2018 Fellows Research Day

Tuesday May 22, 2018

Sponsored by:

UAMS Department of Pediatrics
Arkansas Children’s Hospital (ACH)
Arkansas Children’s Research Institute (ACRI)
Program Agenda & Session Abstracts

Cress Board Room

4th Floor, Office Building
Arkansas Children’s Hospital
Acknowledgements

The Office of Education wishes to thank the people and organizations whose time and generosity contributed to the success of the 2018 Fellows Research Day.

Department of Pediatrics
Frederick Barr, M.D., Chair
Steve Schexnayder, M.D., Vice Chair of Education

Office of Education
Beatrice Boateng, Ph.D.
Tamara Hargrove; Stephanie Veach; Danielle Dowthard, MBA

UAMS Graduate School
Robert E. McGehee Jr., Ph.D.
Dean, UAMS Graduate School
Director, Arkansas Biosciences Institute

Arkansas Children’s Hospital
Marcy Doderer, M.A., FACHE -- CEO
Jayant Deshpande, M.D., MPH Senior Vice President/Chief Medical Officer

Arkansas Children’s Research Institute
Greg Kearns, M.D., President
Barry Brady, Vice President

Program Host
Developmental - Behavioral Pediatrics

Reviewers, Judges and Moderators

| Ashley Antipolo, M.D. (Adolescent Medicine) | Sanjiv Pasala, M.D. (Critical Care) |
| Jaimie M. Flor, M.D. (Developmental - Behavioral Pediatrics) | Abdallah Dalabih, M.D. (Critical Care) |
| Maya Lopez, M.D. (Developmental - Behavioral Pediatrics) | Katherine Irby, M.D. (Critical Care) |
| Angela Scott, M.D. (Developmental - Behavioral Pediatrics) | Kimo Stine, M.D. (Hematology-Oncology) |
| Jill Fussell, M.D. (Developmental - Behavioral Pediatrics) | Michael Stroud, M.D. (Critical Care) |
| Tamara T. Bradford, M.D. (Cardiology) | Ashley Ross, M.D. (Neonatology) |
| Joshua Daily, M.D. (Cardiology) | Elizabeth Kim, M.D. (Neonatology) |
| Priya Bhaskar, M.D. (Cardiology) | Angela Chandler, M.D. (Neonatology) |
| Josh Daily, M.D. (Cardiology) | Wendy Ward, Ph.D. (Child Psychology) |
| Eudice Fontenot, M.D. (Cardiology) | Brandi Whitaker, PhD (Child Psychology) |

And, thank you to the nameless poster judges.
Fellowship Coordinators
Becky Hooks (Pediatric Anesthesiology)
Diana Hersberger (Neonatology)
Tanya Hogan (Infectious Diseases)
Stephanie Veach (Hematology-Oncology Emergency Medicine; Endocrine)
Tamara Hargrove (Cardiology, Pulmonary, Critical Care)
Gienda Aaron (Developmental - Behavioral Pediatrics)
Malinda Scott (Child Neurology)
Toni Sanders (Pediatric Otolaryngology)
T’Auna Brooks (Pediatric Psychology)
Fabian Lairry (Pediatric Radiology)

Fellowship Directors
Anita Akbar Ali, M.D. (Pediatric Anesthesiology)
Angela Chandler, M.D. (Neonatology)
Jose Romero, M.D. (Infectious Diseases)
Nicholas Hobart-Porter, D.O. (Emergency Medicine)
Amber Morse, M.D. (Emergency Medicine)
Michele Hutchison, M.D. (Endocrine)
Josh Daily, M.D. (Cardiology)
Eudice Fontenot, M.D. (Cardiology)
Punkaj Gupta, M.D. (Pediatric Cardiac Intensive Care Medicine)
Jill Fussell, M.D. (Developmental - Behavioral Pediatrics)
Sanjiv Pasala, M.D. (Critical Care)
Kimo C. Stine, M.D. (Hematology/Oncology)
Sam Smith, M.D. (Pediatric Surgery)
John Carroll, M.D. (Pulmonary)
Amit Agarwal, M.D. (Pulmonary)
Larry Hartzell, M.D. (Pediatric Otolaryngology)
Brandi N. Whitaker, Ph.D. (Child Psychology)
Mark C. Edwards, Ph.D. (Child Psychology)

And, a big thank you to all the members of the Scholarship Oversight Committees (SOC), research mentors and everyone that provided support and encouragement to our fellows.
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Message from the Chair of the Department of Pediatrics

This is my first Fellows Research Day as the chair of the department of pediatrics. It has been an honor and privilege to get to know more about the educational activities and accomplishments within our department. The tremendous work done by our fellowship program is reflected in the research shared in this program booklet.

I would be amiss if I didn’t mention some of the accomplishments of our programs. All our fellowship programs (and the pediatric residency program) have received full 10 year accreditation from the ACGME. I’d like to congratulate our program directors, program coordinators, and the faculty and staff who worked to make this a possibility.

Another notable accomplishment is the national recognition received by some of our subspecialties. The Neonatology, Pediatric Cardiology and Pediatric Pulmonology specialties at Arkansas Children’s Hospital received national recognition in the 2017 – 18 US News Best Children’s Hospitals rankings. This is a testament to the commitment you have to educating the next generation of subspecialty pediatricians.

As we celebrate the research accomplishments of our fellows, I am reminded of why we do what we do. We do it to improve the health and wellbeing of the children in Arkansas.

Thank you for your commitment and dedication to improving the lives of children.

Frederick (Rick) E. Barr, M.D. MBA
Chair of Pediatrics & Associate Dean for Child Health
In Memoriam – Richard “Tad” Fiser, MD

August 24, 1965 - July 25, 2017

Tad Fiser, MD was a professor in the Section of Critical Care Medicine and the program director for the Pediatrics Critical Care Fellowship Program. He was also a nationally recognized authority in extracorporeal membrane oxygenation (ECMO). He was well respected in the department and had mentored many trainees.

The UAMS College of Medicine honored Dr. Fiser with the Distinguished Faculty Service Award for his contributions as an educator, physician, scholar and leader in April 2017.

Thank you, Tad!!!!
Fellows’ Day Guest Researcher
Franklin Trimm, M.D.
Professor and Vice Chair of Pediatrics
Associate Dean for Diversity and Inclusion
University of South Alabama Children’s and Women’s Hospital
Immediate Past President of the Association of Pediatric Program Directors

Franklin Trimm, M.D. a Developmental-Behavioral Pediatrician, has been a medical educator focusing on GME for more than 30 years. He is currently serving as the Immediate Past President of the Association of Pediatric Program Directors (APPD) and chairs the American Board of Pediatrics Education and Training Committee.

Prior work with APPD includes leading a team that developed a leadership course for residency and fellowship program directors. He has been on the ACGME Pediatric RRC, serving as Vice-Chair. He has served on and chaired the American Academy of Pediatric Committee on Pediatric Education and the Society for Developmental and Behavioral Pediatrics Education Committee.

He has developed and presented multiple workshops that focus on resident and faculty development and GME program administration at a variety of regional and national meetings. He recently stepped down as the Pediatric residency program director at the University of South Alabama after 25 years. He is now serving as the Associate Dean of the College of Medicine and Assistant Vice-President of Medical Affairs for Diversity and Inclusion and that institution.
## MORNING SESSION - 8:30am to 10:00am

Cress Board Room

**Welcome:** Rick Barr, M.D. Chair- Department of Pediatrics

**Introduction of Guest:** Jill Fussell, M.D. – Developmental Pediatrics Program Director

Moderator: Angela Scott, M.D., PhD

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<th>Time</th>
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<tr>
<td>8:45am</td>
<td>Alberto Allegre, M.D.</td>
<td>Developmental - Behavioral Pediatrics</td>
<td>Does Neonatal Hyperbilirubinemia Negatively Affect Long Term Developmental and Behavioral Outcomes of Preterm Infants</td>
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<tr>
<td>9:00am</td>
<td>Dragon Do, M.D.</td>
<td>Hematology/Oncology</td>
<td>Effects of Disruption of piRNA Pathway in AML Cell Lines Treated with Demethylating Agents</td>
</tr>
<tr>
<td>9:15am</td>
<td>Joana Mack, M.D.</td>
<td>Hematology/Oncology</td>
<td>Effect of Sirolimus on Coagulopathy of Slow-Flow Vascular Malformations</td>
</tr>
<tr>
<td>9:30am</td>
<td>Jennifer Pham, M.D.</td>
<td>Critical Care</td>
<td>Unplanned Extubations in the PICU. What Role Does Breathing Tube Repositioning Play?</td>
</tr>
<tr>
<td>9:45am</td>
<td>Sonia Matehuala, M.D.</td>
<td>Critical Care</td>
<td>Red Blood Cell Distribution Width and PICU Outcomes</td>
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<tr>
<td>10:00am</td>
<td>Pushpa Shivaram, MBBS</td>
<td>Cardiology</td>
<td>Age-Related Changes in Indexed Inferior Vena Cava Dimensions among Syncopal Children and Adolescents</td>
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10:15 -10:30 break
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<tr>
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<tbody>
<tr>
<td>William Phillips, M.D.</td>
<td>Anesthesia</td>
<td>Assessment of Perioperative Hypothermia in NICU Surgical Patients: A Quality Improvement Initiative</td>
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<td>Olga Willett, M.D.</td>
<td>Anesthesia</td>
<td>Decreasing the Incidence of unplanned Admission Secondary to PONV: A Quality Improvement Project</td>
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<tr>
<td>Amy Huggins, M.D.</td>
<td>Anesthesia</td>
<td>Method to Determine Optimal Insertion Depth of Femoral Central Venous Catheters in Infants Undergoing Cardiac Surgery</td>
</tr>
<tr>
<td>Haley Fuller, M.D.</td>
<td>Anesthesia</td>
<td>The Effect of Hypothermia on Transfusion Requirement During and Immediately After Pediatric Craniofacial Surgery: A Retrospective Study</td>
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<tr>
<td>Amanda Marshall, M.D.</td>
<td>Critical Care</td>
<td>Prophylactic enoxaparin dosing in pediatric intensive care patients</td>
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<tr>
<td>Hannah Bauer, M.D.</td>
<td>Critical Care</td>
<td>Venoarterial Extracorporeal Membrane Oxygenation via Right Carotid Artery Utilizing a Gore-Tex Graft, Friend or Foe? A Case Series</td>
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<tr>
<td>J. Arden Conway, M.D.</td>
<td>Critical Care</td>
<td>Ketamine Use in Tracheal Intubation and Adverse Hemodynamic Events.</td>
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<tr>
<td>Kristen Long, M.D.</td>
<td>Critical Care</td>
<td>Apnea-Hypopnea Index (AHI) as an Indicator for Sedation Adverse Events</td>
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<tr>
<td>Saletha Smith, M.D.</td>
<td>Developmental - Behavioral Pediatrics</td>
<td>Regional Variations in the Prevalence and Early Identification of Autism Spectrum Disorder in Arkansas</td>
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<tr>
<td>Hannah Baer, M.D.</td>
<td>Emergency Medicine</td>
<td>Hemispheric RsSO2 Readings Enhance Diagnostic Seizure Reliability, Timeliness of Anticonvulsants, and Objective Response Measure in Epileptic and Intellectual Disability Patients: A Proof of Principle</td>
</tr>
<tr>
<td>Jessica Magruder, M.D.</td>
<td>Emergency Medicine</td>
<td>Vomiting Incidence with Pediatric Emergency Department Procedural Sedation</td>
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<tr>
<td>Alexa Bollinger, M.D.</td>
<td>Emergency Medicine</td>
<td>Hidden in Plain Sight: Screening for Suicidality in the Pediatric ED</td>
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<tr>
<td>April Clawson, M.D.</td>
<td>Emergency Medicine</td>
<td>The Value of Biomarkers in Evaluating Febrile Immunocompromised Pediatric patients in a Pediatric Emergency Department</td>
</tr>
<tr>
<td>Sarah Sylvester, M.D.</td>
<td>Emergency Medicine</td>
<td>Adverse effects of intravenous N-Acetylcysteine for acetaminophen toxicity in pediatric patients: A retrospective chart review</td>
</tr>
<tr>
<td>David Douglass, M.D.</td>
<td>Hematology/Oncology</td>
<td>Plasma Biomarkers in Anthracycline Cardiotoxicity</td>
</tr>
<tr>
<td>Ashley Lynch, M.D.</td>
<td>Neonatology-Perinatal Medicine</td>
<td>Comparison of Pressure Delivery in Non-Invasive Positive Pressure Ventilation Using RAM Cannula Versus Hudson Prongs</td>
</tr>
<tr>
<td>Jennifer Rumpel, M.D.</td>
<td>Neonatology-Perinatal Medicine</td>
<td>Early Diagnosis of Acute Kidney Injury Using Urinary Biomarkers and Renal Oximetry in Neonates with Hypoxic Ischemic Encepha lopathy</td>
</tr>
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<td>Laura Carr, M.D.</td>
<td>Neonatology-Perinatal Medicine</td>
<td>Postnatal Diet Impact on miRNA Expression</td>
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<tr>
<td>Sarada Alla, M.D.</td>
<td>Neonatology-Perinatal Medicine</td>
<td>Maternal indicators associated with shortened latency period with preterm prolonged rupture of membranes and short-term neonatal outcomes</td>
</tr>
<tr>
<td>Sarah Cobb, M.D.</td>
<td>Neurology</td>
<td>Effectiveness of Levetiracetam in Prevention of Early Post Traumatic Seizures in Children 0 – 17 years of Age</td>
</tr>
<tr>
<td>Suzanne Smart, M.D.</td>
<td>Otolaryngology</td>
<td>Association of Chiari Malformation and Dysphagia</td>
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# AFTERNOON SESSION - 1:15pm to 3:00pm

**Cress Board Room**

**Moderator:** Maya Lopez, MD

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<th>Time</th>
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<th>Presentation title</th>
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<td>1:15PM</td>
<td>Bianca Davenport, M.D.</td>
<td>Neonatology</td>
<td>Phenobarbital for Cholestasis in Parenteral Nutrition Associated Liver Disease</td>
</tr>
<tr>
<td>1:30PM</td>
<td>David Matlock, M.D.</td>
<td>Neonatology</td>
<td>Work of breathing in premature newborns during non-invasive ventilation</td>
</tr>
<tr>
<td>1:45PM</td>
<td>Katherine Kosiv, M.D.</td>
<td>Cardiology</td>
<td>End of life care in the ICU: Pediatric Fellows Perspectives</td>
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**Break 2:00 p.m. to 2:15 p.m.**

**Moderator:** Maya Lopez, MD

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<th>Time</th>
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<tr>
<td>2:15PM</td>
<td>Shane McKinney, M.D.</td>
<td>Emergency Medicine</td>
<td>Cerebral Oximetry in non-intubated pediatric isolated TBI patients receiving 3% HTS</td>
</tr>
<tr>
<td>2:30PM</td>
<td>Matthew Digman, M.D.</td>
<td>Emergency Medicine</td>
<td>Evaluation of Procalcitonin as a Negative Predictor of Serious and Invasive Bacterial Infections in Pediatrics</td>
</tr>
<tr>
<td>2:45PM</td>
<td>Sam Selby, D.O.</td>
<td>Emergency Medicine</td>
<td>Improving pediatric resident eFAST Comprehension and acquisition</td>
</tr>
<tr>
<td>3:00PM</td>
<td>Closing Remarks: Steve Schexnayder, M.D. - Vice Chair of Education</td>
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## Graduation and Awards Banquet

**Time:** 5:30pm  
**Venue:** EC 103 (EAST Campus)
Morning Session
Presentation Abstracts

2018 Fellows Research Day
DOES NEONATAL HYPERBILIRUBINEMIA NEGATIVELY AFFECT LONG TERM DEVELOPMENTAL AND BEHAVIORAL OUTCOMES OF PRETERM INFANTS
Alberto Allegre, M.D.

BACKGROUND AND OBJECTIVES: Bilirubin in the neonatal period has been a topic of study for a long time. Hyperbilirubinemia in the neonatal period has been associated with neuro-motor and auditory complications. There are not many studies looking at the effect of neonatal bilirubin levels on long-term outcomes of preterm infants. The objective of our study was to test the association of neonatal bilirubin levels with academic, cognitive, and/or behavioral outcomes from childhood into adulthood in a cohort of patients that were low weight and preterm at birth.

METHODS: The study design consisted of a secondary analysis of the Infant Health and Development Program data base; this set includes 985 preterm, low birth weight patients that were recruited from multiple sites to be enrolled in a randomized trial of intervention and long term monitoring of outcomes. The association between developmental and behavioral outcomes (IQ, achievement, and behavior ratings) at 3, 8, and 18 years and bilirubin levels in the neonatal period were analyzed using an analysis of covariance (ANCOVA) approach to adjust for other confounding variables such as demographics and other risk factors. We did a separate analysis using ANCOVA to compare outcomes between patients who received phototherapy treatment and those who did not after adjusting for the other confounding variables.

RESULTS: 834 infants were included in the final analysis after excluding patients with missing data and that met exclusion criteria.

No significant associations were found between bilirubin at birth and developmental outcomes at 3, 8, and 18 years of age after adjusting for confounding variables. None of the outcomes were significantly associated with phototherapy treatment after adjusting for other confounding variables as well.

CONCLUSIONS: Bilirubin levels in the neonatal period did not affect long-term developmental-behavioral outcomes in our cohort of preterm infants.
EFFECTS OF DISRUPTION OF piRNA PATHWAY IN AML CELL LINES TREATED WITH DEMETHYLATING AGENTS

Dragon C. Do, M.D.; Stephen Dalby, M.D.; Meghan McFadden; Supraja Prakash, MS; David Lee; Elisabeth Heuston, PhD; Jason E. Farrar, M.D.

BACKGROUND: Alterations in epigenetic patterning are a fundamental feature in acute myeloid leukemia (AML). Treatment with DNA methyltransferase inhibitors (DNMTi) yields responses in AML, but the molecular mechanisms underlying this effect are poorly understood. In prior work, we demonstrated induction of genes involved in the piRNA RNA (PIWI) silencing pathway as a common gene feature of 4 AML cell lines treated with decitabine. The PIWI pathway is an RNA silencing system, distinct from classical small RNA transcriptional silencing, responsible for transposon-silencing in gametogenesis; emerging data suggest a role for this system in somatic cells. Based on these data, we postulate that PIWI induction plays a crucial role in AML recovery following demethylation and that disruption of this pathway would modulate response and/or recovery from decitabine treatment. The goal of this study is to assess the effect contribution of the piRNA pathway response following DNMTi treatment in AML.

METHODS: To choose target genes in the piRNA pathway for disruption, Molm13 cells were first treated with escalating doses of decitabine. Using quantitative RT-PCR, the dose-dependent expression of several piRNA-associated genes were analyzed. Two genes, MAEL and PIWIL2, were selected for disruption experiments based on preliminary data suggesting decitabine dose-dependent responses. Molm13 cells were transduced with shRNA targeting these genes using a lentivirus delivery system with selection in puromycin. Knockdown efficiency was assessed by RT-qPCR. To determine how gene disruption affected cell growth, knockdown cells were treated with decitabine 20nM. Proliferation was assessed by CellTiter Glo assay following decitabine treatment. Clonogenic potential was assessed by colony forming assays of transduced cells after treatment with decitabine at 5nM and 10nM.

RESULTS: Following decitabine exposure in Molm13, there was a markedly increased expression of MAEL and PIWIL2 compared to untreated cells (2363:1 and 41:1, respectively). Thus, these were the candidate genes chosen for disruption. Of 4 MAEL shRNA constructs, two resulted in a 25% relative expression of MAEL compared to controls. Of the 3 PIWIL2 shRNA constructs, the best knockdown showed 75% relative expression. There were no significant differences in proliferation or clonogenicity of stably selected MAEL or PIWIL2 knock-down Molm13 cells following decitabine treatment.

CONCLUSION: Using gene knockdown procedures, MAEL and PIWIL2 do not appear to have a marked effect on growth and response to decitabine treatment in Molm13. However, these results may be limited by inefficient knockdown using shRNA targeting methods. Further work using a Cas9/CRI SPAR based inactivation of these genes is ongoing.
EFFECT OF SIROLIMUS ON COAGULOPATHY OF SLOW-FLOW VASCULAR MALFORMATIONS

Joana M. Mack, M.D.; Bethany Verkamp, BS; Gresham T. Richter, M.D.; Kelly Stewart, BSN; Shelley Crary, M.D., MS.

BACKGROUND: Stagnant blood flow in slow-flow vascular malformations (VM) can lead to localized intravascular coagulation (LIC) that is characterized by elevated D-Dimer levels, low fibrinogen and decreased platelet count. LIC can lead to localized thrombosis or bleeding which can result in pain and functional limitations. Patients with complex VM are frequently managed with sirolimus, an mTOR inhibitor, which can lead to clinical improvements. It is possible that some of these improvements from sirolimus could be secondary to improvement in the coexisting LIC. This study assessed the use of sirolimus to manage the coagulopathy seen in slow-flow VM.

METHODS: Chart review of patients with VM started on sirolimus. Efficacy was objectively assessed through improvement of D-dimer, fibrinogen and platelet count. Three sets of lab values (pre-sirolimus, 1-3 months post-sirolimus, and most recent) were obtained for each patient when available.

RESULTS: 35 patients had been prescribed sirolimus. 18 were excluded based on underlying condition other than slow-flow VM and 1 for inadequate records. 16 patients (13 combined vascular, 3 venous) were included in the study. All 16 had elevated D-dimer levels (median 2.99 mcg/mL FEU, range 0.83-14.65) prior to treatment. 2 patients had an associated low fibrinogen (below 175 mg/dL). With treatment, 14 (87.5%) patients showed an overall decrease in D-dimer levels with an average decrease of 1.52 mcg/mL FEU between pre- and post-sirolimus labs and 1.03 mcg/mL FEU between pre-sirolimus and most recent values. The two patients with low fibrinogen prior to treatment showed a decrease in D-dimer levels (mean decrease of 7.845 mcg/mL FEU) and normalization in fibrinogen (mean increase 83.95 mg/dL) after beginning sirolimus. No patient had thrombocytopenia.

CONCLUSION: Sirolimus was effective in improving coagulopathy associated with slow-flow VM. Long-term use of this medication in this population may decrease the bleeding and thrombotic complications that these patients experience, especially following invasive vascular procedures.
UNPLANNED EXTUBATIONS IN THE PICU. WHAT ROLE DOES BREATHING TUBE REPOSITIONING PLAY?

Jennifer L. Pham, M.D.; Ron Sanders, M.D.; Xinyu Tang, PhD

BACKGROUND: Unplanned extubations, or the inadvertent removal of an endotracheal tube occurring at a time other than designated by the health care team, in the PICU setting are associated with increased morbidity and mortality. Unplanned extubations can result in longer mechanical ventilation time, longer ICU and hospital stay, and higher costs. Understanding factors that contribute to unplanned extubation events can help devise effective preventative strategies. Excessive amounts of secretion, looseness of the tape, and frequent ETT adjustment have been suggested to be associated with unplanned extubations. Repositioning and re-taping endotracheal tubes (ETT) are a part of the management of securing the tubes. As such, we are seeking to understand the relationship between tube repositioning and unplanned extubations.

HYPOTHESIS: Unplanned extubations are likely to be associated with recent repositioning of the ETT within the previous 24 hours.

METHODS: This is a case-control retrospective review of medical charts intubated children (0 – 18 years) admitted to the PICU from January 2010 to December 2016 with an unplanned extubation. All ETT are secured by a PICU nurse and/or respiratory therapist. Acquired data has a time-dependent component (tube position on daily chest x-ray) and various one-time components (age, sedation status, movement, retaping). Matching (1 to 3) will be done on month of birth as used elsewhere {Fitzgerald et.al. 2015}. Exclusion criteria- patients with tracheostomies.

ANTICIPATED OUTCOMES: The data is currently in the process of being analyzed. We expect to find an increased rate of endotracheal tube readjustment among patients with unplanned extubations compared to those who did not have an unplanned extubation.
RED BLOOD CELL DISTRIBUTION WIDTH AND PICU OUTCOMES

Sonia I. Matehuala, M.D.; Sanjiv Pasala, M.D.; Shelley E. Crary, M.D.; Richard T. Fiser, M.D.; Ronald C. Sanders, M.D., MS

BACKGROUND: Red blood cell distribution width (RDW) is a customary lab value obtained when ordering a complete blood cell count (CBC). The systemic inflammatory response in critical illness can alter both erythropoiesis and RBC maturation, and as such, can increase the RDW. Because RDW has been shown in several published studies to be a strong biomarker of adverse outcomes in the general population, the rise in RDW seen after a systemic inflammatory response in critical illness may reflect the degree of the underlying inflammatory state and may provide useful information in the critically ill population. We sought to determine the strength of association between RDW values at admission to the PICU and PIM-2 risk of mortality scores, as well as RDW relationship to ICU outcomes including duration of mechanical ventilation and length of stay (LOS) found in a previously-published study.

METHODS: A retrospective single center study of 3 years of admissions to the PICU looking at all patients with CBCs obtained at admission to the PICU. Exclusion criteria: readmissions to the PICU, history of PRBC transfusion within the previous 72 hours or during the first 7 days following PICU admission, patients with malignancy, and organ or tissue transplant recipients. Demographic characteristics, diagnostic categories, ICU admission PIM-2 scores, laboratory values (RDW, markers of erythropoiesis (e.g. reticulocyte count, hemoglobin), markers of inflammation (e.g. CRP, ESR), renal function and nutritional state (e.g. albumin)), PICU LOS, and days of mechanical ventilation were abstracted from the medical records.

RESULTS: Preliminary analysis shows no statistical significance with regard to probability of death or overall mortality but shows a trend in the incidence of multi organ failure and increasing RDW. Kruskall-Wallis rank test performed for nonparametric variables. Fisher’s Exact test used for categorical data. Data refinement and statistical analysis is ongoing and final results are pending.

Table 2. Patient Characteristics- Day 3 RDW values [Preliminary analysis of first 1220 patients]

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Day 3 RDW Quartile</th>
<th>All Patients</th>
<th>&lt; 13.4%</th>
<th>13.4-14.3</th>
<th>14.4-15.7</th>
<th>&gt;15.7%</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number*</td>
<td>389</td>
<td>71</td>
<td>77</td>
<td>106</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDW, % (12.2-17.8)</td>
<td>15.0</td>
<td>12.7</td>
<td>13.8</td>
<td>15.1</td>
<td>17.3</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Sex, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>224 (57.6)</td>
<td>40 (56.3)</td>
<td>45 (58.4)</td>
<td>58 (54.7)</td>
<td>81 (60.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>165 (42.4)</td>
<td>31 (43.7)</td>
<td>32 (41.6)</td>
<td>48 (45.3)</td>
<td>54 (40.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiorgan Failure</td>
<td>126 (32.6)</td>
<td>10 (8.0)</td>
<td>25 (19.8)</td>
<td>37 (29.4)</td>
<td>54 (42.9)</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Mech Ventilation?</td>
<td>218 (56.3)</td>
<td>39 (17.9)</td>
<td>40 (18.3)</td>
<td>60 (27.5)</td>
<td>79 (36.2)</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PICU LOS, days</td>
<td>5 (0-11)</td>
<td>4 (0-9)</td>
<td>4 (0-14)</td>
<td>4.5 (0-10)</td>
<td>6 (0-14)</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>PICU Mortality, n (%)</td>
<td>27 (6.9)</td>
<td>1 (0.3)</td>
<td>5 (1.3)</td>
<td>8 (2.1)</td>
<td>13 (3.3)</td>
<td>0.14</td>
<td></td>
</tr>
</tbody>
</table>
AGE-RELATED CHANGES IN INDEXED INFERIOR VENA CAVA DIMENSIONS AMONG SYNCOPAL CHILDREN AND ADOLESCENTS

Pushpa Shivaram, M.D.; Asif Padiyath, M.D.; Ronnie Collins, M.D.

INTRODUCTION: Transposition of great vessels is the most common cyanotic congenital heart disease, making up 5% of all congenital heart defects. Survival has improved after arterial switch operations. Yearly echocardiograms are recommended, but evidence-based follow-up recommendations for TGV are lacking. We sought to assess how often a patient with TGV with no symptoms or change in physical exam underwent an intervention based solely on echocardiographic changes.

METHODS: We retrospectively reviewed all records from patients with TGV and a history of complete surgical repair followed at Arkansas Children’s Hospital between November 1983 and January 2015. Symptoms and physical exam findings were culled from patient charts. Echocardiographic data were obtained from the echocardiography database. Changes in echocardiograms resulting in hospital admission, significant medication change, interventional catheterization, or surgical procedure were identified via the surgical and cardiac catheterization lab databases, and patient charts. These changes were referred to as an actionable change (AC). Interventions were defined as being driven by either symptom (change in physical exam, patient/parental concerns) or echocardiographic findings.

RESULTS: The records of 213 patients (70% male), including a total of 1604 echocardiograms, will be reviewed. The results will be tabulated as emergent vs non-emergent intervention.

CONCLUSION: Hypothesis-Most echocardiograms performed in asymptomatic patients with TGV lead to no AC. These data indicate most patients with TGV do not require yearly echocardiograms. Decreasing surveillance of asymptomatic patients to biennial follow-up echocardiograms would be safe and would limit unnecessary testing unlikely to lead to a change in management or intervention.
Poster Session
Abstracts

2018 Fellows Research Day
Pediatric Anesthesia

ASSESSMENT OF PERIOPERATIVE HYPOTHERMIA IN NICU SURGICAL PATIENTS: A QUALITY IMPROVEMENT INITIATIVE

William Phillips, M.D.; Jesus Apuya, M.D.

INTRODUCTION: Hypothermia in the neonatal intensive care unit (NICU) patient results in increased morbidity.\(^1\) Hypothermia can increase the risk of pulmonary hypertension, surgical site infections, organ hypoperfusion, metabolic acidosis, hypoglycemia, and delayed wound healing.\(^2,3\) Maintaining perioperative normothermia is a major concern in NICU patients and is the standard of care.

The goal of this quality improvement project was to track patient temperature throughout the perioperative process at our institution and to identify locations and situations in which the surgical NICU patient is susceptible to hypothermia. With this information, an appropriate intervention can be implemented.

METHODS: NICU patients were included for this QI project if they were less than 4 kg, normothermic at baseline, and going to the OR for non-cardiac surgery. Seventeen patients were identified and temperature was monitored and recorded throughout their perioperative care. Interventions were standardized (axillary temperature source, use of forced air warmer, warm pack for transport, OR room temperature setting, etc.) and NICU and operating room (OR) nurses were educated regarding transport and ambient operating room temperature. A checklist was utilized to ensure temperatures were recorded in the NICU, upon arrival in the OR, after surgical prep, when leaving the OR, and after returning to the NICU.

RESULTS:

RESULTS: Consistently demonstrate hypothermia in NICU perioperative setting, particularly after initial transport to the OR and surgical prep. Typically, these patients are rewarmed to a normothermic state by the time they are returned to NICU postoperatively.

DISCUSSION: The CMS guideline for perioperative temperature regulation, regardless of age, states that body temperature greater than or equal to 35.5 degrees Celsius (or 95.9 degrees Fahrenheit) must be recorded within the 30 minutes immediately before or the 15 minutes immediately after anesthesia end time.\(^4\) There were three NICU surgical patients with temperature below 35.5 degrees Celsius in their perioperative course which is considered hypothermic based on CMS guidelines. This occurred after prepping and during the middle of the procedure. All interventions to prevent hypothermia available in our institution were utilized during this project except for overhead heating lamps. There were accidental cases of burns in this small babies in the past so the use of this warming device was discontinued. It was also discovered during the course of this project that it takes 30-45 minutes to sufficiently warm some of the OR rooms.

CONCLUSION: For our institution, the most vulnerable period to develop hypothermia in surgical NICU patients less than 4 kg is after prepping and towards the middle of the surgical procedure. Future intervention should focus on this period to prevent this patient population from developing perioperative hypothermia.
DECREASING THE INCIDENCE OF UNPLANNED ADMISSION SECONDARY TO PONV: A QUALITY IMPROVEMENT PROJECT

Olga Willett, M.D.; Jennifer A Aunspaugh, M.D.; Justin H. Criddle, CSSBB; Jesus Apuya, M.D.

BACKGROUND: This is a phase II of quality improvement project on PONV prevention that was initiated at our institution in response to increased number of unplanned postoperative admissions. During phase 1 appropriate intraoperative administration of antiemetic medications on high risk patients had been evaluated. It was concluded that patients were not administered appropriate antiemetic prophylaxis. Guidelines for PONV prophylaxis were implemented on February 2017. The global aim of this project was to evaluate the percentage of compliance with implemented guidelines.

METHODS: Retrospective chart review was done on the following high risk patients: Adenoidectomy, Tonsillectomy, Tympanoplasty, Inguinal hernia repair and Orchiopexy. Utilization of the following antiemetics were recorded: Dexamethasone, Ondansetron, Diphenhydramine, Metoclopromide and Promethazine. Intraoperative and postoperative administration of these antiemetics were evaluated during the seven month period. Number of unplanned admissions and prolonged recovery time in PACU due to PONV were also recorded.

RESULTS: Total number of the patients at risk of PONV for the studied period was 1581(figure2). There was only one patient admitted due to PONV after the implementation of the PONV guideline. Average recovery times were approximately the same among the high risk PONV groups by procedures (figure 1). The percent compliance with administration of antiemetic medications was 94-97% range. The compliance was highest for the patients undergoing tonsillectomies, adenoidectomies and tympanoplasties and lowest for Inguinal hernia repairs and orchiopexy (Figure3).

CONCLUSION AND SIGNIFICANCE: We have observed reduced number of unplanned admissions due to PONV after implementation of PONV guidelines. Decrease in Phase1 and 2 recovery times was observed as well, this was the only intervention implemented for that period of time. Based on out results compliance needs to be improved on patient undergoing inguinal hernia repair and orchiopexy.

<table>
<thead>
<tr>
<th>Procedure Category</th>
<th># of Patients</th>
<th># with PONV meds in OR</th>
<th>Percent Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adenoidectomy</td>
<td>410</td>
<td>397</td>
<td>97%</td>
</tr>
<tr>
<td>Inguinal Hernia</td>
<td>157</td>
<td>126</td>
<td>80%</td>
</tr>
<tr>
<td>Orchiopexy</td>
<td>112</td>
<td>82</td>
<td>73%</td>
</tr>
<tr>
<td>Strabismus Repair</td>
<td>115</td>
<td>113</td>
<td>98%</td>
</tr>
<tr>
<td>T&amp;A</td>
<td>705</td>
<td>702</td>
<td>100%</td>
</tr>
<tr>
<td>Tympanoplasty</td>
<td>82</td>
<td>82</td>
<td>100%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>1,581</td>
<td>1,502</td>
<td>95%</td>
</tr>
</tbody>
</table>
METHOD TO DETERMINE OPTIMAL INSERTION DEPTH OF FEMORAL CENTRAL VENOUS CATHETERS IN INFANTS UNDERGOING CARDIAC SURGERY

Amy Huggins, M.D.; Michael Schmitz, M.D.; Justin Hamrick, M.D.

BACKGROUND: Methods to estimate the appropriate insertion depth for both internal jugular and subclavian lines have been well studied and published for infants and children. In 2005, a study of infants and children (age 1-101 months and weighing 3.1 to 33.8 kg) created a weight-based formula for determining ideal femoral central venous catheter insertion depth. However, there is currently no published criteria for estimating optimal and maximal insertion depth for femoral central venous catheters in newborns and infants weighing between 2-4 kg. The aim of this current study is to explore a means of determining appropriate depth for 2-4 kg infants.

METHODS: Newborns and infants weighing between 2-4 kg undergoing cardiac surgery with femoral venous catheters as well as post-operative abdominal radiographic imaging were the subjects of the study. After IRB approval, a retrospective study was done using radiographic measurement of the distance from the insertion site of femoral central venous catheters to the midpoint of the third lumbar vertebral body (L3) to determine the optimal insertion length. This optimal depth of central venous catheter insertion was then correlated to the patient’s height, weight, and body surface area (BSA). A linear regression model was used to assess correlation.

RESULTS: The length of the femoral central venous catheters from insertion site to midpoint L3 was measured in 53 infants undergoing cardiac surgery at Arkansas Children’s Hospital. Linear regression models showed weight vs length yielded a formula $y=0.358x + 7.1284$ with a correlation coefficient (r value =0.0195). Height vs length yielded formula $y=0.0683x + 4.9021$, $r$ value=0.0163. BSA vs length yielded formula $y=0.3725x + 7.4566$, $r$ value=0.0204. (Figure 1 on poster)

CONCLUSION AND SIGNIFICANCE: Femoral central venous catheters, when not positioned correctly, can place infants at risk for potential venous thrombosis or perforation, potential cardiac arrhythmias and tamponade. A method for determining optimal femoral central venous catheter insertion depth is important for newborns and infants because femoral venous catheters are commonly used in this age group and come in a variety of diameters and lengths. Ideal placement of catheters are such that the tip is below the outflow of the renal veins into the inferior vena cava so the renal veins are not obstructed. Obstruction of renal vein flow may be less common with a scientifically-based method of determination of the optimal and maximal catheter insertion depth resulting in in potentially less risk of both renal impairment and renal vein thrombosis. Additionally, placement of catheter tips and side ports may be more reliably positioned in the inferior vena cava beyond the iliac veins resulting in better function of side port channels with less risk of iliac vein stenosis or injury.

Our retrospective study explored potential mathematical relationships for optimal distance from the insertion site to the midpoint L3 vertebrae utilizing the infants’ length, weight, and body surface area to determine an optimal insertion depth of femoral central venous catheters for infants weighing between 2-4 kg. However, we were unable to generate a predictive formula based on simple correlations with height and weight. It may be that for such short distances there may have been too much variation with the site of insertion or variation in degrees of anterior posterior catheter curvature.

THE EFFECT OF HYPOTHERMIA ON TRANSFUSION REQUIREMENT DURING AND IMMEDIATELY AFTER PEDIATRIC CRANIOFACIAL SURGERY: A RETROSPECTIVE STUDY.

Haley M. Fuller, M.D., Christopher S. Fiedorick, M.D.; Jesus S. Apuya, M.D.

INTRODUCTION: The primary anesthetic consideration in the management of children undergoing craniofacial surgery is intra-operative hemorrhage. According to the Pediatric Craniofacial collaborative group, majority of these patients receive blood transfusion and about 95% of infants were transfused.\(^1\) Risk factors that were associated with increased blood loss include total operation time, young age, low weight, and multiple-suture craniosynostosis.\(^1\) Hypothermia has been associated with decreased platelet function and prolonged clotting times. We identified only one retrospective risk factor analysis for blood loss during pediatric craniofacial surgery in which there was no association found between intraoperative hypothermia and increased blood loss.\(^3\) However, criteria used for hypothermia was temperature nadir under 34°C and the authors suggested that no association existed due to the small sample size in the hypothermic group.\(^3\)

HYPOTHESIS: We hypothesize that there is an association between hypothermia (<35.5 °C) and intraoperative blood transfusion requirements in craniofacial surgery.

METHODS: After IRB approval was obtained, a retrospective analysis was done which included 86 patients undergoing craniofacial surgery from February 1, 2013 to December 30, 2016 at our institution. Demographics analyzed included: patient age, gender, weight and craniosynostosis diagnosis. Surgical factors analyzed included: total operative time and the following surgical procedure type: strip craniectomy, anterior cranial vault/fronto-orbital advancement, or posterior cranial vault. Primary outcome data was total intraoperative blood transfusion (ml/kg/hr) and the secondary outcomes included: total intraoperative fluid administration (ml/kg/hr), postoperative blood transfusions within twenty-four hours of the procedure (ml/kg).

RESULTS: There were 48 patients in the hypothermic group (intraoperative temperature nadir <35.5 °C) and 38 patients in the normothermic group (intraoperative temperature nadir ≥35.5°C). Multiple linear regression revealed a statistically significant association between intraoperative hypothermia and the primary outcome—intraoperative transfusion of red blood cells. Analysis revealed a 6.03 ml/kg/hr greater intraoperative transfusion requirement in the hypothermic group compared to the normothermic group (95% CI 2.61-9.46, P=<0.001). To evaluate whether intraoperative fluid administration affected intraoperative transfusion requirements, we divided fluid administration into two groups: low (< or equal to 20ml/kg/hr) and high (>20ml/kg/hr). Analysis revealed a 34% increase in intraoperative red blood cell transfusion requirement in the hypothermic (<35.5 °C) group compared to the normothermic (≥35.5°C) group when fluid administration was restricted to 20ml/kg/hr for duration of surgery. When fluid administration was greater than 20ml/kg/hr for duration of surgery, the transfusion requirement increased even further to 51% (P-value=<0.001 comparing across all groups.)

DISCUSSION: In this study of 86 patients undergoing craniofacial surgery, our analysis revealed an association between intraoperative hypothermia and increased intraoperative transfusion of red blood cells. The difference between the groups was also a clinically significant amount of 6.03ml/kg/hr. This finding corresponds with known associations between hypothermia and coagulopathy, and between blood loss and intraoperative hypothermia in various types of surgery in adults. However, before the current study, only one study could be found that sought to establish an association between hypothermia and blood loss in pediatric craniofacial surgery and this previous study failed to demonstrate any correlation.

CONCLUSION: Careful management of temperature at or above 35.5 °C in pediatric surgery reduces intraoperative red blood cell transfusion requirements and possibly its significant associated morbidities in this patient population.
**PROPHYLACTIC ENOXAPARIN DOSING IN PEDIATRIC INTENSIVE CARE PATIENTS**

Amanda M Marshall, M.D.; Matthew P Malone, M.D.

**BACKGROUND:** Pediatric intensive care patients are at a higher risk for ven thromboembolism (VTE) than other hospitalized patients. This is secondary to the potential presence of several factors including significant alterations to baseline mobility, presence of long-term central venous lines and transient coagulopathies secondary to the patient’s disease processes. For this reason, there has been increasing importance placed on VTE prophylaxis in the pediatric intensive care unit population. Enoxaparin is a low molecular weight heparin that acts to inhibit factor Xa, thereby impairing normal hemostasis. The use of enoxaparin for VTE prophylaxis has been studied at length in the adult population, but data on its use in the pediatric population is lacking. Current guidelines exist for the monitoring of therapeutic treatment, but not for prophylactic treatment. We hypothesize that the use of prophylactic enoxaparin dosing for VTE results in therapeutic levels of anticoagulation in a clinically important number of pediatric intensive care unit patients.

**METHODS:** Retrospective chart review identifying pediatric intensive care patients who received enoxaparin from 2015-current. Only those patients who were receiving prophylactic treatment will be included. Criteria for being categorized as receiving prophylactic dosing will be chart documentation stating the intention as prophylactic or enoxaparin dosing of 0.5mg/kg BID. Specific data recorded for each patient will include age, weight and height at admission, admission diagnosis, creatinine and BUN at the time of enoxaparin initiation and any Xa-LMWH levels obtained and the time of the level with respect to the last enoxaparin dose. Goal therapeutic Xa-LMWH defined as 0.5-1. Goal prophylactic Xa-LMWH defined as <0.3.

**RESULTS:** Study is currently in the initial stages of approval.

**EXPECTED CONCLUSION AND SIGNIFICANCE:** Anecdotally we have observed several children on prophylactic enoxaparin who have achieved therapeutic Xa-LMWH levels. We expect to confirm our suspicion that a clinically important number of children treated with prophylactic enoxaparin dosing achieve therapeutic Xa-LMWH levels. If confirmed, we would encourage a practice change in which prophylactic enoxaparin dosing would undergo the same monitoring parameters as treatment dosing.
**VENOARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION VIA RIGHT CAROTID ARTERY UTILIZING A GORE-TEX GRAFT, FRIEND OR FOE? A CASE SERIES**

Bauer, Hannah K., M.D.; Prodhan, Parthak, MBBS; Rettiganti, Mallik, Ph.D.; Fiser, Richard T., M.D.;

**BACKGROUND:** Children with refractory cardio-pulmonary dysfunction may often require ECMO support. While on ECMO support, these critically ill children require optimal nutrition to enhance anabolism and promote recovery. The current Extracorporeal Life Support Organization guidelines for nutritional support are primarily based on studies in neonates and adults. In contrast, for older children there is scant literature to guide nutritional support while on ECMO (1-3). In light of the paucity of evidence regarding nutritional practices among pediatric ECMO patients, we evaluated the nutrition practices within our own institution. We hypothesized that enteral nutrition can be initiated safely and effectively in pediatric ECMO patients.

**METHODS:** This single center retrospective study included children < 18 years of age requiring ECMO support in the Pediatric ICU and Cardiac ICU at Arkansas Children’s Hospital from 2005 to 2013. Data was abstracted from the medical record including patient demographics, outcomes (ICU LOS, hospital mortality), indication for ECMO, co-morbidities, pre-ECMO support and nutrition data, complications while on ECMO, laboratory data, amount of sedative/paralytic used, as well as bowel regimen and fluid balance. REDCap database was used to organize data utilizing grant support from NCATS/NIH 1 UL1 RR029884.

**RESULTS:** Data was abstracted from twenty-six out of our total sample size of sixty patients. Of the initial data analyzed, 46.2% were female and 53.8% were male. Demographics prior to initiation of ECMO included median age of 6 months, weight of 7.2 kg, and BMI of 14.6. The median amount of time on ECMO was 111 hours with an in-hospital survival of 42%. Indications for ECMO included respiratory failure (N= 4), cardiac- medical (N=4), cardiac- surgical (N=7), ECPR (N=2), septic shock (N=1), and mixed indications (N=8). The majority of patients, 88.5%, were cannulated using veno-arterial ECMO. Patients were categorized as being either NPO or on full feeds prior to initiation of ECMO as well as whether TPN and lipids were initiated while NPO prior to ECMO. Approximately 45.6% of patients made NPO prior to ECMO were supplemented with total parenteral nutrition and intra lipids. Once on ECMO, enteral feeds were never initiated in 61.5% of patients. Of those, 23% were cardiac surgery patients with a median age of 3.5 months. However, in the ten patients in whom enteral feeds were initiated, goal feeds were reached 60% of the time. Eighty percent of those patients started on enteral feeds were given a bowel regimen consisting of a pro motility agent such as polyethylene glycol, magnesium hydroxide, or metoclopramide, as well as a proton pump inhibitor. Fifty percent of those patients reached 100% of their caloric goals by enteral feeding. From the time of initiation of ECMO, it took a median of 24 hours to initiate TPN and intralipids and a median of 42 hours to initiate the first enteral feedings. The majority of interruptions in enteral feeding occurred > 24 hours after ECMO initiation and were necessitated by such factors as abdominal distension and increased gastric residual. The median time to reach goal enteral feeds was 192 hours and median time to first bowel movement was 132 hours. In those patients in whom goal enteral nutrition could not be reached, enteral feeds ranged from 4.5 % to 22% and required TPN and intralipid supplementation to reach caloric goals. Daily laboratory values while on ECMO demonstrated a reduction in serum total and direct bilirubin once enteral feeds were initiated.

**CONCLUSION AND SIGNIFICANCE:** Continuing to use the gut in periods of critical illness has been shown to be cost effective, protective of immune function within the gut, as well as tolerable, all the while preventing such complications as TPN cholestasis and associated central line infections. Further study is needed, both on ECMO indication as well as cardiac surgical versus non-cardiac patients, to understand the intricate balance of timing, progression, and appropriate type of feeding necessary during pediatric ECMO.
KETAMINE USE IN TRACHEAL INTUBATION AND ADVERSE HEMODYNAMIC EVENTS.

J. Arden Conway, M.D.; Priyanka Kharayat, M.D.; Jonida Zeqo, M.D.; Scott Weiss, M.D., MSCE; Ronald C. Sanders Jr., M.D.; Vinay Nadkarni, M.D.; Akira Nishisaki, M.D., MSCE for the National Emergency Airway Registry for Children (NEAR4KIDS)

BACKGROUND: Ketamine has been recommended as an induction medication for pediatric tracheal intubation (TI) with septic shock. However, ketamine is known as a direct myocardial depressant, and adult studies show ketamine often cause hypotension. Hypothesis: ketamine use for TI in the PICU is associated with fewer hemodynamic TI associated events compared to the induction without ketamine; and direction and strength of the association between ketamine contained regimen and hemodynamic TI associated events are similar in children with vs. without preexisting shock.

METHODS: Retrospective cohort study of a multicenter pediatric airway quality improvement database (NEAR4KIDS) during 2013-17. Children<18yr with initial tracheal intubation (TI) in the ICUs were included. We defined our outcome: hemodynamic TI associated events as dysrythmia (including sinus bradycardia), hypotension, and cardiac arrest. Our exposure of interest is ketamine use. Stratified analysis among children with shock and without shock as TI indication was done, and effect heterogeneity is assessed by Mantel-Haenszel test. Multivariable logistic regression for effect size while accounting for factors associated with ketamine use.

RESULTS: Ketamine was used in 3,255 (33%) of 9,989 TIs. Ketamine was more commonly used in shock, respiratory failure, procedural indication. Univariate analysis showed that ketamine use was associated with lower hemodynamic TI associated events: With shock: OR 0.83 (95% CI 0.59-1.16); without shock: OR 0.74 (95% CI 0.59-0.93), with non-significant test for homogeneity, p=0.587. The M-H combined OR was 0.77 (0.63-0.93), p=0.006. After adjusting for factors associated ketamine use, the use of ketamine is significantly associated with lower occurrence of hemodynamic TI associated events: OR 0.77, 95% CI 0.60-0.99, p=0.045.

CONCLUSION: Ketamine use for TI induction is associated with fewer hemodynamic TI associated events. Ketamine use is favorable in reducing hemodynamic TI associated events in both children groups with/without existing shock.
**APNEA-HYPOPNEA INDEX (AHI) AS AN INDICATOR FOR SEDATION ADVERSE EVENTS**
Kristen E. Long, M.D.; Supriya Jambhekar, M.D.; James L. Hungerford, M.D.

**BACKGROUND:** Sedation by a non-anesthesiologist is increasingly utilized for procedures in pediatrics, in various locations outside of the operating room (i.e. emergency room, outpatient clinic, ICU, radiology). Most adverse events from sedation in pediatrics are related to airway compromise. Screening currently aims at identifying patients at highest risk for adverse events by history and physical exam. With the rise in childhood obesity, an increasing number of pediatric patients are evaluated for obstructive sleep apnea with polysomnography (PSG). PSG provides measurement of the apnea-hypopnea index (AHI), a value corresponding to severity of obstructive sleep apnea (the higher the AHI value, the worse the OSA severity). The specific aim of this study is to determine if an elevated AHI is associated with an increased risk of experiencing a sedation-related adverse event. We hypothesize that there is an AHI value above which there is association with increased risk of sedation-related adverse events.

**METHODS:** A retrospective chart review will be conducted on all pediatric patients who underwent a sleep study at Arkansas Children’s Hospital from January 2014 - December 2017. This patient list will be cross-referenced with the Sedation Service records. All patients 0 to <18 years of age, that have undergone a sleep study and received sedation utilizing the Sedation Service will be eligible for study inclusion. Data on standard demographic characteristics, diagnosis of obstructive sleep apnea (defined as AHI > 2), ASA classification, NPO status, sedation time of day, sedation location, sedation drug types and dosages used and monitoring utilized will be collected. Sedation-related adverse events will be defined as respiratory depression, desaturation < 90%, apnea, laryngospasm, stridor, unresponsiveness, seizure, bradycardia, cardiac arrest, permanent neurological disability and/or death. Children with documented neuromuscular weakness, tracheostomy, anatomic abnormality affecting airway structure, or children with compromised ability to protect their own airway when not sedated will be excluded from the study.

**RESULTS:** During the study period, approximately x number of children received PSG. After thorough chart review, all patients meeting inclusion/exclusion criteria will be included in the statistical analysis of this study. This study aims to provide information that will improve clinician recognition of patients at risk for sedation-related adverse events.
Regional Variations in the Prevalence and Early Identification of Autism Spectrum Disorder in Arkansas

Saletha Smith, M.D., Maya Lopez, M.D., Thaer Baroud, BSN, MHSA, MA, Allison Hudson, CCRP Yvette Schwenk, MS, LPE-I

Background: The Autism and Developmental Disabilities Monitoring (ADDM) Network gathers data on Autism Spectrum Disorder (ASD) and other developmental disabilities in multiple sites, including Arkansas, in the United States. While racial distribution of ASD prevalence among all ADDM sites are similar (Non-Hispanic Whites > Non-Hispanic Blacks > Hispanics), Arkansas (AR) ADDM site data shows a higher median age of diagnosis of ASD compared to ADDM Network average. Given that Arkansas is a largely rural state, the geographic distribution of racial and ethnic groups in urban and non-urban areas likely affects the prevalence of ASD. We postulate that children in non-urban areas will have a later age of diagnosis than urban areas and that the prevalence of ASD will be lower in rural areas.

Methods: AR ADDM data was collected statewide for study years 2002, 2010 and 2014. The methodology is modeled on a standardized retrospective record review created by the CDC’s Metropolitan Atlanta Developmental Disabilities Surveillance Program (MADDSP). Counties were then categorized into urban versus rural (non-urban) areas for comparison. Data analyzed included prevalence (subdivided by race and ethnicity) per 1000 of 8-year-old children diagnosed with ASD and the median age (in months) at earliest evaluation confirming an ASD diagnosis.

Results: ASD prevalence trends across study years: 1) For total population, significant increase seen in urban and non-urban areas from 2002 to 2010 then stabilized to 2014. 2) For Whites, significant increase in urban and non-urban from 2002 to 2010, but decreased in non-urban areas from 2010 to 2014. ASD prevalence in urban vs non-urban areas: 1) Urban area was significantly higher than non-urban area only in 2010; 2) There was no significant difference in age of diagnosis in non-urban versus urban areas for 2002, 2010 and 2014. 3) For Whites, urban areas were significantly higher compared to non-urban areas in 2010 and 2014.

Conclusion and Significance: In Arkansas, living in urban areas offer no advantage in being diagnosed with ASD earlier despite having more financial resources and access to health care. Differences in ASD prevalence between urban and non-urban areas were not consistently seen. This study is limited by incomplete race/ethnicity data for SY 2014 (Approx. 15% in Other, Missing, Unknown). Further studies are needed to determine contributors to the regional differences noted in this study.
HEMISPHERIC rSO₂ READINGS ENHANCE DIAGNOSTIC SEIZURE RELIABILITY, TIMELINESS OF ANTICONVULSANTS, AND OBJECTIVE RESPONSE MEASURE IN EPILEPTIC AND INTELLECTUAL DISABILITY PATIENTS: A PROOF OF PRINCIPLE.

Hannah Baer, M.D.; Thomas Abramo, M.D.; Lee Crawley

BACKGROUND: Pediatric seizures account for 15% of emergency medical services transports, 1% ED visits, and 100,000 admissions per year. Their high manifestation variability may delay seizure recognition, particularly in complicated patients (i.e. seizure disorder or nonverbal/intellectually disabled). This makes seizure recognition and neuroresuscitation subjective and inconsistent, especially in these patient populations. Delay in first-line anticonvulsant therapy increases the seizure duration, total anticonvulsant requirement, incidence of status epilepticus, and risk of death.

Pediatric hemispheric cerebral oximetry (rcSO₂) reflects cerebral physiology; prior studies have shown rcSO₂ <60% or >80% or a hemispheric rcSO₂ difference >10 equates to abnormal cerebral physiology, neurological insult, and pathology. In inpatient EEG - rcSO₂ seizure studies, altered rcSO₂ from baseline correlated with seizures (see Fig. 1). However, patients with chronic seizure disorder and/or significant intellectual disability may have abnormal baseline cerebral physiology, individualistic hemispheric-seizure rcSO₂, or recalcitrant abnormal-seizure physiology (delay in return to pre-seizure rcSO₂). For this population, research is required to determine non-generalizable seizure rcSO₂ patterns and the usefulness of rcSO₂ monitoring in the ED.

METHODS: This observational, prospective study aims to investigate the functionality of hemispheric rcSO₂ readings for guiding the clinical care of actively seizing ED patients in these special populations (grant status for multi-site study has been applied for). Continuous rcSO₂ readings will be obtained during ED course with documented seizure start/stop times, and medication administration times. Analysis will be based on variation in rcSO₂ trends for each patient before, during, and after clinical seizure events. Statistical methods for analyzing rcSO₂ data have been validated in previous studies.

RESULTS: We anticipate baseline cerebral oximetry may be abnormal in this patient population, but significant changes from baseline in rcSO₂ trends would still likely occur during seizure events as has been previously shown in EEG-rcSO₂ studies. There may be delay in returning to pre-seizure baseline in those with recalcitrant seizures.

CONCLUSION AND SIGNIFICANCE: Results will either support or fail to support the usefulness of continuous hemispheric rcSO₂ monitoring in this patient population in the ED. Since rcSO₂ monitoring is noninvasive and relatively quick and easy to apply, it has potential as a valuable adjunct diagnostic tool in the ED when other testing (i.e. EEG) would be impractical.

Fig. 1: Example of changes in hemispheric rSO₂ trends during generalized seizure events showing return to pre-seizure baseline between events.
BACKGROUND: Pediatric emergency department (PED) procedural sedation complications are extensively well documented. Various factors can contribute to the incidence of adverse effects, including fasting time, age of patient, sedation agent, and comorbidities. One of the less frequently reported complications is emesis. When reported, there was no clear distinction between emesis incidence during the procedure or post procedural. Only one study to date has looked at utilization of ondansetron coinciding with pediatric deep sedation agent administration. This study, however, did not differentiate the phase in which emesis occurred.

OBJECTIVE: A PED quality analysis of the emesis occurrence rate during the procedure or post procedural sedation in relationship to demographics, sedation medication, and the effects of ondansetron administration. Post-sedation was defined as once the procedure was complete and recovery phase began.


RESULTS: For the period 2015 to 2017, a total of 400 PED sedation cases were reviewed. Ondansetron was given in 225 cases. (Table 1). Eight patients had emesis during the recovery phase 8/400 (2%), and one had emesis in the maintenance phase as well. Two patients with emesis received IV ondansetron prior to sedation, which correlates with less than 1% rate of vomiting with ondansetron premedication. All patients with emesis were given it as a post sedation intervention.

CONCLUSION AND SIGNIFICANCE: Preliminary analysis demonstrates IV ondansetron administration pre-procedure could decrease the rate of sedation-related emesis. Preliminary retrospective review indicates PED sedation has relatively low rate of emesis but all occurred in the post-sedation period. Variables to assess further will include total ondansetron dose given, sedation agent, total dose of sedation agent, as well as patient demographics such as age, fasting time, time to discharge, and other adverse effects.

<table>
<thead>
<tr>
<th>TABLE 1.</th>
<th>N=400</th>
<th>Demographics</th>
<th>Type of Procedure</th>
<th>Pre-medication</th>
<th>Induction Medications</th>
<th>Adverse Events</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>Orthopedic Reduction</td>
<td>45 (2.3-4.5)</td>
<td>Lidocaine</td>
<td>Propofol</td>
<td>Apnea</td>
<td>Suction</td>
<td>2</td>
</tr>
<tr>
<td>Gender</td>
<td>Nailbed Repair</td>
<td>Male</td>
<td>46.5%</td>
<td>Atropine</td>
<td>Ketamine</td>
<td>Hypoxia (&gt;$20 seconds)</td>
<td>Jaw Thrust</td>
</tr>
<tr>
<td>Female</td>
<td>Laceration Repair</td>
<td>53.5%</td>
<td>Midazolam</td>
<td>Etomidate</td>
<td>Bradycardia</td>
<td>Other*</td>
<td>1</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>Ondansetron</td>
<td>19.3 (13.6-40.2)</td>
<td>Other</td>
<td>94</td>
<td>Nitrous Oxide</td>
<td>Vomiting</td>
<td>Intubation</td>
</tr>
<tr>
<td>ASA Classification</td>
<td>Other</td>
<td>352 (88%)</td>
<td>Other</td>
<td>4</td>
<td>Vomiting (Maintenance)</td>
<td>LMA</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>Infusion</td>
<td>48 (12%)</td>
<td>Other</td>
<td>8</td>
<td>Vomiting (Recovery)</td>
<td>Nasal Trumpet</td>
<td>0</td>
</tr>
</tbody>
</table>

* = Laryngospasm occurred during induction. *Other interventions* = additional medications given (midazolam, morphine)
HIDDEN IN PLAIN SIGHT: SCREENING FOR SUICIDALITY IN THE PEDIATRIC ED

Alexa Bollinger, M.D.; Mary Aitken, M.D., MPH; Amber Morse, M.D.

BACKGROUND: Mental health pathology plagues the US health care system today. This is not only an adult healthcare problem but a prevalent and rising crisis seen in children and adolescents. According to the CDC, suicide is the 2nd leading cause of death for 10-24 year olds. In Arkansas alone, suicide is the 3rd leading cause of death for 15-24 year olds. 2 million US adolescents will attempt suicide each year, and 1/3 of the youth who die by means of suicide will have made prior attempts. It has been noted that 80 percent of youth who died by suicide have visited a PCP or ED within the 3 months prior to their death. Despite this high prevalence and the known risk factors in these children, suicidality often goes undetected by their caregivers and healthcare providers. Nationally, routine screening has shown promise in identifying patients at risk for suicide, prompting further interventions within individual institutions.

METHODS: A retrospective chart review of children 10 years of age and older presenting to the Arkansas Children’s Hospital (ACH) ED will be performed to gather data spanning one year after implementation of the Columbia Suicide Severity Rating Scale (C-SSRS) in the ED. Data will be pulled from EPIC and entered into a secured REDCap database for further stratification. Variables that will be collected include: chief complaints, prior mental health diagnoses, social history of abuse, family history of mental health diagnoses, current medications, visit diagnoses, chronic medical illnesses, demographics, repeat visit trends, interventions made in the ED, and if a patient within this age group was not screened. This information will be used to perform traditional statistical analysis as well as to evaluate compliance with the screening process in our ED triage.

RESULTS: Since employment of the C-SSRS, there have been several cases in the ACH ED resulting in positive screens. Several of these instances have led to a referral for outpatient psychiatric/psychologic services or to inpatient placement for patients whose initial chief complaint was not related to a mental health issue. It is expected that the results of this study will reveal a significant number of youth who are facing suicidality, particularly in those patients who presented with an unrelated chief complaint. By highlighting these findings, we will attempt to demonstrate the role of emergency room staff as frontline providers, invaluable in the timely discovery of this deadly medical condition.

CONCLUSION AND SIGNIFICANCE: Screening youth for suicidality is critical in prevention of this ongoing epidemic, but it can be a challenge in a busy ED and a hardship with the shortage of mental health services in the US. At the time of presentation, many patients will not have vocalized their suicidal ideations, problems with depression or bullying to their caregivers, or demonstrated signs or symptoms which would prompt concern. However, with the use of this simple screening technique, emergency room providers may be given the opportunity to save the lives of these children. We hope that our results will reflect what is occurring on a national level and serve as a helpful guide for all providers on the front lines of a pediatric emergency room.
THE VALUE OF BIOMARKERS IN EVALUATING FEBRILE IMMUNOCOMPROMISED PEDIATRIC PATIENTS IN A PEDIATRIC EMERGENCY DEPARTMENT

April Clawson, M.D.; Thomas Abramo, M.D.; J. Matthew Digman, M.D.; Lee Crawley, RT.

BACKGROUND: Febrile immunocompromised patients frequently present to pediatric EDs for evaluation. The current standard of care to evaluate for a severe bacterial infection (SBI), including invasive bacterial infections (IBI), is to obtain CBC, blood culture, imaging (if indicated), and CSF culture (if indicated) and admit on antibiotics for a minimum of 48 hours. Biomarkers are increasingly used to investigate for SBI/IBIs in pediatric patients in general. The most commonly used biomarkers are elements of the CBC (such as the WBC, ANC, and platelet count), CRP, and ESR. More recently procalcitonin (PCT) has been used as well. Previous studies have shown that PCT increases within 6-12 hours and has a half-life of 24 hours. The increase of PCT is not affected by immunosuppressive therapy. This is a retrospective observational study that consists of performing a chart review on patients who had a procalcitonin drawn as part of their evaluation at ACH. The goal is to determine the negative predictive value of PCT for SBI/IBIs in febrile immunocompromised pediatric patients. For the purposes of this study, procalcitonin levels were divided into two groups: low to intermediate risk of SBI/IBIs (PCT ≤ 2) and high risk (>2).

METHODS: Patients from age birth to 17 years who had a PCT drawn are being entered into a Redcap database: Pediatric ED Biomarkers in Febrile Patients (Immunocompromised Subgroup). Currently there are 456 patients in this database from 9/9/2014 to 6/1/2017. More are currently being entered from 6/1/2017 to 2/28/2018. The following results are recorded for every patient: CBC, blood culture, CRP, PCT, CXR results, CSF analysis and culture, viral PCR. Other metrics that are also kept in this deidentified database include evidence of SIRS, patient disposition, length of hospital stay, need for an advanced airway, number of boluses received, use of pressors, medicines received, and diagnoses.

RESULTS: Of the 456 febrile immunocompromised patients gathered so far in the Redcap database, 22 had a high risk of SBI based on their PCT level and were also found to have a positive culture or imaging result. 315 patients had a low to intermediate risk PCT and had negative culture/imaging. The number of patients who had a low to intermediate risk level of PCT who had evidence of a SBI was 34, and the number who had a PCT indicative of a high risk but who had negative culture/imaging was 44. (See Table 1.) This data gives a negative predictive value (NPV) of 90%.

CONCLUSION AND SIGNIFICANCE: While this project is not yet complete, early results indicate that PCT may be a useful biomarker in negatively predicting a SBI in immunocompromised pediatric patients presenting with a fever. Once all patients have been entered into the Redcap database, a full statistical analysis will be completed. Additionally, there is room for expansion of the project to compare PCT to CRP as well as evaluate the usefulness of CRP combined with PCT.

Table 1.

<table>
<thead>
<tr>
<th>Culture/Imaging results</th>
<th>Positive for SBI</th>
<th>Negative for SBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk (PCT &gt; 2)</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>Low or intermediate risk (PCT ≤ 2)</td>
<td>34</td>
<td>315</td>
</tr>
</tbody>
</table>
ADVERSE EFFECTS OF INTRAVENOUS N-ACETYLCYSTEINE FOR ACETAMINOPHEN TOXICITY IN PEDIATRIC PATIENTS: A RETROSPECTIVE CHART REVIEW

Sarah Sylvester, Hannah Baer HR, Amy Saunders, Thomas Abramo

INTRODUCTION: Acetaminophen is a commonly used medication in the pediatric population and is safe and effective when administered at the recommended doses;[1] nonetheless, it is also one of the most reported etiologies of acute medication poisoning in the United States, whether secondary to intentional overdose or inappropriate dosing.[2] N-acetylcysteine remains widely accepted as the antidote of choice in acute acetaminophen toxicity, although adverse reactions ranging from nausea and vomiting to anaphylactoid reactions have frequently been reported in the literature[3,4], with an increased frequency in patients with asthma.[5] However, there remains little data regarding adverse effects of intravenous N-acetylcysteine specific to the pediatric population.

OBJECTIVE: An institutional chart review of patients receiving IV N-acetylcysteine for acetaminophen poisoning was performed to review the occurrence of these commonly reported adverse reactions within a pediatric population and to identify potential risk factors associated with these adverse reactions, in order to improve patient safety in our institution.

METHODS: A retrospective chart review of pediatric patients at Arkansas Children’s Hospital receiving intravenous N-acetylcysteine for acute acetaminophen poisoning from December 2010 to July 2016 was performed; patients between the ages of 0 to 17 years were included (n=50). Patient demographics, initial acetaminophen level, acetaminophen dose/kg, duration of IV acetylcysteine therapy, co-ingested substances, laboratory values, and documented adverse reactions were recorded using a standardized form. Adverse events during IV acetylcysteine administration as reported in provider documentation were identified.

RESULTS: A total of 50 patients received IV N-acetylcysteine for acute acetaminophen poisoning during the selected time frame. The average patient age was 13 years (median 15 years; range 0.5 to 17 years); thirteen (26%) were male and 37 (74%) were female. Four patients (8%) had a past medical history significant for asthma; none of these patients had reported adverse reactions. Five of the 50 patients (10%) experienced adverse effects of nausea and/or vomiting; none were reported to have anaphylactoid reactions. Patients who experienced adverse reactions had higher initial acetaminophen levels, peak AST levels, and peak ALT levels than those without adverse reactions (Table 1).

CONCLUSION: From this QA analysis, IV N-acetylcysteine for acetaminophen toxicity in a pediatric population was well tolerated and associated with a low incidence of adverse reactions, which were limited to nausea and/or vomiting, then reported in the literature. In the adverse events group, nausea and/or vomiting incidence was higher coincidentally they had significantly higher liver enzymes elevation than the non-adverse event group. These findings were further studied as to the etiology of vomiting ergo directly related to IV N-acetylcysteine versus the severity of acetaminophen induced liver toxicity.

| TABLE 1. LABORATORY VALUES OF PATIENTS RECEIVING N-ACETYLCYSTEINE FOR ACETAMINOPHEN TOXICITY |
|---------------------------------|-----------------|-----------------|-----------------|
|                                | Adverse reaction (n=5) | No adverse reaction (n=45) | Total (n=50) |
| Peak AST, U/L                  | 1280.2           | 397.5           | 485.8          |
| Peak ALT, U/L                  | 2084             | 423             | 589.1          |
| Initial acetaminophen level, ug/dL | 204.4           | 1.518           | 1.57           |
PLASMA BIOMARKERS IN ANTHRACYCLINE CARDIOTOXICITY

David P. Douglass, M.D.; Kimo Stine, M.D.; Varsha Desai, PhD; James C. Fuscoe, PhD; Richard D. Beger, PhD; Nysia I. George, PhD

BACKGROUND: Approximately 50% of the 15,000 children diagnosed with cancer each year in the U.S. will receive anthracyclines as part of their chemotherapy. Cardiotoxicity is a well-known complication that can occur in a significant minority of patients, particularly those who receive high cumulative doses. Current practice uses echocardiogram to screen for asymptomatic cardiac dysfunction. Unfortunately, by the time a patient’s echocardiogram is abnormal they may have already sustained significant, irreversible cardiac injury. Some studies suggest that this early injury can initiate a cascade of biochemical events that can ultimately lead to symptomatic heart disease or even congestive heart failure even after cessation of anthracyclines. Even if anthracyclines are eventually replaced with novel “targeted” agents, many of these are being found to be cardio toxic as well.

A serum biomarker that could be easily detected before echocardiogram abnormalities appear would allow oncologists to consider dose reductions and/or chemotherapy alterations. Also, earlier detection would allow for treatment with angiotensin converting enzyme inhibitors (ACEI) or beta blockers to potentially slow the progression to heart failure.

Scientists working at the National Center for Toxicological Research (NCTR) in Jefferson, AR have identified two such serum biomarkers, von Willebrand Factor (vWF) and Neurogenic Locus Notch Homolog Protein 1 (NOTCH1), in a mouse model of anthracycline cardiotoxicity. NCTR used its capacity to run high-throughput “omics” analyses to detect these biomarkers.

METHODS: This pilot study will be a collaboration with the NCTR. Twenty pediatric oncology patients will be recruited from Arkansas Children’s Hospital. Recruited patients will be less than 20 years old, have any oncologic diagnosis, be at any stage of therapy, and be scheduled to receive both an anthracycline and a non-anthracycline cycle of chemotherapy. Blood samples will be drawn before and after two cycles of chemotherapy (anthracycline and non-anthracycline cycles). Phase I of the study will only look at vWF and NOTCH1 to see if the biomarker increases seen in the anthracycline-exposed mice can be replicated in pediatric oncology patients. The design will use patients as their own controls.

If funding allows, Phase II will use open “omics” analyses (proteomics, metabolomics, lipidomics, and genomics - microRNA) to screen extra serum that will have been aliquoted and frozen from the initial samples. This will allow for a powerful screen for other novel biomarkers that could be further investigated in a larger study.

RESULTS/CONCLUSION/SIGNIFICANCE: The project proposal has been submitted to the UAMS IRB and review is in process.
COMPARISON OF PRESSURE DELIVERY IN NON-INVASIVE POSITIVE PRESSURE VENTILATION USING RAM CANNULA VERSUS HUDSON PRONGS

Ashley Lynch, M.D.; Sherry E. Courtney, M.D.

BACKGROUND: Use of non-invasive ventilation (NIV) is an important part of the management of many infants requiring neonatal intensive care. Nasal continuous positive airway pressure (CPAP) is a widely-used mode of NIV, but in more severe cases CPAP may not be sufficient for gas exchange. Non-invasive intermittent positive pressure ventilation (NIPPV) is an alternate mode of non-invasive respiratory support which provides intermittent inspiratory pressure delivery, i.e. “breaths,” over a baseline CPAP which is continuously delivered throughout the respiratory cycle. NIPPV is particularly useful in the infants with lung disease of such severity that CPAP is insufficient for adequate ventilation. Many interfaces have been used for delivery of NIV, and controversy exists regarding which is best. RAM cannula use is ubiquitous, given its ease of use and decreased associated damage to nasal and facial tissues. However, there is no expiratory limb incorporated into this cannula, and delivery of CPAP is inconsistent due to a high level of inherent resistance. Research involving neutrally adjusted ventilator assist (NAVA) NIPPV revealed that in the absence of patient effort there was essentially no inspiratory pressure delivered with RAM cannula. My aim is to compare the RAM cannula to another non-invasive ventilation interface, Hudson prongs, to determine if pressure delivery is significantly different. The findings of this study will be highly relevant in the care of infants on NIPPV or non-invasive NAVA, as many of these infants receive these modalities of support via the RAM cannula interface.

METHODS: We will randomize preterm infants, using each patient as its own control, to both RAM cannula and Hudson prongs. We will continuously measure pressure delivery, breathing effort using an electronic activity of the diaphragm (EDI) catheter, and tidal volumes using respiratory inductance plethysmography (RIP) bands. Study size will be approximately 20 infants. Primary outcome will be the difference in tidal volume delivery between interfaces in the absence of patient effort. Secondary outcomes will include oxygen saturations, transcutaneous CO2 measurements, and breathing effort. We estimate that about 20 infants will be needed. Statistical assistance will be obtained to define sample size and needed analyses.

EXPECTED OUTCOMES: We expect that tidal volume—and by reasonable inference also pressure—delivery will be superior using the Hudson prong interface for NIV when compared to RAM cannula.
EARLY DIAGNOSIS OF ACUTE KIDNEY INJURY USING URINARY BIOMARKERS AND RENAL OXIMETRY IN NEONATES WITH HYPOXIC ISCHEMIC ENCEPHALOPATHY

Jennifer Rumpel M.D.; Richard Blaszak M.D., Saritha Ranabothu M.D., Shasha Bai Ph.D., Valerie Chock M.D., Adam Frymoyer M.D., Seo-Ho Cho, Michael Bennett Ph.D., Brenda Poindexter M.D., Cara Slagle M.D., Sherry Courtney M.D.

BACKGROUND: Neonates affected by perinatal asphyxia are at risk of developing acute kidney injury (AKI) as well as brain injury. The incidence of AKI after perinatal asphyxia ranges from 40-60%. In this population of asphyxiated newborns, AKI independently predicts higher rates of death and poor clinical outcomes. Early diagnosis and recognition of AKI can reduce both morbidity and mortality. Currently, the gold standard for diagnosing AKI is elevation in serum creatinine (SCr). SCr has many limitations in the neonatal population. Therefore, it is imperative that new clinical tools for AKI diagnosis are identified and validated. Urinary biomarkers have shown promising results in the recent literature for AKI prediction and diagnosis.

OBJECTIVE: The study objective is to evaluate six urinary biomarkers for early diagnosis of AKI in neonates with hypoxic ischemic encephalopathy (HIE) who are treated with whole body cooling.

MAIN HYPOTHESIS: We hypothesize that in neonates with HIE receiving therapeutic whole body cooling, the urinary biomarkers, IL-18, KIM-1, NGAL, cystatin C, TIMP-2, and IGFBP7, when assessed together, will predict AKI earlier than SCr and with similar reliability as SCr.

METHODS: The proposed study is a multicenter prospective observational study. Neonates with HIE requiring therapeutic whole body cooling will be eligible for study enrollment. Neonates will be enrolled from the NICUs at Arkansas Children’s Hospital, Lucile Packard Children’s Hospital at Stanford University, and Cincinnati’s Children’s Hospital. Eligibility for therapeutic hypothermia is based on a clinical exam consistent with encephalopathy and perinatal depression evident by low Apgar scores, acidosis, and need for prolonged resuscitation after birth. Urine samples will be collected at 12, 24, 48, and 72 hours of life (HOL). Urine aliquots will be centrifuged, frozen, and transported to the Biomarker Laboratory at Cincinnati Children’s Hospital. Urine samples will be evaluated with a multiplexed assay with four urinary biomarkers: IL-18, KIM-1, NGAL, and cystatin C. Urine will also be evaluated with two individual biomarker assays: TIMP-2 and IGFBP7. Urine creatinine will also be tested for urine concentration standardization. SCr will be obtained daily during whole body cooling and rewarming. A SCr will also be obtained on day of life 7. AKI severity will be evaluated using the neonatal modified Kidney Disease Improving Global Outcomes (KDIGO) criteria based on SCr. AKI will be defined as ≥ 0.3 mg/dL rise in SCr within 48 hours or an increase to 150-200% of baseline SCr within 7 days. Continuous renal near-infrared spectroscopy (NIRS) monitoring and arterial oxygen saturations (SpO2) will be obtained from day of life (DOL) 1-4 throughout cooling and rewarming. NIRS data will be analyzed for renal fractional tissue oxygen extraction. In addition to AKI, the following clinical outcomes will be evaluated: need for renal replacement therapy, death, length of hospital stay, days of mechanical ventilation, days of continuous vasopressor therapy, elevated gentamicin trough levels, and positive fluid balance.

EXPECTED RESULTS: Using SCr, we expect that approximately 50% of the neonates will develop AKI. Based on previous research, the urinary biomarkers will be elevated in neonates who develop AKI. The investigators predict that specificity and sensitivity of AKI diagnosis will be improved when the urinary biomarkers are used in conjunction with each other. Also, altered renal oximetry values are anticipated in neonates who develop AKI and may correlate with physiologic renal changes reflected in biomarker elevations.
**POSTNATAL DIET IMPACT ON MiRNA EXPRESSION**

Laura Carr, M.D.; Anne Bowlin; V. Laxmi Yeruva, MS, PhD

**BACKGROUND:** Multiple studies have shown that miRNAs have biological activities in humans. MiRNAs are involved in post-transcriptional gene regulation. MiRNAs influence many physiologic functions including cell proliferation, differentiation, and cell death. Several cell signaling pathways have been found showing that miRNAs produce effects by binding to toll-like receptors or by surface antigen-mediated delivery of exosomes to immune cells. Dietary factors have been shown to influence stem cell regulatory networks by influencing endogenous miRNA levels *in vitro*. In addition to the influence of diet on endogenous miRNA production, diet can also be a source of miRNA.

One study showed that when mice are fed a miRNA-depleted milk diet for four weeks, there was a decrease in measured plasma miRNA by approximately 60% compared to mice fed a miRNA-sufficient diet. This study shows that dietary sources contribute an appreciable amount of miRNA to total miRNA detected in blood. Breast milk has been shown to contain miRNAs which are thought to withstand degradation in the GI tract and be absorbed. MiRNA from bovine milk consumed by humans has been found in the plasma and noted to have a regulatory effect on cell functions. Some milk-derived miRNAs are related to immune function and these are often highly expressed in human milk. Studies have shown a similar miRNA profile in human, bovine, and goat milk. Porcine milk has also been shown to contain many immune-related miRNAs. Infant formulas, however, have been shown to have a decreased amount of miRNA.

**METHODS:** Piglets were separated into 3 groups after 2 days of age to consume either sow milk, human breast milk, or infant formula. Piglets consumed study diet until 21 days of age when they were all switched to a solid diet. Blood was collected from the piglets at 2, 21, 35, and 48 days of age and was stored at -80°C. Total RNA will be isolated from whole blood, a cDNA library will be generated, miRNA will be isolated and a microarray will then be performed to identify differential expression of miRNA among diet groups.

**RESULTS:** Expected outcomes

1. miRNA identified in study diets and consumed by piglets are present in blood after three weeks of consuming study diet and four weeks after weaning.
2. The different study diets will impact endogenous miRNA expression.
3. miRNA that are differentially regulated by diet have physiological consequences on gut development and immune cell differentiation and maturation.

**CONCLUSION AND SIGNIFICANCE:** This work is important because human breast milk consumption is associated with improved health outcomes when compared to infant formula. The exact mechanisms and metabolic intermediates responsible for this observation have not been fully identified and miRNAs are a strong candidate for mediating many physiologic effects of early diet.
MATERNAL INDICATORS ASSOCIATED WITH SHORTENED LATENCY PERIOD WITH PRETERM PREMATURE RUPTURE OF MEMBRANES AND SHORT-TERM NEONATAL OUTCOMES

Sarada Alla, M.D.; Everett Magann, M.D.; Sara Peeples, M.D.; Julie Whittington, M.D.; Songthip Ounpraseuth, PhD

BACKGROUND: Preterm premature rupture of the membranes (PPROM) is a leading cause of preterm deliveries and neonatal mortality and morbidity. Current recommendations for the management of PPROM for women < 34 weeks gestation includes antibiotics and expectant management until maternal or fetal condition requires delivery or after 34 weeks and 0 days has been achieved. There is a paucity of data on maternal predictors of the latency period and neonatal outcomes. Improved data and information on predictors of the latency period with PPROM would be beneficial to both maternal and neonatal healthcare providers with regards to both counseling and caring for our families. The objective of this study is to identify maternal indicators associated with shortened latency period with PPROM, and to assess the impact of these indicators on short-term neonatal outcomes.

HYPOTHESIS: Vaginal bleeding, contractions, low amniotic fluid volume <5cm, cervical dilation >2 cm, and maternal perception of not feeling well are associated with shortened latency period and more severe neonatal outcomes with PPROM.

METHODS: A retrospective chart review of mothers with PPROM who delivered between 2014 and 2017 and their infants is being conducted. For the estimated 320 mother/infant dyad, the following variables are being collected: cervical dilation on admission or at time of rupture; vaginal bleeding on admission or at time of rupture; amniotic fluid volume on admission or at time of rupture; contractions on admission or at time of rupture; maternal perception of not feeling well on admission or at time of rupture; type of antenatal surveillance used; frequency of antenatal surveillance; gestational age at rupture; gestational age at admission; gestational age at delivery; time from hospital admission to delivery; doses of prenatal steroids; mode of delivery; presence of chorioamnionitis; presence of cord prolapse; need and reason for transfer to ACH; infant survival; need for intubation; doses of surfactant needed; need for postnatal steroids; presence of pneumothorax; need for high frequency ventilation; need for nitric oxide; duration of neonatal intensive care unit stay; presence of chronic lung disease and oxygen requirement; home oxygen use; grade of intraventricular hemorrhage; presence of PVL; presence of severe ROP requiring surgery; presence of necrotizing enterocolitis; and presence of culture-proven sepsis.

ANTICIPATED OUTCOMES: It is our expectation that that information gathered during this study will enable us to better counsel families. As a referral center for the state, hospital-specific data on maternal indicators associated with PPROM and subsequent neonatal outcomes for infants with PPROM will be beneficial in helping families understand the risks associated with their pregnancy and hospitalization and improve our quality of care.

REFERENCES:

Pediatric Neurology

EFFECTIVENESS OF LEVETIRACETAM IN PREVENTION OF EARLY POST TRAUMATIC SEIZURES IN CHILDREN 0-17 YEARS OF AGE

Sarah Cobb, M.D. Kapil Arya, M.B.B.S., Sarah Cobb. M.D. Brittany Taylor B.S.

OBJECTIVE: To study if levetiracetam (Lev) is effective in reducing the incidence of early post traumatic seizures (EPTS) in children 0-17 years old with closed head trauma.

BACKGROUND: EPTS occur within seven days of the head trauma. Seizures occur in 10% of traumatic brain injury patients. 20% of people with closed head trauma (CHT) and intracranial bleeding (ICH) have EPTS. 25% patients will have another seizure after their first EPTS. Use of phenytoin to prevent EPTS is the current standard of care in the first seven days post head trauma. In the adult population, some studies have shown that Lev is effective in decreasing the frequency of EPTS. However, in the pediatric population, these studies are lacking.

DESIGN/METHODS: We performed a retrospective chart review of patients admitted to our institution’s Pediatric Intensive Care Unit over a 5 year period, with a diagnosis of CHT. 38 patients were identified. Presence of ICH and incidence of EPTS was compared between 27 patients who received Lev and 11 patients who did not receive anti-epileptic drug (AED) treatment.

RESULTS: Incidence of EPTS was 23.7% (9/38- 7 after Lev, 2 without AED). Neither was there a significant difference (Chi Square p value ‘p’= 0.45) in incidence of seizures in patients with Lev (7/27) compared to those without AED (2/11), nor in incidence of seizures in patients with ICH with lev (7/21) compared to those with ICH without AED (2/5) (p – 0.77).

CONCLUSION: In 0-17 year old children with CHT, with or without ICH, Lev does not significantly reduce the incidence of EPTS. Analyzing a larger number of patients may lend evidence supporting or refuting this conclusion.
**ASSOCIATION OF CHIARI I MALFORMATION AND DYSPHAGIA**

S Smart M.D., M Gaffey M.D., J Bonilla Velez M.D., Will Fuell, Reem Elwy, G Albert M.D., G Richter M.D.

**BACKGROUND:** Chiari I malformation (CM1) may be associated with a wide spectrum of signs and symptoms in children. Lower cranial nerve deficits may present in pediatric patients with CM1, causing dysphagia, absent gag reflex, or vocal cord dysfunction. **We aim to evaluate the incidence of dysphagia in Chiari malformation before and after decompression.**

**METHODS:** This is a retrospective chart review of patients age 21 and under evaluated for Chiari malformation. Patients were seen at the neurosurgery clinic of a tertiary pediatric hospital and satellite clinics from July 2011 to May 2017.

**RESULTS:** 453 patients with Chiari malformation were identified that met exclusion and inclusion criteria. Of those patients, 121 had a history of dysphagia, choking, or abnormal swallow study. Of the patients in our study, 34 underwent Chiari decompression. 28 patients reported no dysphagia post-operatively. 6 patients continued to show evidence of dysphagia including aspiration. All patients with persistent dysphagia had history of global developmental delay.

In the study population, 76 patients underwent a pre-operative swallow study. The exam showed evidence of aspiration in 27 patients, and 28 patients showed penetration. 20 patients had no evidence of aspiration or penetration, and one patient refused to participate. The number of patients with penetration and/or aspiration and developmental delay was 32 of 55 (58%). The number of patients with no aspiration or penetration and developmental delay was 8 of 20 (40%).

**CONCLUSION AND SIGNIFICANCE:** Patients with CM1 should continue to be screened for dysphagia. Clinicians should have a low threshold referral to speech therapy in patients reporting signs or symptoms of dysphagia.
Afternoon Session
Presentation Abstracts

2018 Fellows Research
**PHENOBARBITAL FOR CHOLESTASIS IN PARENTERAL NUTRITION ASSOCIATED LIVER DISEASE**
Bianca M. Davenport, M.D.; Nafisa K. Dajani, M.D.; Shasha Bai PhD

**BACKGROUND:** Infants exposed to diabetes during pregnancy have significant morbidity. It is estimated that gestational diabetes affects approximately 2-10% of pregnancies in the United States. This exposure to hyperglycemia in utero causes significant increases in components of the lipid profile and a predisposition to metabolic syndrome later in life. Although it has been shown that there is an elevation in lipid levels in infants of diabetic mothers, stratification by race or ethnicity is not well understood.

**HYPOTHESIS:** The primary hypothesis is that infants of diabetic mothers who are of African American and Hispanic descent will have significant elevations in triglyceride levels compared to Caucasian infants. The secondary hypothesis is that other lipids will also be elevated in African American and Hispanic infants of diabetic mothers.

**METHODS:** We will collect cord blood from 210 infants of diabetic mothers (70 AA, 70 Hispanic, 70 Caucasian) to determine the difference in lipid levels according to race.

**SIGNIFICANCE:** This will be the first study to evaluate differences in lipid levels by race in infants of diabetic mothers. By identifying risk factors for metabolic syndrome and cardiovascular disease in infancy, we hope to encourage life-long education and preventative medicine efforts to improve the health of children and to maintain optimal health into adulthood.
WORK OF BREATHING IN PREMATURE NEWBORNS DURING NON-INVASIVE VENTILATION

David Matlock, M.D.; Sherry Courtney, M.D.; Mark Heulitt, M.D.; Shasha Bai, PhD; Michelle Jones, DO

BACKGROUND: Respiratory insufficiency and failure have been significant sources of morbidity and mortality in preterm neonates. With the advent of mechanical ventilation in the neonatal intensive care unit, there has been a shift from the morbidities and mortality associated with respiratory failure and insufficiency to those associated with mechanical ventilation. This has promoted efforts to develop non-invasive forms of respiratory support to avoid prolonged mechanical ventilation. It has been difficult to synchronize non-invasive ventilation in preterm neonates to the patient’s own efforts due to the large air leaks, high respiratory rates, and small tidal volumes inherent to this interface and population. Neurally adjusted ventilatory assist (NAVA) is a novel mode of ventilation that uses a functional naso/orogastric tube with embedded electrodes which detect diaphragmatic contractions (called the E\textsubscript{di} signal). NAVA uses this E\textsubscript{di} signal to synchronize ventilator support to the patient’s own respiratory efforts and to support these efforts as needed. Few studies have examined the use of NAVA with non-invasive ventilation (NIV) in preterm neonates, and none have examined its effect on work of breathing. Michelle Jones, DO, recently completed a study funded by a Children’s University Medical Group grant, which looked at work of breathing in neonatal pigs comparing NIV NAVA with the unsynchronized NIPPV mode currently used in the NICU at ACH. She was able to show that work of breathing was lower with NAVA ventilation in this model. Our study will take what Dr. Jones learned in the pig lab and translate her research to the bedside. We will use respiratory inductance plethysmography to measure thoracoabdominal asynchrony and compare work of breathing during NIPPV versus NIV NAVA in preterm neonates with respiratory insufficiency.

HYPOTHESIS: Work of breathing as estimated by the phase angle (θ) using respiratory inductance plethysmography will be decreased with the use of NIV NAVA in comparison to unsynchronized NIPPV in premature neonates with respiratory insufficiency.

METHODS: Fifteen preterm neonates of between 1 and 2 kg current weight and receiving non-invasive ventilation will be enrolled in the study. The infants will be ventilated using NIV NAVA and unsynchronized NIPPV applied in random order for 15 minutes each while using respiratory inductance plethysmography to measure thoracoabdominal asynchrony as an estimate of work of breathing.

SIGNIFICANCE: This study will identify whether or not NIV NAVA has advantages over unsynchronized NIPPV for improving work of breathing in premature neonates receiving non-invasive respiratory support.
END-OF-LIFE CARE IN THE ICU: PEDIATRIC FELLOWS PERSPECTIVES

Katherine A. Kosiv M.D.; Thomas Cunningham PhD, Ronnie Thomas Collins M.D.

BACKGROUND: In 2013, nearly 19,000 children and adolescents died in the United States, many of them following withdrawal of life-sustaining treatment in intensive care units.\(^1\) End-of-life care practices are an important component in pediatric critical care. Unfortunately, studies have shown that residents feel unprepared to provide end-of-life care and would like more education on communication.\(^2\) Beyond surveys no studies have probed pediatric fellows about their perceptions and experiences regarding end-of-life care.

OBJECTIVE: We seek to determine pediatric fellows’ preparation for providing end-of-life care to pediatric patients. We plan to investigate prior education, experiences and attitudes regarding end-of-life care. We will target fellows who will encounter terminal illness in their practice of medicine. By addressing this cohort of physician trainees, we aim to define areas for improvement in education and the practice of end-of-life care.

HYPOTHESIS: End-of-life care communication between physicians, family members and patients is lacking. Education in end-of-life care is not emphasized in pediatric residency or fellowship. Dedicated training and feedback on communication of end-of-life care may foster patient and family satisfaction and improve the delivery of end-of-life care.

METHODS: We will target pediatric fellows who encounter terminal illness in their practice of medicine, specifically in the fields of critical care, cardiology, neonatology, intensive care, pulmonology and nephrology. By addressing this cohort of physician trainees, we aim to define areas for improvement in education and the practice of end-of-life care. Using semi-structured interviews, we will evaluate how pediatric fellows conceptualize end-of-life care. Semi-structured interviews will be conducted either face-to-face or via Skype/Facetime (per the fellow’s preference). A preliminary analysis of the transcripts will establish themes from which a coding schema will be devised. Qualitative content analysis will be performed using Nvivo software. Nvivo allows the coder to scan the transcriptions for specific words or phrases. The facile approach will identify salient topics and themes used to develop a thematic codebook.

ANTICIPATED OUTCOMES: Pediatric fellows have limited training in end-of-life care especially in the realm of communication. Knowledge is mostly gleaned from clinical experience. Fellows are interested in end-of-life care and possess ideas for improvement.

BIBLIOGRAPHY:

CEREBRAL OXIMETRY IN NON-INTUBATED PEDIATRIC ISOLATED TBI PATIENTS RECEIVING 3% HTS

Shane M. McKinney, M.D. MS; Thomas J. Abramo, M.D.; Gregory Albert, M.D.; Nicholas Porter, M.D.; Elizabeth Storm, M.D.

BACKGROUND: In altered traumatic brain injury (TBI) patients, emergency department monitoring for detecting increased ICP and therapeutic response is inconsistent. Cerebral oximetry can detect acute changes in cerebral physiology, pathology, and ICP changes. Cerebral oximetry readings are expressed as a ratio of venous oxyhemoglobin to deoxyhemoglobin (rcSO2) and pediatric normal values range from 60% to 80%. Abnormally low values (rcSO2 80%), and interhemispheric discordance (differences in right and left > 10%) reflect abnormal cerebral physiology and increased ICP. 3% HTS therapy has been used in ED non-intubated TBI patients, showing clinical benefit, but assessing its effects on cerebral physiology changes is done invasively in ICU. Assessing 3% HTS effects in altered non-intubated TBI patients with cerebral pathology (epidural or subdural) or without (no epidural or subdural) in the PED by cerebral oximetry has never been investigated.

METHODS: PED observational convenience study of altered (GCS < 14) non-intubated TBI patients with CT-scan and clinical decisions for 3% HTS infusion had simultaneous cerebral oximetry monitoring during 3% HTS infusion. Patient’s cerebral oximetry and GCS changes were compared at 10 min before, and 10, 20 min after 3% HTS infusions. Patients were subgrouped and analyzed by rcSO2 initial readings, rcSO2 80 (abnormal cerebral pathology), and rcSO2 60-80 (normal cerebral pathology).

RESULTS: Age 3.96(2.3, 8.4), All TBI groups GCS changes before and after 3% HTS were 10(9,10) and 13(13,14), GCS difference 4(3,4), p < 0.0001. 3% HTS infusion time from start to the first 15% change in left and right rcSO2 was 1.5 minutes (1.1, 2.0).

CONCLUSION AND SIGNIFICANCE: This preliminary study has demonstrated the ability of cerebral oximetry (rcSO2) to noninvasively detect real-time effects of 3% HTS on the altered TBI patient’s cerebral physiology in an ED. In isolated non-intubated altered TBI PED patients with or without abnormal cerebral pathology (epidural and/or subdural) the 3% HTS effect on their cerebral physiology as defined by cerebral oximetry changes were highly significant and correlated with GCS changes. Cerebral Oximetry monitoring has shown its capabilities as an objective neuro-assessment and monitoring tool in altered non-intubated TBI patient’s cerebral physiology and response to therapy. Further investigation is warranted.
EVALUATION OF PROCALCITONIN AS A NEGATIVE PREDICTOR OF SERIOUS AND INVASIVE BACTERIAL INFECTIONS IN PEDIATRICS

J. Matthew Digman, M.D.; Ryan R. Roddy, M.D.; Suzanne Godbold BS, RRT, AE-C; Lee Crawley MS, RRT-NPS; Hailey Hardgrave; Alexander Kaczenski, M.D.; Katie Dreher; Jennifer Perry, M.D.; Keith Cross, M.D.; Saleema Karim, PhD, MBA, MHA; Cruz Velasco-Gonzalez, PhD; Gail Woods, M.D.; Thomas Abramo, M.D.

BACKGROUND: Children with serious or invasive bacterial infections (SBI and IBI) often present to the pediatric emergency room. While these children may have compelling signs of a serious or invasive infection, many will be evaluated in the initial stages of illness when the clinical picture has not fully evolved. Physicians use various tools such as laboratory testing, microbiology, and radiography to help identify patients who may be at an increased risk for these types of infections. Procalcitonin is one such biomarker that has been used for adults and children to assist the clinical investigator in this potentially arduous process, yet further studies are required to adequately assess the use of procalcitonin in the acute setting.

METHODS: A retrospective chart review was performed on children from birth-17 years who had a procalcitonin level drawn as part of a work-up for infection from 9/9/2014 to 6/1/2017 (n = 1200). Predictor variables were collected including culture and serology results, imaging, vital signs, SIRS criteria, commonly-used labs results (such as CBC and CRP), diagnoses, advanced airway management, vasopressors, and demographics which were stored in a REDCap database. This information was used to perform traditional statistical analysis, multivariate logistic regression, and recursive partitioning (CART). Results were established for all ages then further stratified by age group: birth to 30 days, 30-60 days, 60-180 days, 6 months-2 years, and 2 years to 18 years. SBI was defined as bacterial pneumonia, UTI, bone/joint infections, and enteritis. IBI was defined as bacterial meningitis, central line infections, and bacteremia.

RESULTS: Using a procalcitonin threshold of >2 ng/mL, prevalence, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (+LR), and negative likelihood ratio (-LR) were calculated for each individual type of SBI and IBI, for all patients and then for each age group. Looking at all ages combined, the mean sensitivity and PPV for SBI were poor (28.8% and 20.4%), though specificity and NPV were considerably better (88.5% and 92.4%). For IBI the sensitivity and PPV were also poor (45.8% and 14%), but the specificity and NPV were again much better (88.3% and 97.5%). Logistic regression was also performed in order to analyze procalcitonin and CRP performance individually for SBI and IBI as well as their combined performance. For all SBI, the AUC for procalcitonin and CRP were 0.656 and 0.716 with no statistical difference (p=0.080). For all IBI, the AUC for procalcitonin and CRP were 0.825 and 0.745, with procalcitonin performing significantly better (p=0.013). When procalcitonin and CRP were combined, the AUC for SBI was 0.712. The combined AUC for IBI was 0.751. Using recursive partitioning, computer analysis was able to produce prediction trees for both SBI and IBI datasets in total, then for each age group, using the collected predictor variables obtained during chart review.

CONCLUSION AND SIGNIFICANCE: Procalcitonin shows high specificity and NPV for different types of SBI and IBI, performing better for IBI across age groups. Its sensitivity and PPV for these types of infections are poor. Using ROC curves and AUC analysis, procalcitonin is no better than CRP for SBI, but it is better than CRP for IBI. Combining the two tests yields no benefit over using procalcitonin alone. Recursive partitioning seems to suggest that procalcitonin is not as useful as CRP and WBC count for predicting SBI in any age group, but does serve a role in predicting IBI, particularly in older children.
IMPROVING PEDIATRIC RESIDENT EFAST COMPREHENSION AND ACQUISITION

**Selby, Samuel D.O.; Saleem, Sandal M.D.; Liggin, Rebecca M.D.; Snead, Gregory M.D.; Velasco, Cruz PhD; Bean, Ashley M.D.; Russ, Brian M.D.; Crawley, Lee RT; Lewis, Zachary M.D.; Vvor-dassu, Komi M.D.; McCarty, Thomas M.D.; Evans, Lauren M.D.; Willard, Erin M.D.; Kierstead, John M.D.**

**BACKGROUND:** Point of care ultrasound (POCUS) is an increasingly important modality across multiple specialties. POCUS assists practitioners at bedside for diagnosis & intervention with increased diagnostic & procedural success while decreasing adverse effects. POCUS has been shown to be quickly taught & adopted with minimal training time. In the specialty of Pediatrics ACGME requirements specify residents must have pediatric emergency medicine training & learn to make “informed diagnostic & decisions resulting in optimal therapeutic judgment.” In this setting the eFAST is commonly utilized to evaluate for injury in trauma patients. Currently no requirements of POCUS curriculum exist for pediatric residents.

**OBJECTIVE:** Assess comfort & competency of pediatric residents at performing the extended focused assessment with sonography for trauma (eFAST) exam prior to & after one didactic/hands-on session. Secondary objective: identify perceived barriers to POCUS implementation.

**METHODS:** Convenience sample of pediatric residents across all years of postgraduate training. A pre/post intervention questionnaire was given up to one-week pre/post intervention. Questions assessed experience, comfort, & knowledge at performing & interpreting an eFAST exam. Intervention consisted of a 1 hour training integrating didactic & hand-on educations with standardized patients followed by a 30-minute case based scenario for image acquisition and interpretation. Paired t-test (N=30) was used to detect a p=0.05 with a power of 80% (SD 2.2 or smaller) of the 5-point Likert scale.

**RESULTS:** 31 total pediatric residents: pgy1 (8), pgy2 (14) & pgy3 (9). There was a significant positive difference (p <.0001) in the comfort of obtaining & interpreting an adequate eFAST in all views after the intervention. Pgy level of residency & previous ultrasound training had no effect on the comfort or competence among the group, but previous performance did have a positive effect (p=0.0073). Among the questions regarding interpretation & knowledge pertaining to the eFAST exam all questions showed improvement between pre and post intervention. Lack of training & time were identified as top barriers for using POCUS.

**CONCLUSION AND SIGNIFICANCE:** This pilot study demonstrated improved both confidence & competence of pediatric residents in performing and interpreting the eFAST with minimal didactic intervention. The most common barrier identified for using POCUS by pediatric residents was lack of training. These results show promise in the potential and effectiveness of increasing formal POCUS training for pediatric residents.
2017 – 2018 Fellows Achievements

Graduate Certificate in Clinical and Translational Sciences

- Developmental Peds
  - Alberto Allegre, M.D.
- Neonatology
  - Bianca Davenport, M.D.
  - David Matlock, M.D.
- Critical Care
  - Hannah Bauer, M.D.
  - Sonia Matehuala, M.D.
  - Jennifer Pham, M.D.

Developmental-Behavioral Pediatrics

PUBLICATIONS


Emergency Medicine

PRESENTATIONS


## Cardiology

### PRESENTATIONS


## Child Anesthesia

### PRESENTATIONS

- **Willett O**; Aunspaugh JA; Criddle JH; Apuya J. Decreasing the Incidence of Unplanned Admission Secondary to PONV: A Quality Improvement Project. Society of Pediatric Anesthesia in Phoenix, Arizona, March 2018.

## Hematology/Oncology

### PRESENTATIONS

- **Do, DC**; Dalby, S., McFadden, M.; Prakash, S.; Lee, D; Heuston, E; Farrar, JE. Effects of Disruption of piRNA Pathway in AML Cell Lines Treated with Demethylating Agents. The American Society of Pediatric Hematology/Oncology, Annual Conference. Pittsburgh, PA, May 2-5, 2018 (Poster Presentation).


### PUBLICATIONS


PRESENTATIONS


GRANTS

  Grant amount: $15,000

- David Matlock, M.D.; Children’s Medical Research Group (CUMG) grant in the amount of $10,000. Prospective Crossover Comparison of Work of Breathing During Non-invasive Ventilation: Neurally Adjusted Ventilatory Assist (NAVA) Versus Non-invasive Positive Pressure Ventilation (NIPPV) In Premature Neonates.
  Grant amount: $10,000 (Pending)