

## Report Documentation Page

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**Learning Objectives:** Payer source is commonly associated with disparities in health outcomes. However, because payer source has not been universally defined in trauma literature nor consistently merged and analyzed, differences in outcome, therefore disparities, may be biased and conclusions inaccurate. The objective was to determine if in-hospital mortality as associated with payer sources vary based on methodology employed (inclusion/exclusion; referent group in modeling; categorization of mixed payer [Medicaid: socioeconomic or Medicare: physiologic reserve definition], and subjective statistical interpretation). **Methods:** Retrospective, registry study of admitted adult patients between 2005-2010 at a Midwestern Level I trauma facility was completed to assess in-hospital mortality. Eligible patients were categorized based on payer source, then stratified by four literature-based definitions: Definition 1-insured [commercially insured (CI), Medicare, Medicaid, mixed insured payer sources] and uninsured; Definition 2-CI, publicly insured (PI) [Medicare, Medicaid, mixed payer Medicare/Medicaid], and uninsured; Definition 3-CI, Medicaid, Medicare, and uninsured; Definition 4-CI, Medicaid, and uninsured. **Results:** Only in Definitions 2 and 3, using CI as referent group, was there a difference in mortality: PI (AOR 2.05; CI 1.2-3.4) and Medicare (AOR 3.41; CI 1.5-7.8). When reclassifying the mixed payer Medicare/Medicaid according to socioeconomic definition, there was an increased risk of mortality for Medicaid (AOR 1.86; CI 1.1-3.2) and Medicare (AOR 2.62; CI 1.3-5.4). When reclassifying into physiologic reserve definition, there was increased risk of mortality for Medicare (AOR 3.63; CI 1.6-8.2). **Conclusions:** Variations in methodology culminated in results that could be interpreted with differing conclusions. Payer source varied as a significant variable depending on literature definition, referent group, and categorization of mixed payer. To accurately determine disparities in health outcomes, it is critical there are consistently defined stratification of payer sources.

### 376

#### THE ASSOCIATION OF AGE WITH SHORT-TERM AND LONG-TERM MORTALITY IN ADULTS ADMITTED TO THE ICU

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**Learning Objectives:** Recent studies have demonstrated that the age of ICU patients is increasing. The significance of this observation is unclear. The literature is mixed on whether advanced age leads to higher mortality or whether it is due to the greater number of comorbidities in the aging population. We hypothesized that increasing age would significantly increase the odds of short-term and long-term mortality after adjusting for comorbidities in patients admitted to the ICU. **Methods:** We performed an IRB approved retrospective cohort study of patients aged 18 or older who were admitted to any ICU over a 5-year period (2007-2012) at two urban, academic tertiary care centers. Patients were divided into four age groups, 18-39, 40-59, 60-79, and  $\geq 80$ . The primary outcomes were 30-day mortality and 360-day mortality. We used multivariate logistic regression to assess for an association between age group and outcomes adjusting for gender, race, Charlson Comorbidity Index and Elixhauser index. Odds ratios (ORs) and 95% confidence intervals (CIs) are reported. **Results:** 57,335 patients were analyzed. 42.8% were female and the mean age was  $64.2 \pm 16.1$  years. 30-day mortality was 5.9%, 8.6%, 11.8%, and 17.4% for age groups 18-39, 40-59, 60-79 and  $\geq 80$  respectively ( $p < 0.001$ ). 360-day mortality was 13.5%, 20.4%, 27.2%, and 32.8% for age groups 18-39, 40-59, 60-79 and  $\geq 80$  respectively ( $p < 0.001$ ). The adjusted 30-day mortality ORs were 1.26 (95% CI 1.10-1.45), 1.57 (95% CI 1.37-1.80), and 2.51 (95% CI 2.17-2.91) for age groups 40-59, 60-79 and  $\geq 80$  respectively, using age group 18-39 as the reference. The adjusted 360-day mortality ORs were 1.11 (95% CI 1.01-1.23), 1.20 (95% CI 1.08-1.32), and 1.50 (95% CI 1.35-1.67) for age groups 40-59, 60-79 and  $\geq 80$  respectively, using age group 18-39 as the reference. **Conclusions:** We observed an increasing proportion of short-term and long-term death with increasing age after ICU admission. After correcting for important clinical variables this trend remained. Further study is needed to assess the contribution of age on outcomes in ICU patients.

### 377

#### WITNESSES AND INITIAL RESPONSE ARE CRUCIAL FOR POSITIVE OUTCOMES IN PATIENTS ASPIRATING FOOD.

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**Learning Objectives:** Rapid aging of the population is a large problem in Japan. The number of patients with food aspiration has been growing. **Methods:** The objective is to clarify the risk factors affecting the outcomes in elderly patients with airway obstruction due to food aspiration who are transferred to the tertiary emergency center. **Results:** Among 72 patients, the mean age was  $80.2 \pm 13.5$

years. The aspirated food consisted of bread (n=8), rice cake (mochi) (n = 8), rice (n = 7), meat (n = 4). Forty-six patients (64%) had witnesses to aspiration. Fourteen patients had a favorable outcome, which was defined as cerebral performance category scale (CPC) 1 or 2 at hospital discharge. Patients with favorable outcomes had witnesses (72% vs. 33%,  $P = 0.0163$ ). Three cases were opened their airway at the site of aspiration by caretakers and all patients were discharged with favorable outcomes. Patients with favorable outcomes had significant differences in arterial blood pH ( $7.33 \pm 0.12$  vs.  $6.97 \pm 0.21$ ,  $P < 0.0001$ ), PaCO<sub>2</sub> ( $44 \pm 22$  mmHg vs.  $85 \pm 39$  mmHg,  $P = 0.001$ ), lactate ( $51 \pm 50$  mg/dL vs.  $134 \pm 56$  mg/dL,  $P < 0.0001$ ); however, no significant difference in PaO<sub>2</sub> was observed ( $162 \pm 117$  vs.  $148 \pm 156$  mmHg,  $P = 0.77$ ). Among 52 patients who suffered cardiac arrest, 17 survived to hospital discharge. Survival group patients were more frequently intubated at the site of aspiration (28% vs. 58%,  $P = 0.021$ ) and were treated by emergency doctors (15% vs. 50%,  $P = 0.012$ ) before hospital admission more than non-survival group patients. All survival group patients had return of spontaneous circulation before hospital arrival. **Conclusions:** Patients of airway obstruction due to food aspiration with favorable outcomes more frequently had witnesses than those with unfavorable outcomes, and cardiac arrest survivors were intubated more often at the scene. Elderly persons who have a high risk of aspiration should be observed during meals and caretakers should be trained for emergency resuscitation.

### 378

#### RBC TRANSFUSION RATES WITHIN MECHANICALLY VENTILATED, MEDICAL ICU SHOCK PATIENTS REQUIRING CRRT

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**Learning Objectives:** The risk of death within the ICU is influenced by pre-morbid factors, severity of acute illness & side effects of ongoing treatments. The need for active kidney replacement treatment for severe kidney injury represents up to a threefold increase risk of death vs. no acute kidney injury. **Methods:** We reviewed all adult patient (pt) admissions over 21 months to a university hospital medical intensive care unit (MICU) to determine mortality of pts in receipt of continuous renal replacement therapy (CRRT) for  $\geq 1$  ICU day. Additionally, we sought the relationship between receipt of CRRT and total # red blood cell (RBC) transfusions within the same hospitalization. Of MICU pts, records were queried by CPT code and by direct data extraction for demographics, mechanical ventilator (MV), CRRT, & death. Shock was assessed by the administration of norepinephrine, dopamine, vasopressin, or phenylephrine in a continuous infusion. Total hospital RBC transfusions were tallied. **Results:** From Sep 2012 to May 2014, 2976 separate pts required 3599 hospitalizations with  $\geq 1$  ICU day. The % pts requiring MV, pressor agents, or CRRT were 44%, 34% & 5%, respectively. The # hospitalizations with combined MV, shock & CRRT were 129 (4%). Mortality was 7% for any MV pt, 9% for any shock pt, & 17% for any CRRT pt. Mortality for combined MV-shock-CRRT was 21%; age-adjusted odds ratio of death vs vent alone was 16. The mean RBC transfusions for MV-shock-CRRT pts was 7 units/hospitalization. Of 101 (78%) CRRT pts who received  $\geq 1$  RBC transfusion, only 8 (8%) had an ICD-9 code for GI hemorrhage or retroperitoneal hemorrhage. There was no alteration in mortality for MV-shock-CRRT pts when reviewed over time by quarter. **Conclusions:** CRRT was overall uncommon but associated with a high mortality particularly in MV-shock-CRRT pts. RBC transfusions occurred in a majority (78%) of these pts. Lack of GI/retroperitoneal hemorrhage may represent opportunity for improved filter-access management to reduce blood loss. Prospective filter-access management studies may show reductions in RBC transfusions in this high mortality MICU pt subset.

### 379

#### A MODEL TO PREDICT DURATION OF VENTILATION AND 30-DAY MORTALITY IN PATIENTS WITH TRAUMATIC INJURIES

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**Learning Objectives:** Scoring systems are widely used in civilian practice to predict intensive care patient outcomes. Tools to predict outcomes from combat trauma are not available; specifically prediction tools for aeromedical evacuation from theater. The objective was to identify pre-flight variables associated with an increased requirement for ventilation time and 30-day mortality. **Methods:** This IRB-approved, retrospective cohort study included all patients evacuated from combat theaters by the U.S. Air Force Critical Care Air Transport Team (CCATT) between 2007 and 2011. Pre-flight physiological variables and treatments were

assessed for associations and examined in stepwise regression models. The primary outcome was total ventilator time ( $\leq 72$  hours vs  $> 72$  hours); the secondary outcome was 30-day mortality. Receiver operating characteristic (ROC) curves were produced for both outcomes. Data are presented as percentages, median [IQR], and odds ratio (OR [95% CI]). **Results:** 1308 combat trauma patients (24 years, 98% male) were included: 72% blast, 17% penetrating, 9% blunt, and 2% burns. Pre-flight systolic blood pressure was 121 [109-143] mmHg, pulse 100 [84-116] bpm, and base deficit 0 [-2-2]. The median number of blood products administered pre-flight were 4 [0-13] units packed red blood cells (PRBC), and 3 [0-12] units fresh frozen plasma. When modeling for ventilator time, injury severity score (ISS) (OR 1.04 [1.03-1.06]), pre-flight PRBC units transfused (OR 1.05 [1.04-1.07]), and pre-flight intubated status (OR 11.9 [8.53-16.89]) were independently associated with increased ventilator days. A composite of the variables produced an AUC of 0.85 with 86% sensitivity and 56% specificity. Using mortality as the outcome, ISS (OR 1.06 [1.03-1.09]), prothrombin time (OR 2.13 [1.18-4.47]), pre-flight intubated status (OR 9.2 [1.88-166.11]), and whole blood (OR 3.18 [1.38-7.04]) were associated with death. The combination of variables produced an AUC of 0.84 with 71% sensitivity and 57% specificity. **Conclusions:** In our large study of critical care aeromedical patients a number of pre-flight variables are a

### 380

#### OUTCOME OF BONE MARROW TRANSPLANTATION IN CHILDREN: AN ANALYSIS OF KID'S INPATIENT DATABASE.

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**Learning Objectives:** Bone marrow transplant (BMT) is used as treatment for various malignant and non-malignant conditions. Outcome of BMT procedure depends on various factors including the patient's condition and the type of transplant (allogeneic, autologous, or cord blood). The objective of this study was to evaluate demographics and outcomes of children who received BMT procedure using Kid's Inpatient Database (KID) during 2009. **Methods:** We have filtered all patients from the KID using ICD codes for BMT and analyzed the data. We evaluated various parameters such as age, gender, race, comorbid diagnosis, mechanical ventilation, type of BMT and their effect on mortality and length of stay (LOS). To obtain the nationally representative estimates of the procedure, discharge weighting was applied towards the data. Chi-square test and student t-test were used to analyze the data. **Results:** A total of 2656 children received BMT during 2009. Mean age was 8.62 years and females were 41%. Most cases of patients who received BMT were Caucasians (47%), followed by Hispanics (16%) and African American (10%). Children requiring mechanical ventilation were younger (7yrs), had a longer LOS (78 vs 40 days;  $p < 0.001$ ), had more co-morbid conditions and higher mortality (58% vs. 2.8%;  $p < 0.001$ ). Presence of renal failure increased mortality (39% vs. 5.7%;  $p < 0.001$ ). Most common type of BMT was Allogeneic (47%) followed by autologous (40%) and cord blood (12%). Children with cord blood BMT were younger (7.4 vs. 8.7 yrs.), had APRDRG extreme risk of mortality (19%,  $P < 0.001$ ) compared to allogeneic (10%) or autologous (5%), had longer LOS (65 days,  $P < 0.001$ ), and higher mortality (17%,  $P < 0.001$ ). Lowest mortality was seen in autologous group (1.5%). **Conclusions:** Our study analyzes children who received BMT during a year using a large national data base. Overall hospital mortality of BMT procedure is 6.2% and is higher in patients who received mechanical ventilation, had renal failure or received cord blood.

## Poster Session: Epidemiology 4

### 381

#### NEW PROGNOSTIC PREDICTION SYSTEM IN CRITICAL CARE BASED ON NETWORK ANALYSIS

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**Learning Objectives:** Several prognostic scoring systems including APACHE II score have been developed and widely used. However, the accuracy and generalizability is not sufficient. This is partly because these systems evaluate each organ separately although the measured variables used in the scoring systems reflect the interactions of each organ or biological response. We hypothesized that network analysis of the interaction of the measured variables will enable to develop a better prognosis prediction. **Methods:** Patients 18 years of age or older who had been admitted to our intensive care unit at the University of Tokyo Hospital during 9 months were included. 17 clinical variables were analyzed using network analysis. Variables with high betweenness centrality were detected by calculating Spearman's rank correlation coefficient, adjusted with Bonferroni correction. Association of the indentifical variables with high betweenness centrality ("hubs") with the clinical outcomes were further evaluated by multivariate regression and receiver operating characteristic analysis. **Results:** NT-proBNP, %prothrombin, hemoglobin, NGAL (a new AKI biomarker), platelet count and serum albumin had significantly high centralities and were identified the "hubs" in the network. The area under the ROC curve (AUC-ROC) of outcome prediction with these 7 variables was significantly higher as compared with that APACHE II score (AUC-ROC=0.911, IQR 0.798-0.964 vs. 0.790, IQR 0.676-0.873,  $p=0.0491$ ). **Conclusions:** Network analysis could identify several clinical "hubs" that enable to predict prognosis in critically ill patients with high accuracy.

### 382

#### PATIENT-SPECIFIC RISK MODEL OF BACTERIAL CO-INFECTION IN CHILDREN WITH SEVERE VIRAL BRONCHIOLITIS

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**Learning Objectives:** Up to 24% of children hospitalized with viral lower respiratory tract infection (LRTI) will require admission to the intensive care unit. Among children with respiratory failure from LRTI caused by respiratory syncytial virus (RSV), between 17% and 39% will develop pulmonary bacterial co-infection yet nearly all will receive antibiotics. We sought to reduce antibiotic overuse in children with LRTI by identifying those patients at low risk of bacterial co-infection through the use of a patient-specific risk model. **Methods:**

Retrospective cohort study of children with laboratory confirmed RSV LRTI requiring mechanical ventilation over a two-year period. Bacterial co-infection was defined using previously published microbiological criteria. Multiple candidate variables were assessed for association with co-infection and potential inclusion in the final model. Model was constructed using a weighted partial correlation method. Model output of risk was assessed using receiver operating curve (ROC) characteristic analysis. **Results:** Forty-five patients were included in the study, 19 (42%) with bacterial co-infection (four (9%) with probable infection, 15 (33%) with possible infection). Candidate variables associated with co-infection: elevated white blood cells (WBC) for age, Gram stained (GS) WBC and bacteria (both ordinal variables). By partial correlations, weighted values for each model variable were elevated WBC (13%), GS WBC (52%), and GS bacteria (35%). By ROC analysis, optimal model cut-offs correctly classified 94% of patients with an area under the curve of 0.83. Model would have decreased unnecessary antibiotic use in 18-51% of patients. **Conclusions:** Patients with RSV LRTI at low risk for bacterial co-infection can be identified using mathematical models, potentially decreasing antibiotic overuse. Efforts to expand patient-specific modeling to other respiratory viruses are needed.

### 383

#### PATTERN OF HOSPITAL ADMISSIONS AND OUTCOME OF ACUTE ALUMINIUM PHOSPHIDE POISONING IN AN INDIAN ICU

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**Learning Objectives:** Acute aluminium poisoning is a major problem in India. This retrospective study was undertaken to describe the epidemiological features of aluminium phosphide poisoning in all patients who were admitted in Pushpanjali Hospital, Agra, India. The specific objectives included the determination of the age range most vulnerable, the annual pattern of occurrence, the clinical features at the time of presentation, duration and course of ICU stay and the outcome. **Methods:** Data was extracted from the medical records of 62 patients with aluminium phosphide poisoning admitted between January 2009 and March 2014. **Results:** 62 patients were admitted for suicidal poisoning. The age ranged from 14 years to 63 years. Females of age group 20 to 35 years accounted for 37 (59.6%) cases. There were 21 males and 41 females with a male: female ratio of 1: 2. Forty seven (75.8%) out of 62 patients were from low social backgrounds. Gastrointestinal symptoms (nausea, vomiting) dominated the clinical presentation