
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

important factor in providing optimal aerosol delivery in the clinical setting. Some of these devices provide an option of either continuous aerosol delivery during the entire breath cycle or during inspiration only with a breath actuation mechanism triggered by the patient. The aim of this study was to determine % tracheal dose with a vibrating mesh nebulizer (VMN) compared to a jet nebulizer in continuous and breath actuated modes using an adult and pediatric spontaneously breathing model.

Methods: Adult (LUCY) and Pediatric (Nasopharyngeal Model for 5-year-old) head models were connected to a breathing simulator (Ingmar ASL 5000, Pittsburgh, US) via an absolute filter (RespirGard II 303 Baxter, Ireland) to simulate normal adult ($V_t$ 500 ml, BPM 15 and I:E 1:1) and pediatric ($V_t$ 155 ml, BPM 25 and I:E 1:2) breath patterns. A 3mL volume of 0.83 mg/ml salbutamol was nebulized using a vibrating mesh nebuliser (VMN) (Aerogen Solo with Ultra, Aerogen, Galway Ireland) and a breath actuated jet nebulizer operated during continuous and breath actuated modes (Aeroeclipse II, Monaghan Medical, Canada). In line with the respective instruction manual-stated ranges, supplemental gas flow was set to 3.5LPM for both nebulizers. Tracheal dose was expressed as a percentage of the nominal dose and determined using UV spectroscopy at 276nm. Testing was completed in triplicate. The Mass Median Aerodynamic Diameter (MMAD) for aerosol droplets was determined using the next Generation Impactor (Copley Scientific, Nottingham, UK) at 3.5LPM.

Results: Results are displayed in the table below. P-Value $<0.05$ was considered as significance.

Conclusions: Nebulizer choice had a significant impact on aerosol delivery for simulated spontaneously breathing adult ($p < 0.0001$) and pediatric ($p < 0.0001$) breath patterns, with the Aerogen Solo and Ultra delivering the highest percent tracheal dose across both settings. The MMAD value for the Aerogen Solo (3.3 $\mu$m) was within the instruction manual-stated range (1 – 5 $\mu$m, average 3.1 $\mu$m), however Aeroeclipse II (1.8 $\mu$m) MMAD value was lower than the instruction manual specified value (4.3 $\mu$m @3.5 L/min). Results highlight the impact nebulizer choice may have on aerosol drug delivery to spontaneously breathing adult and pediatric patients within a clinical setting.

| | | Tracheal Dose (%) | |
|---|---|---|---|
| **Nebulizer** | **MMAD (microns)** | **Adult Breathing Pattern** | **Pediatric Breathing Pattern** |
| **Aerogen Solo/Ultra (VMN)** | 3.3 | 34.83 ± 1.23 | 22.90 ± 1.30 |
| **Aeroeclipse II BAN (Continuous Mode)** | 1.8 | 18.60 ± 1.31 | 10.21 ± 0.73 |
| **Aeroeclipse II BAN (Breath Actuated mode)** | N/A | 20.70 ± 1.53 | 8.29 ± 0.87 |
| **p-value** | N/A | <0.0001 | <0.0001 |

## 178 Safety Comparison of Antibiotics Administered via Intravenous Push versus Intravenous Piggyback to Adult Patients in the Emergency Department

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Study Objectives: Prior to the 1980s, medications were commonly administered as intravenous (IV) push. However, the invention of intravenous piggybacks (IVPB) led to a shift in administration preference from IV push to IVPB. However, IV push administration could offer advantages in speed of administration and reduce costs. Although some data does exist about the safety of IV push antibiotics, as mentioned earlier, this data is generally retrospective in nature or has weak experimental design. Published prospective data is conducted in healthy volunteers and contains small sample sizes. No study on safety has been conducted in the emergency department setting. This study aims to examine the safety of IV push antibiotics in a randomized and controlled environment, examining rates and natures of adverse drug reactions in IV push antibiotics vs IVPB.

Methods: This was a single center, prospective, double-blinded, double-dummy, randomized controlled trial on a convenience sample of patients presenting to the ED from April 2018 to October 2019 receiving select beta-lactam antibiotics.

Results: There was no significant difference in the number of specific adverse reactions or the total number of adverse reactions between the two arms at 90 minutes following the administration of antibiotics: 11.8% of patients in the Piggyback group had an adverse drug reaction (ADR), whereas 18.9% of patients in the Push group had an ADR (95% CI -9.5 to 23.8). Only 3 patients who had a grade 2 reaction, and they all received push antibiotics. Two developed abdominal pain and one developed headache. There were no patients with higher than a grade 2 adverse drug reaction in either arm.

Conclusion: No statistically significant difference in safety profile was found between IV push antibiotics versus IVPB administration of antibiotics

**Tables and Figures**:

**Table 1**: Demographics by study arm

| Demographics | Piggyback (n = 34) | Push (n = 37) | Difference |
|---|---|---|---|
| Average Age | 45.5 | 52 | 6.5 (95% CI -7 to 19) |
| Sex | 20 females | 16 females | 4 (95% CI -0.07 to 0.39) |
| Average Weight | 78.4 | 72.7 | 5.7 (95% CI -6.1 to 19.5) |
| No Known Drug Allergies | 52.9 | 59.5 | 6.6 (95% CI -16.5 to 29.6) |

**Table 2**: Results by study arm

| Measure | Piggyback | Push | Difference |
|---|---|---|---|
| Antibiotic received. | | | |
| Ceftriaxone | 64.7 | 67.6 | 2.9 (95% CI -19.2 to 24.9) |
| Cefepime | 20.6 | 16.2 | 4.4 (95% CI -13.7 to 22.4) |
| Aztreonam | 2.9 | 0 | 2.9 (95% CI -2.7 to 8.6) |
| Cefazolin | 0 | 2.7 | 2.7 (95% CI -2.5 to 7.9) |
| Cefoxitin | 2.9 | 0 | 2.9 (95% CI -2.7 to 8.6) |
| Ertapenem | 0 | 2.7 | 2.7 (95% CI -2.5 to 7.9) |
| Meropenem | 8.8 | 10.8 | 2.0 (95% CI -11.8 to 15.8) |
| Median Lowest SBP* (mmHg) | 120 | 122.5 | 2.5 (95% CI -10 to 16) |
| Median Initial Lactate (mmol/L) | 1.06 | 1.11 | 0.05 (95% CI -0.37 to 0.76) |
| Discharged from the ED (%) | 8.8 | 18.9 | 10.1 (95% CI -5.7 to 25.9) |
| Admitted to the ICU (%) | 8.8 | 2.7 | 6.1 (95% CI -4.8 to 17.0) |
| Median Hospital LOS (hours) | 68.1 | 68.6 | 0.5 (95% CI -29.6 to 45.1) |
| Adverse Drug Reaction (%) | 11.8 | 18.9 | 7.1 (95% CI -9.5 to 23.8) |

*SBP =Systolic blood pressure; 19 patients had no documented blood pressure

## 179 Association of CX3CR1 and Myeloid-derived Suppressor Cell with Survival of Sepsis Patients and Risk of Acute Respiratory Distress Syndrome

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Study Objectives: Peripheral blood immune micro-environment has been shown to influence survival outcomes in sepsis patients. However, the association of immune micro-environment with clinical outcomes of immune-suppression induced by sepsis remains unclear. Here we performed comprehensive analysis of immune cell infiltration and clinically validated association of CX3CR1 and Myeloid-derived suppressor cell (MDSC) with survival of sepsis patients and risk of acute respiratory distress syndrome (ARDS).

Methods: This study analyzed discovering cohort including all sepsis patients, which grouped by survival status and ARDS occurrence, from the Gene Expression

Omnibus database (GSE10474, GSE32707, GSE66890). Core differential expressed genes (DEGs) and immune cell were selected between groups using LASSO and Random Forest machine learning algorithm. Most survival correlated gene and immune cell were validated in validating cohort (GSE65682) using Kaplan-Meier survival analysis. Since gene and immune cell were selected, patients from discovering cohort were divided into higher and lower group. To further explore underlying mechanism, weighted gene co-expression network analysis (WGCNA) were applied. For functional and pathway enrichment analysis, clusterProfiler R package was used for Gene Ontology (GO), Kyoto encyclopedia of genes and genomes (KEGG) analyses.

Results: Among 133 sepsis patients from discovering cohort, 110 down-regulated genes and 76 up-regulated genes were identified as DEGs based on the survival status, while 177 down-regulated genes and 89 up-regulated genes were identified as DEGs based on the ARDS risk, respectively. After combining the DEGs screened out via the LASSO and RF algorithms, 13 DEGs between survival status and 16 DEGs between ARDS risk, were selected simultaneously by these two algorithms. The gene of CX3CR1 and immune cell of MDSC were significantly higher in alive group and none-ARDS group, and they two were correlated most (Spearman r = 0.69 p<0.01). Among 479 patients in validating cohort, higher CX3CR1 was associated with better 28-day survival benefit (hazard ratio [HR] 2.657, 95% CI 1.838-3.843) and higher MDSC associated with better 28-day survival benefit (HR 2.205, 95% CI 1.516-2.206). Using the gene modules of WGCNA that correlated most with CX3CR1 expression level and MDSC proliferation level, biological processes of T cell cytokine production and regulation of glial cell migration were significantly enriched.

Conclusion: We demonstrated that CX3CR1 and MDSC can predict ARDS risk and contribute survival benefit for sepsis patients. MDSC might be important component of the immune micro-environment and should be integrated into predictive biomarker panels for immune therapy and be validated in future prospective clinical trials.

## 180 Disparities in Distribution of PulsePoint Responders and Potential Impacts on Pandemic Response in Underserved Communities of Allegheny County

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Study Objectives: Due to their ubiquity, smartphone applications are becoming increasingly important for emergency response, including providing a means of mobilizing volunteer responders. Data from these applications may be useful for identifying potential disparities in emergency response by revealing geographic gaps and racial and income-based inequity in the availability of volunteers. This could in turn be used to create targeted interventions to increase equitable emergency response coverage. The purpose of our study was to examine associations between race, SES factors, and access to emergency resources using data from *PulsePoint* (*PP*), a smartphone-based emergency response application for public cardiac arrest. We sought to contextualize this investigation to the COVID-19 pandemic, to further understand how pandemic conditions may intersect with existing inequities.

Methods: The *PP* responder position data from the Allegheny County *PP* deployment was aggregated into zip code-level totals from data samplings taken from August 2019 to May 2020 using geospatial informatics software (QGIS). These totals were stratified into pre- and intra-pandemic periods, as well as by racial and demographic characteristics obtained from the US Census Bureau. The change in available responders at the zip-code level, as well as the association between number of available responders and racial and demographic characteristics, were examined using Mann-Whitney U Tests due to non-normal distribution of responder counts.

Results: The median (IQR) of available *PP* responders before and after the stay at home order were 67.4125 (116.9375) and 73.05 (127.95), respectively. Fifteen percent of zip codes in the Pittsburgh area have > 30% of African Americans with a median (IQR) of 280 (1488). This compared to 95.6% of zip codes in the Pittsburgh area that have > 30% of Caucasian-Americans with a median (IQR) of 8582 (12538). The median (IQR) for the percent below the poverty level for all zip codes was 9% (10.8%). The p-value of available *PP* responders before the shutdown for high-income vs. low-income zip codes was 0.493. The p-value of available *PP* responders after the shutdown for high-income vs. low-income zip codes was 0.197. Lastly, the p-values of available *PP* after the shutdown to zip codes with > 30% vs. <30% Caucasian-Americans and > 30% vs. <30% African Americans were -0.443 and 1.095, respectively.

Conclusion: In summary, SES was associated with the number of *PP* responders at the zip code level in Allegheny county. Interestingly, the pandemic shifted the distribution of responders to a net increase in available responders which did not entirely differ by race, but by income.

## 181 Impact of Extreme Temperatures on Hemostatic Gauzes Using Thromboelastography

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Study Objectives: In both military and wilderness/extreme civilian settings, life-threatening hemorrhage can be difficult to control. Hemostatic gauzes provide an excellent option for wounds not amenable to tourniquets. In this study, thromboelastography (TEG) was utilized to evaluate the effect of extreme temperature storage environments on the efficacy of three gauze products.

Methods: Blood from 30 healthy active duty military adults was diluted by 30% with hetastarch to mimic trauma-induced coagulopathy. Temperatures were chosen because they represented thermal extremes that could be encountered in the tactical setting. Kerlix, Combat Gauze, and Chito Gauze stored for 3 weeks in cold (- 10C), hot (70C), and room-temperature (22C) environments were compared in the TEG parameters of R (time to initiation of clot formation), K (clot amplification), $\alpha$ angle (clot formation rate), and MA (maximum amplitude of clot) using repeated measures ANOVA with the p<.05 statistical significance threshold.

Results: Compared to whole blood, diluted blood had weaker clots with slower clot formation kinetics (MA- 58.00 vs 43.00, p<.0001; K- 2.58 vs 4.00, p<.0001; $\alpha$ angle- 54.98 vs 47.36, p<.0003) but faster clot initiation times (R- 8.66 vs 7.14, p<.0001). Addition of any gauze improved clot initiation times (R; Kerlix- 7.14 vs 4.98, p<.0001; Chito Gauze- 7.14 vs 5.22, p<.0001; Combat Gauze- 7.14 vs 2.71, p<.0001), with Combat Gauze significantly improving R over Chito Gauze and Kerlix. Reductions in R values were consistent across temperature extremes (p<.05) The other parameters were consistently unaffected (p>.05)

Conclusion: Hemostatic gauze, regardless of temperature storage conditions, improved the rate of initiation of clot formation when compared to diluted blood. Additionally, our results suggest that Combat Gauze may be the best choice for extreme thermal environments.

## 182 A Multi-Center Randomized Trial of Capsule Endoscopy to Reduce Admissions in Emergency Department Patients With Low Risk Upper Gastrointestinal Bleed

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Study Objective: In US emergency departments (EDs), the provider has limited ability to evaluate for common and serious conditions of the gastrointestinal (GI) mucosa such as a bleeding peptic ulcer. Despite the fact that many bleeding lesions are self-limited, the majority of these patients require emergency hospitalization for an upper endoscopy (EGD). Our objective is to determine if ED risk stratification with Video Capsule Endoscopy (VCE) reduces need for hospitalization for low-to-moderate risk patients with suspected upper GI bleeding.

Methods: A prospective multi-center randomized control trial was designed to investigate the safety of ED risk stratification with VCE. Stable ED patients with suspected upper GI bleeding were randomized to one of two treatment arms: (1) an experimental arm which included VCE risk stratification and brief ED observation versus (2) a standard of care arm which included an admission for inpatient EGD. Patients were followed for 30 days for safety outcomes.

Results: A total of 24 patients were enrolled in the study. In the experimental group, 2/11 (18.2%) patients were admitted to the hospital; and, in the standard of care group, 10/13 (76.9%) patients were admitted to the hospital (p=0.012). There was no difference in safety at day 7 and day 30 after index ED visit.