between hemodiafiltration (HDF) and peritoneal dialysis (PD) was performed in patients with severe leptospirosis with acute renal failure and lung injury.

Methods: Fifteen consecutive patients (seven under HDF and eight under PD) were studied. All of them were oliguric and underwent mechanical ventilation. There were no statistically differences in the parameters before dialysis: age (44 ± 5 versus 48 ± 5), APACHE II (22 ± 1 versus 20 ± 2), blood urea (Ur; 160 ± 20 versus 212 ± 31 mg/dl), serum creatinine (Cr; 5.5 ± 0.8 versus 7.0 ± 1.1 mg/dl), acidosis (17.5 ± 0.6 versus 15.2 ± 1.1 mEq/l), bilirubin (25.6 ± 3 versus 19.5 ± 4 mg/dl) or pyruvic transaminase (149 ± 44 versus 81 ± 10 IU). The pO_2/FiO_2 was worse in HDF than in the PD group (109 ± 17 versus 198 ± 25; $P<0.02$).

Results: There were statistically differences between HDF and PD after the treatment: PaO_2/FiO_2 (299 ± 55 versus 159 ± 19; $P<0.02$), Cr (2.8 ± 0.4 versus 6.0 ± 0.9 mg/dl; $P<0.01$) and Ur (87 ± 12 versus 169 ± 21 mg/dl; $P<0.01$). There were no statistically differences in survival (two versus three), time of recovery the renal function (12 ± 5 versus 13 ± 5 days), under mechanical ventilation (24 ± 2 versus 17 days) and the beginning of diuresis (8 ± 3 versus 8 ± 5 days).

Conclusion: The patients under HDF had a better metabolic control and oxygenation than those under HD. However, further studies will needed to show an impact on survival.

P37 Bicarbonate buffered dialysate and replacement solutions for CRRT: effect of crystallization on the measured levels of electrolytes and buffer

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The aim of this study was to investigate the impact of the addition of calcium to bicarbonate solutions for CRRT. We tested single bag (SB; bicarbonate and calcium mixed 24 h before testing) and double bag (DB) solutions (mixed immediately before), with and without the addition of 4 mEq/l acetate. Prescribed calcium varied from 0–5 mEq/l. In all test solutions prepared with calcium 5 mEq/l there was a decrease in the measured calcium concentration. SB solutions presented lower concentrations of calcium, compared with DB solutions. When the prescribed calcium concentration was increased, there was a parallel increase in calcium deficit (prescribed–measured). The prescribed calcium showed a negative correlation with sodium and potassium and a positive correlation with pCO_2. We also found a positive correlation between calcium deficit and pCO_2 ($r=+0.59$; $P<0.001$). The crystallization, as measured by the weight of the crystals, was greater in the SB solutions when compared to the DB solutions (17.7 ± 7.0 mg versus 9.1 ± 1.8 mg, $n=14$; $P=0.01$). The crystallization correlated with the measured concentration of calcium ($r=-0.62$; $P=0.02$), and pCO_2 ($r=+0.75$; $P=0.002$). We also observed a negative correlation between the pH, and the pCO_2 ($r=-0.82$; $P<0.001$). Our results suggest that the use of bicarbonate solutions containing calcium as replacement fluids for CRRT is a potentially unsafe procedure.

P38 Hypokalemic thyrotoxic periodic paralysis in intensive care unit (UCI)

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Hypokalemia with profound muscle weakness and respiratory failure may be occasionally found in intensive care unit (ICU) patients. Thyrotoxic periodic paralysis is a rare cause of this disturbance mainly seen in Asian patients. Hyperadrenergic activity with potassium shift from extracellular to intracellular medium has been implicated as the pathogenic mechanism. We report a patient who had thyrotoxic periodic paralysis diagnosed 7 years ago, and he has been followed until now. A 23-year-old white man presented to the emergency room with profound weakness and respiratory failure, the patient was moved to the ICU for ventilatory assistance. His blood pressure was 11 × 7 cmHg, heart rate 88 beats/min. The serum potassium was 1.5 mEq/l. He was treated with intravenous potassium chloride infusion and the symptoms progressively improved. He denied weight loss, palpitations and excessive perspiration. He was not taking diuretics or laxatives, or any drugs. His thyroid was diffusely enlarged. Laboratory investigation showed urinary potassium of 55 mEq/l, serum creatinine 0.5 mg/dl, fractional excretion of potassium 8.3%, glucose 88 mg/dl, magnesium 1.7 mg/dl, aldosterone 7.0 ng/dl, T3 382 ng/dl, T4 16.8 ng/dl, and TSH <0.03 mU/l. He was discharged on propylthiouracil 100 mg four times daily and propranolol 40 mg three times daily. Propranolol was withdrawn 2 months after, and propylthiouracil was maintained in reduced doses for 5 years when radioiodine therapy was performed. During 7 years of follow-up no recurrent episode of periodic paralysis was observed, confirming that hyperthyroidism was the cause of this episode. In conclusion, thyroid periodic paralysis may produce fatal complications; prompt recognition of this entity and therapy with KCl infusion and β-blockers to inhibit the intracellular shift of potassium are important to terminate acute attacks.

P39 Serial prognostic score indexes in acute renal failure (ARF): best performance of scores obtained at the time of referral to the nephrologist

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The APACHE-II score has been validated for the time of admission at the ICU, but has been widely used in outcome studies of patients with ARF, and frequently obtained at the time of indication of dialysis. Another prognostic score index – the ATN-ISS – obtained at the time of referral to the nephrologist, seems to have a better performance than the APACHE-II score. We sought to investigate whether the time of collection of data for APACHE-II could influence its prognostic value, and to compare it with the more specific ATN-ISS score. In a historical prospective study, we collected data from 205 ARF patients at the Hospital São Paulo – a university-based, not-for-profit, tertiary hospital – between February 1997 and November 1997. APACHE-II scores were calculated at the time of hospital admission (AP-1), time of referral for the nephrologist (AP-2) and day of the first dialysis (AP3). The ATN-ISS score was also obtained at the time of referral to the nephrologist. There were 98 males and 107 females, with a mean age of 52 ± 18 years; 70 patients (34%) required dialysis and 68 patients (33%) were admitted to the ICU. The overall mortality rate was 46%. Nonsurvivors had higher AP1 (19.6 ± 8.7 versus 15.4 ± 6.0; $P < 0.001$), AP2 (23.4 ± 7.2 versus 16.7 ± 5.3; $P < 0.001$) and AP3 (25.8 ± 6.24 versus 20.3 ± 3.9; $P < 0.001$). ATN-ISS was also higher for nonsurvivors (0.81 ± 0.17 versus 0.26 ± 0.15; $P < 0.001$). The area under the receiver operator curve (AUC) was obtained for each score. The AUC was lower for AP1 than for AP2 (0.64 versus 0.76; $P < 0.001$). However, the AUC for AP2 was similar to the AUC for AP3 (0.78 and 0.77, respectively; $P = 0.75$). The ATN-ISS was a better predictor than AP2 (0.97 versus 0.76; $P < 0.001$). The better performance of scores at the time of referral to the nephrologist than scores obtained at the admission or at the day of first dialysis suggests that ARF *per se* may be an important determinant of prognosis.

P40 Use of APACHE-II as a prognostic score index for non-ICU patients with acute renal failure (ARF)

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The APACHE-II score has been used as an index of severity of illness for non-ICU patients with ARF in some studies. We sought to investigate the differences between ICU and non-ICU patients, and to determine whether APACHE-II can or cannot be used as a prognostic score index for non-ICU patients and to compare it with the ATN-ISS. To this end, we collected data from 205 ARF patients at the Hospital São Paulo – a university based, not-for-profit, tertiary hospital – between February 1997 and November 1997. APACHE-II scores were calculated at the time of hospital admission (AP-1) and time of referral to the nephrologist (AP-2). The ATN-ISS score was also obtained at the time of referral to the nephrologist. The period prevalence of ARF during the study was 1% (205/19524 admissions). There were 98 males and 107 females, with a mean age of 52 ± 18 years, and 70 patients (34%) required dialysis. Sixty-eight patients (33%) were admitted to the ICUs and 137 (67%) were treated in the wards or at the emergency ward. The overall mortality rate was 46%. In multivariate analysis, no differences were found between non-ICU and ICU patients for age, gender or oliguria. However, non-ICU patients had lower frequency of shock (25% versus 57%; $P = 0.007$) and mechanical ventilation (25% versus 60%; $P = 0.007$), a lower ATN-ISS (0.41 versus 0.78; $P < 0.001$), a lower AP1 (16.5 versus 19; $P = 0.02$) and a lower risk of death as calculated using the AP1 (23% versus 50%; $P < 0.001$). Non-ICU patients also needed dialysis less often (32% versus 38%; $P = 0.003$) and had a lower mortality rate (31% versus 78%; $P < 0.001$), compared to ICU patients. The observed/expected mortality ratio was similar in both groups (1.34 for non-ICU versus 1.56 for ICU patients). The area under the receiver operator curve was similar between ICU and non-ICU patients for AP1 (0.63 versus 0.66; $P = 0.78$), AP2 (0.71 versus 0.80; $P = 0.21$) and for the ATN-ISS (0.95 versus 0.96; $P = 0.80$), suggesting that the APACHE-II collected at hospital admission or at the time of referral to the nephrologist and ATN-ISS can be used as severity of illness scores for non-ICU patients.

P41 Regional citrate anticoagulation (RCA) for continuous venovenous hemodiafiltration (CVVHDF): initial experience

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In the intensive care setting, some patients develop acute renal failure (ARF) as a component of multiple organ failure, and are at high risk for bleeding. The inapropriate control of anticoagulation during CVVHDF may lead to bleeding due to excessive anticoagulation, while circuit clotting decreases dialysis effectiveness, increases blood losses and the need for transfusion. The risk of bleeding may be minimized by using RCA. Citrate reduces ionized calcium (Ca_i^{2+}) by chelation. Therefore, we decided to establish RCA in our ICU. A total of 11 patients (APACHE = 25, 18–35) with ARF were treated with CVVHDF. They were on vasoactive drugs and under hemodynamic monitoring and mechanical ventilation. CVVHDF: Q_b 100 ml/min, Q_d 1–2 l/h, minimal UF 600 ml/h. RCA protocol (UCLA, San Diego, EUA): 4% trisodium citrate (arterial line), $CaCl_2$ 1 mEq/10 ml (central venous line), dialysate (Na^+ 117, K^+ 4, Cl^- 122.5 and Mg^{2+} 1.5 mEq/l, without Ca^{2+} and alkali) and postfilter replacement solution (0.9% saline). Goal: post-filter Ca_i^{2+} from 0.25 to 0.35 mmol/l. Citrate and calcium rate infusion changed from 150 to 190 ml/h and from 40 to 90 ml/h, respectively. A total of 1194 h of treatment (110 h/patient) was performed and 21 filters (mean filter life 57 h) were used. Mean initial serum and during treatment Ca_i^{2+} was 1.11 and 1.10 mmol/l, respectively. Ca_i^{2+} postfilter was 0.29 mmol/l. Two severe hypocalcemic ($Ca_i^{2+} < 0.90$ mmol/l), two hypercalcemic ($Ca_i^{+2} > 1.35$ mmol/l) and one hypernatremic ($Na^+ > 150$ mEq/L) episodes occurred. Important metabolic alkalosis ($HCO_3^- > 30$ mEq/l) was present in two situations. There were no

bleeding episodes related to RCA. In conclusion, RCA is a feasible treatment in the ICU. However, it demands constant metabolic control (four to six times/day). Postfilter Ca_i^{2+} measurement, instead of activated clotting time (ACT), can be used to guide citrate rate infusion. Filters showed good performance during this study.

PNEUMOLOGY

P42 Presentation of 50 cases of Wegener's granulomatosis from São Paulo, Brazil

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The purpose of this study is to analyze 50 cases of Wegener's granulomatosis admitted at Hospital das Clínicas (São Paulo, Brazil) from 1985 to 2000, regarding the clinical presentation, sites of accomitment, diagnostic procedures, therapeutics and prognosis of this systemic vasculitis that involves preferentially the upper airways, lungs and kidneys.

The initial clinical presentation was characterized by upper airways involvement in 42/50, pulmonary 39/50, kidney 31/50, ocular manifestations 23/50, osteoarticular in 21/50, cutaneous 21/50 and nervous system involvement in 15/50. The mean age of the patients was 39 ± 15 years, and 26 were female. The diagnosis was confirmed in biopsies or necropsies in 44/50 patients. C-ANCA was positive in 26/40 and P-ANCA in 7/40 patients. The initial pulmonary manifestations were characterized by nodules with or without cavitation in 27/50, masses with or without cavitation in 13/50, and alveolar hemorrhage in 9/50. The treatment was prednisone (1 mg/kg) and cyclophosphamide (2–3 mg/kg). The severe cases also received 3 days methylprednisolone 1 g/day. From the 50 patients attended 11 died, 10 lost follow up, and 29 are in remission. The pneumologist should be aware of the pulmonary and systemic presentation of WG in order to diagnose and treat these patients properly.

P43 Effects of PEEP above the L-Pflex on gas exchange, hemodynamic and gastric tonometer in ARDS patients

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Introduction and method: In order to study the acute effects of optimal PEEP on oxygenation, CO_2 exchange, hemodynamic parameters and gastric mucosal PCO_2 we analyzed 10 ARDS patients (<5 days of installation) after 30 min on PEEP 5 cmH_2O (T0), then 30 min on PEEP 2 cmH_2O above the L-Pflex (T1) and than 30 min after PEEP of 5 cmH2O (T2). They were all sedated-paralyzed. A Swan-Ganz catheter with a semicontinuous cardiac output and continuous gastric tonometer was inserted in each patient. The tidal volume and respiratory rate were kept constant (8 ml/kg and 20/min; VCV). L-Pflex was titrated by PxV curve (random volumes). The mean APACHE II was 21.3.

Results: See Table

Conclusion: Although cardiac index had decreased, PEEP titrated by L-Pflex of PxV curve of the respiratory system improved oxygenation without impairing regional hemodynamics in ARDS patients.

Table

Patients	T0-30 min after	T1-30 min after	T2-30 min after
$n=10$	PEEP= 5cmH_2O	PEEP 2 cmH_2O >L-Pflex	PEEP= 5cmH_2O
PEEP (cmH_2O)	5.0 ± 0.0	11.6 ± 3.0*	5.0 ± 0.0
Minute ventilation (l/min)	11.4 ± 1.8	11.4 ± 1.8	11.4 ± 1.8
PaO_2/FIO_2	77.6 ± 23.5	136 ± 41.4†	97.7 ± 41.1
$PaCO_2$ (mmHg)	38.6 ± 12.2	36.8 ± 12.0	39.1 ± 13.2
PCO_2 gap (mmHg)	8.6 ± 4.8	9.4 ± 3.6	7.8 ± 3.0
SVO_2%	67.4 ± 13.6	76.6 ± 9.0†	73.6 ± 5.1
Arterial lactate (mg/dl)	20.2 ± 6.1	20.5 ± 5.0	21.6 ± 4.8
PCW (mmHg)	11.4 ± 4.5	13.3 ± 2.9	12.3 ± 2.4
Cardiac index	4.6 ± 1.0	3.9 ± 1.0*	4.3 ± 1.2

P44 Pressure support ventilation versus bilevel positive airway pressure for acute exacerbation of chronic obstructive pulmonary disease: a randomized trial

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Objectives: Noninvasive positive pressure ventilation (NPPV) is widely used in an attempt to reduce the need for endotracheal intubation and mechanical ventilation in patients with acute exacerbation of chronic obstructive pulmonary disease (COPD). However, few controlled studies have compared pressure support ventilation by face mask (PSV) to bilevel positive airway pressure (BiPAP™) in patients with acute exacerbation of COPD. This study aims to compare these two modes of NPPV in acute hypercapnic respiratory failure in order to reduce respiratory rate (RR) and $PaCO_2$ in an equivalent degree.

Method: Eleven consecutive adult patients admitted to the Critical Care Unit of Hospital Albert Einstein, São Paulo, Brazil, in acute respiratory failure due to exacerbation of COPD were randomized to receive PSV ($n=5$) versus BiPAP™ ($n=6$). Inclusion criteria were a high probability of acute exacerbation of COPD,

RR above 24 breaths per minute, a $PaCO_2$ above 45 mmHg, and arterial pH below 7.35 but above 7.10. Pressure support was used initially at 15–20 cmH_2O (×=15.2 cmH_2O) delivered through a facemask with a microprocessed ventilator. The patients allocated to BiPAP™ group received initially inspiratory pressure through a facemask at 20–25 cmH_2O (×=21.3 cmH_2O). The device was adjusted in the S/T mode. Positive end-expiratory pressure was 5 cmH_2O. Oxygen was administered to provide an arterial oxygen saturation above 90%. The RR, arterial blood gases, arterial pressure, and heart rate were measured on admission, after 2 h, 6 h during NPPV, and 1 h after the patient was weaned.

Results: See Table.

Discussion: NPPV is a commonly used therapy for the treatment of acute hypercapnic respiratory failure due to COPD exacerbation. The results reported here confirm the effectiveness of NPPV in improving COPD patients in acute respiratory failure. This is demonstrated by the significant fall in RR, the increase in oxygenation (not shown), and the fall in $PaCO_2$ despite neither PSV or BiPAP™ reduced $PaCO_2$ significantly. Comparing PSV and BiPAP™ both are effective.

Table

	Mean		Mean
BiPAP			
RR_0h	30.6	$PaCO_2$_0	77.6
RR_2h	21.0*	$PaCO_2$_2	66.9
RR_6h	17.6*	$PaCO_2$_6	67.0
RR_7h	18.0*	$PaCO_2$_7	63.9
PSV			
RR_0h	28.4	$PaCO_2$_0	79.1
RR_2h	24.0*	$PaCO_2$_2	69.5
RR_6h	19.4*	$PaCO_2$_6	65.2
RR_7h	18.4*	$PaCO_2$_7	61.8

*$P = 0.0001$.

P45 CO_2 dynamics in ARDS patients: effects of PEEP above the Pflex

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Introduction and method: Titrating PEEP above the Pflex can improve oxygenation and survival when compared to the conventional ventilation in ARDS patients. In order to study the dynamics of CO_2 in ARDS patients as well as the effects of setting PEEP above the Pflex on the CO_2 dynamics we studied seven patients with ARDS criteria (less than 5 days of installation), with mean age of 63 ± 0.11 years and mean APACHE score of 21.4. After performing the PxV curve (random volumes) we ventilated the patients with 8 ml/kg TV and RR of 15 and PEEP of 5 cmH_2O. Then we kept the same MV and set PEEP 2 cmH_2O above Pflex for 30 min. Then we decreased PEEP to 5 for more 30 min. All the patients have a Swan-Ganz catheter and a continuous tonometer.

Results: See Table.

Conclusion: PEEP above the Pflex decreased the cardiac index and the arterial-expired CO_2 gradient while increased the oxygenation and the PvO_2.

Table

	30 min PEEP=5	30 min PEEP >Pflex	30 min PEEP of 5
PEEP	5 ± 0	11.6 ± 3	5 ± 0
PaO_2/FiO_2	81 ± 24	128 ± 42*	101 ± 47
PvO_2	42.7 ± 5.8	47.2 ± 7*	42 ± 3
$PaCO_2$	40.6 ± 12	37.5 ± 12	35 ± 12
$PvCO_2$/v-a (CO_2)	43 ± 13/4.3 ± 1.5	42 ± 12/4.5 ± 0.3	40 ± 10/4.7 ± 2.3
$ETCO_2$/a-ET(CO_2)	23.7 ± 8/16.6 ± 3.4	24 ± 7/13.5 ± 4.3*	23 ± 6/12.2 ± 6.5
$PgCO_2$/g-v (CO_2)	47 ± 13/3.6 ± 1.2	46 ± 13/4.5 ± 0.3	45 ± 13/5.3 ± 3
CI (l/min/m^2)	4.6 ± 1	4.05 ± 0.9*	4.5 ± 1.4

P46 Recruitment maneuvers with different pressure control levels in ARDS patients

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Background and objective: Respiratory system PxV curves and recruitment maneuvers can improve oxygenation and survival when compared to the conventional ventilation in ARDS patients.

Method: In order to study the effects of recruiting the respiratory system with either 40 cmH_2O plateau pressure or 60 cmH_2O plateau pressures after the PEEP was set 2 cmH_2O above the inflection point we studied 10 patients with ARDS criteria (less than 5 days of installation), with mean age of 66 ± 0.10 years and mean APACHE score of 21.8. After performing the PxV curve (random volumes) we set the PEEP 2 cmH_2O above the Pflex and ventilated the patients with 6 ml/kg TV and RR of 20. Then we ran-

domly assigned the patients to two groups. Group 1: three cycles of PCV with maximal pressure of 40, 40, 40 cmH_2O for 6 s each; and Group 2: three cycles of PCV with maximal pressures of 40, 50 and 60 for 6 s each every 3 h during the first 24 h of mechanical ventilation. We measured the respiratory and hemodynamic parameters at baseline, after 1 and 6 h.

Results: See table.

Conclusion: Recruitment maneuvers with PCV of 60 cmH_2O allowed a better oxygention compared to recruitment maneuver of PCV 40 mainly after 6 h in ARDS patients without hemodynamic impairments.

Table

$n=10$		Baseline	After 1 h	After 6 h
PaO_2/FiO_2	Group 1 (5)	98 ± 50	107 ± 74	126 ± 85*
PaO_2/FiO_2	Group 2 (5)	97 ± 22	145 ± 66*	202 ± 90†
$PaCO_2$	Group 1 (5)	43 ± 17	50 ± 12	52 ± 12
$PaCO_2$	Group 2 (5)	33 ± 10	40 ± 14	45 ± 8
Cardiac index	Group 1 (5)	4.5 ± 0.8	4.4 ± 0.8	4.1 ± 0.8
Cardiac index	Group 2 (5)	4.3 ± 1.7	3.9 ± 1.3	4.4 ± 1.5

P47 Pneumonia associated with mechanical ventilation (VAP): influence on morbidity and mortality in critically ill patients

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Introduction: VAP is an avoidable complicating factor and may change the morbidity and mortality of critical patients under mechanical ventilation.

Aim: To evaluate the effects of VAP on morbidity and mortality in critically ill patients.

Methods: In this retrospective study, 141 ICU patients were evaluated from January 1997 to November 1999. All patients were submitted to artificial ventilation for more than 48 h and did not present signs, symptoms or laboratory tests that could suggest pneumonia at the start of mechanical ventilation. Patients were divided in two groups: group 1 (with VAP) and group 2 (without VAP). The following variables were correlated with VAP: age, APACHE II and time under mechanical ventilation. Statistical analysis included Student's *t*-test, Mann–Whitney and χ^2 test ($P<0.05$).

Results: No difference was found for age ($P=0.08$), mortality ($P=0.25$) and for APACHE II values ($P=0.09$) between patients from groups 1 and 2. Patients with VAP showed longer ventilation times ($P=0.0001$) than patients without VAP (Table).

Table

	Group 1 ($n=78$)	Group 2 ($n=63$)
Age (years)	67 (26–97)	63 (18–94)
APACHE II	18 ± 6.6	20 ± 8.4
Deaths	54 (52.4%)	49 (47.6%)
Days/ventilation	18.2 (4–57)	6.3 (4–24)

Conclusion: All preventive methods should be employed to avoid VAP in critically ill patients since the evaluated group in this study remained under mechanical ventilation for a significantly longer period than patients without VAP, although the mortality rate was unaffected.

P48 Ventilation-associated pneumonia in a general ICU

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Introduction: Nosocomial infection affects up to 20% of ICU patients. Half of the cases correspond to nosocomial pneumonia. Most cases of nosocomial pneumonia are related to mechanical ventilation with a significant associated mortality. Several risk factors are attributed to ventilation-associated pneumonia (VAP).

Objective: To identify and weight risk factors to VAP.

Design: Prospective international multicenter study.

Methods: Every patient intubated for more than 12 h was included and followed for 60 days or death to identify the development of VAP. VAP was defined as presence of new infiltrate in the chest radiograph together with at least two of the following criteria: fever; leukocytosis or 10% immature forms or leukopenia; and purulent bronchial secretion. All patients admitted from another hospital were excluded.

Results: We show the preliminary results of one participating center: 33% (11/33) developed VAP. Forty-five per cent (5/11) of VAP patients versus 24% (5/21) non-VAP patients died ($P<0.05$). Sixty-four per cent (7/11) of VAP patients versus 10% (2/21) non-VAP patients were intubated more than one time ($P<0.05$). Forty-five per cent (5/11) of VAP patients versus 20% (4/21) of non-PAV patients used H_2-blockers ($P<0.05$). There was no difference for previous use of antibiotics, nutrition, APACHE II, etc.

Conclusion: The preliminary results show an associated mortality to VAP that is not related to previous clinical conditions. Reintubation and the use of H_2-blockers seem to be isolated risk factors.

P49 Patterns in oxygenation, dead space ventilation, lung mechanics and CO_2 kinetics after prolonged cardiopulmonary bypass: an analysis by the CO_2SMO-PLUS

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Cardiopulmonary bypass (CPB) alters pulmonary function and its duration is related to postoperative problems. The lung is the first organ to initiate a clinical response to this inflammatory reaction, translated as an acute lung injury, with ventilation, oxygenation and pulmonary mechanics alterations. The aim of this study was to investigate the immediate changes in lung function after a prolonged (more than 2 h) CPB in cardiac surgeries.

Twelve patients (36–85 years; 56–92 kg) were studied before (B) and after (A) CPB. Respiratory monitoring was achieved by intermittent measurements of arterial blood gases, dead space ventilation (VD/VT), and continuous evaluation of expired carbon dioxide ($PETCO_2$), CO_2 flow (VCO_2), inspired fraction of oxygen (FiO_2) and expired tidal volumes (VT), minute ventilation/kg weight (VE/Kg), inspiratory and expiratory flows, pressures and mechanics (static compliance-CSt), utilizing a solid state/single beam nondispersal infrared unit-main stream capnography with a fixed orifice differential pressure pneumotach (CO_2SMO-PLUS-Novametrix). PaO_2/FiO_2 was calculated. Data were gathered before and after CPB, with the chest closed and stable hemodynamics. Normality was evaluated by Kolmogorov–Smirnov test, modified by Lilliefors. Equal variances were assessed by Levene median test. Comparisons between the groups were performed by Student's *t*-test and Mann–Whitney Rank Sum test. Significance level was 5%.

The mean CPB time was 151.08 ± 38.85 (120–245 min). There were no statistical differences in VE/kg (87.08 ± 14.54 versus 88.24 ± 12.31), FiO_2 (0.47 ± 0.4 versus 0.50 ± 0.4), WmOB (1.34 ± 0.5 versus 1.34 ± 0.4), Raw I, Raw E, Cdyn and VD/VT. There were significant differences in PaO_2 (153.72 ± 61.11 versus 106.90 ± 38.43), pH (7.46 ± 0.06 versus 7.39 ± 0.09), $PaCO_2$ (33.86 ± 6.47 versus 40.47 ± 7.85) and CSt (47.60 ± 14.90 versus 42.08 ± 12.80).

Thus, in patients after prolonged CPB, the only change in pulmonary mechanics was the static compliance values. On the other hand, oxygenation was greatly impaired. An increase in CO_2 values was seen despite the same minute ventilation and VD/VT ratio, probably due to a high VCO_2.

P50 Impact of mechanical ventilation in the elderly

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Introduction: The need and length of mechanical ventilation (MV) in the elderly is accepted as an important determinant of mortality. The purpose of this study is to analyze the impact of MV on survival of elderly people.

Method: This is a retrospective survey of all patients aged ≥80 years admitted to the ICU from January 1997 to December 1999. The following data were studied: age, gender, APACHE II score, type of admission (clinical/surgical), need of MV, length of MV and ICU mortality. Statistical analysis were done by Student's *t*-test, Mann–Whitney and χ^2 as indicated.

Results: There were 1441 admissions to the ICU during the period of the study, with 106 patients (7.5%) older than 80 years. The age varied from 80–94 years (84.1 ± 3.7 years), 53 (50%) patients were male, the mean APACHE II score was 18.9 ± 7.2, and the type of admission was clinical in 74 (69.8%) patients. Thirty-one (29.2%) patients did not use MV and 75 (70.8%) received MV. In the group who received MV, 25 (33.3%) patients were mechanically ventilated up to 3 days and 50 (66.7%) patients used MV longer. Global mortality rate was 60.4%. Analysis of MV and its length are shown in Tables 1 and 2.

Table 1

Use of MV and mortality

Use of MV	*n*	Age*	APACHE II†	Mortality†
Yes	75	84.1 ± 3.9	21 ± 6.9	80%
No	31	84.2 ± 3.4	13.9 ± 5.3	12%

*P = NS; †$P < 0.001$.

Table 2

Length of MV and mortality

Length of MV (days)	*n*	Age*	APACHE II*	Mortality*
Until 3	25	83.7 ± 4.0	21.5 ± 7.7	76%
4 or more	50	84.3 ± 3.8	20.7 ± 6.5	82%

*P = NS.

Conclusion: Despite the fact that those patients who needed MV were more ill, its subgroups (regarding length of MV) have no difference on APACHE II score, making them comparable. Our data points that mortality was affected by the need and not by the length of MV in the elderly.

P51 Early prediction of mechanical ventilation length of stay (MV-LOS) for patients submitted to heart surgery

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Background: Among clinical cardiologists, intensivists and cardiac surgeons, weaning from mechanical ventilation is usually considered a major determinant of short course outcome for patients submitted to heart surgery.

Objective: To determine factors collected preoperatively, perioperatively and within the first 24 h postoperative that could predict the MV-LOS.

Methods: We retrospectively analyzed 207 patients submitted to heart surgery from June 2000 to February 2001 at a tertiary care cardiology hospital, correlating data obtained before, during, and within first 24 h postoperative to LOS-MV. Data were treated applying linear regression and R-R2 goodness-of-fit statistics.

Results: Under univariate analysis one could note significant predictive value of the variables age ($P=0.001$), body mass index ($P=0.004$), reoperation ($P<0.001$), hemotransfusion ($P<0.001$), pre-existing chronic obstructive pulmonary disease ($P=0.02$) and diabetes mellitus ($P=0.005$), preoperative ($P=0.004$) levels of creatinine, immediate postoperative levels of arterial bicarbonate ($P=0.004$), oxygen alveolar-arterial gradient ($P=0.002$), first posoperative day (FPD) MODs ($P=0.018$), and SOFA scores ($P=0.015$) and pressure-adjusted heart rate (PAR; $P<0.001$). Multivariate analysis (R=0.791, R2=0.625, R2 adjusted=0.594) revealed significant predictive value of the variables age ($P<0.001$), PAR ($P=0.006$), preoperative creatinine ($P=0.003$), hemotransfusion ($P<0.001$), arterial bicarbonate ($P=0.003$) and reoperation ($P<0.001$).

Conclusion: In our sample only the variables age, reoperation, pre- and postoperative creatinine levels, total hemotransfusion, and arterial bicarbonate level at immediate postoperative and PAR in FDP demonstrated significant correlation to LOS-MV. Even under univariate analysis, variables like previous left ventricle systolic function, length of extracorporeal circulation, Cleveland Clinic score, and use of vasoactive agents demonstrated no relevant correlation to MV-LOS.

P52 Effects of inhaled nitric oxide combined to mechanic ventilation on the patients with acute respiratory dysfunction in postoperative heart surgery: comparative study among pressure controlled ventilation and volume controlled ventilation

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Introduction: Pressure-controlled ventilation (PCV), is related to a better distribution of the inhaling flow and lower pressure peaks, when compared to volume-controlled ventilation (VCV). Nitric oxide (NO) promotes redistribution of blood flow to the ventilated areas and decreases the pulmonary shunt effect improving oxygenation.

Objectives: To evaluate the effects of 10 ppm of inhaled nitric oxide, combined to two ventilation modalities – pressure-controlled ventilation and volume-controlled ventilation – on the respiratory function of 40 patients undergoing heart surgery with extracorporeal circulation and respiratory dysfunction characterized by PaO_2/FiO_2 ratio <200 in postoperative heart surgeries.

Method: The patients were randomized into four groups: PCVNO group, pressure controlled ventilation with NO; PCVWNO group, pressure-controlled ventilation without NO; VCVWNO group, volume-controlled ventilation without NO; and VCVNO group, volume-controlled ventilation with NO. Evaluations were performed at times zero (baseline), 60, 120, 240 and 360 min. NO was administered in all times for groups I and IV.

Results: There were no significant changes in hemodynamic parameters, peak inspired pressure and oxygenation among the groups. There was a significant difference in the four groups for the following parameters throughout the different times: systolic pulmonary pressure (SPP); diastolic pulmonary pressure (DPP); mean pulmonary pressure (MPP); systolic systemic pressure (SSP); mean blood pressure (PBP); transpulmonary gradient (TPG); pulmonary/systemic vascular resistance index (PVRI/SVRI); ratio of partial arterial oxygen pressure and fractional inspired oxygen concentration (PaO_2/FiO_2); partial arterial carbon dioxide pressure ($PaCO_2$); oxygen consumption index (VO_2I); pulmonary shunt (Qs/Qt); oxygen extraction rate (O_2ER); alveolar-arterial oxygen gradient ($A\text{-}aO_2$)G; and pulmonary compliance (Cst) expressed by hemodynamic and oxygenation improvement.

Conclusions: No significant differences were observed for hemodynamic and respiratory parameters and those related to respiratory mechanics, when volume-controlled ventilation (VCV) was compared to pressure-controlled ventilation (PCV). NO inhalation did not show significant improvement in blood oxygenation of the studied patients. Ventilation time seems to have had a favorable influence on the clinical course. Ideal PEEP was calculated for all patients prior to the study

P53 Weaning from mechanical ventilation: comparison of two methods

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Objectives: To compare two methods of weaning from mechanical ventilation – once-daily trial of spontaneous ventilation (ODT) and pressure support ventilation (PSV) – analyzing (1) total duration of mechanical ventilation, (2) duration of weaning and (3) frequency of successful weaning.

Design: Prospective, randomized trial.

Patients: All patients submitted to mechanical ventilation for at least 48 h that fulfilled criteria for weaning.

Measurements and main results: We studied 125 patients submitted to mechanical ventilation for at least 48 h and that had clinical and radiological evidence of improvement of the process that motivated artificial support of respiration in addiction to the following functional and gasometric criteria: PaO_2/FIO_2 >200 with PEEP of 5 cmH_2O or less; PI Max smaller than −30 cmH_2O; and f/VT <100. Patients could not be under deep sedation or curarization, and when using vasoactive drugs (dopamine or dobutamine) the dose could not exceed 5 μg/kg/min. Sixty-five patients were randomized to ODT and 60 to PVS using a simple randomization technique and sealed envelopes. Weaning was considered successful when the patient was liberated from mechanical ventilation, remaining well for at least 48 h. The two groups were comparable in relation to age, gender, APACHE III score and cause of respiratory failure. The total duration of mechanical ventilation was 6.1 ± 6.8 days in the ODT group and 8.7 ± 7.5 days in the PSV group ($P<0.05$). Weaning duration was 10.6 ± 25.4 h in the ODT group and 38.7 ± 33.0 h in the PSV group ($P<0.001$). Fifty-seven patients (87.0%) were successfully weaned in the ODT group versus 45 (75.0%) in the PSV group ($P=0.6$). Twelve (26.1%) patients died in the ODT group against 12 (20.0%) in the PSV group (P=NS).

Conclusions: This study, similarly to other recent publications, suggests that most patients submitted to mechanical ventilation can be rapidly removed from the ventilator if they present clinical, gasometric and functional conditions and tolerate well a 2-h trial of spontaneous breathing. This approach results in reduction in the duration of artificial airway, mechanical ventilation and weaning with expected reduction in the frequency of complications and cost of hospitalization.

P54 Noninvasive positive pressure ventilation can prevent reintubation after acute respiratory failure: results of a prospective and randomized study

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Introduction: We hypothesize that the use of noninvasive positive pressure ventilation can be helpful in preventing reintubation after weaning of mechanical ventilation in patients with acute respiratory failure (ARF).

Methods: We prospectively studied 38 patients with ARF, with more than 3 days in mechanical ventilation. They were randomly assigned to receive nasal noninvasive positive pressure ventilation (NIPPV, 20 patients) or oxygen mask (OM, 18 patients) after achieving criteria for extubation: pressure support of 5–7 cmH_2O, PEEP of 3–5 cmH_2O, FIO_2 <40%, SaO_2 >93%, and RR/TV <100. We did a set of respiratory measurements 15 min and 24 h after extubation. A successful extubation was considered if the patient remained out of mechanical ventilation after 48 h.

Results: After 48 h we had 19/20 successful extubations in NIPPV and 11/18 in OM ($P=0.013$). Results after 24 h of extubation are shown in the Table.

Conclusion: Noninvasive positive pressure ventilation prevented reintubation after mechanical ventilation in ARF patients.

Table

	NIPPV		Oxygen mask		
	Mean	CI (95%)	Mean	CI (95%)	*P*
pH	7.38	7.36–7.39	7.36	7.33–7.39	0.290
PaO_2	110.65	100.66–120.64	84.29	76.67–91.91	<0.001
SaO_2	98.82	97.83–99.81	95.83	94.38–97.28	<0.001
$PaCO_2$	37.22	34.78–39.65	42.95	38.29–47.61	0.029
RR	22.50	20.55–24.45	27.39	24.39–30.38	0.006
HR	89.35	84.59–94.10	98.55	91.03–106.08	0.032
MAP	96.10	90.23–101.97	100.17	92.01–108.32	0.393

$P<0.05$.

P55 PxV curve behavior inside and outside the thorax in normal rats

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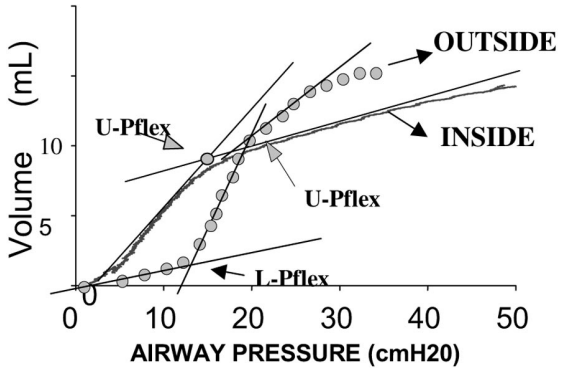
Introduction: PxV curve is a good way to study the mechanical behavior of the respiratory system in animal models; however, it is important to distinguish between the behavior of the PxV curve inside the thorax (PxV curve of the respiratory system) and outside the thorax (PxV curve of the lung) as we studied in isolated lungs models.

Methods: In order to evaluate the behavior of the curve inside and outside the thorax, we studied 42 Wistar normal rats. In 21 rats we performed the PxV curve of the respiratory system with a constant flow of 1.66 ml after the rats were anesthetized and paralyzed. In the other 21 rats, after we had anesthetized the rats, we excised the lungs from the thorax and performed the PxV curve of the isolated lung with a syringe (Figure). We recorded the curve in a PC computer and then calculated the L-Pflex and the U-Pflex.

Results: In the 21 rats with closed thoracic cage the mean U-Pflex of the PxV curves was 13.5 ± 1.90. None of the 21 normal rats had L-Pflex. In contrast the isolated lungs showed a mean L-Pflex of 12.05 ± 3.03 and a mean U-Pflex 16.96 ± 2.93 (Figure).

Conclusion: The PxV curve has a completely different shape inside and outside the thorax, and this fact has to be taken into account during mechanical measurements in rats experimental models. FAPESP-LIM-FMUSP.

Figure



P56 MODS in mechanically ventilated patients

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Introduction: The need of mechanical ventilation (MV) lead to augment of nosocomial infections and sepsis, length of stay in ICU, as well as MODS. Our purpose was to stratify and correlate the occurrence of MODS with mortality in patients on MV using a specific score.

Methods: This is a retrospective analysis of all patients in the ICU who were on MV between January 1999 and December 2000. Data collected was age, gender, APACHE II score and length of stay (LOS) in ICU. Criteria for MODS were those proposed by Marshall *et al*. Patients were divided in survivors (SV) and nonsurvivors (NSV) accordingly to ICU survival. The differences between groups were analyzed with *t*-test, χ^2 and Mann–Whitney as indicated.

Results: During the study period there were 903 admissions, of whom 621 (68%) recquired MV. Mean age was 51.5 ± 18.9 (SV) and 61 ± 17.1 years (NSV; $P<0.0001$), 328 (52.8%) were male (NS), and APACHE II was 12.6 ± 6 versus 19.3 ± 7.8 ($P<0.0001$) in SV and NSV, respectively. The LOS in ICU was 15 ± 14.6 and 9.6 ± 11.6 days in SV and NSV ($P<0.0001$). The results of the MODS in SV and NSV are shown in the Table. Six patients were excluded from this analysis due to lack of data.

Conclusions: Nonsurvivors of mechanical ventilation had higher scores of MODS than SV and also higher individual organ system scores, although severe individual organ dysfunction was not present. Age and APACHE II score at admission also were associated with mortality.

Table

		Day						
MODS		1	2	3	4	5	6	7
	n	615	585	531	481	438	390	347
Total	SV	3.5 ± 2.8*	3.5 ± 2.5*	3.7 ± 2.6*	3.6 ± 2.5*	3.5 ± 2.5*	3.3 ± 2.3*	3.4 ± 2.5*
	NSV	5.8 ± 3.6	6 ± 3.4	6.4 ± 3.6	6.7 ± 3.5	7.1 ± 3.7	6.9 ± 3.5	6.7 ± 3.5
CNS	SV	0.6 ± 1.2	0.5 ± 1.2	0.5 ± 1.1	0.6 ± 1.2	0.7 ± 1.3	0.8 ± 1.3	0.7 ± 1.3
	NSV	0.6 ± 1.3	0.5 ± 1.2	0.6 ± 1.2	0.6 ± 1.3	0.7 ± 1.4	0.7 ± 1.3	0.6 ± 1.3
Cardiovascular	SV	0.8 ± 1.1†	0.9 ± 1.1*	1 ± 1.1*	0.9 ± 1.1*	0.8 ± 1*	0.7 ± 0.9*	0.7 ± 0.9*
	NSV	1.3 ± 1.5	1.3 ± 1.3	1.4 ± 1.3	1.4 ± 1.3	1.6 ± 1.4	1.5 ± 1.3	1.5 ± 1.3
Pulmonary	SV	1.2 ± 1.2*	1.1 ± 1.1*	1.1 ± 1.1*	1.1 ± 1.1*	1 ± 1*	0.9 ± 1*	1.1 ± 1.1*
	NSV	1.6 ± 1.4	1.6 ± 1.3	1.7 ± 1.2	1.8 ± 1.2	1.8 ± 1.3	1.9 ± 1.2	1.8 ± 1.2
Renal	SV	0.4 ± 0.8*	0.4 ± 0.8*	0.4 ± 0.8*	0.3 ± 0.7*	0.4 ± 1.1*	0.2 ± 0.6*	0.3 ± 0.6*
	NSV	0.9 ± 1.1	0.9 ± 1.1	0.9 ± 1.6	0.9 ± 1	0.9 ± 1	0.9 ± 1	0.9 ± 1.1
Hematologic	SV	0.3 ± 0.8*	0.4 ± 0.8*	0.4 ± 0.8*	0.4 ± 0.8*	0.4 ± 0.8*	0.3 ± 0.7*	0.3 ± 0.8*
	NSV	0.9 ± 1.3	1 ± 1.4	1.1 ± 1.4	1.2 ± 1.4	1.3 ± 1.5	1.1 ± 1.4	1.1 ± 1.4
Hepatic	SV	0.3 ± 0.6†	0.3 ± 0.6*	0.3 ± 0.7*	0.3 ± 0.6*	0.3 ± 0.6*	0.3 ± 0.6*	0.3 ± 0.6*
	NSV	0.5 ± 1	0.6 ± 0.1	0.7 ± 1.1	0.7 ± 1.1	0.7 ± 1.1	0.7 ± 1.1	0.8 ± 1.1

*$P<0.0001$; †$P<0.001$.

P57 Lung computed tomography during a lung recruitment maneuver on patients with acute respiratory failure: mechanisms and clinical usefulness

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Introduction: Lung computed tomography (CT) has been widely used to assess lung morphology, which has led us to a better understanding on the pathophysiology of ARDS, mechanical ventilation and ventilatory induced lung injury. Despite the absence of controlled studies and standardization, LRM are increasingly used in patients with acute respiratory failure. The objective of our study was to assess the effect of different levels of airway pressure on lung morphology by performing a LRM during the lung CT-scan. This way, we could set the best ventilatory strategy for the patient and identify the mechanisms involved during the LRM.

Methods: Ten patients (5 male, 5 female, 58 ± 16 years old) with ARF (PaO_2/FiO_2 46–214) underwent a thoracic CT scan for diagnostic or therapeutic reasons. Patients were connected to a Siemens 900-C ventilator in the CT-scan facility, under sedatives and muscle relaxants. We used a Picker PQ2000 CT-scan, which has a workstation for the processing of images. At first, a conventional CT scan from the neck down to the lung basis was performed with CT slices 8 mm thick during an inspiratory pause. Then, PEEP was down to ZEEP and a LRM applied with 5 cmH_2O increments in PEEP up to 30–40 cmH_2O. A CT slice from the basal third of the lung during an expiratory pause was performed at each PEEP level. This took 4–6 min and then the patient was back to baseline ventilatory parameters. Arterial blood gases were taken at baseline, ZEEP, 30–40 cmH_2O PEEP and 3 min after LRM, and airway pressures and tidal volumes registered. Lung slice volumes and densities were measured as previously described [1,2].

Results: Decreasing PEEP down to 0 cmH_2O (ZEEP) was associated with an increase in basal densities. The increase in PEEP level from 0 up to 40 cmH_2O was associated with a significant increase in lung volume in both lungs, because of an increase in gas volume and not change in the amount of lung tissue, even with high levels of PEEP. This was associated with increases in PaO_2, PaO_2:FiO_2 ratio and mean airway pressure, and a decrease in tidal volume and total static compliance. Three to five minutes after LRM, there was a significant improvement in oxygenation index, despite similar airway pressures.

Discussion: This study showed that lung CT scan during a LRM in patients with ARF is safe and gives morphologic and functional information that could be useful in setting ventilatory parameters. By the other way, LRM improves lung mechanics and oxygenation in the short-term period, probably by effectively opening previously closed alveoli. The time course of these effects is still unknown.

References

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P58 Impact of weaning failure in the evolution of patients under mechanical ventilation

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Introduction: Weaning is a critical period in the evolution acute respiratory failure (ARF) patients. Weaning failure has been associated with increased morbidity and mortality. We evaluated the impact of weaning failure on mortality, and morbidity.

Methods: Patients who were admitted to our eight-bed surgical-ICU and stayed more than 24 h on MV were prospectively evaluated from June 1999 to June 2000. Demographics, ARF etiology, APACHE II, and gas exchange and mechanical parameters were assessed. A protocol-directed weaning consisting in a 2-h trial of low levels of pressure support ventilation and PEEP was used before extubation. Weaning failure was defined as reintubation within 48 h after extubation. Weaning failure (WF) patients were compared with those who were successfully extubated (SE), and also with the total group (TG = SE + WF + patients who died before attempting weaning). Outcome measures were mortality, MV and ICU length of stay, and MV-free days (30-days on MV).

Results: A total of 155 patients required MV for more than 24 h (TG), of which 33 (21%) died before weaning could be attempted. Of the remaining 122 patients, 19 (16%) had weaning failure and were reintubated (WF), and 103 (84%) were successfully extubated (SE). There were no differences in age, sex, APACHE II scores, or etiology between WF and other groups. However, WF patients had longer ICU and MV length of stay than TG and SE patients. WF patients had also fewer MV-free days than SE patients, but not compared with TG. There was no difference in mortality between WF and TG patients.

Discussion: We found that patients who failed weaning do not have a higher mortality rate than all mechanically ventilated patients, although do worse in terms of days on mechanical ventilation and ICU length of stay. This may seem to be in contrast with several previous studies that addressed that extubation failure increases mortality. The explanation for this difference could be that we compared weaning failure (WF) with all mechanically ventilated patients, while the other studies have compared WF only with successfully extubated (SE) patients.

P59 Measurements of respiratory mechanics in difficult weaning

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Introduction: The evaluation of respiratory mechanics through an esophageal balloon can improve the evolution of a difficult weaning.

Method: We originally studied eight patients, and change in medical weaning procedures were evaluated, before and after the respiratory mechanics measurements. Later, the study was modified and another 10 patients were observed according to the modification on clinical diagnosis of the respiratory failure (if the problem was related to compliance, resistance, drive or muscle dysfunction). The agreement among three observers that were asked to make the diagnosis were evaluated, before and after the measurements.

Results: The compliance was reduced in 10 patients (mean 47.72 ± 26.89 ml/cmH_2O); respiratory drive was assessed through the measurement of P0.1 and was increased in two patients and reduced in seven (mean 2.7 ± 3.3 cmH_2O); esophageal pressure was increased in five patients and reduced in two (mean 13.57 ± 10.08 cmH_2O); respiratory work was increased in four patients and reduced in one (mean 1.04 ± 0.56 J/l), both, esophageal pressure and respiratory work was observed only in 10 of the 18 patients; airway resistance was increased in 16 patients (mean 15.34 ± 9.16 cmH_2O/l/s). The mean of respiratory rate (RR)/tidal volume (Vt) index was 123.4 ± 85.4 and was over 105 in eight out of 17 patients. There was difference in clinical diagnosis in 50% of the time, before and after measurements. The changes in clinical diagnosis happened in eight out of 10 patients ($P=0.057$) and in weaning procedures in 14 out of 18 patients ($P=0.018$). Evolution of weaning was satisfactory in 11 out of 16 patients ($P=0.059$).

Conclusion: These results show how important could be the measurements of respiratory mechanics, when the weaning is difficult, modifying the clinical diagnosis as well as the weaning procedures, contributing to a better outcome.

P60 Association between ventilation parameters and outcomes in acute respiratory failure patients

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Background: In recent years, several studies have described different strategies for ventilatory support, some of them associated with lower morbidity and mortality. Although lower tidal volume ventilation seems to be preferred over traditional volumes, there is a great variability in clinical practice. Scarce data exist describing daily practice in patients managed in intensive care units outside clinical trials and in nonacademic institutions.

Objectives: (1) To describe mechanical ventilation parameters in patients admitted to our intensive care unit, and (2) to evaluate the effect of lower volume ventilation compared with traditional ventilation on clinical outcomes.

Method: Consecutive patients admitted between June and November 2000 in the medical-surgical ICU, who required mechanical ventilation for more than 24 h because of acute respiratory failure, were included in this observational study. Clinical and ventilatory parameters were recorded at baseline, soon after initiation of mechanical support, and within 36–48 h. Patients were stratified into two groups: group I, patients ventilated with lower tidal volumes (<8 ml/kg); and group II, patients ventilated with higher volumes (≥8 ml/kg). Multivariate analyses for repeated measures were performed to evaluate the independent effect of lower minute volume ventilation on mortality and duration of mechanical ventilation.

Results: A total of 58 patients were enrolled in the study (mean age 66 ± 18 [20–98] years, 39 [66%] were male and mean APACHE II score of 20 ± 7). Primary modes of mechanical ventilation were pressure-control ventilation (73%), pressure-support ventilation (25%) and synchronized intermittent mandatory ventilation (2%). Sixty-one per cent of the patients were initially ventilated with volumes greater than 8 ml/kg (Table). Tidal volumes did not differ from baseline to 36 h (8.9 ± 2 versus 8.9 ± 3 ml/kg; $P=0.89$). Both groups were similar in their demographics and causes of respiratory failure.

Table

	Group I (<8 ml/kg); $n=23$	Group II (>8 ml/kg); $n=36$	P
APACHE II	18 ± 6	22 ± 7	0.05
Ratio of PaO_2/FiO_2	332 ± 362	234 ± 128	0.27
PEEP	6.3 ± 2	6.4 ± 3	0.84
Maximal inspiratory pressure	21 ± 4	23 ± 7	0.26
Static compliance	39 ± 10	49 ± 23	0.03
Sedation	12 (52%)	30 (83%)	0.04
Ventilator time, days	8 ± 6	10 ± 11	0.59
Mortality	6 (26%)	12 (33%)	0.77

In multivariate analysis, after adjustment for the clinical differences between groups, tidal volumes were not independently associated with mortality and ventilator time. Patients managed with higher tidal volumes (≥10 ml/kg) at 36 h had prolonged mechanical ventilation (9 ± 8 versus 6 ± 4 days; $P=0.05$). Other ventilator settings such as FiO_2, pressure control mode and maximal inspiratory pressure at 36 h were significantly associated with increased mortality.

Conclusion: In this heterogeneous cohort of mechanically ventilated patients, pressure control and pressure support were the preferred modes of mechanical ventilation, and traditional tidal volumes (greater than 8 ml/kg) were utilized in the majority of the cases. Although our results showed a nonsignificant difference in mortality, there was a trend towards shorter ventilator times in patients ventilated with lower tidal volumes.

P61 Multiple organ dysfuntion in ARDS

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Introduction: The multiple organ dysfunction syndrome (MODS) is a major cause of mortality in ARDS. However, there are few studies evaluating this relationship using new score systems for MODS.

Methods: All patients in the ICU who met American-European Consensus criteria for ARDS [1] between November 1998 and December 2000 were included in the analysis. Criteria for MODS were those proposed by Marshall *et al* [2]. Age, gender, APACHE II score and outcome were also evaluated. The patients were divided into survivors (SV) and nonsurvivors (NSV). The differences between groups were analyzed with *t*-test, χ^2 and Mann–Whitney as indicated.

Results: There were 975 admissions to the ICU, of whom 64 (6.6%) presented ARDS criteria. The mean age was 35 ± 13 years and 54 ± 16 years ($P<0.001$), and the APACHE II was 16.4 ± 3.3 and 20 ± 5.2 ($P=0.02$) in SV and NSV, respectively. General mortality was 79% ($n=51$), 39% ($n=20$) in females and 61% ($n=31$) in males ($P=0.066$). The results of the MODS in SV and NSV are shown in the Table.

Conclusion: The severity of MODS measured by a specific score is associated with increased mortality in ARDS. Advanced age, male gender and individual dysfunction of renal and hepatic systems were associated with a poor prognosis.

References
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Table

		Day						
MODS		1	2	3	4	5	6	7
	n	64	59	49	42	35	33	26
Total	SV	6.2 ± 2.2**	5.6 ± 2.5*	5.8 ± 3*	4.8 ± 2.5*	4.3 ± 2.4*	4.7 ± 3.1*	5.5 ± 3.2†
	NSV	8.5 ± 3	9.3 ± 2.8	9.7 ± 2.8	9.5 ± 2.2	8.6 ± 2.8	9.9 ± 2.5	9.2 ± 3.6
CNS	SV	0	0.1 ± 0.5	0	0	0	0	0
	NSV	0	0.2 ± 0.8	0	0	0	0.2 ± 0.9	0
Cardiovascular	SV	1.2 ± 1.2	1.3 ± 1.2	1.5 ± 1	1 ± 0.7†	0.7 ± 1.2**	1.5 ± 1.1	1.7 ± 1.2
	NSV	1.8 ± 1.4	2.1 ± 1.3	2.1 ± 1	1.9 ± 1.2	1.8 ± 1.2	2.2 ± 1.1	1.6 ± 1.3
Pulmonary	SV	3.3 ± 0.5	2.4 ± 1†	2.4 ± 1†	2 ± 1.2†	2.3 ± 1.2	2.1 ± 1.2	2.3 ± 1.1
	NSV	3.2 ± 0.7	3.1 ± 0.8	3.1 ± 0.9	2.7 ± 0.9	2.7 ± 1	2.6 ± 0.9	2.4 ± 0.8
Renal	SV	0.4 ± 0.5	0.5 ± 0.8†	0.4 ± 0.6**	0.2 ± 0.4*	0.1 ± 0.4*	0.2 ± 0.4*	0.2 ± 0.6**
	NSV	0.8 ± 0.8	1 ± 0.9	1.1 ± 0.8	1.4 ± 0.9	1.4 ± 0.8	1.6 ± 1	1.4 ± 0.8
Hematologic	SV	0.8 ± 1.1†	1 ± 1.1†	1.3 ± 1.4	1.3 ± 1.5	0.8 ± 1.3	0.5 ± 1†	0.7 ± 1.4
	NSV	1.8 ± 1.5	1.9 ± 1.3	2.1 ± 1.5	2.2 ± 1.6	1.6 ± 1.4	1.7 ± 1.4	1.8 ± 1.5
Hepatic	SV	0.5 ± 0.7	0.3 ± 0.6†	0.2 ± 0.4**	0.3 ± 0.6**	0.3 ± 0.5	0.4 ± 0.7**	0.5 ± 0.9**
	NSV	1 ± 1.1	1.1 ± 1.2	1.3 ± 1.2	1.4 ± 1.3	1.2 ± 1.4	1.4 ± 1.2	2 ± 1.3

*$P<0.001$; **$P<0.01$; †$P<0.05$.

INFECTION

P62 Multidrug Resistant Bacteria in an Intensive Care Unit: relationship between excessive workload and increasing requirement of contact isolation

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Introduction: Multidrug resistant bacteria (MRB) transmission occurs frequently as a result of inadequate compliance to handwashing practices in ICUs. Decreasing rates of handwashing compliance are related to work overload. Little is known about the relationship between excessive work and recovery of selected multidrug resistant bacteria.

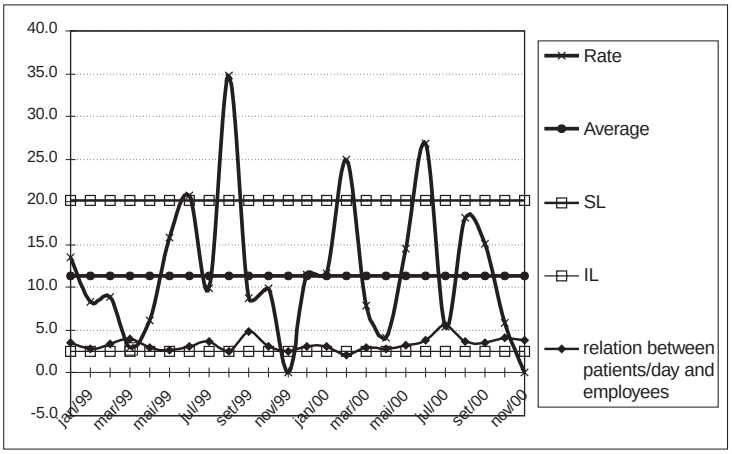
Objective: to establish a relationship between workload in an intensive care unit and the rate of isolation of selected MRB requiring the institution of contact precautions.

Methods: The study was conducted in a 24-bed-medical-surgical ICU. Routine surveillance of selected MRB is conducted every monday and contact isolation is indicated upon the isolation of epidemiological important bacteria (methicilin Resistant *S.aureus*, *Acinetobacter*, Gram-negative bacteria resistant to carbapenens/ceftazidime and vancomycin resistant *Enterococcus*). The ratio of patient/month and the number of multidisciplinary health staff working in the same month was used as an index of workload.

Results: The figure bellow shows an endemic curve of MRB, considering a two-year-period of routine surveillance. As shown, there is a clear relationship between work overload and peaks of isolation of MRB above the upper limit in the endemic curve.

Conclusion: Excessive workload in this ICU is related to an increasing rate of recovery of MRB, probably due to inadequate compliance to handwashing.

Figure



P63 Contact precautions for multidrug resistant bacteria: positive impact on handwashing compliance in an intensive care unit

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Introduction: Critical patients are highly susceptible to acquiring both infections and multidrug-resistant bacteria in the ICU. Handwashing compliance practices are generally low, particularly in ICUs, and contact precautions are recommended to reduce transmission of selected micro-organisms between patients. Although widely used, little is known about the effect of contact precautions on hand-washing practices.

Objective: Our objective was to compare hand-washing compliance in patients under contact precautions with patients under standard precautions in a medical–surgical ICU.

Patients and method: Hand-washing opportunities were defined according to Institutional guidelines and patients infected or colonized with multidrug-resistant bacteria (methicillin-resistant *S aureus*, *Acinetobacter*, Gram-negative bacteria resistant to carbapenens/ceftazidime and vancomycin-resistant *Enterococcus*) were isolated and contact precautions were instituted. Patients on routine standard precautions served as controls. Hand-washing compliance was recorded with prospective direct observation by trained personnel without the knowledge of the multidisciplinary team.

Results: During two distinct periods (September 1999 and May 2000), 543 hand-washing opportunities were observed for a general compliance rate of 45.1% (before and after patient care). Compliance was higher after than before patient care (71% × 20.3%, OR 10.09, 95% CI 6.6–15.33). Compliance was higher during care of patients under contact isolations (54.9 × 36.2%, OR 2.14, 95% CI 1.49–3.04; $P=0.00002$), which was mainly due to hand-washing after patient care (87.6% × 56.3%, OR 5.52, 95% CI 2.86–10.78; $P=0.000001$). Higher compliance was observed for nurses (57.5%).

Conclusion: Hand-washing compliance in our ICU is low and comparable to rates described in the medical literature. Contact precautions for patients colonized/infected with multidrug-resistant bacteria significantly enhances hand-washing compliance practices, mainly after patient care. A careful evaluation should be focused on other beneficial effects of strict contact isolation policies, such as decreasing rates of nosocomial infections or lower rates of recovery of multidrug-resistant organisms.

P64 Quality improvement tools (PDCA cycle) enhances compliance to nosocomial infection preventive measures: experience of a medical–surgical ICU

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Introduction: Although nosocomial infection rates are prospectively collected and widely known, little is known about compliance rates to preventive measures that are assumed to be implemented for nosocomial infection control. Monitoring and improving compliance rates to preventive measures can help maintain nosocomial infection rates within acceptable ranges and even prevent outbreaks.

Objectives: To evaluate compliance rates to institutional nosocomial infection preventive measures and the effect of a quality improvement strategy on compliance rates.

Methods: During two distinct periods (October 1998 and June 1999), compliance to specific nosocomial preventive measures related to respiratory, bloodstream and urinary infections (defined according to institutional guidelines) were recorded by direct patient observation and chart reviews. Compliance rates were discussed with the multidisciplinary team, and low-compliance practices were focused and re-emphasized after the first surveillance. Subsequent surveillance evaluated improvement of compliance rates.

Results: General compliance to selected nosocomial infection preventive measures improved from 75.5% during October 1998 to 87% during June 1999 ($P<0.05$). Higher compliance rates were observed to preventive measures related to urinary infections (88–94%), catheter-related infections (75–89%) as well as to respiratory infections (67–76%). General compliance rates remained high in a further surveillance (85.7% in February 2000). Concomitantly with higher compliance practices, the ICU general nosocomial infection rate decreased from 27.7 infections/1000 patients/day in 1998 to 20.6 infections/1000 patients/day in 1999.

Conclusion: General compliance rates to nosocomial infection preventive measures is high in our ICU, with lower rates related to prevention of respiratory infections. Quality improvement tools, such as discussing low compliance rates and retraining the multidisciplinary team, are useful to increase compliance rates. Higher compliance to preventive methods was associated with a decrease in the general nosocomial infection rate, although a causal relationship needs to be investigated.

P65 Epidemiology, diagnosis and prognosis of critically ill patients with positive fungal cultures

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Introduction: Fungal infection in critically ill patients is an increasingly prevalent problem [1]. *Candida* spp cause the majority of these infections in ICU. The significance of a positive culture has been debated as it may represent local colonization or disseminated infection [2].

Objectives: This study analyzed the clinical significance of positive fungus cultures in the ICU patient.

Method: We reviewed the charts of all patients with at least one positive fungal culture who were admitted to a 13-bed general intensive care unit between 01/02/98 and 31/01/2000. We analyzed the following: age, APACHE III score, length of stay in the ICU, diagnosis, site and species of fungal isolation, risk factors and treatment. The patients were classified according to the clinical profile, microbiological data and therapeutic interventions in five groups: probable fungal infection, empiric therapy, fungemia, confirmed fungal infection and colonization.

Results: Of the 1084 patients admitted to the ICU in the period of the study, 55 (5.0%) had at least one positive culture for fungus. These patients were older, worse and had a greater length of stay in the ICU compared to the general ICU population. One *Candida* species was isolated in 107 out of 109 positive fungal cultures. The urine was the site of growth in 56 cultures, tracheal secretion in 29, intravenous catheter in eight and blood in four cultures. Twenty-eight patients (50.9%) were colonized. Twenty-two patients (40.0%) were classified as probable fungal infection. Four patients had fungemia, and only one patient had confirmed fungal infection. Thirty-seven (67.2%) of the patients received at least one antifungal therapy. Of these, 15 were colonized. Fourteen (63.6%) of the 22 patients with probable fungal infection died, compared with nine out of 28 (32.1%) of the colonized patients ($P<0.05$). Three out of four patients with fungemia and the patient with confirmed fungal infection survived.

Conclusion: Positive fungal cultures are associated with markedly increased mortality rates in critically ill patients. A percentage of these patients may be succumbing to unrecognized fungal infection. To identify and treat the patients with probable fungal infection could reduce the high mortality rate observed today.

P66 Features and markers of nosocomial pneumonia in patients undergoing heart surgery

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Background: Nosocomial pneumonia (NP) is probably the most frequent and severe cause of postoperative infection in patients undergoing heart surgery. This group has high incidence (2–20%) of NP.

Objective: Description of the microbiological patterns and markers of NP in patients submitted to heart surgery.

Development and method: An observational and prospective study was conducted between June 2000 and February 2001. All patients submitted to heart surgery and to MV were included. Diagnosis of NP followed NNISS criteria (CDC). We evaluated the results of bronchoalveolar lavage (BAL) and blood cultures collected at the same day of NP diagnosis. Variables analyzed were age, gender, smoking, diabetes, chronic obstructive pulmonary (COPD) disease, body surface, ventricular function, time of extracorporeal circulation (ECC), clamp time, type and length of stay (LOS) in surgery, LOS MV. EPI Info 6.04 from CDC was used to perform univaried analysis.

Results: A total of 211 patients were submitted to heart surgery during this period; 29 NP were observed in 23 (11%) patients. Median age of 66 years, 65% were men. Gender, COPD, diabetes and body surface were not related to increase NP. Smoking patients had increased risk of NP ($P<0.001$). Patients with normal ventricular function had a lesser incidence of NP ($P=0.002$). LOS in surgery (median 6 h) and clamp time was not related to NP. LOS MV ($P<0.001$), duration of ECC ($P<0.001$), coronary artery bypass graft ($P=0.04$) and emergency ($P=0.01$) were related to increase of NP. BAL could not be performed in two cases of NP. Micro-organisms related to these infections were *Pseudomonas*

aeruginosa in five (18%), *B cepacia* in four (15%), *Staphylococcus aureus* oxacillin-resistant in three (11%), *Haemophillus* sp in three (11%), *Neisseria* sp in one (4%), *Enterobacter cloacae* in three (11%), *E coli* in two (7%), *Morganella morgani* in two (7%), *Staphylococcus epidermidis* in one (4%), *Klebsiella oxytoca* in one (4%), *Serratia marcenses* in one (4%), *Proteus mirabilis* in one (4%) and *Enterobacter aerogenes* in one (4%). These data demonstrate high prevalence (11/27) of enterobacteria. We found 18% of positive blood cultures.

Discussion: The initial univariate analysis agrees with the literature information. A multivariate analysis should be performed. Reduction in time of ECC and LOS MV could be associated with decreased infection rate in this group.

P67 Description of MRSA small colony variant (SCV) outbreak in an ICU in Rio de Janeiro

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Objective: To describe an outbreak of SCV and its epidemiology.

Materials and method: We conducted a retrospective study analyzing nine previously identified cases (two of them out of the ICU) of SCV-related sepsis occurring in the period between November 1998 and September 1999. Clinical and epidemiologic data were collected and compared to patients with MRSA (non-SCV) infection.

Results: We found a higher hospital mortality (100% versus 50%) and ICU mortality (71.5% versus 12.5%) comparing SCV and non-SCV infection, respectively. SCV-infected patients received more antibiotics when compared with the control group (85.7% versus 62.5%). Data such as age (71.8 versus 79.4 years), sex, APACHE II (23 versus 21.8), time of acquisition of MRSA (22.5 versus 27 days) and duration of mechanical ventilation (27.8 versus 24.2 days) did not achieve statistically significant difference.

Conclusion: This is a unique study on this subject in Brazil, and its original data confirm previous description of infections caused by *S aureus* SCV whose characteristics result from its phenotypical adaptations. A worse prognosis is usually associated with this strain, which are a cause of more persistent, recurrent and resistant infections; in this case an ominous prognosis is worsened by methicillin resistance.

P68 Appropriateness of antibiotic use and its influence on outcome of patients admitted to an intensive care unit

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Objectives: To evaluate the appropriateness of antibiotic use in patients hospitalized in our intensive care unit and to describe its effect on clinical outcomes.

Setting: Medical–surgical intensive care unit of Hospital Moinhos de Vento, a private hospital with an open medical service.

Methods: Between March 2000 and October 2000, antibiotic prescription made for adult patients hospitalized in the ICU were reviewed according to an institutional protocol from the Infectious Control Service (ICS). This protocol specified that for all cases a written justification is provided by the responsible physician, although no direct intervention is expected on the medical order. Appropriateness was established by the investigators through prospective collection of clinical data and chart review. Antibiotic prescription was evaluated regarding its indication, empirical use, pharmacokinetics and duration of treatment. Clinical outcomes evaluated were infection worsening or cure and mortality.

Results: A total of 137 antibiotic prescriptions were studied, from 90 patients. Sixty-six per cent were male, age ranged from 17 to 98 years, 61% were older than 61 years, and 61 (68%) medical and 29 (32%) were surgical cases. Among these patients, 81 infections were observed, predominantly respiratory infections (48 [59%] episodes) and sepsis (28 [34%] episodes), and less frequently other infections (abdominal, endocardites, gaseous gangrene, urinary tract, phlebitis). Nosocomial infection occurred in 61 (75.3%) episodes, and in 13 (16.7%) cases immunodeficiency was associated. One or more etiologic agent was only identified in 44 (54%) episodes, 54% Gram-negative bacilli and 43% Gram-positive cocci. Antibiotic use was empirical in 54.4%, etiology guided in 27.8% and in 2.2% no infection was observed. According to criteria defined by ICS, appropriate antibiotic use was observed in only 39% of prescriptions, and the majority were considered inappropriate (61%). Prescriptions were considered inappropriate because of inadequate choice of the drug (44 episodes); errors in doses, intervals or duration (five episodes); choice of combined drugs (one episode); and no adjustment after antibiogram release (two episodes). There was no statistical difference in the appropriateness between empirical (57%) and nonempirical (44%) antibiotic use. Treatment of community-acquired infections were more inappropriate than nosocomial infections (73% versus 54%; $P<0.05$). However, empirical or appropriate use was not associated with clinical outcomes. Empirical treatment had similar rates of cure (54.5% versus 45.5%) or worsening (58.3% versus 41.6%) to nonempirical treatment, respectively. Although not statistically significant, appropriate use had a cure rate lower than inappropriate use (40% versus 60%), probably due to other clinical factors besides antibiotic use.

Conclusion: Antibiotic use in an ICU setting is empirical in majority of the cases, probably due to the lack of an etiologic agent identified in half of the episodes, and high complexity of patients. In the present study, empirical or inappropriate use did not seem to influence clinical outcome. Appropriateness of antibiotic use for ICU patients may need to consider other criteria than those used for regular patients.

NEUROLOGY

P69 The evaluation of intracranial pressure by the carotid eco-color Doppler

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Introduction: The evaluation of intracranial pressure (ICP) is useful in several clinical situations. The value of the ICP in centimeters of water is available by a specific and invasive catheter in many hospitals. A simple and noninvasive method for assessing ICP would be of considerable value. This is particularly true with respect to cerebral brain because of the recent interest in the effects of cerebral flow and efforts to understand neurologic dysfunction.

Objective: Our intention in this study is to demonstrate, for the first time, the possibility of the ICP value to be described by the carotid color Doppler method. To our knowledge, no comparison between carotid color Doppler method and ICP available for invasive catheter has been performed until now.

Method: After institutional approval by the local ethical committee on human research, we studied 15 individuals in an intensive care unit by the carotid color Doppler method before transferring them to the surgery center for invasive catheter intracranial introduction.

Results: Their mean age was 40 years, their mean body height was 170 ± 5 cm and mean weight was 68.4 ± 10.2 kg. A 7.5-MHz linear pulsed carotid color Doppler device was used to evaluate the flow, the carotid wave, the pulsatility index and the resistance index. The ICP index of the group was subdivided in normal value between 5–15 cmH_2O; moderate >20 cmH_2O; severe >40 cmH_2O; and critical >60 cmH_2O, as first described by *Stene J* in 1997.

Table

Value	Catheter (*n*)	Carotid (*n*)
Normal	4	4
Moderate	3	3
Severe	5	5
Critical	3	3

When the normal value was observed in ICP, the typical normal flow in carotid method was also observed. Moderate elevation in ICP value was represented by higher systolic flow in carotid Doppler than the normal value, while extremes values were observed with higher systolic flow and inversion of diastolic flow in comparison with the baseline. In the critical ICP value, the systolic flow in the carotid method was attenuated and the diastolic flow disappeared.

Conclusion: The carotid color Doppler method is indicated to analyze the elevation of ICP.

P70 Immediate postoperative analgesia and sedation following heart surgery: a comparative analysis of dexmedetomidine chlorohydrate versus remifentanyl hydrochloride

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Background: Pain and anxiety are factors contributing to postoperative morbidity, since they are correlated with elevated heart rate and blood pressure, besides increasing peripheral O_2 consumption and serum adrenergic neurohormone levels. Maintaining homeostasis after heart surgery is thus central to the patient's favorable postoperative evolution.

Objectives: This study aims at a comparative analysis of an IV central adrenergic α_2-blocker, dexmedetomidine chlorohydrate, versus a short-acting venous opioid, remifentanyl hydrochloride (RH), with regard to analgesia, sedation and side effects. The primary objective is to identify the most adequate drug for the postoperative ICU setting.

Sample and method: This was a prospective, randomized, open-label study, involving 34 patients, divided into two groups. Group I consisted of 20 patients who received RH at an IV dose of 0.05–0.1 μg/kg/min. Group II consisted of 14 patients who received DC at an IV loading dose of 1 μg/kg in 10 min, followed by infusion at 0.2–0.7 μg/kg/h. Monitoring of analgesia (and sedation) was performed with the following methods: Ramsay Scale (sedation) and Visual-Analogue Scale (VAS) (analgesia). Statistical techniques were exploratory data analysis, Mann–Whitney non-parametric test (95% CI), and Kruskal–Wallis Test (95% CI).

Results: Statistical analysis of data was performed within 10 h after patient admission to the post-operative ICU. Like the Ramsay Scale, VAS, independently of time, showed a significant difference between the two groups ($P<0.001$), with group I displaying the lowest values. Over time, group II continued to display lower values, but this difference was not significant ($P>0.1$).

Conclusion: Both drugs proved effective for controlling pain and anxiety. RH was more efficient in this control, especially when time was not considered, based on the better results in the first 4 h of the postoperative period. A larger patient sample is needed for more adequate evaluation of the results.

P71 Immediate postoperative thoracic epidural analgesia following heart surgery: a comparative analysis of patient-controlled continuous thoracic epidural analgesia (PCCTEA) versus intermittent thoracic epidural analgesia (ITEA)

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Background: Surgical procedures involving medial sternotomy or anterolateral thoracotomy are still frequently employed in the therapeutic approach to heart diseases. The surgical tissue lesion sets off a series of neurohumoral responses often resulting in undesirable physiological alterations during the immediate postoperative period. Pain plays a relevant role in this context.

Objective: This study aims to compare PCCTEA using fentanyl versus ITEA using morphine, both in the thoracic epidural space in the immediate postoperative period following heart surgery. The primary objective is to identify the most adequate technique for the postoperative ICU setting.

Patient sample and method: This is a prospective, randomized, open-label study involving 18 patients, divided into two groups. Group I (PCCTEA) consisted of nine patients who received fentanyl at a dose of 0.5 μg/kg/h, associated with a patient-controlled bolus of 20 μg up to 20/20 min. Group II (ITEA) consisted of nine patients who received morphine, 1 mg 12/12 h. The observation period began at patient admission to the PO-ICU until removal of thoracic drains, that is, from 12–24 h postoperatively. Monitoring of analgesia (and sedation) was performed with the following methods: Ramsay Scale (sedation) and Visual-Analogue Scale (VAS) (analgesia). Statistical techniques were exploratory data analysis, Mann–Whitney nonparametric test (95% CI) and Kruskal–Wallis test (95% CI).

Results: Statistical analysis of data was performed within 10 h after patient admission to the postoperative ICU. Like the Ramsay Scale, VAS, independently of time, showed a significant difference between the two groups ($P < 0.001$), with Group II displaying the lowest values. Over time, Group II continued to display lower values, but this difference was not significant ($P = 0.134$).

Conclusion: Both techniques proved effective for controlling pain and anxiety. ITEA was more efficient, especially when time was not considered, based on the better results in the first 4 h of the postoperative period. A larger patient sample is needed for more adequate evaluation of the results.

P72 Malignant hyperthermia emergency consultation: preliminary results from 'hotline' calls

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Objective: To demonstrate the functioning of the only 24-h call system in Brazil for help in hyperthermia malignant cases.

Method: Between February 2000 and February 2001, all the phone calls to 'hotline' were analyzed. We examined the index-card filled out by the doctors who worked in the ICU and were responsible for the hotline calls.

Results: We registered 60 calls during this period, and all were reported in the index-card. There were 50 calls (83.4%) done by health care professionals, including 43 (86%) physicians, four (8%) nurses and three (6%) pharmacists. The Southeast region of Brazil was responsible for 78.3% of all calls, including 89.36% from São Paulo. The most frequent doubt presented by phone was about the purchase and administration of Dantrolene® (30%). The other calls were about suspected but not confirmed cases (16.7%), prophylaxis and diagnosis (21.7%), preoperative evaluation in susceptible patients (10%) and general scientific information about the disease (6.7%). The main objective of the 'hotline' was to direct the assistance in confirmed cases of malignant hyperthermia. We had seven (11.6%) calls that were related to malignant hyperthermia cases.

Conclusions: Malignant hyperthermia is still a disease with high morbidity and mortality, which is poorly diagnosed and inappropriately treated. The maintenance of a 'hotline' system 24 h/day is justified not only because of the emergency characteristic of the disease, but also for complementary evaluation and information related to the diagnosis, treatment and prevention in susceptible patients.

P73 Monitoring of severely head-injured patients during the first 72 h: correlation with mortality

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Introduction: Monitoring of severely head-injured and postoperative neurosurgical patients is essential to optimize cerebral hemodynamics and thus to minimize secondary injuries. We investigated the correlation between cerebral variables obtained in the first 72 h and survival.

Methods: This was a prospective study in 14 patients in a 24-bed adult ICU. After initial resuscitation, cerebral monitoring was performed and cerebral perfusion pressure (CPP) was increased to 70 mmHg by an increase in mean arterial pressure (MAP) with volume expansion and vasopressors as needed.

Measurements and results: Mean values from daily measurements of intracranial pressure (ICP), CPP, and simultaneous arterial and venous blood gases were evaluated during 72 h of cerebral monitoring. CPP values were significantly higher in survivors compared to nonsurvivors (81 ± 8.6 versus 71 ± 34 mmHg, 87 ± 8.7 versus 68 ± 23 mmHg and 87 ± 18 versus 69 ± 20 mmHg on days 1,2 and 3, respectively; $P = 0.02$). In 139 measurements obtained jugular venous oxygen saturation ($SjvO_2$) values did not correlate with CPP ($r = 0.02$; $P = 0.08$, NS).

Conclusion: In the first 72 h, ICP was significantly higher and CPP significantly lower in nonsurvivors. Dynamic evaluation in the first 72 h of injury shows trends towards higher $SjvO_2$ in nonsurvivors (NS). When patients were initially resuscitated before cerebral monitoring we found no correlation between $SjvO_2$ and CPP.

P74 Study of 531 consecutive cases of severe head trauma in Florianópolis, 1994–2000

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Background and objective: Trauma is the major cause of mortality in the population aged below 40 years. Brazil has a high incidence of traffic accidents. Our main objective was to study the epidemiology and the mortality secondary to severe head trauma in a medium-sized southern Brazilian city (Florianopolis, ca 600,000 inhabitants). We compared the impact of safety traffic campaigns on epidemiological variations and mortality during the period 1994–2000.

Settings: A regional reference hospital for head trauma.

Method: Data from 531 consecutive patients admitted to the ICU (period 1994–2000) with severe head trauma (Glasgow Coma Score ≤8) were obtained. The following variables were collected and analyzed: demographics, cause of trauma, Marshall's topographic classification for head trauma and in-hospital mortality. We compared total mortality and mortality during the periods 1994–1995 and 1999–2000.

Results: Patients were predominantly males (85%), aged 12 to 40 years (74%). In-hospital mortality was 35%; in 1994–1995 it was 44%, and in 1999–2000 it was 32%. There was a fall in the percentage of victims of car accidents from 33 to 21%, and an increase in the percentage of victims of motorcycle accidents from 13.4 to 21% and of pedestrian injuries from 31 to 33.4%. We observed an increase in injury type V (mass lesion evacuated) from 29 to 35%.

Conclusion: Seat belts and new traffic legislation have resulted in a change in the epidemiology of trauma. Car crashes were the most important cause of trauma during the period 1994–1995, but in 1999–2000 it was pedestrian injury and motorcycle accidents. A fall in mortality occurred that was of multifactorial cause, involving better prehospital and critical care assistance, more frequent monitoring and control of intracranial pressure, and better tomographic control, and clinical and surgical treatment. We highlighted the importance of traffic safety campaigns.

QUALITY CONTROL AND HUMANIZATION

P75 Assuring the effectiveness of nursing technical training: the experience of a 75-bed critical care unit

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Purpose: To evaluate contributions of a workshop training program in assuring and improving nursing technical procedure performance.

Description: Currently, there are three most critical issues concerning the performance of nursing technical procedures: the high number of procedures; the short time available to train the staff on the job; and the difficulty of measuring the effectiveness of the training program. We observed and received some complaints from patients' families that some special procedures were not performed in a uniform way. One of these was continuous ambulatory peritoneal dialysis (CAPD).

Quality indicators were elected for peritoneal dialysis. The initial analysis showed that the worst results were related to the incidence of peritonitis or peritoneal dialysis technique-related infection. In the period from October to December 1998, there were three episodes of infection in 68 patient-days (one peritonitis to each 1.3 patient-month). A workshop training program was developed to improve the nursing performance in CAPD procedure. Next, we applied a PDCA deming cycle (January 1999): 'plan', evaluation of the technique used and also the training program development; 'do', training of the nursing staff; 'check', re-evaluation of the technique and new analysis of infection incidence; and 'act', retraining (if necessary) and continuous nurse education.

Evaluation: Fifty-six nurses (100%) were trained. When we evaluated the understanding of the technique, twenty-five of them (44%) were not fully compliant with the standard technique and had to be retrained. Afterward a new evaluation revealed that all of them were then compliant (Fisher's exact test, $P<0.001$). During January to June 1999, we observed no new cases of peritonitis in 94 patient-days (incidence-density analysis, $P=0.07$).

Outcomes: This preventive approach allows a practical and systematic feedback from the professional involved, a uniform procedure performance, a customized retraining, and detection of technical faults before the real performance with patients.

P76 Patients' and their relatives' satisfaction in an intensive care unit

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Introduction: The evaluation of a health service is intimately linked to the definition and the social consent and implies in values and ideologies. Its settles down in conformity or adaptation to that user's expectations.

Objective: The aim of this work was to make a descriptive study about the ICU patients and care givers satisfaction at a general hospital.

Material and methods: This is a prevalence study conducted during a period of 3 months. The sample is composed by 724 interviews (356 care givers and 368 patients), according to the inclusion criteria previously established. The instrument was a questionnaire to assess the patients' and families' satisfaction, developed especially for this purpose and is composed by Linkert scale (1–7).

Results: The mean age of the interviewed was 56.7 years (SD = 17.5 years), predominantly of female sex (60.5%). In the sample, 61.7% had university degree. Sixty-six per cent of the individuals were married. Seventy-seven per cent of the care givers were relatives (son or husband or wife) and 63% of the patients had had previous admissions at the hospital. The total satisfaction score was 6.14, and 98% of the interviewed recommended the service. The score of the variable 'expectation with received service' was 6.2, with no difference for sex, age and length of stay.

Conclusion: We have previously identified a tendency of high level of satisfaction. This tendency was associated with scores for expectation and recommendation. The user's satisfaction is the most important indicator for measure the quality of care. However, this indicator is not precise and it must be continuously improved to provide the best information about satisfaction.

P77 Needs of families of critically ill patients and perception of the health care team

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Introduction: The 'Critical Care Family Needs Inventory' (CCFNI) has been used to identify the needs of the relatives of critically ill patients in ICUs. Few studies have compared the needs of the relatives with the perception of the health care team.

Objective: The aim of this study was to compare the perceived needs of family members of patients in the intensive care unit with those perceived by health care team using the 'Critical Care Family Needs Inventory' (CCFNI).

Materials and method: The sample is composed by 72 family members of patients hospitalized in ICUs, as well as 86 members of the health care team, from 1 August to 31 December 1997. The CCFNI scale was translated into Portuguese and three questions were added. The data obtained were analyzed using the mean and the standard deviation of the answers, and the Pearson's correlation was used to compare the samples.

Results: Information and assurance were perceived as being the major needs by the relatives and the multiprofissional team. A significant correlation was found between the score obtained for both groups ($r = 0.89$; $P < 0.001$). The mean scores evaluated by the relatives were higher than those perceived by the health care team.

Conclusion: The main categories of needs were assurance and information about the real conditions of their hospitalized relatives; there is a strong correlation between the family evaluation and the perception of the health care team.

P78 Patient satisfaction with postoperative analgesia in ICU: pain is not the unique determinant

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Despite advances in its management, pain is a frequent problem in ICU. It is a major determinant of patient stress and it is also correlated with morbidity, probably due to sympathetic activation, respiratory restriction, immobility, etc. Several studies have tried to validate different tools for analgesia evaluation, but they fail to evaluate the impact of pain management strategies on patient satisfaction.

Our objective was to evaluate whether different pain management strategies alter postoperative ICU patient satisfaction reports. A total of 110 postoperative patients without evident cognitive deficits were evaluated. We obtained data about type of surgery, type of analgesia used (continuous or intermittent, regularly administered or on a patient-demand basis), patient pain scores from an analogic-visual pain scale (AVPS: 0, no pain; 4, moderate pain; 10, most severe pain) and patient satisfaction scores at the moment they left the ICU.

Sixty per cent of the patients were males, 40% were females, and mean age was 63 ± 17 years (mean ± SE). Of the patients investigated 82% gave high satisfaction scores with the analgesia strategy used, but 18% (20 patients) were not satisfied, referring they had unbearable pain during ICU stay; from those 20 patients, 10 (50%) never referred a pain score above 3 during ICU, 13 (66%) were female and 16 (80%) did not receive analgesia on a regular basis.

Our data suggest that evaluation of satisfaction with pain management in ICU should take into account pain scores, but also a specific satisfaction questionnaire. We could observe that female and patients with on-demand-basis analgesia are more prone to refer low levels of satisfaction with pain management. Further, simple pain scores like the classical analogic-visual pain scale may fail to detect pain in the ICU patient because of a putative high incidence of a communication disorder.

P79 What can a psychologist do at an ICU? The epidemiological description of the patients

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Introduction: The participation of a psychologist in ICU team is a recent event that is becoming frequent in some modern hospitals. This experience demands careful evaluation of patients, families and health care team needs, and the efficiency of the psychological intervention. The aim of this work is to describe clinical and epidemiological data about the patients attended by a psychology service at a general ICU in order to optimize the psychologist's work.

Materials and method: This retrospective prevalence study is composed by a sample of 515 patients. The instrument was an electronic case register (MedTrack).

Results: The preliminary outcomes, from 10 months analyzed, showed that the psychological consultation was made to 19.5% of the patients during their ICU stay. The mean age of the patients was 62 years (SD = 19 years), and 57% were male. The prevalence of psychotherapy assistance made directly to the patient or family members during the hospital stay was 21%. Seventy-nine per cent were the first evaluation, short-time intervention such as educational and brief interventions focused on the admission period. The prevalences of diagnosis were as follows: neoplasic disease (17%), cardiac system (17%), respiratory system (16%), trauma (13%), neurological system (10%) and others (27%).

Conclusion: The results showed no differences between the means of the population admitted to our ICU and those attended by the psychology team. However, a lower prevalence of cardiologic patients (17% versus 50%) was observed. The high prevalence (79%) of the short interventions suggested that psychological approach had to deal with dysfunctional emotional symptoms during the initial ICU stay and related to the acute forms the clinical disease. These data suggested that the psychologist has to be aware of the characteristics of their patients to optimize their work.

P80 The ICU Humanization Program: contributions from the psychologist team

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Introduction: The great scientific and technological breakthrough in the field of experimental sciences applied to medicine and health sciences is being responsible for the process of dehumanization. To understand the process and bring back a humanistic view to education seems to be necessary to rehumanizing medicine.

Objective: The aim of this work was to discuss the contribution a psychologist might provide to an Humanization Program and to present the models that are being used as a reference to the clinical work at an ICU in a private hospital in São Paulo.

Materials and method: A qualitative analysis of psychological assistance was performed, based on the standard psychological routines.

Results: The analysis of the psychological model has been divided in four ways: health psychology applied to medical setting, focused mostly in the patients and the psychological clinical assistance given to them; consultation-liaison, focused in the situation in which the health care team demands psychological help; humanizing assistance, the objective was to help in the identification of difficulties faced by patients and their family members in coping with the ICU stay; and educational assistance, focused in health care team, had the objective to help them with the relationship with the patients and identify dysfunctional aspects of the professional himself.

Conclusion: It has become imperative to incorporate humanitarian aspects into the benefits brought by many years of technological progress and development of the intensive care units. Following this proposal, the clinical work of the ICU psychologist might contribute to the recovery patient's personal values and to improve the team relationship with the patients and families.

P81 Patient information after hospitalization improves humanistic care in intensive care units

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Introduction: Understanding patients' perceptions of caring is the basis for a more compassionate approach during hospitalization in intensive care units (ICU). Extensive literature covers the aspects of more humanistic care, but objective data on patients' experience and impression after ICU stay is rare. This article describes how ICU staff can evaluate caring environments utilizing patient information.

Method: This study was conducted in a hospital that incorporated a humanistic approach to care since 1995. Between November 1995 and February 1997, 138 patients discharged from the ICU answered questionnaires evaluating eight relevant variables about their ICU stay. Questions cover crucial points for humanistic care: quality of information before admission; satisfaction of expectations; positive experiences during stay; stressing factors; more frequent concerns; idea of death; utilization of audio-visual equipment; intensity of relationship with the staff; and additional comments.

Results: Twenty seven per cent of patients received instructions and visited the ICU before hospitalization; 75% considered the relationship with the staff and multidisciplinary team pleasant; 25% refer to the procedures as stressing factors; 43% refer the family as

a major concern; 52% thought about death; 31% did not utilize audiovisual equipment; 36% considered health care providers close enough; and 71% of the comments about the unit were positive.

Conclusion: We described a simple analysis of humanistic care in general ICUs. Consistent data can be obtained to direct the attention of care providers to critical issues related to the comfort and satisfaction of critically ill patients.

P82 The attitude of Brazilian intensive care physicians towards the decisions of withdrawal or withholding treatments

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Introduction: The decision to forgo life-sustaining treatment is among the most challenging problems that physicians and patients face.

Objective: To examine the attitudes of the critical care physicians regarding the end-of-life decisions.

Design: An anonymous questionnaire was given to the physicians who participated in the National Congress of the Brazilian Society of Critical Care Medicine.

Results: A total of 82 questionnaires were answered. The majority of those who answered the questionnaire (94%) had withheld and withdrawn life-sustaining medical treatment. Decisions were more commonly made by physicians, and the younger physicians were more likely to admit patients with no survival expectancy. Dialysis was the therapy most frequently withheld and withdrawn. Sedation or analgesia were less frequently withheld or withdrawn. The most frequently factors taken under consideration for nonadmission into the intensive care were diagnosis and prognosis. To ensure comfort to the patient with no survival expectancy is the most important factor in his admission into an ICU.

Conclusions: Despite the discomfort in forgoing treatment, the majority of critical care professionals have been discussing forgoing treatment in irreversible, terminally ill patients. It is a serious ethical matter that needs to be studied.

P83 Evaluating the level of comfort and stress of conscious ICU patients

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Introduction: Compassionate and humane care was recently incorporated into standard intensive care units. Alleviation of stress and discomfort is now recognized as an important step during the treatment of critically ill patients. The impact and relevance of this issue have been largely discussed but not yet fully evaluated. The authors hypothesized that conscious patients might provide important information that can result in improved compassionate care in adult ICUs.

Materials and method: Between November 1995 and February 1997, 138 patients admitted in the ICU with total alertness and preserved cognitive function for at least 3 days were asked to answer a questionnaire elaborated by the multidisciplinary team. Questions focused on aspects related to well-being and comfort of the patients: ambient temperature, noise, satisfaction with health care providers, sleepiness, pain, time orientation, complaints, and psychological reactions.

Results: The temperature was considered fair by 60% of the patients, 18% felt hot and 22% cold; 85% of the patients considered general professional care satisfactory; 82% were bothered by loud noise; 46% did not sleep during the night; 45% refer pain; 11% were not time oriented; and 17% had at least one complaint. Anxiety (47%) and fear (35%) were the most common psychological reactions.

Conclusion: The data suggest that short and simple questionnaires applied periodically to conscious patients might identify factors of stress and discomfort during ICU stay. This is an efficient and relatively inexpensive tool to improve the quality of care provided by a multidisciplinary team.

P84 Short stay unit/observation unit: a new paradigm

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A short unit is a new concept of emergency medicine where patients are under the care of a proper staff connected daily to the emergency department staff. This remains true even considering that patients are also admitted to the unit from other care sites or at the request of other services.

It is a protocol-driven unit designed for patients who require short-term interventions or additional time for treatment or diagnosis; it is not intended for patients with significant illnesses that require full hospital level services, including significant interventions. Patients who are not able to complete their course of treatment and leave the unit to home at about 48 h are supposed to be transferred to regular units.

The short stay unit has been designed as a unit for care of patients who need a short time for additional treatment on diagnosis. From September 1999 to March 2001, 945 consecutive patients were admitted to Pró-Cardíaco short stay unit. Approximately 66% of these came from the emergency department, and about 80% could be discharged home from the unit. Mean age of the patients was 65 years, with a mean time of hospital stay of 1.83 days. Fifty per cent of admissions had a cardiovascular origin with a mean time of stay of 1.88 days, and 50% were of noncardiovascular origin (mean time of stay 1.78 days).

Excluding admissions secondary to intrahospital interventions (which were about 25%), the most frequent diagnosis were as follows: chest

pain 16%, 1.4 days; infectious syndromes 9.3%, 2.0 days; atrial fibrillation/flutter 8.6%, 1.66 days; syncope 5.5%, 1.38 days; heart failure 4.3%, 2.5 days; and TIA/ischemic stroke 3.9%, 1.7–2.5 days.

Conclusion: The short stay unit represents an extension of the concept of chest pain units for prevalent situations seen at the emergency department.

P85 ISO 9002 for intensive care unit (ICU): quality improvement, process control or marketing?: a case study on a 75-bed adult and pediatric ICUs of a private hospital in São Paulo, Brazil

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Introduction: Although ISO standards have been largely adopted for the industrial sector, its use in the health sector has been mostly limited to clinical laboratories and blood banks units [1–3].

Objectives: The development of research in intensive care units aimed to answer two major questions. How efficient and applicable could a model developed for industrial processes be for health services directly related to patient care? What were the contributing and limiting factors during the ISO implementation and what were the results obtained 2 years after the certification?

Methods: Case-study research was conducted to understand the perception of the leaders of ISO 9002 certified ICU units of a 460-bed acute care hospital. Leaders in both adult and pediatric units include the head physician, head nurse, quality co-ordinator and supervisors. The nine interviews were based on a semistructured questionnaire, totaling 16 h of interview. The analysis of the interviews was done based on qualitative methods.

Results: During the implementation, the most important contributing factors were the multiprofessional structure of the Quality Committee and the need for exactness and preciseness in the patient care-related services. The main limiting factors were the difficulty on comprehension and adaptation of the model to the patient care services and the characteristic of autonomy of the medical practice. As a result of the process, it was clear for the leaders that the greatest benefits were related to process control mechanisms. These include the following: standardization and documentation of policies, technical procedures and administrative routines; mandatory records for critical process; internal and external auditing systems; and equipment maintenance control. Concerning the use of ISO as a tool for marketing promotion, leaders agreed that the certification did not impact positively on the demand of the services. One final result relates to its ineffectiveness in implementing a quality management system, due to its lack on leadership and quality improvement requirements.

Conclusion: Results indicate that ISO 9002 can be a possible and useful alternative for health care services, mainly if effective mechanisms for standardization and control of their processes are not yet in place. Also, ISO implementation may be useful for services with little experience on quality initiatives that are willing to adopt it as a first step towards a quality management system.

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P86 The influence of the use of human albumin on morbidity/mortality and the costs of hospitalization of critically ill patients

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Introduction: Human albumin has been used in the clinical practice for more than 40 years, and its use was stimulated by several studies that showed inverse correlation between serum albumin and mortality [1]. However, a meta-analysis published in 1998 [2] radically modified that line of reasoning by demonstrating that the use of albumin solutions to expand volemia and to correct hypoalbuminaemia was associated with an increase in the mortality rate in critically ill patients.

Objectives: To compare two groups of patients admitted to a general ICU to determine the influence of the accentuated reduction in the use of human albumin to correct hypovolemia and hypoalbuminaemia on the morbidity/mortality and costs of hospitalization.

Methods: We included in the study all patients with a length of stay of at least 48 h in a 13-bed general ICU in two periods of 5 months. Group I comprised 137 patients admitted in the period from 1 March to 31 July 31 1998. During this period the main fluid for volemic replacement was 5% human albumin and almost all the patients with albuminemia below 3.0 g% received 20% albumin solution, 20 g/day. Group II comprised 131 patients admitted in the period from 1 March to 31 July 1999. In this period the main fluid for volemic replacement was 6% hydroxyethyl starch, and few patients (burned, liver failure) received albumin solution to correct hypoalbuminaemia. The two groups were compared as to the mortality, ICU stay, duration of mechanical ventilation, incidence of nosocomial pneumonia, acute renal failure and costs of the hospitalization.

Results: The two groups were comparable in relation to age, sex and APACHE III score. The incidence of renal dysfunction at the ICU arrival was significantly more elevated in the group I ($P<0.05$). Sixty-seven (48.9%) of the 137 patients of group I and 13 (9.9%) of the 131 patients of the group II used albumin ($P<0.001$). There was no significant difference between the two groups in relation to mortality, ICU stay, duration of mechanical ventilation and incidence of nosocomial pneumonia. The overall cost of hospitalization for the patients from group I was \$US11,364.73 ± 14,787.19, while in group II it was \$US6,712.50 ± 9,922.50 ($P<0.01$).

Conclusions: The Cochrane Institute meta-analysis comparing the use versus no use of human albumin in critically ill patients to restore volemia or to treat hypoalbuminaemia and that concluded that there was an increase in the mortality rate within the patients that used albumin, radically modified albumin consumption. Roberts *et al*. [3] analyzed the consumption of human albumin in the UK in the period extending from January 1993 to December 1998. In Scotland, the consumption that used to be stable, dropped 65% starting from July 1998. In the remainder of the UK the fall was of 45%.

In our Service, comparing two periods of 5 months, before and after the publication of the meta-analysis, the reduction in the consumption of human albumin was of 80%. Furthermore, it was not observed mortality or morbidity difference concerning this approach change. The costs of hospitalization, however, were considerably reduced with the restriction of albumin use.

If we consider the elevation of the costs of the treatment when albumin is used, compared to other plasmatic expansors, the nonexistence of differences in the morbidity/mortality is already a strong argument in favor of the substitution of albumin for volemic expansion of critically ill patients, and to use an approach based on a precocious and well-designed nutritional support to correct hypoalbuminemia.

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PROGNOSIS

P87 Evaluation of thrombocytopenia in a general intensive care unit

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Introduction: Thrombocytopenia is a common laboratory abnormality in intensive care units (ICU), and generally results from multifactorial causes. The goal of this study was to determine the incidence of thrombocytopenia and the correlation with length of ICU stay, mortality rate, admission severity scores APACHE II and SAPS II, and multiple organ dysfunction scores SOFA and LODS.

Method: We evaluated patients admitted in a general ICU from January to July 2000 and collected the referring data to APACHE II, SAPS II, SOFA and LODS correlated with platelet count at the admission day and daily during ICU stay. We also obtained the mortality rate and the incidence of bleeding. We considered thrombocytopenia platelet count <150 000.

Results: The total of 326 patients were analyzed in 7 months. The group of thrombocytopenia patients ($n=94$) had longer ICU stay, higher APACHE II, SAPS II, LODS and SOFA as well as higher mortality rate.

Table

	Patients with thrombocytopenia	Patients with normal platelet count
n	94	232
Platelet count	111,000 ± 34,000	249,000 ± 87,000
ICU stay (days)	5.93 (± 8.66)	2.32 (± 3.20)
APACHE II	14.26 (± 7.52)	10.57 (± 6.54)
SAPS II	10.74 (± 5.46)	8.43 (± 4.43)
LODS	4.31 (± 4.12)	2.20 (± 3.05)
SOFA	3.55 (± 2.78)	1.74 (± 2.10)
Mortality rate	17 patients (18%)	11 patients (4.74%)

Conclusions: Thrombocytopenia constitutes 28.90% of the population admitted at ICU and its development is predictive element for longer ICU stay and mortality rate. It is associate with worse prognosis index and higher organic dysfunction in the first day.

P88 Markers of length of stay in surgical intensive care unit, in patients submitted to heart surgery

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Background: Postoperative management of heart surgery (HS) has been changing in the last decade. 'Fast-track strategy' has been proposed, but not for all patients; markers of length of stay (LOS) in surgical intensive care unit (SICU) are still a goal.

Objective: To analyze demographic data, pre-, peri- and postoperative risk stratification factors and scores impact in SICU-LOS, among patients submitted to heart surgery.

Design: Retrospective, consecutive and nonselective observational study.

Setting: Surgical intensive care unit of a tertiary care community hospital.

Methods: All patients submitted to heart surgery at this hospital, from 1 June 2000 to 16 February 2001 were analyzed. Demographic data; preoperative risk stratification factors and scores of American Heart Association score (AHAs), Goldman and Caldera score (GCs), Cleveland Clinic preoperative score (CCs) and European Society of Cardiology score (Es); perioperative times; fluids infusion data; postoperative first day data; and scores of MODS, SOFA and TISS. Correlation/predictive value

with SICU LOS were recorded for statistical analysis (multiple linear regretion).

Results: During this period, 211 patients were considered for the study. A total of 207 fulfilled inclusion criteria (had delivered of SICU or died). Forty-eight variables were submitted to statistical analysis. Significant impact in SICU LOS with $r=0.931$ and $r^2=0.866$ in the follow variables show positive predictive value: age ($P=0.0001$), GCs ($P=0.0001$), combined HS ($P=0.0001$), reoperation ($P=0.014$), LOS in mechanical ventilation ($P=0.0001$); and negative predictive value in the first postoperative (FPO) day creatinine ($P=0.002$) and correct by weight fluid imbalance ($P=0.0001$).

Discussion: In this small series, we had some interesting information like GCs implication in SICU LOS in HS and negative predictive value fluid imbalance in the FPO. We had strange negative predictive value of creatinine, probably due to the high impact in mortality in these series. Classical information like reoperation, age, LOS in mechanical ventilation and combined HS implication SICU LOS. We shall do a prospective multicentric validation of these findings in the next months, to make a predictive score of SICU-LOS.

P89 Serial lactate and prognosis in intensive care patients

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Introduction: Despite the fact that serum lactate (Lact) is a byproduct of anaerobic metabolism [1], its utility as marker of prognosis for patients in the intensive care unit (ICU) is still controversial [2,3].

Objectives: (1) To verify if the two first dosages of Lact were different between survivors (S) and nonsurvivors (NS), and (2) to verify whether there is difference between S and NS at ICU in relation to the temporal variation of Lact levels in the first 24 h of ICU admission.

Method: This was a prospective study including all patients admitted to the ICU during a 3-month period. Lact measurements were done (mmol/l) at ICU admission (L_{ADM}) and in the in the 3 following days (L_1, L_2, L_3) according to the laboratory routine, making a total of until four measures per patient. The exclusion criteria were brain death at admission and patients who discharged or died before the L_1 dosage. Demographic data were collected. Lact was compared between S and NS in four ways: L_{ADM}; L_1; mean Lact; and variation between L_{ADM} and L_1 in time by calculating the area under the curve. Data were analyzed using the package Statistica v5.0®. Means were compared using the nonpaired *t*-student test, and a $P < 0.05$ was considered statistically significant.

Results: A total of 90 patients were analyzed. Eleven (12%) were NS.

Conclusion: The dosages of Lact at admission, L_1, mean Lact and permanence of high levels of Lact in the first hours in the ICU were different between S and NS, suggesting that serial dosages of Lact may be a useful prognostic marker in ICU patients.

Table

Data	Mean ± DP	*P*
L_{ADM} (mmol/l)	S = 2.44 ± 1.35 NS = 5.34 ± 3.86	<0.00001
L_1 (mmol/l)	S = 2.17 ± 1.10 NS = 5.10 ± 5.30	0.003
Mean Lactate (mmol/l)	S = 2.04 ± 0.70 NS = 4.79 ± 4.07	<0.00001
Mean hourly variation for L_{ADM} and L_1 (mmol/l)	S = −0.03 ± 0.12 NS = 0.02 ± 0.54	0.522
Area under the curve between L_{ADM} and L_1 and time of the dosages	S = 33.89 ± 18.86 NS = 67.70 ± 52.37	0.0001
Time between the dosages of L_{ADM} and L_1	S = 14.81 ± 4.90 NS = 12.73 ± 6.02	0.203

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P90 Early and delayed onset of acute respiratory failure: different patterns?

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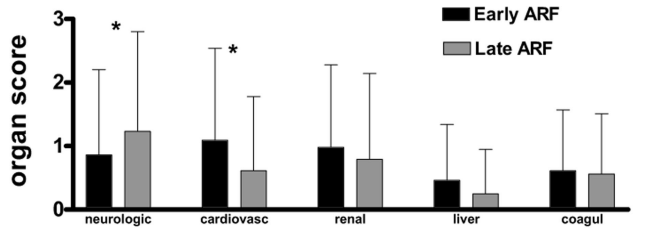
Introduction: Multiple organ dysfunction has been recognized as a major factor associated with mortality in patients with acute respiratory failure (ARF). To investigate whether early and late onset ARF can present different patterns of nonpulmonary associated organ dysfunction (OD), a prospective data bank was created with physiological variables and organ function scores.

Methods: For the purpose of this study, 313 patients who stayed in the ICU for more than 48 h were prospectively evaluated from April to July 1999. ARF was defined as a PaO_2/FiO_2 ratio less than 200 mmHg and the need for any form of respiratory support. The group of early ARF included the patients who met the criteria for ARF at the time of ICU admission (123/313, 39%) and late ARF those who met 48 h after ICU admission (50/313, 16%). Organ failure was defined as a SOFA score of ≥3 points in each system.

Results: The most frequently associated nonpulmonary OD was cardiovascular dysfunction (25%) for early-onset ARF, and neurologic dysfunction (36%) for late-onset ARF (Figure). Nonsurvivors and survivors of early ARF had similar respiratory scores on admis-

Figure



sion (3.2 ± 0.5 versus 3.1 ± 0.5; NS), but nonsurvivors had higher cardiovascular (1.8 ± 1.7 versus 1.2 ± 1.3; $P = 0.012$) and neurologic (1.8 ± 1.7 versus 0.9 ± 1.4; $P = 0.000$) scores. Nonsurvivors of late ARF had significantly higher coagulation (0.8 ± 1.0 versus 0.4 ± 0.8; $P = 0.0006$) scores than survivors.

Conclusion: The process of evolution of early ARF is related to cardiovascular dysfunction. The recognized pathogenic sequence of nosocomial pneumonia is oropharyngeal colonization and the aspiration of gastric contents could be related to the neurologic dysfunction in late ARF. The degree of initial respiratory dysfunction was not a reliable prognostic indicator. Trends in oxygenation and nonpulmonary compromise at 48 h are more useful.

P91 Disseminated intravascular coagulation (DIC) in ICU: predictors and outcome

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Introduction: Signs and symptoms of shock are not only the direct effect of endotoxin and proinflammatory cytokines. When the process progresses to malperfusion and organ failure, activation of the coagulation system comes into play. Early diagnosis and treatment are thus required to improve the clinical management of DIC.

Methods: Fifty patients at high risk of DIC were prospectively evaluated: 19 with sepsis (38%), 13 with septic shock (26%), six with hypovolemic shock (12%), six with cardiogenic shock (12%) and six with polytrauma (12%). Blood samples for measurements of coagulation variables were taken daily for the following 3 days.

Results: DIC independent predictors at admission were: soluble fibrin (SF; OR 1.14, 95% CI 1.01–1.28; $P = 0.037$); thrombin-antithrombin (TAT; OR 1.06, 95% CI 1.00–1.11; $P = 0.046$); and antithrombin (AT; OR 0.85, 95% CI 0.74–0.98; $P = 0.033$). Kaplan–Meier estimates of hospital survival showed significantly higher mortality rates for patients with increasing severity of DIC according to this classification (Table): non-DIC, 0%; mild DIC, 6%; moderate DIC, 32%; and severe DIC, 62% ($P = 0.0005$).

Table

Points	0	1	2
aPTT (s)	<35	35–40	>40
AT (activity, %)	>70	50–70	<50
Platelets ($\times 10^3/\mu l$)	>160	100–160	<100

Non-DIC, 0 points; mild DIC, 1–3 points; moderate DIC, 4–5 points; severe DIC, 6 points.

Conclusion: Low concentrations of AT on admission are the best predictor for DIC. Efforts should be directed to this group of patients to improve outcome. Moderate and severe DIC carry a very high mortality.

P92 C-reactive protein levels on admission are correlated with mortality and organ failures in critically ill patients

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Objective: C-reactive protein (CRP) increases in response to infection, trauma, ischemia, burns, and inflammatory conditions. Although used frequently in the ICU setting as a marker of systemic inflammation, its relation with organ damage is not well known. This study assessed the association between early serum CRP levels and the development of organ failure (OF) and mortality in ICU patients.

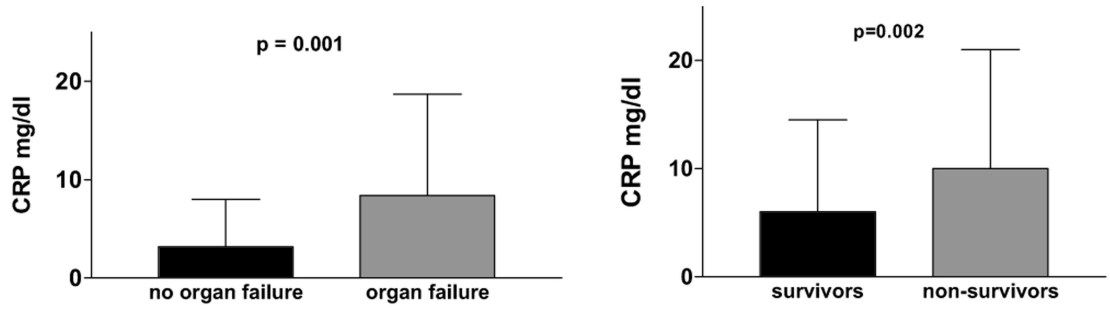
Design: A prospective cohort study conducted in a 31-bed intensive care unit of a university hospital.

Patients: A total of 307 admitted within a 4-month period.

Measurements and main outcomes: At admission, the 223 patients (73%) who developed at least one organ failure during the ICU stay had significantly higher CRP concentrations than the 84 patients (27%) without organ failure (8.4 ± 10.3 versus 3.2 ± 4.8 mg/dl; $P < 0.05$; Figure overleaf). The number of organs failing during the ICU stay raised with increasing CRP concentrations on ICU admission (two OF, 8.2 ± 11 mg/dl; three OF, 9.8 ± 8.3 mg/dl; and four OF, 14 ± 4.3 mg/dl). Nonsurvivors had significantly higher CRP levels than survivors on ICU admission (10.0 ± 11.0 versus 6.0 ± 8.5; $P < 0.05$; Figure overleaf).

Conclusion: Elevated concentrations of serum CRP on admission are potential indicators of an increased risk of organ failure and dying.

Figure



P93 Predictors of mortality and prolonged mechanical ventilation in patients admitted to a medical-surgical intensive care unit

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Background: Ventilatory support has become a major therapeutic modality in intensive care units. However, scarce data exist on the clinical characteristics and prognosis of patients managed in private hospitals in Brazil.

Purpose: The objectives of this study are (1) to describe demographics, clinical features, physiologic parameters, and prognosis of patients on mechanical ventilation admitted to the Intensive Care Unit of Hospital Moinhos de Vento; and (2) to identify predictors of mortality and ventilator time.

Methods: All consecutive patients admitted between June and November 2000 in the medical-surgical intensive care unit, who required mechanical ventilation for more than 24 h because of acute respiratory failure, were included in this observational study. Clinical and ventilatory parameters were recorded twice daily, within 8–12 h intervals. Major end-points evaluated were mortality and duration of mechanical ventilation. Multivariate analyses were performed to identify independent predictors of prognosis.

Results: Fifty-nine patients (in 794 screening evaluations) were studied, mean age of 66 ± 18 (20–98) years, 39 (66%) were male, and mean APACHE II score of 20 ± 7. Most frequent causes of acute respiratory failure were nosocomial respiratory infection (14%), community-acquired pneumonia (12%) and acute neurologic injury (24%). Similar proportion of patients had primary respiratory (42%) and nonrespiratory (58%) disorders. In-hospital mortality was 31% (18 patients). In univariate analysis, age, APACHE II score, primary respiratory disorders, inotropic use, heart rate and inspired fraction of oxygen (FiO_2) at baseline were associated with increased hospital mortality (Table). Chest radiographic findings at admission, such as pulmonary infiltrates and severity score, were not significantly associated with hospital outcome. However, by multivariate analysis, APACHE II was the only independent predictor of mortality.

Table

Variable	Odds ratio	95% CI	*P*
APACHE II >20	4.2	1.4–13	0.003
Heart rate >100 bpm	2.6	1.2–5.8	0.01
Age >65 years	2.3	1.0–5.8	0.04
FiO_2 >0.50	2.2	1.0–4.5	0.04
Primary respiratory disorder	2.1	1.0–4.7	0.05
Inotropic use	2.0	0.9–4.4	0.08

Duration of mechanical ventilation was 8 ± 8 days (median 7 days) and length of ICU stay was 14 ± 12 days (median 10 days). Predictors of prolonged mechanical ventilation were low ratio of PaO_2/FiO_2, high static compliance and inotropic use at baseline. Mortality was higher after 3 days of mechanical ventilation (31% versus 17%), although the difference was not statistically significant.

Conclusion: In this heterogeneous cohort of medical-surgical patients, demographics and clinical features were similar to those described in other studies. Indications for mechanical ventilation showed a pattern resembling other ICUs in Brazil, but were different from other countries. Hospital prognosis and predictors of mortality and prolonged mechanical ventilation does not appear to be different from other institutions. Nevertheless, these results, in conjunction with prior studies, may help planning resource allocation more effectively in the ICU.

SURGERY AND TRAUMA

P94 Percutaneous multidilatational tracheostomy endoscopic guided: a simple and safe bedside procedure done by intensivists

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Purpose: Tracheotomy (Trach) is one of the most frequently performed operations in critically ill patients, and percutaneous dilatational tracheotomy (PDT) has become increasingly popular as an alternative to formal surgical Trach. This study was designed to examine prospectively the incidence of perioperative and early complications associated with elective PDT in critically ill adults, and to assess the feasibility and advantage of widespread application of flexible fiberoptic bronchoscope (FFB) in this setting.

Method: Over a 6-month period 48 consecutive patients requiring mechanical ventilation underwent bedside endoscopic guided PDT. Ciaglia's technique was performed by intensivists, in majority not familiar with PDT. Bronchoscope guide was performed to provide the following: a good identification of venous circulation on the site of needle puncture by transillumination; appropriate middle-trach placement of dilators and Trach tube; and security to help prevent injury of the posterior tracheal mucosa (PTM) supposed in risk by the procedure and to clean the upper airway with aspiration.

Results: A correct median puncture was observed by FFB in 21 interventions (43.7%). An initial paramedian puncture was detected in 27/48 (56.2%) and was corrected by renewed insertion in all cases. There was no procedure-related death or PTM injury. Procedure-related complications included haemodinamic instability in 4/48 (8.3%); stoma hemorrhage requiring blood transfusion in 1/48 (2%); stoma infection in 3/48 (6.2%); and moderate internal stomal bleeding without external oozing 17p and 7p with concomitant external visualization (χ^2 $P=0.009$).

Conclusion: FFB guidance increases the safety of this procedure, better identification of bleeding complications and may help prevents paratracheal false passage and pneumothorax reported in the literature with blinded PDT.

Clinical implications: (1) Curved dilators ensure that PTM perforation does not occur. (2) The stiffness of the guiding catheter-guidewire assembly, the depth of dilator insertion and gentle movement with dilators having an oily smoothness prevents PTM damage. (3) All endotracheal tubes (ET) were withdrawn guided by FFB until they were just below the vocal cords. This approach warranted good oxygenation during the procedure. (4) FFB confirmed median needle insertion and was able to correct guidewire placement, so avoiding paratracheal insertion of the canula. (5) The FFB would enable inexperienced operators to perform PDT safely and cost-effectively.

P95 The external jugular vein as the first choice for central venous access in critically ill patients with severe coagulopathy

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Introduction: The external jugular vein (EJV) may be used for central venous access. It is a superficial vein, allowing easy control of hematomas and, differently from the internal jugular vein (IJV) access, with no risk for airway obstruction in patients with significant coagulopathies. Additionally, pneumothorax, a feared complication of the subclavian venous access, is unlikely to occur after the EJV access. The main disadvantage of the EJV catheterization has been considered its unpredictability of passage of the catheter to the central compartment.

Objective: To present our initial experience with the EJV approach in unstable patients with significant coagulopathies requiring central venous catheterization, in whom the internal jugular and sublavian vein punctures were contraindicated.

Method: From July 1999 to December 2000, 37 consecutive patients (23 males, 14 females), who were unstable and critically ill, requiring central venous access in the presence of significant coagulopathies (protrombin activity <40% and/or platelets <50.000), were included. The age varied between 35 and 93 years (mean 71.7 years). The main causes for the coagulopathy were septic shock in 17, anticoagulants in 10, chemotherapy in five, hepatic dysfunction in three, and disseminated intravascular coagulation in two patients. Our initial approach was a visible and palpable right EJV, unless a larger left EJV was present. There were 32 double-lumen, three pulmonary artery and one Shilley catheters.

Results: From the 32 attempts to catheterize the right EJV, there were three failures due to lack of guidewire progression; in these three patients the left EJV was successfully catheterized. There were also three catheter malpositionings (two at the ipsilateral IJV and one at the contralateral IJV), which were repositioned successfully. All 11 attempts to catheterize the left EJV were successful, with no catheter malposition. Hematomas, arterial puncture, pneumothorax or hemothorax were not observed in this series.

Conclusion: We conclude that the EJV approach can be used efficiently and safely for central venous catheterization in unstable, critically ill patients with severe coagulopathy.

P96 Soluble receptors of tumor necrosis factor-α: early predictors of mortality in patients with severe burn injury

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Introduction: Burn injury is associated with intense immunoinflammatory activity and release of mediators that perpetuate an inflammatory cascade causing damage to many organs. It appears that tumor necrosis factor (TNF)-α levels are related to poor prognosis

in this condition. Endothelin (ET)-1 levels are also elevated but its role as a prognostic marker is unclear. However, early sequential profiling of circulating levels of TNF-α, TNF soluble receptors and of ET-1 in patients with burn injury remains poorly investigated. Early biologic markers of severity in these patients could be useful to support earlier and more aggressive therapeutic approaches.

Methods: Twenty patients with burn injury with total body surface area burned (TBSA) of 30% were enrolled within less than 6 h from the accident. Clinical variables were recorded. Blood samples were drawn at time zero, 6, 12, 24 h to sequentially measure TNF-α, TNF-α 1 and 2 soluble receptors (sTNFR1 and sTNFR2), and ET-1 levels using ELISA assays. All patients were followed up to hospital discharge.

Results: Age, TSBA and inhalation injury were not significantly different among survivors ($n=10$; 30 ± 13 years, TSBA 40 ± 12%) and nonsurvivors ($n=11$, 38 ± 15 years, TSBA 56 ± 20%). As expected, APACHE II and multiple organ dysfunction syndrome scores were significantly higher in nonsurvivors (15.4 ± 6.2 and 2.6 ± 1.6) compared to survivors (9.8 ± 5.2 and 0.44 ± 0.7) ($P=0.048$ and $P=0.002$, respectively). Levels of TNF-α and ET-1 were similarly elevated in both groups in all time-points. sTNFR1 levels, however, were increased in nonsurvivors (2937 ± 1676 pg/ml; 4548 ± 1436 pg/ml) compared to survivors (1313 ± 561 pg/ml; 2561 ± 804 pg/ml) at 6 h and 24 h, respectively ($P=0.01$ and $P=0.002$). sTNFR2 levels were significantly increased in nonsurvivors (4617 ± 1876 pg/ml) versus survivors (2611 ± 1326 pg/ml) only at 6 h ($P=0.015$). Elevated levels of sTNFR1 at 6 h and of TNF-α at 12 h configured positive (100% for both markers) and negative predictive values for mortality of 70 and 52%, respectively (relative risk 3.25 and 1.2, respectively; confidence intervals 1.4–7.3 and 1.28–3.52, respectively). Significant correlations between APACHE II scores and biological markers, especially sTNFR1 and ET-1, at early time points were observed. TSBA correlated only with sTNFR1 and TNF-α at 12 h.

Conclusion: TNF-α and ET-1 levels did not appear to be increased in nonsurvivors compared to survivors. Alternatively, increased levels of sTNFR1 and sTNFR2 were consistently higher at 6 h in nonsurvivor patients with burns. Clinical parameters of severity were associated to high biological markers levels. Very early determination of sTNFR1 and sTNFR2 may help to identify patients at higher risk for adverse outcome in severe burn injury.

P97 Early experience of intensive postoperative unit (IPU): percutaneous tracheotomy as the first option after long-term oro-tracheal intubation

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Background: Surgical tracheotomy has been used as the first choice procedure in most intensive care units after long-term artificial ventilation. Percutaneous access is an option in such patients, and the clinical staff can perform it.

Objective: To evaluate the early experience in performing the procedure, including the timing of its indication, its complications, its safety in thoracotomized patients and follow-up.

Patients and method: Fifteen adult patients who underwent percutaneous tracheotomy in the IPU were retrospectively studied. Between December 1999 and January 2001, the following were evaluated: admission diagnosis, length of mechanical ventilation before and after the procedure, complications and patient follow-up. The only patient whose procedure was previously not indicated for technical consideration was excluded from this analysis. Eight patients were admitted after open-heart surgery. Three patients were admitted after neurosurgery and another one after a correction of ruptured abdominal aortic aneurysm. Three patients were admitted for clinical reasons.

Results: In one patient intense local bleeding complicated the percutaneous procedure and a surgical tracheotomy was needed. All other procedures were successfully performed. Two open-heart surgery patients, one neurosurgical and one clinical, died in follow-up analysis. The mean time for procedure indication was 9.3 days (4–18 days). Local infection or mediastinytis were not reported. The mean mechanical ventilation time after procedure was 12.4 days. Two patients were transferred to another institution, and therefore the follow up was lost. The deaths were not related to the percutaneous tracheotomy intervention.

Conclusion: Percutaneous tracheotomy was considered to be a safe procedure for obtaining an artificial air pathway in long-term artificially ventilated patients in this series, including those who underwent open-heart surgery. Since only a small number of patients were included in this study, further evaluation is mandatory for supporting this conclusion.

P98 Monitoring trauma patients with total bioelectrical impedance

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Introduction: Volume support is frequently required in critically ill patients with hypovolemia due to severe trauma. Aggressive intravenous therapy may cause serious dislocations of body water compartments, and the degree of expansion of the extracelular water compartment may influence outcome in trauma patients. We used total bioelectrical impedance (TBI) to detect the development of edema and fluid redistribution in more severe trauma patients.

Methods: Prospective clinical study in a 24-bed ICU from a university hospital.

Measurements and results: Severity scores often used in trauma patients together with TBI variables (resistance and reactance) were prospectively evaluated in 33 consecutive trauma patients (12 died and 21 survived). TBI was performed on ICU admission and after 72 h. Fluid intake and output were measured daily. Severity scores, resistance (R) and net fluid intake are shown in the Table.

Conclusion: A pattern of decreasing resistance was found in nonsurvivor patients, reflecting an increased distribution volume.

Table

	TRISS	GCS	APACHE	R 1	R 2	NFB
Survivors	87 ± 11	9.0 ± 2.9	13.0 ± 3.2	444 ± 83	475 ± 59	−730 (−2621 to 3910)
Nonsurvivors	39 ± 18*	3.9 ± 1.0*	21.5 ± 4.1*	411 ± 58	355 ± 71*	1417 (−295 to 5747)

GCS, Glasgow Coma Scale; NFB, net fluid balance-72 h (ml); R1, resistance-admission (Ohms); R2, resistance-72 h; TRISS, Trauma and Injury Severity Score. *$P < 0.05$.

Higher values of net fluid balance in nonsurvivors are due to higher amounts of intravenous fluid therapy used in more severe trauma patients. TBI may help evaluate body fluid compartments in trauma patients, and may also be helpful in identifying high-risk patients who would benefit from more aggressive therapeutic interventions.

P99 Intraneuronal calcium release after traumatic brain injury and hemorrhagic hypotension: a comparison between small-volume hypertonic saline and large-volume lactated Ringer's infusions

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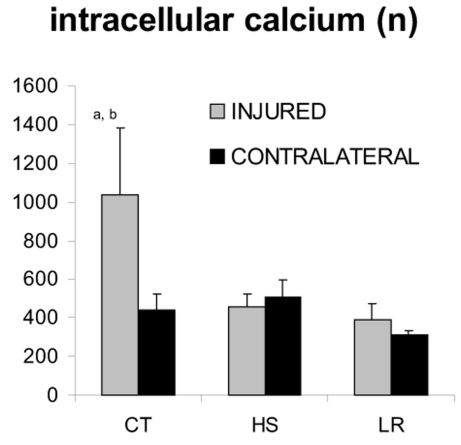
Introduction: Calcium is one of the triggers involved in ischemic neuronal death. The injury can be truly delayed, even after cells repolarize and resume physiological and metabolic functions. Therefore, it would be reasonable to prevent calcium influx in early stages of traumatic brain injury (TBI). In the same way, hypertonic saline (7.5% NaCl) infused to hemorrhaged animals rapidly restores cardiac output and arterial pressure. Because hypotension is a strong predictor of outcome in TBI, we tested the hypothesis that hypertonic saline blunts calcium influx in hemorrhagic shock associated with head injury, compared with lactated Ringer's.

Method: Fifteen ketamine-halotane anesthetized mongrel dogs (18.7 ± 1.4 kg) received a localized criogenic brain injury simultaneously with blood withdrawal to a mean arterial pressure (MAP) of 40 mmHg in 5 min, which was maintained at this level for 20 min (shed blood volume 25.5 ± 6.5 ml/kg) and then randomized into three groups: HS, 7.5% NaCl, 4 ml/kg, in 3 min; LR, lactated Ringer's, 33 ml/kg, in 15 min; and CT, controls, which received no treatment. After 20 min, cerebral biopsies were obtained next to the lesion ('clinical penumbra') and from the corresponding contralateral side ('lesion's mirror'), to determine intracellular calcium by fluorescence signals of FURA-2 loaded cells.

Figure



Results: Controls remained in hypotension and in a low-flow state, while fluid resuscitation improved hemodynamic profile. There was a significant increase in intracellular calcium in the injured hemisphere in CT (1035 ± 782 nM), compared to both HS (457 ± 149 nM; $P = 0.028$) and LR (392 ± 178 nM; $P = 0.017$), with no differences between HS and LR ($P = 0.38$). Intracellular calcium at the contralateral, uninjured hemisphere, was 438 ± 192 nM in CT, 510 ± 196 nM in HS, and 311 ± 51 nM in LR, with no significant differences between them.

Conclusion: Both small volume hypertonic saline and large volume lactated Ringer's blunts calcium influx in early stages of TBI associated with hemorrhagic shock, suggesting a potential, early benefit, specially during immediate care and transport.