AAP Section on Critical Care
Scientific & Educational Program
Abstract & Poster Presentations

AAP National Conference
October 12-13, 2014
San Diego, CA

SOCC 30-YEAR ANNIVERSARY!
H2026 – SECTION ON CRITICAL CARE – DAY 1

Hilton Bayfront, Indigo Ballroom EF

8:00 AM – 12:30 PM  SCIENTIFIC ABSTRACT PRESENTATIONS, POSTERS & AWARDS

Moderator: Brad Poss, MD, MMM, FAAP

8:00 am  Welcome-Introduction

8:15 am – 9:30 AM  ABSTRACT SESSION I

Moderators: Edward Conway Jr, MD, FAAP & Jana Stockwell, MD, FAAP

8:15 am  1. #25866  Binod Balakrishnan, MD
Near Infrared Spectroscopic (NIRS) Somatic Oxygen Saturation at Admission as a Predictor of Need for Life Saving Interventions among Unplanned Admissions to the PICU

8:30 am  2. #25057  Ebaa Jastaniah, MD, MPH
Sleep-Wake Cycles of Children Admitted to the PICU after Major Cardiac Surgery

8:45 am  3. #25701  Aaron Spicer, MD
Cumulative Fluid Balance Is Associated with Mortality in Pediatric Acute Respiratory Distress Syndrome Only in the Setting of Acute Kidney Injury

9:00 am  4. #26965  Kelly Rose Pekala, BA
Serum Glucose and Temperature Predict Prolonged Seizure Activity and Mortality in Pediatric Traumatic Brain Injury

9:15 am  5. #24251  Christina L. Cifra, MD – 2013 Small Project Grant Recipient
Transforming the Morbidity and Mortality Conference to Improve PICU Safety and Quality

9:30 AM – 11:00 AM  POSTER WALK ROUNDS AND BREAK + ANNIVERSARY SLIDE SHOW

POSTERS – GROUP I

Moderators: Michael Agus, MD, FAAP & LCDR Luke Zabrocki, MC, USN, MD, FAAP

Shari A. Toomey, MBA, RRT-NPS
Implementation of Best Practice Strategies to Decrease Unplanned Extubations in the Neonate

Steven L. Shein, MD
Serum Eosinophilia Is Associated with Unfavorable Outcomes in Hospitalized Children with Bronchiolitis

Sangita Trivedi, MBBS
Ondansetron Does Not Change QTc Interval in the Patients Cared for in a PICU

Mitchell T. Hamele, MD
Microbiology and Risk Factors for Ventilator Associated Pneumonia in Pediatric Traumatic Brain Injury
Posters – Group II
Moderators: John Straumanis, MD, FAAP & Richard Mink, MD, MACM, FAAP

Mark Dugan, MD
Pediatric Septic Shock: Do Attitudes and Knowledge Correlate with Performance?

Joshua D. Godding, BS
Why the Need for Speed? All-Terrain Vehicles, Speed and Brain Injuries

Erin Bennett, MD, MPH
Assessment of Actual Pediatric Organ Donation Potential: Neurologic and Circulatory Determination of Death

Meghan M. Cirulis, MD
Comparing the New CDC Criteria for “Ventilator-Associated Condition” to a Clinical Diagnosis of Ventilator-Associated Pneumonia in Pediatric Traumatic Brain Injury

Angelo Cruz
Defining Head-Tilt Position of Resuscitation

Posters – Group III
Moderators: Richard Salerno, MD, MS, FAAP & Carley Riley, MD, MPP, FAAP

Wail Ali
Altered Ventricular Repolarization Following Status Epilepticus

Siriporn Phongjitsiri, MD
The New CDC’s Definitions for Complications of Mechanical Ventilation Shift the Focus of Quality Surveillance and Predict Clinical Outcomes in a PICU

Natalia Martinez-Schlurmann, MD
Hyponatremia and Severely Hypotonic Intravenous Fluid Are Associated with Unfavorable Outcomes during Bronchiolitis Admission

James P. Marcin, MD, MPH
Appropriateness of Disposition Following Telemedicine Consultations to Rural EDs

Arun Saini, MD, FAAP
Pediatric Severe Traumatic Brain Injury: Hypo or Hypercoagulable State?

11:00 AM – 12:30 PM
Abstract Session II
Moderators: Susan Bratton, MD, MPH, FAAP & Carley Riley, MD, MPP, FAAP

11:00 am 6. #26092
Vicki S Stringfellow, MSN, APRN
So Easy an ICU Can Do It! Simple Interventions to Decrease Unnecessary Labs in a PICU

11:15 am 7. #27325
Alina Khromykh, MD
Complex Genomic Presentation in the NICU

11:30 am 8. #25751
Brian M. Jackson, MD
Family Meetings Occur Infrequently for PICU Patients with Prolonged Length of Stay

11:45 am 9. #27007
Aparna Roy, MD
Risk of Pneumonia Increases on a Daily Basis for Pediatric TBI Patients Undergoing Mechanical Ventilation

12:00 pm 10. #26839
Natasha Susana Afonso, MD – 2013 Small Project Grant Recipient
Integrating Evidence-Based Learning Sciences into Continuing Education for Pediatric Sepsis

12:15 – 12:30 PM
Abstract Awards
12:30 PM – 4:50 PM  
**FUN WITH PEDIATRIC CRITICAL CARE SIMULATION**  
(Registration Required – Box Lunch Provided – Catered Event M18 or M19)

*Moderator: Brad Poss, MD, MMM, FAAP*

12:30 pm  
PEDIATRIC SIMULATION OVERVIEW

1:30 pm  
**SIMULATION SESSIONS**  
Kiran B. Hebbar, MD, MBBS, FAAP  
Tom C. Kallay, MD  
Jamie McElrath Schwartz, MD, MPH, FAAP  
LCDR Luke A. Zabrocki, MC, USN, MD, FAAP

4:50 PM – 5:30 PM  
**SOCC UPDATE & DISTINGUISHED CAREER AWARD**

4:50 pm  
**SOCC EXECUTIVE COMMITTEE UPDATE**  
Edward E. Conway, MD, MS, FAAP - Chairperson

5:00 pm  
**SOCC DISTINGUISHED CAREER AWARD 2014**  
Barry P. Markovitz, MD, MPH, FAAP

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**MONDAY, OCTOBER 13, 2014**  
**8:30 AM – 12:00 PM**

**H3033 – JOINT PROGRAM: SECTION ON CRITICAL CARE & SECTION ON HOSPITAL MEDICINE**  
*Hilton Bayfront, Sapphire Ballroom KL*

8:00 AM – 12:00 PM  
**POST-INTENSIVE CARE SYNDROME (PICS): ARE THEY REALLY OK WHEN THEY LEAVE THE ICU?**  
*Moderator: Laura M. Ibsen, MD, FAAP*

8:30 am  
**PICS: WHAT IS IT AND WHY SHOULD WE CARE?**  
John P. Straumanis, MD, FAAP

9:20 am  
**THE EFFECT OF PICS ON FAMILIES: CAN WE IMPROVE THE FAMILY’S EXPERIENCE?**  
Roger K. Nicome, MD, FAAP

10:10 am  
Break

10:30 am  
**THE ECONOMIC COST OF PCIS: CAN WE AFFORD TO NOT PAY ATTENTION?**  
Carly L. Riley, MD, MPP, FAAP

11:20 pm  
**PANEL DISCUSSION AND WRAP-UP**

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**Use the AAP National Conference Event Planner to Search for Other Sessions by Topic including the popular SOCC sponsored session “Are You Smarter than an Intensivist”**  

**Note:** An inaugural brainstorming meeting of the newly established SOCC Subcommittee on Member Engagement & Mentorship will be held Sat, Oct 11 at the Marriott Marquis, Conference Suite 1 from 5-6:30pm.
ABSTRACT SESSION I

Sunday, October 12, 2014 – 8:15 AM-9:30 AM

**Abstract ID: 25866 - Presentation Time: 8:15 AM - 8:30 AM**

**NEAR INFRARED SPECTROSCOPIC (NIRS) SOMATIC OXYGEN SATURATION AT ADMISSION AS A PREDICTOR OF NEED FOR LIFE SAVING INTERVENTIONS AMONG UNPLANNED ADMISSIONS TO THE PEDIATRIC INTENSIVE CARE UNIT**

**Binod Balakrishnan, MD, Kim Gajewski, Mahua Dasgupta, MS, Raymond Hoffmann, PhD and Sheila Hanson, MD, Medical College of Wisconsin, Milwaukee, WI**

**Purpose:** Near infrared spectroscopic (NIRS) monitoring is a continuous, non-invasive modality that monitors regional oxygen saturation of the underlying tissue, thus obtaining an assessment of tissue perfusion. Some studies have shown NIRS changes to precede changes in lactate and base deficit in situations of systemic hypoperfusion. Studies done among battlefield injury victims have shown somatic oxygen saturation to predict the need for life saving interventions (LSI) including blood transfusions and operative procedures. No studies have been performed to evaluate NIRS saturation as a predictor of LSI in children. Unplanned admissions to the PICU often need more LSIs than planned admissions. We hypothesize that a low NIRS somatic oxygen saturation (<70%) at admission will predict the need for a lifesaving intervention in the initial 24 hours of admission.

**Methods:** This retrospective chart review included all unplanned admissions to the Children's Hospital of Wisconsin PICU with NIRS somatic oxygen saturation data available within 4 hours of admission. Admissions with a cardiac diagnosis as defined by Virtual PICU Performance System (VPS, LLC) database were excluded. LSI data were collected for the first 24 hours after admission (defined as CPR, emergent intubation, vasoactive medications, blood products, emergent surgical procedures, fluid bolus > 40 ml/kg in 2 hours, emergent dialysis) from VPS and the medical records. Hemodynamic parameters, laboratory values, injury severity scores, diagnoses and LSI prior to PICU admission were collected. Included PICU admissions were stratified into 3 groups based on somatic NIRS values: <70% (Low), 70-90% (normal) and > 90 % (high). Rate of LSI were compared using chi-squared tests. Association of NIRS saturation with LSI will be compared to other clinical parameters.

**Results:** There were 414 patients with 482 consecutive unplanned admissions to the PICU from May 30, 2012 - September 30, 2012. **203** admissions had NIRS monitoring. Among these admissions, those with somatic NIRS saturation < 70% had an increased rate of LSI (p-values in table).

<table>
<thead>
<tr>
<th></th>
<th>N=203</th>
<th>NIRS &lt;70%</th>
<th>NIRS 70-90%</th>
<th>NIRS &gt;90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSI</td>
<td>N= 53</td>
<td>42 (79%)</td>
<td>17 (27%)*</td>
<td>17 (19%)</td>
</tr>
<tr>
<td>No LSI</td>
<td>11 (21%)</td>
<td>46 (73%)</td>
<td>70 (81%)</td>
<td></td>
</tr>
</tbody>
</table>

* * p < 0.0001 when compared to the group with NIRS <70%

PICU admissions with somatic NIRS monitoring had more LSIs compared to the admissions without (37.4% vs 5.02%, p<0.001).

**Conclusion:** Pediatric ICU admissions with somatic NIRS oxygen saturation <70% upon admission require more lifesaving interventions in the initial 24 hours of admission to the PICU compared to those that had higher NIRS saturation. Noninvasive, continuous, somatic NIRS monitoring may identify children at high risk of medical instability.
SLEEP-WAKE CYCLES OF CHILDREN ADMITTED TO THE PICU AFTER MAJOR CARDIAC SURGERY

Sapna R. Kudchadkar, MD1, Ebaa A. Jastaniah, MD, MPH1, Othman A. Aljohani, MD2 and Naresh M Punjabi, MD3, (1)Johns Hopkins Children’s Center, Baltimore, MD, (2)Children’s National Medical Center, Washington, DC, (3)Johns Hopkins Hospital, Baltimore, MD

Purpose: Sleep is an integral component of the neurocognitive development occurring during childhood. In the Pediatric Intensive Care Unit (PICU) setting, sleep is all too often interrupted, jeopardizing the quantity and quality of the critically ill child’s sleep. Factors that contribute to sleep disruption in the PICU may include pain, noise, light, medications and medical staff interventions. In this observational study, we aimed to characterize the sleep-wake patterns of infants and children admitted to the PICU following major cardiac surgery using actigraphy. We hypothesized that the longitudinal actigraphy measurements of sleep-wake patterns in critically ill children are profoundly fragmented during their PICU stay with prolonged recovery to normal sleep-wake patterns.

Methods: Children admitted to the PICU following major cardiac surgery were eligible for the study. After obtaining informed consent, actigraphy watches were placed on one of patients’ extremities on postoperative day 1, and remained until the day of discharge to home. Baseline sleep behavior was surveyed using the Brief Infant Sleep Questionnaire (BISQ) or Children Sleep Health Questionnaire (CSHQ).

Results: Of 65 eligible patients over 12 months, 58 (89%) were enrolled in the study. Among those enrolled, 5 patients (0.07%) discontinued the study due to watch irritability or instability. A total of 53 patients (81%) continued the study throughout their PICU and floor admissions up to their discharge from the hospital. The mean age in years was 3.8 (SD 13.9) and 46% of subjects were female. Actigraphy plots demonstrated severe disruption of sleep-wake patterns during the PICU stay with improving consolidation after transfer to the floor, although sleep remained fragmented until hospital discharge.

Conclusion: The sleep experience of children admitted to the PICU following major cardiac surgery is severely fragmented during a time when optimized sleep may be most important for recovery. This study provides the foundation for future research in the role of sleep as a modulator of outcomes after pediatric cardiac surgery.

CUMULATIVE FLUID BALANCE IS ASSOCIATED WITH MORTALITY IN PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME ONLY IN THE SETTING OF ACUTE KIDNEY INJURY

Aaron Spicer, MD1, Victoria Lo, BA1, Robinder Khemani, MD, MsCi2, Heidi Flori, MD3, Carolyn S. Calfee, MD, MAS1, Michael A. Matthay, MD1 and Anil Sapru, MD1, (1)University of California, San Francisco, San Francisco, CA, (2)Anesthesia Critical Care Medicine, Children's Hospital Los Angeles, Los Angeles, CA, (3)Children's Hospital & Research Center, Oakland, Oakland, CA

Purpose: The hallmark of acute respiratory distress syndrome (ARDS) is noncardiogenic pulmonary edema. We and others have reported the association between mortality and cumulative fluid balance 3 days after ARDS onset (Valentine 2012, Willson 2013). Acute kidney injury (AKI) may also be associated with fluid overload; whether the association of cumulative fluid balance with ARDS mortality is modified by AKI is unknown.

Methods: We calculated cumulative fluid balance 3 days after ARDS onset in a multi-center cohort of children with ARDS as defined by the American-European Consensus Conference (Bernard 1994). AKI was defined as renal “injury” or "failure" by pediatric-modified RIFLE criteria (Akcakar-Arikans 2007), assuming normal baseline renal function. Pediatric Risk of Mortality (PRISM 3) scores from the first 24 hours of intensive care were used to adjust for initial severity of illness.

Results: Age, sex and race were similar in subjects with and without AKI 3 days after ARDS onset. Patients with AKI had higher PRISM 3 scores on admission. AKI on day 3 was associated with concurrently lower PaO2/FiO2 ratios, higher cumulative fluid balance, and inotrope requirement. Mortality was 17% higher in patients with AKI (Table 1).
Cumulative fluid balance on ARDS day 3 was also associated with mortality. This association was independent of age, sex, race, PRISM 3, and day 3 PaO₂/FiO₂ ratio and inotrope requirement. Upon stratification, cumulative fluid balance was associated with mortality only in subjects with AKI (Table 2 and Figure).

**Table 1: Patient Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No AKI (n=153)</th>
<th>AKI (n=56)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, Months (Mean ± SD)</td>
<td>86±71</td>
<td>86±76</td>
<td>0.97</td>
</tr>
<tr>
<td>Male</td>
<td>86 (56%)</td>
<td>31 (55%)</td>
<td>0.91</td>
</tr>
<tr>
<td>Day 3 PaO₂/FiO₂ Ratio (Mean ± SD)</td>
<td>201±94</td>
<td>169±96</td>
<td>0.03</td>
</tr>
<tr>
<td>Day 3 Inotrope Use</td>
<td>65 (42%)</td>
<td>39 (70%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Admission PRISM 3 (Mean ± SD)</td>
<td>13±8</td>
<td>21±11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Day 3 Cumulative Fluid Balance (100mL/kg) (Mean ± SD)</td>
<td>0.61±0.97</td>
<td>1.1±1.59</td>
<td>0.008</td>
</tr>
<tr>
<td>Mortality</td>
<td>12 (8%)</td>
<td>14 (25%)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

**Table 2. Logistic Regression Model Adjusted For Age, Sex, Race, PRISM 3, and Day 3 PaO₂/FiO₂ and Inotrope Requirement**

**Outcome: Mortality**  **Predictor: Day 3 Fluid Balance (100mL/kg)**

<table>
<thead>
<tr>
<th>Population</th>
<th>n</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Patients</td>
<td>209</td>
<td>1.63</td>
<td>1.07 - 2.49</td>
<td>0.02</td>
</tr>
<tr>
<td>Patients Without AKI</td>
<td>153</td>
<td>1.26</td>
<td>0.59 – 2.73</td>
<td>0.55</td>
</tr>
<tr>
<td>Patients With AKI</td>
<td>56</td>
<td>2.29</td>
<td>1.16 – 4.55</td>
<td>0.02</td>
</tr>
</tbody>
</table>

**Conclusions:**

Day 3 cumulative fluid balance and acute kidney injury are associated with mortality in pediatric ARDS. After stratification, the association between fluid balance and mortality is limited to patients with acute kidney injury. This has important implications for fluid management in ARDS patients.
Abstract ID: 26965 - Presentation Time: 9:00 AM - 9:15 AM

SERUM GLUCOSE AND TEMPERATURE PREDICT PROLONGED SEIZURE ACTIVITY AND MORTALITY IN PEDIATRIC TRAUMATIC BRAIN INJURY

Kelly Rose Pekala, BA, MS\(^1\), Benjamin D Theobald, BS\(^1\), Katherine A Kelly\(^1\), Amber L Greeno, MSN, RN\(^2\), John C. Wellons, III, M.D., M.S.P.H.\(^2\) and Chevis N. Shannon, M.B.A., M.P.H., Dr.P.H.\(^2\), (1)Vanderbilt University, Nashville, TN, (2)Vanderbilt University Medical Center, Nashville, TN

**Purpose:** In pediatrics, hyperglycemia after traumatic brain injury (TBI) has been correlated with poor neurologic outcomes, morbidity, and mortality. Hypothermia is currently being explored as a therapeutic option, yet early trials in pediatrics show an increased mortality in this treatment group. The objective of this study was to evaluate the predictive value of serum glucose and temperature on two specific TBI related outcomes: prolonged seizure activity and mortality.

**Methods:** A retrospective study of 1812 children undergoing treatment and management of TBI at a tertiary academic pediatric hospital between January 2006 and April 2013 was conducted. Demographic, admission, and clinical factors were captured. Serum glucose levels at admission were collected and stratified into 4 ranges for evaluation. Temperature at initial presentation, 12, and 24 hours was evaluated to determine association with prolonged seizures and mortality. Prolonged seizure activity was defined as post discharge prescription of a seizure-modifying medication. Descriptive statistics, multivariate and backwards stepwise logistic regression were conducted using SAS 9.3.

**Results:** We first examined prolonged seizure activity as a marker of adverse neurological outcome. Patients presenting with midline shift or >1% temperature change in the first 24 hours were shown to have the greatest odds of prolonged seizure activity. Additionally, the odds ratios for elevated serum glucose (>140 mg/dl), hypothermia, and subdural hematoma were found to be statistically significant. Although not found to be significant, hypoglycemia was trending towards significance (OR 3.7).

We then turned our attention to effects on mortality, where we found an even greater association. Hypothermia and hyperglycemia were the best predictors of mortality with odds ratios of 80.2 and 32.8 respectively. Of the cohort of 1813 patients, 71% of those who died met criteria for either hypothermia, hyperglycemia (>199 mg/dl) or both.

<table>
<thead>
<tr>
<th></th>
<th>Prolonged Seizure</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>CI</td>
</tr>
<tr>
<td>Subdural</td>
<td>4.8</td>
<td>3.3 to 7.1</td>
</tr>
<tr>
<td>Midline Shift</td>
<td>5.8</td>
<td>3.4 to 9.9</td>
</tr>
<tr>
<td>Hypothermia (&lt;35°C)</td>
<td>3.8</td>
<td>2.1 to 7.1</td>
</tr>
<tr>
<td>TempÆ &gt;1%</td>
<td>5.4</td>
<td>2.8 to 10.4</td>
</tr>
<tr>
<td>Hyperglycemia (&gt;199 mg/dl)</td>
<td>3.3</td>
<td>1.9 to 6.0</td>
</tr>
<tr>
<td>Elevated Serum Glucose (&gt;140 mg/dl)</td>
<td>2.8</td>
<td>1.8 to 4.3</td>
</tr>
</tbody>
</table>

* p<.03
** this denotes significance at p<.0001 for all other variables
Conclusion: We found temperature and serum glucose to be strong predictors of outcome in our pediatric patient population. Patients presenting with hypothermia or hyperglycemia comprised 71% of the deaths in our pediatric TBI cohort. The strong correlation between hyperglycemia, hypothermia, and adverse outcomes has informed a current study further assessing confounding clinical factors in this particular subpopulation.

Abstract ID: 24251 - Presentation Time: 9:15 AM - 9:30 AM

TRANSFORMING THE MORBIDITY AND MORTALITY CONFERENCE TO IMPROVE SAFETY AND QUALITY IN THE PEDIATRIC INTENSIVE CARE UNIT (2013 SOCC SMALL GRANT PROJECT RECIPIENT)

Christina L. Cifra, MD1, Melania M. Bembea, MD, MPH1, Utpal S. Bhalala, MD1, James C. Fackler, MD1 and Marlene R. Miller, MD, MSc2, (1)Johns Hopkins Hospital, Baltimore, MD, (2)Pediatrics, Johns Hopkins Children's Center, Baltimore, MD

Purpose: The Morbidity and Mortality Conference (MMC) is a powerful yet under-utilized tool for advancing patient safety, as it is an ideal forum for standardized case review to efficiently identify errors and underlying systems problems while providing a mechanism for assigning responsibility and follow-up. Our objective was to improve the process of reviewing and responding to adverse events in the Pediatric Intensive Care Unit (PICU) by implementing a structured systems-oriented MMC.

Methods: We conducted an interrupted time-series analysis of our process of reviewing and responding to adverse events before and after implementation of a structured systems-oriented MMC. A multidisciplinary group representative of the PICU staff developed the new MMC structure and an accompanying systematic process of MMC preparation. The new MMC was designed to employ key elements of medical incident analysis to maximize its utility as a safety and quality improvement tool. Primary outcomes measured were the mean number of cases per meeting with adverse events discussed through a standard review process and the mean number of interventions discussed per meeting that were successfully implemented. Means were compared pre- and post-intervention using a paired t-test.

Results: We conducted the study from April 2013 to March 2014, for a total of 20 MMC meetings. Pre-intervention data was collected for 6 months before the new MMC structure was implemented, and post-intervention data was collected afterwards for another 6 months.
Table 1. Morbidity and Mortality Conference Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pre-Intervention</th>
<th>Post-Intervention</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting attendance, mean (SD)</td>
<td>12.4 (3.4)</td>
<td>31.2 (5.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cases volunteered</td>
<td>42</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Cases volunteered per meeting, mean (SD)</td>
<td>4.2 (1)</td>
<td>4.6 (1)</td>
<td>0.423</td>
</tr>
<tr>
<td>Total cases discussed, n (%)</td>
<td>33/42 (78.6)</td>
<td>33/46 (71.7)</td>
<td></td>
</tr>
<tr>
<td>Cases discussed per meeting, mean (SD)</td>
<td>3.3 (0.8)</td>
<td>3.3 (0.5)</td>
<td>1.000</td>
</tr>
<tr>
<td>Cases discussed through a standard review tool, n (%)</td>
<td>9/33 (27.3)</td>
<td>14/33 (42.4)</td>
<td></td>
</tr>
<tr>
<td>Cases discussed through a standard review tool per meeting, mean (SD)</td>
<td>0.9 (0.9)</td>
<td>1.4 (0.8)</td>
<td>0.138</td>
</tr>
<tr>
<td>Interventions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total interventions suggested</td>
<td>24</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td>Interventions suggested per meeting, mean (SD)</td>
<td>2.4 (1)</td>
<td>5.6 (2)</td>
<td>0.002</td>
</tr>
<tr>
<td>Interventions discussed that were implemented, n (%)</td>
<td>17/24 (71.8)</td>
<td>44/56 (78.6)</td>
<td></td>
</tr>
<tr>
<td>Interventions discussed per meeting that were</td>
<td>1.7 (1.2)</td>
<td>4.4 (1.7)</td>
<td>0.007</td>
</tr>
<tr>
<td>implemented, mean (SD)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Figure 1. Cases Discussed with a Standard Review Tool

Horizontal black lines denote mean number of cases discussed per meeting using a standard review tool before (0.9) and after (1.4) the new MMC was implemented (p=0.138). MMC, Morbidity and Mortality Conference
Figure 2. Interventions Implemented

Horizontal black lines denote mean number of interventions discussed per meeting that were implemented before (1.7) and after (4.4) the new MMC was implemented ($p=0.007$). MMC, Morbidity and Mortality Conference

Conclusion: Implementing a structured systems-oriented MMC improves the PICU's process of reviewing and responding to adverse events, with significantly more quality improvement interventions implemented.
ABSTRACT SESSION II

Sunday, October 12, 2014 – 11:00 AM-12:30 PM

Abstract ID: 26092 - Presentation Time: 11:00 AM - 11:15 AM

SO EASY AN ICU CAN DO IT! SIMPLE INTERVENTIONS TO DECREASE UNNECESSARY LABS IN A PICU

Vicki S Stringfellow, MSN, APRN, Philip A Bernard, MD, Scottie B Day, MD, Horacio F Zaglul, MD, Todd H Hjorth, MPA and Cheri D Landers, MD, University of Kentucky, Lexington, KY

Purpose: Minimizing unnecessary tests in a hospital setting decreases healthcare costs and improves patient safety. Multiple scheduled daily labs are sent on hospitalized patients, especially those in ICUs. Unnecessary lab tests can result in patient harm including pain, anemia, infection, unnecessary cost and treatment. The PICU collaborative practice workgroup at Kentucky Children's Hospital identified reducing frequent and potentially unnecessary lab tests as a quality and safety project. We describe our implementation of simple techniques to decrease unnecessary labs in our PICU.

Methods: A physician and nurse champion worked with laboratory personnel to obtain monthly PICU lab volume data. Total lab numbers were adjusted for patient volume (labs per patient day, LPPD) as well as for daily case mix index (dCMI LPPD). Hospital finance provided PICU lab charges per month which were also adjusted per patient day (PPD). Baseline data was collected for nine months. Simple interventions were implemented aiming to decrease the ordering of unnecessary labs. Interventions included: 1) adding the word “labs” to the de-escalation section of the rounding checklist, 2) including the anticipated lab schedule on the daily plan written on a dry erase board in the patient room, and 3) minimizing recurring labs without an end date. There was a six month transition period for education and implementation. LPPD, dCMI LPPD and charges PPD were followed throughout. PICU length of stay and observed:expected mortality were collected over the same time periods.

Results: Pre-intervention average monthly LPPD and dCMI LPPD was 12.51 and 3.04, respectively. Pre-intervention average monthly lab charges PPD were $1619. Over the 23 months post transition the average monthly LPPD and dCMI LPPD dropped to 8.29 (p < 0.01 vs pre intervention) and 2.86 (p = NS vs pre intervention), respectively. Average monthly lab charges PPD dropped to $1395 (p = NS vs pre intervention). Over the two time periods there was no change in the patient PICU length of stay or observed:expected mortality.

Conclusions: Simple, minimal to no-cost approaches were able to decrease the numbers of labs sent on PICU patients. Although decreases in dCMI LPPD and charges PPD did not reach statistical significance, the monthly averages are likely clinically and financially significant, especially considering the time over which the improvement has been maintained. Importantly, there was no negative impact on PICU length of stay or observed:expected mortality ratio by sending fewer labs. The decrease in labs has been sustained over a 2 year period. These techniques could easily be adopted by other patient care areas.

Abstract ID: 27325 - Presentation Time: 11:15 AM - 11:30 AM

COMPLEX GENOMIC PRESENTATION IN THE NICU

Alina Khromykh, MD1, Benjamin D. Solomon, MD2, Dale L. Bodian, PhD1, Rajiv Baveja, MD, PhD2, Shukwan Wendy Wong, PhD1, Elisabeth Z. Klein, RN, DNP1, Ramaswamy K. Iyer, PhD1, David Ascher, MD, MBA2, Kathi C. Huddleston, R.N., Ph.D.1, Joseph G. Vockley, PhD1 and John E. Niederhuber, MD1, (1)Inova Translational Medicine Institute, Falls Church., VA, (2)Neonatology, Fairfax Neonatal Associates at Inova Hospital for Children, Falls Church, VA, (3)Inova Children’s Hospital, VA
Purpose: Congenital anomalies are a leading cause of infant morbidity and mortality. These conditions frequently require Neonatal Intensive Care Unit (NICU) hospitalization, long term medical care, and involve significant familial stress/anxiety. The goal of our IRB-approved 'Impact of Genetic Disorders' study is to elucidate the genetic and genomic factors that contribute to the etiologies of congenital anomalies. We have observed that ~18% of total NICU patients admitted at our medical center in the past year involved newborns with a suspected genetic disorder, and where standard genetic testing was not informative. Our study aims to determine if whole genome sequencing (WGS) can explain the origin of disease in these patients.

Methods: The study is conducted at a large children’s hospital’s 75 bed, level IV NICU. Approximately 18% of the NICU population was suspected of having an underlying genetic disorder and underwent a standard genetic workup, yielding a clinical diagnosis in ~20% of these patients, resulting in a majority without a clear genetic diagnosis. A subset of this group (n=80) is participating in our ongoing study that requires a family trio (mother, father, and proband) to consent to WGS, RNA expression, methylation, and miRNA characterization. Clinical data are obtained from the electronic health records as well as parental input on nutrition, stress and environmental exposure via study-specific surveys. A variety of principal component analyses, familial-based analyses, pathway analyses and genomic network analyses are utilized in an attempt to identify the underlying genomic explanation. Our analyses are bolstered by our database of >5,000 WGS (along with other biological data and clinical information) derived from multiple ongoing trio-based genomic studies.

Results: WGS data has been generated on 30 families to date. Analyses of WGS from an initial group of 7 families has already enabled us to identify the potential cause of previously undiagnosed disorders in all 7 children, including molecular evidence for IMAGE syndrome, DiGeorge syndrome, Rubinstein-Taybi II, D-bifunctional protein deficiency, CHARGE syndrome, and GATA4 mutation. The average time required to analyze a family for sequence variants responsible for the clinical phenotype observed in this cohort is 12 days. Research findings are verified in a CLIA-certified laboratory before being communicated to the care team and families, along with comprehensive genomic counseling and disease-related follow-up recommendations.

Conclusion: The application of WGS is expected to significantly enhance the ability to understand the causes of congenital anomalies. Our study demonstrates the potential of WGS analysis to end diagnostic quandaries for patients in an efficient and cost-effective way. The establishment of our analysis pipeline can allow effective, timely analysis of hundreds of cases per year. Our genomic counseling infrastructure provides physicians and their patients with a wide range of services, making WGS a usable diagnostic tool.

Abstract ID: 25751 - Presentation Time: 11:30 AM - 11:45 AM

FAMILY MEETINGS OCCUR INFREQUENTLY FOR PICU PATIENTS WITH PROLONGED LENGTH OF STAY

Brian M. Jackson, MD1, Peter M. Mourani, MD1, Jacqueline J. Glover, PhD2 and Angela S. Czaja, MD, MSc1, (1)University of Colorado / Children's Hospital Colorado, Aurora, CO, (2)University of Colorado, Aurora, CO

Purpose: Pediatric Intensive Care Unit (PICU) patients frequently have complex medical needs requiring excellent communication between families and providers to enhance shared decision making. The American College of Critical Care Medicine (ACCM) recommends beginning family meetings (FM) within 24-48 hours of ICU admission. Improved provider-family agreement about goals of care has been observed when FMs were initiated within 72 hours of ICU admission for adult patients with a high mortality risk or anticipated length of stay over five days. FM frequency and adherence to ACCM guidelines have not been described in the PICU.

Methods: Data for this study were extracted from the screening log of an ongoing prospective study of PICU FMs, defined as pre-scheduled meetings including at least one family member with decision-making power, a medical provider, and one other hospital staff member. Screened patients under age 18 admitted to the PICU for at least five days between September 2013 and March 2014 were included in the current study. This PICU is a mixed medical-surgical unit in a tertiary care children’s hospital with cardiovascular surgery patients cared for in a separate unit. The critical care service manages all medical patients and co-manages or consults on all surgical patients. Data analyzed included the presence or absence of a FM, the timing of FMs, the primary service responsible for each patient and the PICU length of stay (PLOS). Comparisons between groups were analyzed using Pearson’s Chi-Square and the Mann-Whitney U tests as appropriate.

Results: Over the study period, 136/842 (16%) of admissions to the PICU met the inclusion criteria. Only fifteen patients (11%) had a FM during their PICU stay. The median time from PICU admission to the first family meeting was 7 days (range 2 – 27). Patients with at least one FM had longer PLOS than those without a FM (median 24 days v. 7 days; p<0.001), and they were more likely to have critical care as their primary service than a surgery service (26% v. 8%; p=0.021). Six patients had
more than one FM during their PICU stay with a median time between meetings of 12 days (range 7-39). The median PLOS of these patients was 42 days (range 16 – 126) and 83% had critical care as their primary service.

**Conclusion:** The study shows a low rate of FMs for PICU patients with prolonged PLOS despite current ACCM recommendations, and that FMs occurred less frequently for surgical patients when compared with medical patients. This infrequency of FMs may impact shared decision making for critically ill children. Future studies should examine the reasons for the low frequency of FMs and whether increasing FM frequency improved shared decision making and patient-centered outcomes in the PICU.

**Abstract ID:** 27007 - **Presentation Time:** 11:45 AM - 12:00 PM

**RISK OF PNEUMONIA INCREASES ON A DAILY BASIS FOR PEDIATRIC TBI PATIENTS UNDERGOING MECHANICAL VENTILATION**

**Aparna Roy, MD, MPH**, Xuan Hui, MD, ScM², Veerajalandhar Allareddy, MD, MBA, FAAP, FACP³, Karen Lidsky, MD³ and Eric Schneider, PhD³, (1)Rainbow Babies and Children’s Hospital, Case Western Reserve University, Cleveland, OH, (2)Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, (3)Johns Hopkins School of Medicine, Baltimore, MD

**Purpose:** Traumatic Brain Injury (TBI) is a significant health problem in pediatric patients with a reported incidence of around 230 per 100,000 children. It remains an important cause of death and disability in children. Pediatric patients with TBI frequently require mechanical ventilation (MV). We sought to examine the relationship between length of MV exposure and the development of pneumonia among pediatric TBI patients.

**Methods:** The National Trauma Data Bank (NTDB) from the year 2007 through 2012 was queried retrospectively and abbreviated injury scale (AIS) scores were calculated for each individual aged 0-21 years. All patients with head AIS coded from 1 to 6 who required MV and had no other body-region injury with AIS>3 were identified and included for study. Patients with severe burns, or a hospital length-of-stay>30-days, were excluded, as were patients treated at hospitals which did not report at least one case of pneumonia. A generalized linear model was used to determine the approximate relative risk of incident aspiration pneumonia, ventilator-associated pneumonia (VAP) or infectious pneumonia, as identified by ICD 9 Diagnosis Code, for each day of MV. Models controlled for gender, age, Glasgow Coma Scale (GCS) motor score at admission, comorbidity (based on the Charlson Comorbidity Index), insurance status, as well as injury type and severity.

**Results:** A total of 14,682 pediatric TBI patients at 79 unique hospitals were exposed to MV. Among these patients, a total of 260 (1.8%) cases of aspiration pneumonia, 383 (2.6%) cases of infectious pneumonia and 127 (0.9%) cases of VAP were reported. After controlling for patient and injury characteristics, each additional day of ventilator time was associated with an 8% increase in the risk of infectious pneumonia (RR 1.08, 95%CI 1.07 – 1.09), a 6% increase in the risk of aspiration pneumonia (RR 1.06 95%CI 1.05-1.07) and a nearly 10% increase in the risk of VAP (RR 1.09, 95%CI 1.09-1.11) [see Table].

**Conclusion:** Among pediatric TBI patients, the risk of developing pneumonia increased significantly with each additional day of MV exposure. Strategies to reduce prolonged MV utilization among pediatric TBI patients may reduce pneumonia risk.

**Table:** Risk factors associated with incidence of pneumonia

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Aspiration Pneumonia</th>
<th>Infectious Pneumonia</th>
<th>Ventilator Associated Pneumonia</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Relative Risk (RR)</td>
<td>95% CI</td>
<td>Relative Risk (RR)</td>
</tr>
<tr>
<td>Ventilation days (per additional day)</td>
<td>1.06 [1.05-1.07]</td>
<td>1.08 [1.07-1.09]</td>
<td>1.10 [1.09-1.11]</td>
</tr>
<tr>
<td>Age (per year)</td>
<td>1.01 [0.99-1.03]</td>
<td>1.08 [1.06-1.10]</td>
<td>1.10 [1.06-1.13]</td>
</tr>
<tr>
<td>Presence of Any Comorbidity</td>
<td>2.68 [2.15-3.35]</td>
<td>0.78 [0.65-0.94]</td>
<td>2.14 [1.73-2.65]</td>
</tr>
<tr>
<td>Uninsured</td>
<td>1.04 [0.81-1.33]</td>
<td>1.02 [0.89-1.17]</td>
<td>1.17 [0.94-1.44]</td>
</tr>
<tr>
<td>Penetrating Injury</td>
<td>0.13 [0.02-0.75]</td>
<td>0.78 [0.65-0.94]</td>
<td>0.85 [0.64-1.14]</td>
</tr>
<tr>
<td>Injury Severity (ISS≥15)</td>
<td>0.85 [0.69-1.06]</td>
<td>1.68 [1.44-1.97]</td>
<td>1.57 [1.25-1.98]</td>
</tr>
</tbody>
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**Integrating Evidence-Based Learning Sciences into Continuing Education for Pediatric Sepsis**

*(2013 SOCC Small Grant Project Recipient)*

**Natasha Susana Afonso, MD, MPH†, Jaime Silva, MD‡, Valdemar Abrego-Moya, MD§, Fernando Stein, MD‡, Belinda Ortegon Diaz, MD‡, M. Hossein Tcharmtchi, MD§, Amada Briones Ramirez, RN¶, Gabriel Vargas, MD‖, Eric Williams, MD‡, Jorge A. Coss-Bu, MD‡ and Satid Thammasitboon, MD, MHPE†, (1)Baylor College of Medicine, Texas Children's Hospital, Houston, TX, (2)Hospital Regional Materno Infantil de Alta Especialidad, Monterrey, Mexico, (3)Escuela de Medicina Y Ciencias De La Salud del Tecnologico de Monterrey, Monterrey, Mexico*

**Purpose:** In resource-limited settings, the lack of knowledge and clinical skills are commonly reported as critical barriers for adherence to clinical guidelines. Literature has shown disappointing evidence on the impact of conventional continuing education on retention of knowledge and clinician's practice behaviors. We developed and implemented educational interventions using evidence-based learning sciences to enhance knowledge and skills in pediatric sepsis management among providers at a resource-limited setting.

**Methods:** Based on our field study, analyses of surveys, and semi-structured interviews with local staff, we identified system needs, knowledge and practice gaps in current sepsis management. A series of educational interventions were collaboratively developed as a critical component of a multifaceted quality improvement project to improve management strategies at a resource-limited setting. We strategically integrated several evidence-based educational innovations into the curriculum aimed at enhancing acquisition and retention of knowledge specifically focused on the early recognition and timely management of patients in septic shock. The Kolb's cycle of experiential learning guided curriculum design. The curriculum targeted a variety of learning styles and allowed all learners to go through the cycle of reflecting, experiencing, thinking and acting to create a meaningful learning experience. The curriculum consists of two major parts, a workshop and an online spaced repetition learning module (SRL). Team-based learning and simulations were used to create engaged learning during the workshop. A knowledge test and self-efficacy test were developed and validated. The sepsis self-efficacy test was developed based on crisis resource management (CRM) dimensions and self-efficacy (SE) domains. A quasi-experimental study for pre- and post-intervention comparisons determined short-term, educational outcomes for knowledge and self-efficacy. Following the workshop, the SRL module delivered short repeated burst of knowledge using periodic emails with clinical scenarios and questions ("chunk" learning) aimed at enhancing knowledge retention.

**Results:** A total of 52 nurses, 27 residents, 24 physicians and 10 additional trainees participated in the workshops. After the workshops, learners scored higher in knowledge (post-pre score (95%CI): 32% (26, 38) for nurses, 17% (13, 21) for physicians, p <0.05). Physicians reported higher level of self-efficacy in all CRM dimensions (situational awareness, team management, decision-making), and all self-efficacy domains (cognitive, conative, affective), and overall median SE score (post 57 vs. pre 47 p <0.001). There were no correlations between level of experience and test scores. Learners rated the workshop as highly educational and effective. The online spaced repetition learning module was implemented to optimize learning long term learning. More importantly, the educational interventions generated awareness and enthusiasm for improvement initiatives among providers, administration and leadership. This change in culture was critical in implementing system changes by local staff to further improve sepsis identification and treatment.

**Conclusion:** Educational interventions that incorporate evidence-based learning sciences enhance knowledge and self-efficacy for optimal management of pediatric septic shock.
IMPLEMENTATION OF BEST PRACTICE STRATEGIES TO DECREASE UNPLANNED EXTUBATIONS IN THE NEONATE

Shari A. Toomey, MBA, RRT-NPS, Carilion Clinic Children’s Hospital, Roanoke, VA

Purpose: Unplanned extubations (UEX) are a serious and potentially life-threatening event for a neonate. UEX leads to emergent, less-controlled endotracheal re-intubations. Repeated intubations increase the risk of ventilator associated pneumonia, tracheal injury, and may prolong length of stay. A number of factors increase the risk of UEXs. These include lack of adequate sedation; type of tube stabilization used, and lack of vigilance by staff.

Methods: A prospective cohort quality study was designed to consider the impact of modifying these factors and implementing a sequence of best practice strategies. Three leading factors were defined: stabilization of endotracheal tube (ETT), sedation for intubated patients, and personnel at the bedside. Strategies were developed to address these factors: 1) A six month trial of three different stabilization techniques; 2) Sedation guideline implemented, for patients who self extubated and required re-intubation within 48hrs (scheduled sedation, 1mcg/Kg Fentanyl Q4, 1 mcg/kg Fentanyl q2 hrs. PRN); 3) Intubated patients required two personnel at the bedside during care or procedures. Patients requiring intubation from February 2010 to present were included in this 5 year quality study. A tracking tool was developed and data collected included: patient data were protocols followed, circumstances and personnel present for UEX and level of sedation.

Results: Baseline data indicated an UEX rate of 4.5/100 ventilator days. Following the implementation of three standards of care practice changes we saw the following decrease in the UEX rate: 1) Standardized Taping to 2.4/100 ventilator days; 2) Standard sedation to 1.7/100 ventilator days; 3) Adequate personnel at the bedside to 0.4/100 ventilator days.

Conclusion: UEXs continued to occur despite the implementation of standardized taping. It was determined that lack of sedation and the absence of adequate number of personnel at bedside during procedures and care time contributed to UEXs. After the implementation of Sedation Guidelines and standardizing personnel at the bedside during procedures, we experienced additional decrease in the UEXs rate. Care time, procedures, and sedation are coordinated by nursing and respiratory therapy Qshift. We continue to evaluate and track UEXs as part of our ongoing quality initiatives.
Abstract ID: 24987

SERUM EOSINOPHILIA IS ASSOCIATED WITH UNFAVORABLE OUTCOMES IN HOSPITALIZED CHILDREN WITH BRONCHIOLITIS

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Purpose: To identify patient characteristics associated with prolonged hospitalization in a large cohort of children diagnosed with bronchiolitis.

Methods: With IRB approval, data for inpatient admissions between 2010 and 2013 for bronchiolitis were extracted from the electronic health record of our hospital using Population Explorer (Exploryx, Cleveland, OH). Variables included date and time of hospital admission/discharge, birth year, race, gender, medications prescribed during hospitalization, inpatient laboratory results and associated diagnoses. Only initial admissions with bronchiolitis occurring during their birth year or the subsequent year were included. Prolonged hospitalization (PH) was defined as ≥72 hours. Eosinophilia was defined as ≥300 serum eosinophils per microliter or ≥3% of all white blood cells on a complete blood count (CBC) with differential during the first week of hospitalization. Children were divided into those without CBC data in the first week (CBC-none), CBC-diff data with eosinophilia (EOS-positive) and CBC-diff data entirely without eosinophilia (EOS-negative). Variables associated with PH were identified using logistic regression analyses. Data shown as adjusted OR (95% CI).

Results: Median duration of bronchiolitis hospitalization among 1356 children less than 2 years old (59.3% male, 44.5% Caucasian, 46.7% African-American) was 59.0 hours. Most children (57.2%) had a positive RSV test at our facility and 11.1% were born prematurely. PH occurred in 515 (38.0%) children, including all 53 cases requiring mechanical ventilation (MV). MV was used in 24.2% of EOS-positive children (22 of 91 children), 7.2% of EOS-negative children (25 of 348 children) and 0.7% of CBC-none children (6 of 917) (p < 0.001 by chi squared). PH occurred in 67.0% of EOS-positive children, 54.9% of EOS-negative children and 28.7% of CBC-negative children (p < 0.001). In multivariable analysis, EOS-positive was independently associated with PH (1.88 [1.22-3.17], p = 0.02 vs. EOS-negative). Other variables independently associated with PH were RSV infection (n = 980) (2.76 [2.04-3.73], p < 0.01), apnea (n = 20) (7.88 [2.37-26.22], p < 0.01), congenital heart disease (n = 128) (3.11 [2.02-4.77], p < 0.01) and bronchodilator prescription (n = 554) (1.58 [1.15-2.16], p = 0.04). Compared to no corticosteroid prescription (n = 1067), intravenous corticosteroid prescription was associated with PH (n = 78) (3.36 [1.90-5.91], p<0.01) but enteral corticosteroid prescription was not (n = 211) (0.92 [0.60-1.40).

Conclusion: Serum eosinophilia is associated with prolonged hospitalization and mechanical ventilation in a large cohort of children with bronchiolitis. To our knowledge, this is the first report of eosinophilia as a risk factor for an unfavorable course of bronchiolitis. Further study is needed to confirm these findings and investigate their clinical utility.

Abstract ID: 25241

ONDANSETRON DOES NOT CHANGE QTC INTERVAL IN THE PATIENTS CARED FOR IN A PEDIATRIC INTENSIVE CARE UNIT

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Purpose: In 2011, the US FDA issued a drug safety communication citing the risk of development of prolonged QT interval with administration of ondansetron, which places the patient at risk for Torsade de Pointes (TdP). In addition the American Heart Association recommends monitoring of QT interval in presence of risk factors, such as electrolyte abnormalities and exposure to other medications, which can potentially cause prolongation of QT interval. This study aimed to describe the effect of ondansetron on the QTc interval in patients on the pediatric intensive care unit (PICU).

Methods: This is a retrospective cohort study, conducted on patients less than 18-years old, admitted over a 6-month period in a single-center, tertiary level, medical/surgical PICU. Patients with atrial arrhythmia, bundle-branch block and long QT syndrome were excluded from the study. QTc interval data was acquired in real time from the bedside monitor and recorded before the administration of ondansetron and every 15 minutes after administration for 2 hours. Paired sample t-test was performed for comparison of observations before and after administration of ondansetron.

Results: A total of 104 patients received ondansetron from July 1 to Dec 31, 2013, of which 78 patients (36 male, 42 female, mean age 10.6 ± 4.8 years) met the inclusion criteria, receiving a total of 158 doses of ondansetron. Fifty-seven (70%) patients were admitted for surgical interventions, 30 (38.4%) patients received multiple doses of ondansetron, 37 (47.4%) patients also
received other QT prolonging drugs and 11 (14%) patients had liver and/or kidney dysfunction. The mean dose of ondansetron was 0.09 ± 0.03 mg/kg. The mean baseline QTc interval was 442 ± 32ms. A total of 54 doses (34%) of ondansetron were given during presence of electrolyte abnormalities.

There was no statistically significant QTc difference with concomitant QT prolonging drugs. A statistically significant difference was detected only at 90 minutes following ondansetron administration in all patients 4.9ms (95%CI 9.9-0.13, p-value <0.05), and patients receiving multiple doses of ondansetron 5.7ms (95%CI 11.4-0.1, p-value <0.05). Patients with concomitant electrolyte abnormalities had statistically significant QTc prolongation at 15 minutes 12.5ms (95%CI 22.9-2.0, p-value <0.05) and 90 minutes 12.2ms (95%CI 19.6-4.7, p-value <0.05). However, all detected changes did not reach clinical significance (>20 ms). No patient developed TdP.

Conclusion: Ondansetron, when administered in medical/surgical PICU patients, does not have a clinically significant increase in QTc interval, including patients with electrolyte abnormalities, concomitant administration of other QT prolonging drugs, and administration of multiple doses. Ondansetron appears to be safe for use in critically ill pediatric patients.

Abstract ID: 25515

MICROBIOLOGY AND RISK FACTORS FOR VENTILATOR ASSOCIATED PNEUMONIA IN PEDIATRIC TRAUMATIC BRAIN INJURY

Mitchell T. Hamele, MD, Susan L. Bratton, MD, MPH, Meghan Woolley, BS, Tellen D. Bennett, MD, MS and Ryan R. Metzger, PhD, University of Utah School of Medicine, Salt Lake City, UT

Purpose: Ventilator associated pneumonia (VAP) commonly complicates care of pediatric head injured patients treated with mechanical ventilation. Development of VAP is associated with increased length of stay and increased rates of death. Although prophylactic antibiotic administration is recommended for adult patients with severe traumatic brain injury (TBI) antimicrobial prophylaxis is not endorsed for children. We describe the microbiology and risk factors for VAP in pediatric patients with moderate to severe TBI.

Methods: This is a single-center retrospective cohort study from a level I pediatric trauma center of children ages 0-18 with moderate to severe TBI (GCS ≤12) treated from 2009 through 2012. Additional inclusion criteria included need for mechanical ventilation > 2 day and absence of penetrating head injury. VAP was diagnosed with microbiologic testing in the presence of clinical symptoms. Cultures were assessed using CDC criteria. Demographic and clinical data regarding injury as well as outcomes were compared for patients with VAP to those without by calculating Relative Risk Ratios (RR) with 95% confidence intervals (CI) or comparing median values.

Results: Of the 121 eligible subjects, 46 (38%) had VAP and grew 61 different isolates 44 using protected brush specimens. Methacillin sensitive Staph aureus (34%), Haemophilus influenza (21%), and Streptococcus pneumonia (16%) comprised 44 of the 61 isolates. Only 3 (5%) identified gram stain negative enteric bacteria with 2 (3%) MRSA.

Patients who developed VAP were significantly older (median 9 [IQR 6, 13] vs. 6 [IQR 1.3, 13 years). They did not differ by gender or initial severity of illness measures (ISS, AIS sub scores, or Glasgow Coma Scale). Children with non-accidental trauma (NAT) had lower VAP risk than children injured by trauma involving motors (RR 2.9: 95% CI: (1.0-8.6)) and significantly lower risk than injuries from non-motorized traumatic events (RR 3.3 95% CI : (1.1-9.7)). Neither intubation site, nor cardiac arrest prior to arrival at the trauma center were associated with VAP.

Patients with intracranial pressure monitors had significantly increased risk of VAP (RR 11.0; 95% CI: (3.9-31.0)); however, other cranial surgery was not associated with VAP. Surviving patients with VAP had significantly longer medians day of mechanical ventilation (4.0 vs 2.5 days) ICU LOS (12.0 vs 2.4 days) and hospital LOS (21 vs 13 days).

A trend for lower VAP risk among patients who died (RR 0.4 (95% CI: 0.2-1.0)) was noted, perhaps because those who died had significantly shorter duration of ventilation (3.2 vs 7.6 days). Those discharged to rehabilitation or to nursing homes/hospice had a 2 fold increased rate of VAP compared to children discharged directly home.

Conclusion: VAP was common among ventilated patients with TBI who had ICP measured as well as those who survived with greater disabilities. Those with VAP were unlikely to have resistant organisms.
**Abstract ID: 25734**

**PEDiatric SEPTIC SHOCK: DO attitudes AND KnowLEDGE CORRELATE WITH PERFORMANCE?**

Mark Dugan, MD,1 Courtney E. McCracken, MS, PhD1 and Kiran Hebbar, MD2, (1)Emory University School of Medicine, ATLANTA, GA, (2)Pediatric Critical Care, Emory University School of Medicine, Atlanta, GA

**Purpose:** Various studies have been conducted using high fidelity simulation to gauge performance and provide feedback for learners throughout their medical education. This study seeks to elucidate a correlation between a learner’s attitudes and knowledge regarding the diagnosis and management of pediatric septic shock (PSS), and a learner’s performance during a simulation of PSS.

**Methods:** A multi-rater assessment checklist was designed and validated, in conjunction with internationally accepted guidelines and algorithms for the diagnosis and management of PSS. Pediatric residents participated in simulated crises of PSS after answering questions related to their confidence regarding the diagnosis and management of PSS, attitudes towards simulation education, and their own knowledge of PSS (using a quiz). Objective technical simulation performance was measured on an array of 27 items relating to monitoring, data gathering, and interventions in the diagnosis and management of PSS. Technical performance was graded on a 0-1 scale (credit/no credit). A post-simulation knowledge quiz and a follow-up survey were administered immediately following the simulation. Descriptive variables were analyzed using paired t-test, and measures of correlation were quantified using Spearman’s rank correlation coefficient with an associated 95% confidence interval (CI).

**Results:** 20 PGY-3 pediatric residents and 18 PGY-2 pediatric residents participated in the study. At the time of the simulation the PGY-3 residents had completed 2 months of pediatric critical care, while the PGY-2 residents had completed one month. There were no statistical differences between resident class demographics, including age, sex and simulation experience. The PGY-3 residents had higher median performance scores during the simulation (79% vs. 66%; p = 0.033). Irrespective of PGY year, resident knowledge scores were similar before and after the simulation. No correlation between resident attitudes about the diagnosis and management of pediatric septic shock and objective performance was noted (r = 0.15, p = 0.366). Additionally, resident knowledge scores about the diagnosis and management of pediatric septic shock was not correlated with objective performance (r = 0.28, p = 0.092). Residents with lower quiz and objective performance scores felt strongly they had forgotten prior PALS training (r = -0.43, 95% CI: [-0.65 – -0.12]), p = 0.007). Simulation training for PSS management significantly improved resident knowledge and overall confidence about managing septic shock (p < 0.001).

**Conclusion:** A single simulation training session significantly improved resident knowledge and overall confidence about managing PSS. However, no correlation was observed between resident attitudes about the diagnosis and management of PSS, resident knowledge scores and objective simulation performance. Ascertaining resident attitudes regarding the management of PSS did not translate to objective performance.
WHY THE NEED FOR SPEED? ALL-TERRAIN VEHICLES, SPEED AND BRAIN INJURIES

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Purpose: All-terrain vehicle (ATV)-related deaths and injuries are a growing public health concern, particularly in rural and suburban communities. Since 2001, children 15 years and younger have accounted for nearly 30% of all injuries and one-quarter of all deaths from ATV-related crashes in the U.S. Head trauma is the leading cause of death and serious injury from ATV crashes. The objective of this study was to better understand the relationship between speed and ATV crash-related brain injuries.

Methods: A retrospective chart review was performed of ATV-related injuries from 2002-2013 at a university hospital. Descriptive and comparative analyses were performed.

Results: Preliminary data identified 345 cases from 2002-2009; 79% were male and 32% were children <16 years of age. Rollovers (42%) were most common, followed by striking an object (20%) and ejection/fall (13%). Collisions with another ATV occurred in 7% of patients. Victims were struck by the ATV in 21% and pinned by the vehicle in 9% of cases. Higher speeds were associated with a trend towards lower patient Glasgow Coma Scale (GCS) scores and higher head injury scores. Maximum Head Scores between those driving <16 mph were significantly less than those driving 26-40 mph (p=0.05) or >40 mph (p=0.02). Only about 20% of victims overall were wearing a helmet. Younger riders (<16 years old) were more likely to be helmeted than those older (p=0.03). Competitive ATV racers, although helmeted, had lower GCS scores than all other victims. Helmeted racers had more severe head injuries than non-racing helmeted victims (p=0.02). Non-racers without helmets had lower GCS scores than their helmeted peers (p=0.01). Analysis of all cases through 2013 will be performed prior to the AAP national meeting.

Conclusion: The increasing speeds of today’s ATVs are likely contributing to more serious injuries, including more severe head injuries. Although helmets are protective, there may be ATV crash speeds or mechanisms of brain injury at higher speeds that reduce helmet effectiveness. All ATVs should have a code-protected, tamper-proof speed governor. This would particularly assist parents and employers in protecting youth and employees from the serious risks associated with high operating speeds.

ASSESSMENT OF ACTUAL PEDIATRIC ORGAN DONATION POTENTIAL: NEUROLOGIC AND CIRCULATORY DETERMINATION OF DEATH

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Purpose: Organ donation after circulatory determination of death (DCDD) is increasing. Although neurological death (DNDD) is the largest group of deceased donors, DCDD offers potential for additional abdominal organ donation. We evaluated all dying patients in our hospital to estimate the entire organ donation potential from a children’s hospital.

Methods: Data were obtained from Primary Children’s Hospital and Intermountain Donor Services records for all patients dying in an intensive care unit (ICU) during 2011 and 2012. The organ procurement organization (OPO) guidelines were used to determine potential eligible donors. Data are reported as counts, medians, and interquartile ranges (IQR); SPSS and Excel were used for analysis.

Results: There were 224 deaths; neonatal ICU N=82, pediatric ICU N=119, and cardiac ICU N=23. Neurologic death occurred in 23, 47 died despite ongoing care, and 154 had planned withdrawal of mechanical support.

18 of 23 (78%) donated after neurologic death. The median days in the ICU among these patients was 1 day (IQR 1, 2).
Among those with care withdrawn (n=154), 15 (10%) were not referred to the OPO; 21 (14%) were referred after death. The OPO prospectively ruled out 73 for donation in the remaining 118 dying children: 2 unstable, 38 infected, 7 malignancy, 6 genetic disease, 8 severe organ dysfunction, and 12 no potential recipient: small size organ.

Of 45 dying children judged eligible for DCDD, 33 families (73%) declined while 12 (27%) authorized donation. DCDD consented patients (n=12) came from all ICUs: 3 (25%) neonatal ICU, 8 (67%) pediatric ICU, and 1 (8%) cardiac ICU, and all died within 1 hour after withdrawal. The median days in the ICU among these patients were 3 days (IQR 2, 5). 33 families declined DCDD: 6 (18%) neonatal ICU, 24 (73%) pediatric ICU, and 3 (9%) cardiac ICU. 24 (76%) died within an hour. The median days in the ICU among these patients were 2 days (IQR 1, 13).

Among the 36 not reported to the OPO before death, 22 died in ≤ 1 month. 25 (67%) died within an hour. The median days in the ICU among these patients were 5 days (IQR 1, 11).

Organs donated included: en bloc kidneys (n=10): 7 DCDD, 3 DNDD, kidneys (n=35): 9 DCDD, 26 DNDD, livers (n=15): 2 DCDD, 13 DNDD, hearts (n=10), lungs (n=1), and small bowels (n=3) solely DNDD.

Conclusion: DCDD increased pediatric organ donors by 66% and donated organs by 32%. Barriers to DCDD included missed referrals, inability to place small organs and family declination of donation. DCDD can increase pediatric organ donation, but small patient organ size and inability to accurately predict death in an hour may limit acceptability to both parents and care providers.

Abstract ID: 26219

COMPARING THE NEW CDC CRITERIA FOR “VENTILATOR-ASSOCIATED CONDITION” TO A CLINICAL DIAGNOSIS OF VENTILATOR-ASSOCIATED PNEUMONIA IN PEDIATRIC TRAUMATIC BRAIN INJURY

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Purpose: Diagnosis of pediatric ventilator-associated pneumonia (VAP) is not standardized. Use of hospital VAP rates as a quality metric is, therefore, challenging. The Center for Disease Control (CDC) recently endorsed a new screening tool for VAP, not validated in pediatrics. The algorithm emphasizes changes in oxygenation (positive end-expiratory pressure [PEEP] and fraction of inspired oxygen [FiO2]) to identify “ventilator-associated condition (VAC)”, the first of four successive diagnoses. We compared the incidence of VAC to a diagnosis of VAP in pediatric traumatic brain injury (TBI) patients.

Methods: This is a single-center retrospective cohort study from a level I pediatric trauma center of children age 0-18, ventilated for ≥2 hospital days, with moderate to severe TBI (GCS ≤12) treated from 2009-2012. Daily charting was assessed for changes in PEEP and FiO2. Clinical VAP was defined as protected bronchial brushing (PB), tracheal aspirate (TA) or bronchoalveolar lavage (BAL) meeting CDC threshold values for infection in patients with symptoms of pneumonia. Descriptive statistics are presented as counts and medians with interquartile range (IQR), and diagnostic performance of VAC vs. clinical VAP was evaluated using sensitivity, specificity, positive and negative predictive values, and likelihood ratios (LR).

Results: 121 TBI patients were included: 80% had severe TBI, 72% were male, 17% had non-accidental trauma, 10% had cardiopulmonary arrest before admission and median age was 8 years (IQR 2, 13). Site of intubation varied with 25% at the scene, 64% at a referring hospital and 7% in our ED. 60% had an ICP monitor, 26% had neurosurgery and 18% died.

Thirty-eight percent had VAP while 17% had VAC. VAC was 35% sensitive (95% CI: 21-50%) and 95% specific (95% CI: 87-99%); positive and negative predictive values were 80% (95% CI: 56-94%) and 70% (95% CI: 60-79%); and positive and negative LR were 6.54 (95% CI: 2.32-18.31) and 0.69 (95% CI: 0.55-0.86) compared to VAP. Sensitivity of VAC was similar when evaluated comparing patients stratified by age.

Among patients with VAP, 16 were VAC+ and 30 VAC-. There was no significant difference in demographics, course of illness or length of stay (LOS) between VAC+ and VAC-. Four patients had VAP without VAC. They appeared clinically different to VAP (±VAC) and VAC-VAP- cases. 100% had severe TBI (vs. 83% and 78%), median chest AIS=2(0.3) [vs 0(0.3); 1(0.3)], median ISS=32(26,65) [vs. 30(25,42); 27(21,34)]. Duration of ventilation was 12 d. (7.47) [vs. 9(7.12); 4(3.6)] and ICU LOS was 15 d. (10.22) [vs. 12(8.14) and 5(3.7)]. No comparisons were significant.
**Conclusion:** VAC criteria demonstrate poor sensitivity for clinical VAP in a high-risk pediatric group, suggesting that the current VAC definition is an inappropriate screening tool for VAP. VAC+ without VAP comprised a unique patient subset with severe injuries, specifically to the chest.

*Abstract ID: 26492*

**DEFINING HEAD-TILT POSITION OF RESUSCITATION**

Malvi Kulin Hemani1, Meehir Shah2, Barbara Kim1, Brian Gu1, Angelo Cruz1, Taylor Lam1, Elli Tian1, Priya Arunachalam1, Alisa Brown1, Christine Yu1, Josh Punnoose1, Steven Chen1, Grant Kitchen1, Karina Munoz1, Christopher Petrillo1, Thangamadhan Bosemani, MD2, Thierry A. Huisman, MD3 and Utpal S. Bhalala, MD4, (1)Johns Hopkins University, Baltimore, MD, (2)The College of New Jersey, Ewing, NJ, (3)Pediatric Radiology, Johns Hopkins, Baltimore, MD, (4)Johns Hopkins Hospital, Baltimore, MD

**Purpose:** In unconscious, sedated and sleeping children, there is a tendency for airway obstruction due to relaxation of airway tone and glossoptosis. Head-tilt/sniffing position and chin-lift maneuvers are well-described airway maneuvers, which assist with achieving and maintaining airway patency during resuscitation. The relationship between degree/angle of head-tilt and airway patency has not been defined.

**Methods:** We performed a retrospective study of MRI of head and neck region of neonates and infants to define the degree/angle of head-tilt for airway patency. We included all the neonates and infants who underwent MRI of head and neck at Johns Hopkins Hospital from January 1984 to December 2013. We excluded those who had an artificial airway or a distorted airway from a malformation on MRI. On sagittal and axial MRI images, we assessed airway for patency and measured antero-posterior and lateral airway diameters at the level of palate and dorsum of tongue. We defined head-tilt angle as the angle between occipito-ophisthion line and ophisthion-C7 spinous process line in sagittal view of MRI. We evaluated medical records for underlying medical condition and exposure to sedation during MRI. We performed univariate analysis using distribution of each variable with its central tendency as well as a comparison of variables using student t-test with p<0.05 as significant value.

**Results:** A total of 831 children between 0-12 months of age underwent MRI of head and neck at Johns Hopkins Hospital between January 1984 and December 2013. Of these, 748 subjects were excluded due to either an artificial airway or a distorted airway from malformation. So, a total of 83 children (66 neonates and 17 infants) were included for measurements and analysis. Of these 83 children, 29 had evidence of airway obstruction and 54 had open airway on MRI. Of those with open airway, 43 had evidence of central nervous system depression due to exposure to sedative or underlying disease. The airway diameters (mean ± SD) in spontaneously breathing, sedated children with open airway were 5.9 ± 2.0 mm (AP at palate), 7.4 ± 2.9 mm (AP at dorsum of tongue) and 6.3 mm ± 1.6 (lateral). The mean head-tilt angle (121.90 ± 11.18) associated with open airway in spontaneously breathing, sedated children was significantly different from mean angle of a blocked airway in both flexion (136.88 ± 7.32) and hyper-extended (101.73 ± 8.31) positions (p=0.024143). No correlation was determined between mean head-tilt angle and either gestational age or weight of the child.

**Conclusion:** A specific degree or angle of head-tilt is associated with airway patency during resuscitation. The mean head-tilt angle (between occiput-ophisthion-cervical spine) of 121.90 ± 11.18 is associated with a patent airway in spontaneously breathing, sedated children between the ages of 0-12 months.
POSTER PRESENTATIONS

Sunday, October 12, 2014 – 9:30 AM-11:00 AM

GROUP III

Abstract ID: 26545

ALTERED VENTRICULAR REPOLARIZATION FOLLOWING STATUS EPILEPTICUS

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Purpose: Status epilepticus (SE) is a common neurological condition in children and is associated with profound cardiovascular changes. In addition to tachycardia commonly associated with SE, QRS axis deviation and ST segment/T wave changes are observed in adults suggesting that SE can affect ventricular repolarization. However, whether SE has same effects in children and whether prior seizures (epilepsy) exacerbate cardiac changes following SE remains unknown. We hypothesize that altered ventricular repolarization occurs following SE and the effects are more pronounced in epileptic children compared to children with new onset seizure.

Methods: We conducted a retrospective study of patients admitted to the pediatric intensive care unit (PICU) with the primary diagnosis of SE between 2/1/2011 and 2/28/2013. 12-lead EKG were included in the analysis if: 1) obtained within 24h of PICU admission; 2) not on cardiac medications; 3) no history of heart disease; 4) no history of ion channel defects or known family history of ion channel defects. Patients were categorized into new onset seizure and epilepsy. Standard EKG parameters were obtained, as well as other abnormalities noted by the official report. Age-matched controls meeting the same inclusion criteria were similarly analyzed.

Results: OF 442 patients admitted with the primary diagnosis of SE, 67 EKG (30 new onset, 37 epilepsy) were included and compared with 29 control EKG. More ST changes (control, new onset, epilepsy: 14%, 37%, 49%, p<0.05) and QRS axis deviation (control, new onset, epilepsy: 7%, 20%, 19%, p<0.05) were seen in the SE groups. The T wave axis of the SE groups also differed from the controls (control, new onset, epilepsy: 58±6o, 39±5o, 41±3o, mean±SEM, p<0.01).

Conclusion: Our findings suggest that altered ventricular repolarization occurs following SE as reflected in more frequent early repolarization (ST changes) and altered vectors of electrical impulse propagation (QRS axis deviation and T wave axis changes). Children with new onset seizure and epileptic children exhibit comparable EKG findings suggesting that prior seizures do not exacerbate cardiac changes following SE. Studies are ongoing to examine whether the observed EKG changes persist over time.

Abstract ID: 26743

THE NEW CDC’S DEFINITIONS FOR COMPLICATIONS OF MECHANICAL VENTILATION SHIFT THE FOCUS OF QUALITY SURVEILLANCE AND PREDICT CLINICAL OUTCOMES IN A PEDIATRIC INTENSIVE CARE UNIT

Siriporn Phongjitsiri, MD, Satid Thanmasitboon, MD, MHPE, Jorge A Cossbu, MD, Curtis E Kennedy, MD, PhD, Jaime Silva, MD and Jeanine Graf, MD, Baylor College of Medicine, Houston, TX

Purpose: The CDC’s proposed an alternate surveillance paradigm for patients receiving mechanical ventilation, moving from the current standard of ventilator-associated pneumonia to broader complications in general. These new surveillance definitions were designed to enable objective measures and efficient processes, so as to facilitate quality improvement initiatives, improve patient care and enhance standardized benchmark comparisons. We evaluated the new CDC’s surveillance definitions for
complications of mechanical ventilation in terms of its objectivity, ease of electronic surveillance and clinical predictability in a pediatric intensive care unit

Methods: We retrospectively applied the definition of a ventilator-associated condition (VAC), defined as a sustained increase in ventilator setting after a period of stable or decreasing support, to our locally developed "invigilence" clinical decision support database to identify eligible patients over 1 year period. All VAC cases were then assessed for infection-related ventilator-associated complication (IVAC), probable and possible pneumonia. A subset of patients with VAC were reviewed to determine possible etiologies. We compared ventilator, ICU and hospital days and hospital mortality of all groups.

Results: The operational definition of VAC allowed an automated screening of a large database (606 patients, 3,787 ventilator days) in a single query. A reviewer then spent only 20 cumulative hours (average 5 min/record) completing surveillance and reported incidence of VAC and IVAC subcategories. Of total 606 patients, 14.5% had VAC (20.9/1,000 ventilator days), and 8.1% had IVAC (12.9/1,000 ventilator days). The remainders were patients with VAC from various etiologies (e.g. atelectasis, pulmonary edema, shock, etc.). The patients with IVAC were classified into probable pneumonia (55%, 7.1/1,000 ventilator days), possible pneumonia (28.6%, 3.7/1,000 ventilator days) and undetermined infection (16.3%, 2.1/1,000 ventilator days). Patients who developed VAC had significantly more ventilator, ICU and hospital days and increased mortality than non-VAC group. Multivariate logistic regression identified VAC as one of the independent predictors of hospital mortality (OR 3.13, 95%CI: 1.63, 6.15). Independent risk factors for VAC included chronic respiratory disease, immunocompromised status and tracheostomy-dependence. There were no differences in mortality rates within VAC subgroups (i.e., VAC with or without infection).

<table>
<thead>
<tr>
<th>Outcome</th>
<th>VAC</th>
<th>Non-VAC</th>
<th>P-value*</th>
<th>RR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU days (median, IQR)</td>
<td>27(14.50)</td>
<td>6 (4.1)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Hospital days (median, IQR)</td>
<td>42(24.72)</td>
<td>13 (8, 24)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Ventilator days (median, IQR)</td>
<td>23(11.40)</td>
<td>5 (3, 8)</td>
<td>&lt;0.0001</td>
<td></td>
</tr>
<tr>
<td>Prolonged ventilator day ( 7 days), n (%)</td>
<td>81(92)</td>
<td>176 (34)</td>
<td>&lt;0.0001</td>
<td>2.71 (2.37, 3.10)</td>
</tr>
<tr>
<td>30-day mortality, n (%)</td>
<td>12 (13.6)</td>
<td>35 (6.8)</td>
<td>0.032</td>
<td>2.02 (1.09, 3.73)</td>
</tr>
<tr>
<td>Hospital mortality, n (%)</td>
<td>17 (19.3)</td>
<td>36 (6.9)</td>
<td>0.0007</td>
<td>2.78 (1.64, 4.72)</td>
</tr>
</tbody>
</table>

*Chi-square test

Conclusions: The proposed definitions for VAC and other associated complications are highly objective, amenable to automated surveillance and good predictors of outcomes. Rather than focusing only on ventilator-associated pneumonia, quality improvement initiatives should focus on broader complications in general.

Abstract ID: 26828

**HYPONATREMIA AND SEVERELY HYPTONIC INTRAVENOUS FLUID ARE ASSOCIATED WITH UNFAVORABLE OUTCOMES DURING BRONCHIOLITIS ADMISSION**

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Purpose: To analyze the associations between hyponatremia, maintenance intravenous fluid (mIVF) composition and outcome in a large cohort of children hospitalized with bronchiolitis.

Methods: With IRB approval, data for our hospital's bronchiolitis admissions 2010-2013 were extracted using Population Explorer (Explorys, Cleveland, OH). Variables included birth year, hospital length of stay (LOS), mIVF prescription and serum sodium measurements. Initial admissions during the child’s birth year or the subsequent two years were included. Use of severely hypotonic mIVF (SHIVF) for a given day was defined as any prescription of mIVF with < 70 mEq/L of sodium on that day. Use of relatively isotonic mIVF (RIIVF) was defined as prescription of mIVF exclusively with > 70 mEq/L of sodium on a
given day. IVF boluses prescription was not considered. Hyponatremia (HypoNa) was defined as any sodium level ≤135 mEq/L on a given day. Normonatremia (NormoNa) was defined as any sodium measurement, not ≤135 mEq/L on a given day. Median LOS (in hours) was compared with Wilcoxon rank sum. Categorical variables were compared with Fischer’s exact test or chi squared. A p-value of <0.05 defined statistical significance.

Results: Median LOS among 1557 children with bronchiolitis was 60.3 (40.4 – 95.6) hours. Most children were male (58.6%), 45.0% were white, 46.3% were black and 57.7% had RSV infection. mIVF were prescribed to 48.2% of children and SHIVF were prescribed on ≥1 day in 46.3% of these children (n = 348). Serum sodium levels were available in 33.5% of children, 25.7% of whom had ≥1 day with hypoNa (n = 134). Data is statistically significant with p<0.05. Increased LOS was associated with HypoNa (vs. NormoNa) on Day 1 (136.3 vs. 73.8), Day 2 (385.9 vs. 94.4), Day 3 (435.3 vs. 176.3) and Day 4 (422.2 vs. 314.5) and with SHIVF (vs. RIIVF) on Day 1 (85.3 vs. 64.7), Day 2 (88.6 vs. 68.8), Day 3 (108.7 vs. 85.4) and Day 4 (136.3 vs. 110.7). Prescription of SHIVF on Day 1 was associated with HypoNa on Day 2.

Mechanical ventilation (MV) with (n=59) was significantly associated with HypoNa vs. NormoNa on Day 1 (26.1% vs. 6.3%), Day 2 (58.5% vs. 14.5%), Day 3 (80.0% vs. 29.3%), Day 4 (76.7% vs. 44.7%), Day 5 (83.3% vs. 55.3%), Day 6 (81.6% vs. 55.6%) and Day 7 (85.7% vs. 50.0%). MV was associated with SHIVF prescription on days 2 and 3.

Conclusion: Hyponatremia and severely hypotonic IVF prescription (i.e. “quarter normal” saline) were significantly associated with unfavorable outcome in this large cohort of children hospitalized with bronchiolitis. If these findings are confirmed in our multivariate models, prospective trials of sodium and fluid management in bronchiolitis would be warranted. Pending more data, avoiding routine use of SHIVF should be considered.

Abstract ID: 26928

APPROPRIATENESS OF DISPOSITION FOLLOWING TELEMEDICINE CONSULTATIONS TO RURAL EMERGENCY DEPARTMENTS

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Purpose: To compare the appropriateness of hospital admission between a cohort of acutely ill and injured children who receive pediatric critical care telemedicine consultations and a cohort of similar children who receive pediatric critical care telephone consultations.

Methods: We conducted a retrospective chart review of acutely ill and injured children who received either a telemedicine or telephone consultation in eight rural EDs between January, 2003 and May, 2012. We compared the overall and stratified observed to expected hospital admission ratios (O/E admission ratios) between telemedicine and telephone cohorts by calculating the risk of admission using the Pediatric Risk of Admission (PRISA II) and the Revised Pediatric Emergency Assessment Tool (RePEAT).

Main Results: A total of 138 charts were reviewed; 74 received telemedicine and 64 received telephone consultations. Patients in the telemedicine cohort were less likely to be admitted to the hospital than patients in the telephone cohort (59.5% versus 87.5%; p<0.05). Patients in the telemedicine cohort also experienced a non-significant trend towards lower and more favorable overall O/E admission ratios compared with patients in the telephone cohort (PRISA II: 2.36 versus 2.58; RePEAT: 2.34 versus 2.57). When the cohorts were stratified based on low and high risk of admission, telemedicine consultations were again associated with a non-significant trend towards lower and more favorable O/E admission ratios for both PRISA II (low risk: 18.22 versus 22.83; high risk: 1.40 versus 1.54) and RePEAT (low risk: 5.35 versus 5.94; high risk: 1.51 versus 1.81).

Conclusions: Pediatric critical care telemedicine consultations were associated with lower rates of hospital admission and a trend towards more favorable O/E admission ratios. Telemedicine consultations to pediatric patients presenting to rural EDs may be a useful means of reducing inappropriate transfers and admissions.
Pediatric Severe Traumatic Brain Injury: Hypo or Hypercoagulable State?

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Purpose: Coagulopathy after severe traumatic brain injury (sTBI) occurs frequently and is independently associated with worse outcome. Reduced clot strength measured by TEG with platelet mapping (TEG-PM), has been associated with mortality in adults. No studies on the frequency and outcomes associated with clot strength abnormalities have been reported in children with sTBI.

Methods: We performed a prospective observational study in children <18 years of age admitted with sTBI (Glasgow coma scale (GCS) < 8) from June 2012 to January 2014. Data collected included; injury severity scale (ISS), standard coagulation tests (prothrombin time [PT], INR, activated partial thromboplastin time aPTT, platelet count. TEG-PM was measured daily for 5 days. Outcomes measured were mortality, length of ICU stay, and pediatric functional independence measure [WeeFIM scale]). We defined coagulopathy by standard coagulation tests as platelet count <100,000 per cumm, INR >1.2 or aPTT >36 seconds and by TEG-PM as reaction time (R) >12 minutes, K time >3 minutes or G <6. Data are described as median (interquartile range).

Results: We enrolled 16 children with sTBI with median age of 13.5 years (10.2-16.7). 75% were male and 37% of patients had isolated sTBI. Median admission GCS was 5 (3-6) and median ISS was 29 (17-41). Coagulopathy after sTBI based on standard coagulation parameters occurred in 62.5% patients in the first 24 hours after injury. However, only one of the patients had evidence of hypocoagulability on TEG-PM. Instead, 87.5% patients had evidence of hypercoagulability (R < 5 minutes). For simultaneously sampled INR and TEG samples, 58% of INR results > 1.2 also had a TEG R-time of < 5 min. Moderate platelet inhibition was found on day 1 with median platelet inhibition on adenosine diphosphate receptor of 54% (24-65%). TEG-PM parameters trended towards normal on serial evaluation over 5 days. One patient died, 50% patients had moderate (WeeFIM of 71 to 84) and 37.5% patients had good functional independence measure (WeeFIM of >85) at hospital discharge. There was no correlation between any measured coagulation parameter and outcomes measured.

Conclusion: In our preliminary data in children with sTBI, we found divergent results between standard coagulation tests and TEG-PM. Also, TEG-PM parameters suggest a mixed coagulopathic state with increased thrombin generation but moderate platelet inhibition. Larger prospective studies are needed to determine if standard coagulation tests or TEG-PM more accurately identify and classify coagulopathy in children with sTBI.