The Mission of the Charles P. Darby Children’s Research Institute is to improve the lives of children, their families and communities by conducting high quality children’s research, by training superior physicians and scientists, and by fostering innovation through the sciences of discovery and application.
March 28, 2018

Dear Attendee:

We are delighted that you have joined us to celebrate the 11th Annual Darby Children’s Research Institute (DCRI) & Pediatric Research Symposium – Celebrating Discoveries in Children’s Research! The theme for this year’s event is: Pediatric Brain Injury and Recovery.

The DCRI was created to strengthen children’s research at the Medical University of South Carolina. We are excited to present this new two-day celebration, highlighting many of the accomplishments in Pediatric basic, translational and clinical research. The first day of the symposium will feature abstract and poster presentations, awards, and guest exhibitors showcasing some of the amazing technology today’s healthcare professionals rely upon to bring about as much normalcy as possible to young lives affected by physical abnormalities or brain injury. Day-two will feature a half-day of family-friendly, interactive stations, where attendees can observe and gain first-hand experience with selected technology and meet some of the professionals who use them.

The DCRI continues to house groups of investigators that interact with one another across divisions, departments, colleges and universities, and the environment has inspired many award-winning trainees. Although the DCRI physically serves as an anchor and symbol for pediatric research on campus, we have many investigators who are performing child-related clinical research across the MUSC campus, and this research symposium celebrates that work as well.

Dr. Kimberly Kuchinski, MD, MPH, Medical Director for Physical Medicine and Rehabilitation joins us from the Good Shepherd Rehabilitation Network, in Allentown, PA, to help us celebrate this year’s achievements. You are cordially invited to attend her keynote presentation titled, “Functional Recovery after Pediatric Brain Injury – Application of Innovative Rehabilitation Technologies” at 8:00 AM in the Bioengineering Building, room 110.

Sincerely,

Ramin Eskandari, MD, MS
2018 DCRI & Pediatrics Research Symposium Chair
Director of Pediatric Neurosurgery
Assistant Professor of Neurosurgery
Departments of Neurosurgery, Surgery, and Pediatrics

Andrew Atz, MD
Chairman
Department of Pediatrics
Professor of Pediatrics, Chief of Cardiology
“Functional Recovery after Pediatric Brain Injury – Application of Innovative Rehabilitation Technologies”

Traumatic Brain Injury (TBI) refers to injury to the brain which results in cognitive, physical and psychosocial impairment. Symptoms such as decline in level of arousal, memory loss, gross and fine motor impairment, visual deficits, balance impairment, other neurological deficits or even death result from TBI. These injuries not only affect the children, but have lasting effects on their families and communities. TBI is the most costly public health crisis in America and the leading cause of long term disability in children. It is critical to understand and discover ways to improve cognition, vision, gross and fine motor control, stabilize behavior, mood and impulsivity following brain injury. While historically rehabilitation following a traumatic brain injury focused on compensation for loss of function, rehabilitation is now focusing on neuroplastic interventions to promote recovery and restore function. This presentation will focus on many rehabilitation interventions used to induce neuroplasticity including constraint induced movement therapy, various modes of locomotion training, interactive metronome, virtual reality, transcranial stimulation, neuromuscular electric stimulation, functional electrical stimulation for extremities and in swallowing therapy. Biochemical changes following TBI and pharmacological interventions that aide in TBI recovery will be explored. Finally, the future of TBI rehabilitation in pediatrics will be discussed.

Learning objectives:
1) To familiarize participants with the severity of traumatic brain injury in pediatrics as a public health crisis
2) To understand neuroplasticity and the application of neuroplasticity in rehabilitation
3) To enable participants to understand different rehabilitation interventions used to induce neuroplasticity
4) To explore the pathophysiology of brain injury and beneficial pharmacological interventions after TBI
# AGENDA

**"Pediatric Brain Injury and Recovery"**

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:15 – 7:45 am</td>
<td>Registration</td>
<td>Bioengineering Lobby</td>
</tr>
<tr>
<td>7:15 am – 7:45 am</td>
<td>Breakfast</td>
<td>Bioengineering &amp; Drug Discovery Building Lobby</td>
</tr>
<tr>
<td>7:45 – 8:00 am</td>
<td>Welcome and Introduction</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td></td>
<td>Ramin Eskandari, MS, MD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Director of Pediatric Neurosurgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assistant Professor of Neurosurgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Departments of Neurosurgery, Surgery and Pediatrics</td>
<td></td>
</tr>
<tr>
<td>8:00 – 9:00 am</td>
<td><strong>KEYNOTE</strong></td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td></td>
<td>Kimberly Kuchinski, MD, MPH, Medical Director, Pediatric Physical Medicine and Rehabilitation, Good Shepherd Rehabilitation Network, Allentown, PA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Functional Recovery after Pediatric Brain Injury – Application of Innovative Rehabilitation Technologies”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>KEYNOTE PRESENTATION, by Dr. Kuchinski, serves as the Pediatric GRAND ROUNDS event for this week, and as such is approved for a maximum of 1.0 AMA PRA Category 1 Credit(s)™</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Speaker</td>
<td>Title</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>9:00– 9:15 am</td>
<td>Katy Hallman, MS2</td>
<td>“Does the integrity of specific white matter tracts relate to early and late motor performance in preterm neonates?”</td>
</tr>
<tr>
<td>9:15 – 9:30 am</td>
<td>Sarah Yale, MD</td>
<td>“Comparison of Propofol Alone with Propofol Plus”</td>
</tr>
<tr>
<td>9:30 – 9:45 am</td>
<td>Ryan Gedney, MS2</td>
<td>“Astrocytes Under Pressure: Examining Cell Migration in an <em>Ex-Vivo</em> Model of Hydrocephalus”</td>
</tr>
<tr>
<td>9:45 – 10:00 am</td>
<td>Mushfiquddin Khan, PhD</td>
<td>“S-Nitrosoglutathione Increases Benefit of Motor Exercise on Functional Recovery and Stimulates Neurorepair Mechanisms Following Experimental Stroke in Rats”</td>
</tr>
<tr>
<td>10:00 – 10:15 am</td>
<td>Nishant Saxena, PhD</td>
<td>“S-Nitrosoglutathione reductase (GSNOR) inhibitor as an immune modulator in experimental autoimmune encephalomyelitis”</td>
</tr>
<tr>
<td>10:00 – 10:30 am</td>
<td>BREAK</td>
<td><strong>Break</strong>&lt;br&gt;• Poster Viewing (preliminary)&lt;br&gt;• Sponsor Exhibition – demonstrations and technology presentations at individual Sponsors’ exhibition tables&lt;br&gt;<strong>Break and Refreshments – served in poster viewing</strong></td>
</tr>
<tr>
<td>10:45 – 11:00 am</td>
<td>Jacqueline Kraveka, DO</td>
<td>“Genomic Analysis and Precision Therapy for High Risk Neuroblastoma at Diagnosis and Relapse”</td>
</tr>
<tr>
<td>11:00 – 11:15 am</td>
<td>Shannon Phillips, PhD, RN</td>
<td>“A Family-Centered Self-Management Program for Children with Sickle Cell Disease”</td>
</tr>
<tr>
<td>11:15 – 11:30 am</td>
<td>Oyindamola Awe, MS</td>
<td>“Regulation of Angiogenic Signaling in Pregnancy and Preeclampsia”</td>
</tr>
<tr>
<td>11:30 – 11:45 am</td>
<td>Tammy Lane Churchill, RDCS (PE FE), FASE</td>
<td>“Implementation of Sonographer Driven Organizational Goals Improves Study Completeness and Image Quality in the Pediatric Echo Lab”</td>
</tr>
<tr>
<td>11:45 – 12:00 pm</td>
<td>Xiaoyi Tina Zhang, MD, PhD</td>
<td>“Filling the Feeding Gap: Interventions in a Nutrition NICU Graduate Clinic”</td>
</tr>
<tr>
<td>Time</td>
<td>Event</td>
<td>Location</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>12:00 – 1:00 pm</td>
<td><strong>LUNCH</strong>&lt;br&gt;• Poster Viewing (preliminary)&lt;br&gt;• Sponsor Exhibition – demonstrations and technology presentations at individual Sponsors’ exhibition tables</td>
<td>Bioengineering and Drug Discovery Building Lobby Areas</td>
</tr>
<tr>
<td>1:00 – 2:30 pm</td>
<td><strong>JUDGING EVENT</strong>&lt;br&gt;POSTER SESSION – Refreshments Provided (Author or designee attendance required; judges circulating)</td>
<td>Bioengineering and Drug Discovery Building Lobby Areas</td>
</tr>
<tr>
<td>2:30 – 2:45 pm</td>
<td>Heidi J. Murphy, MD “Early Continuous Renal Replacement Therapy during Infant Extracorporeal Life Support Decreases Lung Opacification”</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>2:45 – 3:00 pm</td>
<td>Dan A. Newton, PhD “Vitamin D Binding Protein Polymorphisms Significantly Impact Vitamin D. Status in Children”</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>3:00 – 3:15 pm</td>
<td>Katherine Vincent, NNP “Acute Kidney Injury Guidelines Improve Recognition and Follow-Up for Neonatal Patients”</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>3:15 – 3:30 pm</td>
<td>Jason Buckley, MD “Early Childhood Outcomes Following Repair of Truncus Arteriosus: A Contemporary Multicenter Analysis”</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>3:30 – 3:45 pm</td>
<td>W. Scott Streitfeld, MS “A Novel Role for Iron Sulfur Trafficking in the Genesis of Congenital Heart Disease”</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>3:45 – 4:30 pm</td>
<td><strong>CLOSING SPEAKER</strong>&lt;br&gt;Frank Hyland – Active Therapy for Pediatric Brain Injury&lt;br&gt;Good Shepherd Rehabilitation Network, Allentown, PA</td>
<td>Bioengineering Room 110</td>
</tr>
<tr>
<td>4:30 – 5:00 pm</td>
<td><strong>AWARDS SESSION and Closing Remarks</strong>&lt;br&gt;Ramin Eskandari, MS, MD&lt;br&gt;2018 DCRI &amp; Pediatrics Research Symposium Chairman&lt;br&gt;Director of Pediatric Neurosurgery&lt;br&gt;Assistant Professor of Neurosurgery&lt;br&gt;Departments of Neurosurgery, Surgery and Pediatrics&lt;br&gt;Andrew Atz, MD&lt;br&gt;Chairman, Department of Pediatrics&lt;br&gt;Professor of Pediatric Cardiology&lt;br&gt;Director, Pediatric Clinical Trials Group</td>
<td>Bioengineering Room 110</td>
</tr>
</tbody>
</table>
You are cordially invited!!

5:00 – 7:00 pm

**NETWORKING EVENT**
Come relax! Join us for wine and cheese for the perfect end-of-the-day event
(Conference nametag must be visible at all times)

Drug Discovery Building
Lobby area

Saturday, April 14, 2018
MUSC Bioengineering Building & Drug Discovery Building
8:00 am – 12:00 pm, Room 110

AGENDA
“Family-Friendly Day of Discovery”

<table>
<thead>
<tr>
<th>TIME</th>
<th>EVENT</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:15 – 7:45 am</td>
<td>Registration</td>
<td>Bioengineering Lobby</td>
</tr>
<tr>
<td>7:15 am – 8:45 am</td>
<td>Breakfast</td>
<td>Drug Discovery Lobby</td>
</tr>
</tbody>
</table>
| 7:45 – 8:00 am | Welcome and Introduction

Ramin Eskandari, MS, MD
2018 DCRI & Pediatrics Research Symposium Chairman
Director of Pediatric Neurosurgery
Assistant Professor of Neurosurgery
Departments of Neurosurgery, Surgery and Pediatrics |

Bioengineering Room 110

8:00 am – 12:00 pm

**MULTIPLE STATIONS**
Breakfast and snacks will be provided

Families and healthcare professionals are invited to observe multiple demonstrations and interact with the visiting Sponsors to experience state-of-the-art medical equipment designed to normalize life, to the extent possible, for pediatric patients with brain injury or in various stages of recovery from brain injury.

This half-day event promises to be educational, illuminating, and inspirational!
The DCRI Pediatric Symposium is supported by the Department of Pediatrics, The Children’s Hospital Fund, the MUSC Foundation for Research Development, and the Good Shepherd Rehabilitation Network.

The 11th Annual DCRI & Pediatrics Research Symposium is also made possible by the generous support of our Corporate Sponsors including:

Brainlab, Inc.
Medtronic
Monteris Medical
Niconeuro
Stryker
Synaptive
<table>
<thead>
<tr>
<th>ABSTRACT NUMBER</th>
<th>POSTER NUMBER</th>
<th>1ST Authors</th>
<th>ABSTRACT TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>1</td>
<td>Oyindamola Awe</td>
<td>Regulation of Angiogenic signaling in pregnancy and preeclampsia</td>
</tr>
<tr>
<td>62</td>
<td>2</td>
<td>Meghan Brunswick</td>
<td>Oral feeding volumes as a measure of prediction for newborns in the neonatal intensive care unit that will require gastrostomy placement</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>Jason Buckley</td>
<td>Early Childhood Outcomes Following Repair of Truncus Arteriosus: A Contemporary Multicenter Analysis</td>
</tr>
<tr>
<td>40</td>
<td>4</td>
<td>Jennifer Calder</td>
<td>Utilization of EMS by Hispanic patients accessing the pediatric emergency department</td>
</tr>
<tr>
<td>61</td>
<td>5</td>
<td>Seungho Choi</td>
<td>Regulation of endothelial barrier integrity by redox-dependent nitric oxide signaling: Implication in traumatic brain injury pathology</td>
</tr>
<tr>
<td>53</td>
<td>6</td>
<td>Tammy Lane Churchill</td>
<td>Implementation of Sonographer Driven Organizational Goals Improves Study Completeness and Image Quality in the Pediatric Echo Lab</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>Zachary Coffman</td>
<td>Predictors of Acute Kidney Injury in Neonates with a Patent Ductus Arteriosus</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>Bridget Curley</td>
<td>Healthcare Utilization in the First Year of Life for Children with Hypoplastic Left Heart Syndrome</td>
</tr>
<tr>
<td>43</td>
<td>9</td>
<td>Nadirah El-aMIN</td>
<td>An Atypical Presentation of Cold Agglutinin Autoimmune Hemolytic Anemia in a Pediatric Patient</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>Stephanie Gaydos</td>
<td>Transition Readiness and Follow-up Rates in Adolescents and Young Adults with Congenital Heart Disease</td>
</tr>
<tr>
<td>22</td>
<td>12</td>
<td>Majd Ghanim</td>
<td>Exceptional Clinical Response to Molecular Guided Therapy in a Patient with Progressive Lymphoepithelioma-like Thymic Carcinoma</td>
</tr>
<tr>
<td>56</td>
<td>13</td>
<td>Stephanie Glenn</td>
<td>Exceptional Clinical Response to Molecular Guided Therapy in a Patient</td>
</tr>
<tr>
<td>ID</td>
<td>Title</td>
<td>Author(s)</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Does Direct Admission Increase Risk for Early Unplanned Escalation of Care?</td>
<td>Michelle Greene</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Treating severe spinal deformity in medically fragile children - the PICU is a critical component</td>
<td>Richard Gross</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Atypical Kawasaki Disease Presenting with Generalized Pustulosis</td>
<td>Kris Hardy</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Antibiotic Disruption of Gut Microbiota Dysregulates Osteoimmune Crosstalk in Post-Pubertal Skeletal Development</td>
<td>Jessica Hathaway-Schrader</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Vacation Sedation: Improving the experience of procedural sedation in the pediatric emergency department</td>
<td>Jonathan Henderson</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Preoperative Imaging of Pulmonary Arteries in Neonates with Ductal Dependent Congenital Heart Disease</td>
<td>Anthony Hlavacek</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>The integrity of specific white matter tracts relates to early and late motor performance in preterm neonates</td>
<td>Dorothy Jenkins</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pediatric Chiari I Malformation: Age Stratified Literature Review</td>
<td>Sarah Johnson</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>S-Nitrosoglutathione Increases Benefit of Motor Exercise on Functional Recovery and Stimulates Neurorepair Mechanisms Following Experimental Stroke in Rats</td>
<td>Mushfiquddin Khan</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Genomic Analysis and Precision Therapy for High Risk Neuroblastoma at Diagnosis and Relapse</td>
<td>Jacqueline Kraveka</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Lysosomal Acid Lipase is a Potential Therapeutic Target for Controlling GVHD after Allogeneic Hematopoietic Cell Transplantation in Mice</td>
<td>Sandeepjumar Kuril</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Factors Associated with Delayed Transition to Oral Feeding in Infants with Single Ventricle Physiology</td>
<td>Joshua Kurtz</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Correlation and Agreement of Cardiac MRI and Balloon Waist Diameter of the Right Ventricular Outflow Tract for Percutaneous Pulmonary Valve Replacement</td>
<td>Joshua Kurtz</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Common Links Between Fetal Cardiac and Placental Development</td>
<td>Kyu-Ho Lee</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Chloroma Causing Cord</td>
<td>Mamatha Mandava</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>ID</td>
<td>Authors</td>
<td>Title</td>
</tr>
<tr>
<td>------</td>
<td>----</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>63</td>
<td>29</td>
<td>Meenall Mehrotra</td>
<td>Efficacy of Regulatory T Cell Transplantation in a Mouse Model of Osteogenesis Imperfecta</td>
</tr>
<tr>
<td>44</td>
<td>30</td>
<td>John Melville</td>
<td>Expected and Unexpected Disclosures in the Forensic Interview</td>
</tr>
<tr>
<td>59</td>
<td>31</td>
<td>Shruti Mittal</td>
<td>Perinatal Risk Factors and Outcomes For Social Emotional Difficulties in High Risk Infants</td>
</tr>
<tr>
<td>18</td>
<td>32</td>
<td>Matthew Moake</td>
<td>Case Report: Belhassen Tachycardia in a Healthy Adolescent Male</td>
</tr>
<tr>
<td>23</td>
<td>33</td>
<td>Anjan Motamarry</td>
<td>Novel Method for Systemic Removal of Thermosensitive Liposomal Doxorubicin to Reduce Toxicities</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>Heidi Murphy</td>
<td>Early Continuous Renal Replacement Therapy During Infant Extracorporeal Life Support Decreases Lung Opacification</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>Heidi Murphy</td>
<td>Continuous Renal Replacement Therapy Removes Cytokines During Infant Extracorporeal Life Support</td>
</tr>
<tr>
<td>24</td>
<td>36</td>
<td>Christina Neiger</td>
<td>Effect of Physical Activity on Vitamin D (VitD) Status in Pregnant Women Participating in a Randomized Controlled Trial (RCT)</td>
</tr>
<tr>
<td>27</td>
<td>37</td>
<td>Danforth Newton</td>
<td>Vitamin D Binding Protein Polymorphisms Significantly Impact Responses to Vitamin D Supplementation in Children</td>
</tr>
<tr>
<td>52</td>
<td>38</td>
<td>Chad Novince</td>
<td>Commensal Gut Bacterium Impairs Bone Modeling in Post-natal Skeletal Development</td>
</tr>
<tr>
<td>4</td>
<td>39</td>
<td>Thomas Offerle</td>
<td>Treatment of Early Onset Scoliosis and its Emotional Effects on Patients and Their Families: An EOSQ Analysis</td>
</tr>
<tr>
<td>36</td>
<td>40</td>
<td>Karina Phang</td>
<td>Prescribing Patterns of High-Risk Medications in Pediatric Patients with Pneumonia and Sinusitis</td>
</tr>
<tr>
<td>15</td>
<td>41</td>
<td>Shannon Phillips</td>
<td>A Family-Centered Self-Management Program for Young Children with Sickle Cell Disease: Phase I</td>
</tr>
<tr>
<td>29</td>
<td>42</td>
<td>Tarah Popp</td>
<td>NASA and Pediatric Echo Errors: Echo QA is Not Rocket Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>41</td>
<td>43</td>
<td>Mayra</td>
<td>Robinson</td>
</tr>
<tr>
<td>26</td>
<td>44</td>
<td>Nishant</td>
<td>Saxena</td>
</tr>
<tr>
<td>31</td>
<td>45</td>
<td>Luke</td>
<td>Schroeder</td>
</tr>
<tr>
<td>50</td>
<td>46</td>
<td>Morgan</td>
<td>Sims</td>
</tr>
<tr>
<td>13</td>
<td>47</td>
<td>Inderjit</td>
<td>Singh</td>
</tr>
<tr>
<td>32</td>
<td>48</td>
<td>Gregg</td>
<td>Stephen</td>
</tr>
<tr>
<td>38</td>
<td>49</td>
<td>William</td>
<td>Streitfeld</td>
</tr>
<tr>
<td>42</td>
<td>50</td>
<td>Sarah</td>
<td>Taylor</td>
</tr>
<tr>
<td>39</td>
<td>51</td>
<td>Allison</td>
<td>Uber</td>
</tr>
<tr>
<td>57</td>
<td>52</td>
<td>Katherine</td>
<td>Vincent</td>
</tr>
<tr>
<td>37</td>
<td>53</td>
<td>von Asten</td>
<td>Max</td>
</tr>
<tr>
<td>9</td>
<td>54</td>
<td>Hannah</td>
<td>Wakefield</td>
</tr>
<tr>
<td>33</td>
<td>55</td>
<td>Price</td>
<td>Ward</td>
</tr>
<tr>
<td>34</td>
<td>56</td>
<td>Price</td>
<td>Ward</td>
</tr>
<tr>
<td>19</td>
<td>57</td>
<td>Sarah</td>
<td>Yale</td>
</tr>
<tr>
<td>47</td>
<td>58</td>
<td>Tina</td>
<td>Zhang</td>
</tr>
</tbody>
</table>
ABSTRACTS

AND

PRESENTATIONS
Regulation of Angiogenic Signaling in Pregnancy and Preeclampsia

Oyindamola, Awe, Jim Sinkway, Elizabeth V. Schulz, Carol L. Wagner and Kyu-Ho Lee

INTRODUCTION: Preeclampsia (PE) is a prevalent disease, affecting 7% of pregnancies that can lead to complications and fatalities in the mother and the child. Currently, the only cure is delivery, and primary mechanisms of pathology are still unclear.

In a prior study, we detected an association between expression levels of the Nkx2-5 transcription factor and the RNA splicing factor Sam68, with expression levels of the candidate PE marker sFlt-1 in placentae of women with early onset and severe preeclampsia (EOSPE). Statistically significant positive correlations between increased Nkx2-5 and increased Sam68 and sFlt-1 mRNA expression were particularly prominent in Caucasian American (CA) populations versus African Americans (AA) with EOSPE. Even stronger positive correlations were observed between Sam68 and sFlt-1 alone, regardless of race.

The objective of this study was to determine the correlations between Nkx2-5, Sam68, sFlt-1 expression in normal pregnancy, through secondary analysis of term placental samples from a vitamin D supplementation study. This study found a correlation between higher vitamin D serum levels and lower sFlt-1 mRNA levels in placentae from uncomplicated term pregnancies. A secondary objective was thus to determine if such by vitamin D supplementation status also correlated with Nkx2-5 and Sam68 expression levels.

METHODS: To test this hypothesis, placental RNA samples from the vitamin D study cohort (n=43); were converted to cDNA and qPCRs were run on the samples to quantify relative Nkx2-5, Sam68 and sFlt-1 expression. Spearman's rank order analysis and associated significance testing were determined in pairwise fashion for assayed gene values.

RESULTS: In contrast to our prior PE study, low or undetectable Nkx2-5 expression levels were found for the majority of term placental samples. Consistent with our prior study, we found positive and highly significant correlations between Sam68 and sFlt-1 expression levels in the study population as a whole, that persisted when stratified by race.

CONCLUSIONS: These data further support our overarching hypothesis that Sam68 expression is a key determinant of sFlt-1 VEGFR1 isoform expression in placenta. They also indicate that Nkx2-5 regulation of placental Sam68 and sFlt-1 may be restricted to specific developmental stages, and/or disease states. Ongoing analysis will examine correlations to both vitamin D supplementation administered throughout pregnancy, and vitamin D serum levels at the time of placental collection in the population as a whole, and in specific racial groups.

Oral feeding volumes as a measure of prediction for newborns in the neonatal intensive care unit that will require gastrostomy placement

AUTHOR: Meghan Brunswick

Background: Extreme prematurity, sometimes accompanied by multiple medical complications that exist in this unique population, make oral feedings a difficult task. Some patients ultimately fail oral feeding and require gastrostomy tube (G-tube) placement, delaying discharge. Most of these babies undergo surgery long after they reach the minimum weight of 2.8kg for insertion. We have been developing a predictive model to identify in advance who will need a G-tube. We have presented descriptive data previously on 35 babies in 2015-2016 <30w who received G-tubes and now have collected similar data on 20 of 282 babies < 30w admitted in 2015-2016 who did not receive a G-tube.
Objective: In this specific phase of the project we are examining our data collection on the first twenty babies who did not receive a G-tube, primarily focused on rapidity of oral feeding, a new variable. The long-term aim of the study is to compare premature infants within our neonatal ICU who underwent gastrostomy placement (G-tube) with those who did not, to ultimately develop a model that will predict which babies will require gastrostomy placement prior to discharge.

Methods: The MUSC Perinatal Information System (PINS) database was used to identify babies <30w admitted in 2015-2016. Data collection included multiple demographic and clinical factors; however, the weight-based daily oral feeding volumes are new data being collected for comparison between the two groups. Based on clinical expertise and current NICU feeding protocols, we chose the following time points to record cc/kg/day of oral feeds: 34w corrected GA (CGA), 34.5w, 35w, 35.5w....39.5w, 40w and oral feeding day 1, 2, 3....19, 20.

Results: We have data on 59 babies (39 G-tube and 20 non-G-tube babies). CGA at oral feeding for non-G-tube babies start of 34.3 ± 2.6 weeks, CGA at full oral feeds 37.4 ± 3.4w, and 15.7 ± 5.3 days of oral feeding to reach full feeds of 140cc/kg/day. The rate of increase from day 5 to day 15 of oral feeding is 4.6cc/kg/day each day and is 8.8cc/kg/d each day from day 7 to day 12. Overall, increase in oral feeding was quite different between G-tube and non-G-tube babies (see Figure).

Conclusions: For the predictive model it is likely that CGA at start of oral feeding may be the most predictive finding and a threshold may be identified for this variable. Rapidity of feeding as well as several clinical characteristics may also be useful and thus it appears that we have identified some variables that will be useful for the predictive model.

18-117 [Presentation]
Early Childhood Outcomes Following Repair of Truncus Arteriosus: A Contemporary Multicenter Analysis

AUTHOR: Jason Buckley

Background: Truncus arteriosus (TA) is a complex cardiac anomaly that continues to be associated with significant morbidity and mortality. Reports describing intermediate and long-term outcomes after TA repair are limited to single-center experiences.

Objectives: Using a multicenter dataset, we sought to describe contemporary outcomes and risk factors for right ventricle to pulmonary artery (RV-PA) conduit intervention in children who have undergone TA repair in early infancy.

Methods: We retrospectively reviewed children who underwent repair of TA without concomitant arch obstruction from 2009-2016 at 15 centers within the United States. Cox regression survival analysis was conducted to determine risk factors for overall mortality. The probability of any RV-PA conduit intervention or replacement was analyzed over time in the presence of the competing risk for mortality using a Fine Gray model.

Results: We included 216 patients. Median follow-up was 2.9 years (range: 0.1–8.8). One-hundred seven patients (50%) required at least one RV-PA conduit intervention at a median time of 14
months (range: 0.3–93) after initial surgery. The probability of any RV-PA conduit intervention was less in Contegra conduits compared to pulmonary and aortic homografts (p=0.005). Risk factors for conduit intervention included the use of pulmonary or aortic homograft (p=0.03) and smaller conduit size (p<0.01). Overall mortality was 13.4%, with 16 operative deaths and 13 late deaths. Median time to death was 3.3 months after surgery (range: 0.1–77.9). Risk factors for overall mortality included DiGeorge syndrome (odds ratio(OR): 2.2, 95% CI: 1.1-4.7), preoperative ventilation (OR: 2.4, 95% CI: 1.2-5.4), delayed sternal closure (OR: 3.3, 95% CI: 1.1-9.8) and postoperative ECMO (OR: 5.3, 95% CI: 2.3-11.8). DiGeorge syndrome and preoperative ventilation were significant risk factors for late mortality but not operative mortality.

**Conclusions:** To our knowledge, this study represents the first multicenter analysis of intermediate-term outcomes following repair of truncus arteriosus. RV-PA conduit intervention is frequently required in early childhood. Probability of conduit intervention was influenced by conduit type and size. Overall mortality was 13.4% with the majority of deaths occurring within the first year of life. Late mortality was associated with DiGeorge syndrome and preoperative ventilation. These high-risk patients may benefit from increased surveillance and frequent follow-up after hospital discharge.

**Authors**
1. Jason R. Buckley, MD; Medical University of South Carolina; buckleyj@musc.edu
2. Venu Amula, MD; University of Utah Health; Venu.Amula@hsc.utah.edu
3. Peter Sassalos, MD; University of Michigan C.S. Mott Children’s Hospital; psassalo@med.umich.edu
4. John M. Costello MD MPH; Northwestern University Feinberg School of Medicine/Ann & Robert H. Lurie Children’s Hospital of Chicago; JMCostello@luriechildrens.org
5. Ilias Iliopoulos, MD; Cincinnati Children’s Hospital Medical Center; ilias.iliopoulos@cchmc.org
6. Aimee Jennings, MSN, APRN; Seattle Children’s Hospital; Aimee.Jennings@seattlechildrens.org
7. Christine Riley, MSN, APRN; Children’s National Health System; criley@childrensnational.org
8. Katherine Cashen, DO; Children’s Hospital of Michigan; kcashen@med.wayne.edu
9. Sukumar Suguna Narasimhulu, MD; Arnold Palmer Hospital for Children; Sukumar.SugunaNarasimhulu@orlandohealth.com
10. Keshava M.N. Gowda, MBBS; Cleveland Clinic; GOWDAK@ccf.org
11. Adnan Bakar, MD; Cohen Children’s Medical Center; Abakar@northwell.edu
12. Michael Wilhelm, MD; American Family Hospital; mwilhelm@pediatrics.wisc.edu
13. Aditya Badheka, MBBS; University of Iowa Stead Family Children’s Hospital; aditya-badheka@uiowa.edu
14. Arthur Smerling, MD; Columbia University College of Physician and Surgeons / Morgan Stanley Children’s Hospital of New York-Presbyterian; ajs8@columbia.edu
15. Elizabeth A. S. Moser, MS; Indiana University School of Medicine & Richard M. Fairbanks School of Public Health; easmoser@iu.edu
16. Christopher W. Mastropietro, MD; Indiana University School of Medicine, Riley Hospital for Children at Indiana University Health; cmastrop@iupui.edu
Utilization of EMS by Hispanic patients accessing the pediatric emergency department

Calder, MD, Jennifer, French, MD, David, Titus, MD, Olivia

Purpose: In the emergency department (ED) setting, limited English proficiency (LEP) results in longer visits, more diagnostic tests, and higher hospital admission rates. There is a gap in knowledge about how LEP affects prehospital care and timely access to emergency services. Focus groups and surveys in US literature have identified that caregivers with LEP have difficulty communicating with EMS and lack awareness of appropriate use of 9-1-1. There have been no studies to establish the rate at which Hispanic patients utilize EMS compared to all other racial groups.

Methods: This is a retrospective review of the electronic health records (EHR) of patients aged ≤ 18 years with Emergency Severity Index (ESI) triage level 1 or 2 visiting our urban, academic, tertiary PED between July 2015 and December 2015. Visits were categorized as Hispanic or Non-Hispanic using "Race" as recorded in the EHR by hospital registration staff. Visits of Hispanic patients were defined as those who self-identified as either "Hispanic" or "Hispanic-(other)". Method of Arrival was categorized as EMS or Non-EMS. Frequency of EMS arrival was then compared between the two groups. Secondary outcomes included disposition, duration of symptoms prior to presentation, and complex medical history.

Results: A total of 11819 pediatric ED visits occurred during the selected period. Patients identified as Hispanic in 801 of those visits (6.8%). There were 1551 Non-Hispanic visits with ESI triage level of 1 or 2, and 323 (21%) arrived via EMS. Hispanic patients with an ESI of 1 or 2 accessed EMS transport in only 5 of 69 visits (7%, p<0.05). Of Hispanic patient accessing EMS, 2 out of 5 had complex medical histories and 1 required ICU admission. Of Hispanic patients not accessing EMS, 26% had complex medical histories and 14% required ICU-level admission.
Conclusions: Hispanic patients are significantly less likely to arrive to the pediatric ED via EMS despite high acuity conditions. Even with an established medical history requiring subspecialty care, Hispanic patients are unlikely to access EMS. Quantifying this healthcare disparity will provide a basis for targeted education initiatives at community events. This effort represents one component of a needs analysis for pediatric emergency care in our Hispanic population.

18-159 (Poster #5)
Regulation of endothelial barrier integrity by redox-dependent nitric oxide signaling: Implication in traumatic brain injury pathology

Authors: Seungho Choi*, Jeseong Won†, §, Nishant Saxena*, Tajinder Dhammu*, Mushfiquddin Khan*, Avtar K. Singh †, ‡, and Inderjit Singh *,#, §

Thrombin plays a critical role in blood coagulation but is potentially harmful in the setting of traumatic and inflammatory CNS injury by causing brain endothelial barrier disruption. In this study, we investigated roles of endothelial nitric oxide synthase (eNOS) and redox-dependent nitric oxide (NO) metabolisms producing S-nitrosoglutathione (GSNO) and peroxynitrite (ONOO-) in regulation of thrombin-induced brain endothelial barrier disruption. In cell culture model, thrombin treatment of human brain microvessel endothelial cells (HBMVECs) resulted an endothelial barrier disruption by activation of RhoA and calcium (Ca2+) influx mediated phosphorylation of myosin light chain (MLC) and associated F-actin stress fibers formation. The thrombin-induced MLC phosphorylation and endothelial barrier disruption involved eNOS activation and de novo synthesis of ONOO- as eNOS inhibitor and ONOO- scavenger inhibited the thrombin-induced MLC phosphorylation as well as endothelial barrier disruption. Thrombin treatment at high concentration also resulted in decreased cellular synthesis of GSNO and treatment of HBMVECs with exogenous GSNO attenuated the thrombin-induced MLC phosphorylation and endothelial barrier disruption. Accordingly with these data, we observed in animal models of traumatic brain injury (TBI) and experimental autoimmune encephalomyelitis (EAE) that FeTPPS (ONOO- scavenger) treatment as well as GSNO treatment ameliorated the TBI- or EAE-induced BBB leakage and edema formation or CNS infiltration of mononuclear cells. Taken together, these data indicate that eNOS-mediated NO production and followed redox-dependent NO metabolism (ONOO- vs. GSNO) are the potential therapeutic target for thrombin-induced micro-neurovascular pathology in traumatic and inflammatory CNS injuries as well as other neurological disorder involving thrombin pathology.

18-159 [Presentation]
Implementation of Sonographer Driven Organizational Goals Improves Study Completeness and Image Quality in the Pediatric Echo Lab

TL Churchill, SM Chowdhury, A Perkins, GA, Forbus , CL Taylor

Background: Quality improvement (QI) in the pediatric echocardiography (echo) laboratory is an ongoing process that requires group engagement. However, hospital organizational goals for staff may not align with echo specific QI efforts, thus detracting from the QI process. To overcome this barrier, we created echo QI related organizational goals to improve our lab’s study completeness (SC) and image quality (IQ). Our goal was to demonstrate improved SC and IQ at one year after initiation of organizational goal driven QI intervention.

Methods: Study Completeness Score (SCS) was graded on a scale of 1-5 starting in July 2015. SCS of 1-3 were considered incomplete and 4-5 considered complete. A senior sonographer retrospectively scored 70-100 randomly selected transthoracic echos billed as complete at each time point. Six months of data were collected prior to intervention (time point 1). The intervention consisted of lectures on the complete protocol, reminder signs placed on each machine, and individual feedback. Eighteen months of data divided into six month blocks (time points 2, 3, and 4) were collected after the initial intervention. Image quality score (IQS) was graded on a 1-5 scale.
starting in July 2016. IQS of 1-2 were considered unacceptable quality and 3-5 considered acceptable. Six months of data were collected prior to intervention (time point 1). Intervention for IQ included lectures on IQ improvement and physics, and individual feedback. Twelve months of data divided into six month blocks (time points 2 and 3) were collected after the initial intervention. Monthly reviews of IQS and SCS at sonographer meetings and individual feedback have continued.

**Results:** SCS was measured on 342 total echos. There were 75% incomplete studies at time point 1, and improved to 49%, 13% and 6% at time points 2-4, respectively. Changes between time points were all statistically significant (p < 0.001) except between points 3 and 4 (p = 0.302). IQS was measured on 220 total echos. There were 32% unacceptable studies at time point 1, and improved to 24% and 9% at time points 2 and 3, respectively. The difference between time point 1 and 2 was not significant (p = 0.597), but the difference between time point 1 and 3 was significant (p = 0.004).

**Conclusion:** QI efforts aligned with work related organizational goals can improve SC and IQ in the pediatric echo laboratory. SCS showed immediate and consistent improvement up to 18 months. Improvement in IQS was not seen in the 6 months after initial intervention, however, with continued monthly education, improvement is IQS was noted in months 6-12 after the initial intervention.

**Predictors of Acute Kidney Injury in Neonates with a Patent Ductus Arteriosus**

Zachary Coffman, MD, David Steflik, MD, Shahryar Chowdhury, MD, Katherine Twombley, MD, Jason Buckley, MD
Department of Pediatrics, Division of Pediatric Cardiology, Medical University of South Carolina, Charleston, SC

**Introduction:** A patent ductus arteriosus (PDA) is a very common finding in neonates. PDAs increase the risk of systemic hypoperfusion and acute kidney injury (AKI), which can lead to increased morbidity and mortality. The predictors of AKI in neonates with PDAs have been elusive and not yet clearly identified, but identifying them could help clinicians decide which patients would benefit most from medical or surgical intervention to close their PDAs. This study’s objective was to investigate AKI in neonates with PDAs including incidence, risk factors, impact on clinical outcomes, and possible correlations between PDA related echocardiographic measurements and AKI incidence.

**Methods:** This was a single-center, retrospective cohort study using clinical data from the medical record. Patients admitted to the neonatal intensive care unit with a diagnosis of PDA from July 2015-July 2017 were included. Patients were excluded if they were discharged home within 2 weeks or did not have at least 2 creatinine values during their hospitalization. AKI was defined by the modified neonatal KDIGO criteria. Patient demographic, clinical, and echocardiographic data were collected. Comparison of medians were done using the Mann Whitney U test. Multivariable logistic regression was then used to assess for associations between patient characteristics and AKI.

**Results:** A total of 47 patients with moderate or large PDAs were included; 21 (45%) met KDIGO criteria for AKI. Patients with AKI had longer length of stay [120 (IQR 103, 167) days versus 89 (68, 114), p = 0.03], lower gestational age [24.5 (24, 25.3) weeks versus 26.5 (24.9, 28.7) weeks, p=0.04], lower birth weight [650 (547, 737) grams versus 872 (686, 1196) grams, p<0.01] and shorter birth length [31 (29, 32.25) cm versus 34.25 (31.75, 38.5) cm, p<0.01]. Patients with AKI were more likely to have a positive blood culture (52% versus 11%, p <0.01). There were no important differences in echocardiographic measures of PDA size, flow, or left ventricular size and function between the AKI versus no AKI groups. Sixteen patients underwent catheter/surgical intervention for their PDAs (34%); 12 of these patients had AKI and were all diagnosed with AKI prior to intervention. Upon regression analysis, lower gestational age (OR 1.4, p=0.045) and positive blood cultures (OR = 7.8, p=0.018) were independent predictors of whether a patient developed AKI. No echocardiographic measurements independently predicted whether a patient would develop AKI.

**Discussion:** Acute kidney injury is common in neonates with a PDA and associated with increased morbidity. Of those referred for catheter or surgical PDA closure, the majority (75%) were diagnosed with AKI prior to the intervention. Patients in our population with lower gestational age and positive blood cultures were at significantly higher risk for developing AKI, but our data indicated that no standard echocardiographic measurements were predictive of increased risk of developing AKI.
Additional studies and diagnostic indicators are needed to further define the relationship between neonatal AKI and PDAs and help inform decision-making in PDA management.

18-118 (Poster #8)
Healthcare Utilization in the First Year of Life for Children with Hypoplastic Left Heart Syndrome

Curley BM, Gaydos SS, Scheurer MA, McHugh KE

Introduction
Patients with hypoplastic left heart syndrome (HLHS) and similar variants require a series of three staged surgical palliations, including the Norwood operation and bidirectional Glenn in the first year of life. Accordingly, this condition has some of the highest costs of any birth defect, however little is known regarding resource utilization for these patients outside of the surgical hospitalization. We examined all health care encounters in the first year of life for patients born at our institution with HLHS during a 7 year period.

Methods
Surgical records were reviewed to identify patients discharged after a Norwood operation at our institution between January 2007 - March 2014. Records were linked via indirect identifiers (date of birth, date of admission, date of discharge, gender) to the Health Sciences South Carolina (HSSC) database, a statewide research collaborative that links patient data throughout the major medical systems and universities in South Carolina. The database was queried for all hospital admissions, outpatient encounters, and emergency room visits for the cohort in the first year of life.

Results
A total of 78/85 (92%) eligible records were successfully linked between the datasets (98 underwent a Norwood procedure during the study period, 10 died prior to hospital discharge, and 3 were discharged out of state). Seven of the 85 patients in the linked cohort died prior to one year of age. Total encounters of any type ranged from 1 to 69 visits. All of the patients had
additional inpatient encounters in the first year of life (range 1-7), with an average of 2.72
encounters per patient. The average inpatient visit days was 84.2 (range 4-292), with a median
60.5 days. Outpatient encounters ranged from 0 to 60, with an average of 15 and median of 11.5
encounters per patient. Emergency room visits averaged 0.6 visits per patient (range 0-5).
There was an average of 102 total visit days per patient (range 23-339, median 79.5 days). This
resulted in an average of 263 (median 285.5) visit-free days in the first year of life. On average,
this cohort of patients with HLHS spent 27.9% of their time interfacing with health care during
the first year of life.

Conclusions
Children with HLHS discharged after undergoing successful Norwood operation spend over a
quarter of their first year of life interacting with the healthcare system. As survival rates for
HLHS palliation continue to improve, it will be essential to shift focus to optimizing outpatient
resource utilization and improving quality of care for this fragile patient population. Future
directions should include analysis of health care utilization after the first year of life, including
post fontan. As well as the use of healthcare technology, such as telemedicine, on the effect of
health care costs in these medically complex children.

18-142 (Poster #43)
An atypical presentation of Cold Agglutinin Autoimmune Hemolytic Anemia in a pediatric
patient.

Nadirah El-Amin, Michelle P Hudspeth, Michael Stump, Elsie Hill

Background: Cold agglutinin autoimmune disorder is a form of autoimmune hemolytic anemia
(AIHA) characterized by the presence of autoantibodies, usually IgM, against the I antigen of one’s
own red blood cells. This disease is rare with an estimated annual incidence of 1 in 80,000 persons.
Most pediatric cases of AIHA are due to Mycoplasma or Epstein-Barr Virus. There have been very
few reported cases of cold agglutinin AIHA associated with Influenza virus, and it is uncommon to
have biphasic antibodies associated with this disorder. Objectives: To describe an unusual
presentation of a pediatric patient with cold agglutinin AIHA.

Methods: We report a case of a 7 year old previously healthy male who presented with three
days of fever, abdominal pain and emesis. On admission, a complete blood count was unable to
be obtained due to agglutination. Repeat blood work was sent on warm packs and was significant
for a Hemoglobin of 5.0 gms/dl, White blood cell count of 14 K/CUMM and platelets of 252 K/CUMM.
Hemolysis labs included an LDH of 1052 U/L, Haptoglobin <8.0 mg/DL, reticulocyte count of 11% with
a positive direct coombs test for IgG. The antibody was identified by the blood bank as a cold
agglutinin antibody. Mycoplasma antibodies were negative, but a respiratory viral panel was
positive for Influenza B virus. He was diagnosed with cold agglutinin AIHA secondary to influenza
virus. His treatment included two 5cc/kg transfusions of packed red blood cells with a blood warmer
and he was discharged home when his hemoglobin had stabilized with no further evidence of
hemolysis. Results: During his hospital course his hemoglobin (Hgb) level initially improved from
5 to 9 after his first transfusion, but quickly fell back down to 6.0. He was again transfused 5cc/kg
with improvement in his Hgb to 7.6. He was able to maintain his Hgb without further transfusions
and was discharged home on hospital day 4 with a Hgb of 10. He was seen as an outpatient, 8
days after presentation and his Hgb remained stable at 9.1. Conclusions: Cold agglutinin hemolytic
anemia is a rare form of anemia in children. There have been only a few reported cases in the
literature associated with Influenza virus. It is also uncommon to have biphasic mediated cold
agglutinin auto-antibodies. Despite the atypical presentation it is important to recognize AIHA
immediately to prevent the potentially dangerous sequelae of the disease process.
Transition Readiness and Follow-up Rates in Adolescents and Young Adults with Congenital Heart Disease

Authors: Stephanie S. Gaydos, MD; Shahryar M. Chowdhury, MD MSCR; Rochelle Judd, FNP-BC; Kimberly McHugh, MD MSCR

Institution: Medical University of South Carolina (MUSC) Children’s Health, Charleston, South Carolina

Background: The population of adolescents and young adults with congenital heart disease (CHD) is rapidly expanding. This group will require lifelong cardiology follow-up, however, many experience long gaps in care with associated morbidity around the age of transition to adult-oriented care. Provider efforts to increase patient education, assess self-management skills, and emphasize the importance of ongoing care may improve this challenging transition.

Objectives: 1) To examine the impact of a CHD Transition Clinic intervention on patient follow-up rates, 2) describe variables in transition-readiness assessments, and 3) examine trends in referral from pediatric to adult congenital heart disease (ACHD) care.

Methods: The Transition Clinic intervention group consisted of patients ages ≥ 12 years with structural CHD. Visits consisted of disease-specific education, transition resource provision, and introduction to an ACHD nurse practitioner. Participants completed the Transition Readiness Assessment Questionnaire (TRAQ) and Pediatric Quality of Life 3.0 Cardiac Module (PedsQL). The primary outcome was participant “lost to follow-up” rate, identified by chart review as an absence from care for ≥ 6 months beyond the recommended date, in comparison with a control rate among similar CHD patients receiving usual outpatient care. Secondary outcomes were TRAQ and PedsQL scores and ACHD referral trends.

Results: 48 patients enrolled in the CHD Transition Clinic. Median age was 17.5 years (IQR 16, 21.8). The study cohort’s “lost to follow-up” rate was 5.3% in those eligible to be lost to follow-up (n=38); this was lower than the control (n=105) rate of 26.7%, p= 0.006. Median TRAQ Total Score was 4.15 (IQR 3.08, 4.75) out of 5.00, and median patient PedsQL Total Score was 78.3% (IQR 69.7, 89.8) out of 100%, with higher scores indicating greater transition readiness skills and health-related quality of life. Patients aged <18 years reported multiple lower median subscale scores than those ≥18 years (p< 0.05); sex, biventricular versus single ventricle physiology, and history of surgery did not affect transition readiness. In participants ≥18 years old, 63.0% (17/27) were offered to transition to ACHD care; 9/17 (52.9%) completed care transition.

Conclusions: Better “lost to follow-up” rates were seen in CHD Transition Clinic participants. Age is an important factor in patient transition readiness. An intervention program focusing on disease- and age-specific CHD education and self-management skills can reduce gaps in cardiac care in adolescents and young adults.

Astrocytes under Pressure: Examining Cell Migration in an Ex-Vivo Model of Hydrocephalus

Authors: Ryan Gedney, Dr. Ramin Eskandari, Dr. Michael Smith, Stephen Frederico

Introduction
Very little is known about what happens to cell migration in the brain of individuals with elevated intracranial pressure (ICP), especially when elevated ICP is maintained for an extended period of time. The mechanisms of secondary injury to brain tissue resulting from sustained increases in ICP are not fully understood, and may provide a means of therapeutic targeting that can prevent cognitive deficits and improve the outcomes of patients with hydrocephalus.

Objective
Here we present a model for studying the changes in migratory response of human astrocytes following insult, using an ex-vivo model that combines 3D cell cultures and the newly developed pressure-controlled cell culture incubator (PC3I).
Methods
The PC3I allows cells to be exposed to elevated pressure under controlled conditions and is
effective at modeling different types of pressure conditions so we may directly study the effects of
increased pressure on cellular growth, proliferation, migration, and death of cells. Peptide-
conjugated alginate hydrogel scaffolds were formed, and a small aliquot of astrocyte containing
alginate was injected to an isolated portion of the hydrogels. The number of cells within the entire
scaffold were assessed using a fluorescent LIVE-DEAD assay. Migration was quantified by
assessing the change in the number of cells in different regions of the hydrogel over 7 days and 14
days. Total cell change, normalized to initial injection concentration, was measured for each region
over time to assess the effects of pressure on cell migration.

Conclusion
Overall, we found differences in the migration of cells following pressure exposure when compared
to controls, including an acceleration in the migration of astrocytes in several regions following
extended pressure exposure of 8, 24, and 48 hours. We can interpret this as a direct reaction of
astrocytes to pressure insult, dependent on the amount of time of pressure exposure, and may have
implications in some of the pathophysiology of hydrocephalus. Future experiments are planned to
study the effects of pressure on other cell types including neurons and co-culture models to
compare the difference between neuron and astrocyte migration after pressure exposure.

Exceptional Clinical Response to Molecular Guided Therapy in a Patient with Progressive
Lymphoepithelioma-like Thymic Carcinoma

Majd T. Ghanim MD1, Giselle Saulnier Sholler MD2, Michelle Hudspeth MD1, Lori Donahoo RN1,
William J. Rieter MD PhD3, Genevieve Bergendahl RN2, Gina K. Hana PharmD4, William P.D.
Hendricks PhD5, Sarah Byron PhD5, Abhinav B. Nagulapally MS2, Jeffery P. Bond PhD2, Jeffrey M.
Trent PhD5, and Jacqueline M. Kraveka DO1

1Division of Pediatric Hematology Oncology, Department of Pediatrics, Medical University of South
Carolina, Charleston SC; 2Spectrum Health, Helen DeVos Children's Hospital, Grand Rapids MI;
3Department of Radiology, Medical University of South Carolina, Charleston SC; 4Dana-Farber
Cancer Institute, Boston MA; 5Translational Genomics Research Institute, Phoenix AZ

Background:
Lymphoepithelioma-like thymic carcinoma (LELC) is a rare, aggressive neoplasm with a high rate of
invasion, metastasis and recurrence. There are no known curative therapies for metastatic LELC.
We report the case of a 16-year-old male who presented with metastatic EBV positive LELC. Sites
of disease included a large primary anterior mediastinal mass and metastases to hilar lymph nodes,
lungs and liver. He was initially treated with cisplatin and 5-fluorouracil followed by mediastinal
radiation. He had a partial response to therapy but his end of therapy scans showed disease
progression in lungs, liver, and hilar, supraclavicular and axillary lymph nodes.

Objective:
Molecularly targeted therapies tailored to the patient’s genetic profile offer a novel approach to
obtain improved survival outcomes.

Design/Method:
The patient enrolled on a precision medicine trial, NMTRC009: Molecular-Guided Therapy for the
Treatment of Patients with Relapsed and Refractory Childhood Cancer (NCT02162732). In this
study, tumor/normal whole exome sequencing and tumor RNA sequencing were performed and a
molecular report detailing the results of genomic and gene expression analysis was generated. A
treatment plan was designed within a molecular tumor board comprising oncologists, pharmacists,
genomicians, and molecular biologists with domain expertise.

Results:
Exome sequencing revealed 26 somatic coding point mutations and no structural mutations (focal
copy number changes or translocations). Candidate somatic driver mutations included TP53 S94X
and R248W as well as KIT N655K. Both genes have been previously implicated in thymic
carcinoma. RNA expression analysis demonstrated aberrant activation of biological pathways, including overexpression of KIT, HDAC1, 2 and 9, TYMS, and DHFR. The molecular tumor board selected the combination of pemetrexed (500 mg/m2) on Day 1 of a 21 day cycle, imatinib (400 mg daily), and vorinostat (400 mg days 1-5, 8-12, 15-19). On Day 8 of Cycle 1, he was admitted with a herpes zoster infection and imatinib was discontinued in order to reduce risk of herpes zoster recurrence. Imaging after 2 cycles showed a complete metabolic response on F-18 FDG PET and a partial response by CT size criteria. As of December 2017, the patient had received 15 cycles of pemetrexed and vorinostat. Scans in December 2017 showed an increase in the size and metabolic activity of two right lower lobe pulmonary nodules. There were no new sites of disease and imatinib was re-started. Evaluation after 2 cycles with imatinib showed a decrease in the size and metabolic activity of the nodules.

**Conclusion:** Aside from the episode of herpes zoster, there have been no serious adverse events, no hospitalizations and excellent quality of life and prolonged disease stabilization.

**18-152 (Poster #13)**

**First Investigation of a Common Clinical Approach to Poor Growth in Preterm Infants**

Glenn, Stephanie R.1; Ross, Julie R.1; Morella, Kristen1; Taylor, Sarah1

**Background:** Human milk fortifier (HMF) is a well-studied standard of care to sustain preterm infant growth. Yet, with this intervention, very low birth weight (VLBW) infants may still exhibit postnatal growth failure. In review of published literature, no report of energy added beyond standard bovine, liquid HMF fortification was identified.

**Objective:** To measure the effect of elevated energy intake on growth velocity and weight Z-score in VLBW infants receiving human milk (HM) and HMF.

**Design/Methods:** A real-time quality improvement nutrition database provided data for a retrospective cohort study of VLBW infants born <32 weeks’ gestation 12/01/2016 to 05/31/2017 and fed HM and HMF (estimated 128 kcal/kg/day and 4.6 g/kg/day protein delivery) by standard protocol. Subjects were eligible if exposed to medium chain triglyceride (MCT) oil or formula powder in addition to standard fortification (estimated 140-150 kcal/kg/day delivery) for at least 7 days per clinician discretion to improve growth. Mean seven-day change in Olsen weight Z-scores and growth velocity (g/kg/day) were compared pre- and post-exposure by a paired t-test.

**Results:** Of the 80 infants meeting criteria based on birth weight and gestational age, 21 infants (11 females, 10 males) were identified as receiving increased energy with MCT oil or formula powder at a mean of 26 postnatal days. The mean birth gestational age and weight was 26 weeks and 855 grams (mean birth weight Z-score -0.62). When evaluating 7-day pre- and post-exposure, the overall mean weight Z-score changes were -0.296 and -0.01, respectively (p value <0.0001) with specific groups identified in Figure 1. The mean growth velocity overall and for each specific exposure is shown in Table 1.

**Conclusion(s):** This common clinical approach using MCT oil or formula powder for 12-22 kcal/kg/day additional energy was associated with improved, at least short-term, growth velocity and weight z-score trajectory. Further evaluation of efficacy including long-term outcomes and evaluation of safety is warranted.

**18-167 (Poster #14)**

**Does Direct Admission Increase Risk for Early Unplanned Escalation of Care?**

Michelle Greene

Patients transferred from acute to intensive care units (ICU) have higher rates of morbidity, mortality, and adverse events than patients admitted directly to the ICU. We examined direct admission from outside hospitals or outpatient clinics as a risk factor for early unplanned escalation of care (EOC) and assessed common characteristics in this patient population.
We performed a retrospective descriptive study of pediatric patients requiring EOC at an academic, tertiary care hospital over 12 months. Patients were identified using electronic medical records and ICU admission logs. We excluded cardiology patients as they have separate acute and intensive care units as well as hematology and oncology patients due to high numbers of scheduled direct admissions. An initial review identified patients requiring early unplanned EOC, defined as transfer to intermediate or intensive care units within 24 hours of admission. A structured review then identified route of admission, age, sex, diagnosis, admission within the past 30 days, ICU admission in the past 3 months, or greater than 2 admissions to any service within the previous year. Microsoft Excel was used to assess descriptive statistics and calculate relative risk of early unplanned EOC with direct admission.

Of 2385 admissions, we identified 66 children requiring early unplanned EOC. The relative risk for early unplanned EOC for patients who were directly admitted was 0.7 (95% CI 0.4, 1.2) compared to emergency department (ED) admission. Our clinical profile of these patients was consistent with prior studies, including age less than one year (36.9 %), male gender (56.9%), respiratory diagnoses (41.5%) and neurologic diagnoses (30.8%). Additionally, 32.3% of our cohort had been admitted within the past 30 days, 23.1% had an ICU admission within the preceding 3 months, and 41.5% had 2 or more admissions within the previous year.

Direct admission was not a risk factor for early unplanned EOC in our study, possibly because higher risk diagnoses are often referred to the ED for additional triage. Our clinical profile was similar to prior studies assessing this population, but added that admission within past 30 days, recent ICU admission, and frequent admissions were also prominent. This likely reflects underlying medical complexity, which we were not able to assess in our cohort. Future work may include development of a risk assessment or decision support tool to help triage patient to the appropriate level of care.

18-112 (Poster #15)
Treating Severe Spinal Deformity in Medically Fragile Children – the PICU is a Critical Component

Richard Gross

Hyperkyphosis, osteoporosis, neuromuscular(NM) and syndromic etiologies are associated with increased blood loss and/or complications for deformity surgery. We report a Level IV study of 21 high risk medically fragile pediatric patients treated by a single surgeon with the rib construct(RC) for proximal fixation.

Materials and Methods: 6 early onset syndromic or NM kyphoscoliosis,(EOS); 3 congenital; 12 later onset syndromic or NM scoliosis. Comorbidities: osteoporosis (18, 3 not tested), congenital heart disease (3), developmental delay(19). Average operating time 283 mins; average EBL 262 without fusion(12), 1072 with fusion(9,3 prior fusion) 18 had > 5-year follow-up or died (6) of unrelated causes, 3 had >2 year follow-up. All had preoperative consultation with MUSC’s PICU; most were unable to cooperate for pulmonary function evaluation.

Results: Syndromic scoliosis 80.6° preop to 55.5° postop. Thoracic kyphosis (TK) 105.6° to 64°. Thoracolumbar (TL) kyphosis 50° to 13°. Rigid congenital kyphosis 64.5° to 19°. NM/syndromic w/o prior fusion scoliosis 114.6° to 60.6°, TK 92.5° to 59.5, global kyphosis 117.3° to 39°;with prior fusion TK 117.3°to 89°, scoliosis 88° to 58°. 3 with prior fusion had > 30° PJK, chin brow angle from 39.6° to 13°. Complications (24): 2 periop pulmonary, 5 failure distal fixation, 5 hook failures, 4 rod fractures, 3 migration of S rods, 2 deep wound infections, 2 pseudarthrosis, 1 wound dehiscence, 1 poor rod contouring. No PJK, no change in evoked potentials, or permanent sequelae of complications

Discussion: Prior work in our lab documented superior resistance to kyphotic pullout forces of the RC to pedicle screws in the thoracic porcine spine. That superior purchase of rib fixation to spine gives the surgeon greater safety and flexibility for deformity correction, especially in medically fragile patients. A preliminary anterior release was
performed in 1 patient. The RC can be safely placed without the need for CT imaging, which is currently recommended for safe insertion of thoracic pedicle screws, and is thus applicable for settings in developing countries without sophisticated imaging and/or monitoring. The minimal blood loss involved with the RC allowed correction of severe deformity (without fusion) in a Jehovah’s Witness child. The procedures on this medically fragile population could not have been performed without skilled intraoperative anesthesia and superb postoperative management in the PICU.

18-144c (Poster #16) Case Study Atypical Kawasaki Disease Presenting with Generalized Pustulosis
Hardy, K., Thomas, Moake, Matthew, and Jackson, Benjamin

Case: A 6-year-old male presented to the ED with a 7 day history of fever and 2 day history of rash on his arms, legs, and torso. The rash started as fine flesh colored papules on his arms and legs and progressed to larger white papules/pustules covering most of his arms, legs and torso. The rash spares the palms, soles of the feet and face. Physical exam showed an uncomfortable child with bilateral purulent conjunctivitis and shotty cervical lymphadenopathy. The rest of the physical exam was unremarkable. The patient took no medications other than diphenhydramine and acetaminophen.

Laboratory testing revealed WBC of 28k with 85% neutrophils, Hgb of 10.3, ALT of 42, CRP of 22.8 and ESR > 100. Respiratory viral panel, blood and urine cultures were all negative. Echocardiogram showed mild dilation of the proximal LAD. 1 dose of IVIG was given (2 g/kg) with rapid improvement in clinical symptoms and resolution of fevers. The patient was started on high dose aspirin and transitioned to low dose aspirin prior to discharge from the hospital.

Discussion: Kawasaki Disease is a vasculitic process that presents with 5 clinical findings (polymorphous exanthem, mucocutaneous inflammation, desquamation, cervical lymphadenopathy, and conjunctivitis) along with persistent fever greater than five days. Clinical diagnosis is made based on the presence of 4 of the 5 symptoms along with fever, but there is a subset of the population who present with 2-3 of the classic symptoms like our patient. These patients fall under the incomplete or atypical Kawasaki Disease diagnosis. Also of note, the pustular exanthem seen in our patient is a rare manifestation of Kawasaki disease.
The integrity of specific white matter tracts relates to early and late motor performance in preterm neonates

Katy Hallman, Hunter Moss, Danielle Lowe, Dorothea Jenkins and Patty Coker

ABSTRACT
Preterm infants are at high risk for developmental delays, but do not receive any developmental screening at discharge, due to lack of validated, feasible early motor tests. We previously developed the Specific Test of Early Infant Motor Performance (STEP), to quantify term and 3 month infant motor performance, and have shown the STEP predicts 12 month motor and cognitive outcomes. In this project, we utilized Diffusion Tensor imaging (DTI) data collected on preterm neonates at term age equivalent, who were assessed with the STEP, to quantify microstructural integrity of white matter tracts by fractional anisotropy (WM FA). We hypothesized that a combination of WM FA in specific white matter tracts and STEP scores, would predict 12---month motor outcomes in preterm infants better than early motor performance alone, and that higher FA values indicating higher WM integrity, would relate to higher scores on individual motor items.

Methods: 23 preterm infants received DTI (term), STEP (term, 3mo), and Bayley III (12mo). Tract---based spatial statistics measured WM FA. We tested individual WM FA with total STEP scores, in predicting Bayley Gross Motor Scaled Scores using generalized linear models. Individual STEP item scores (rolling leg, rolling arm, head movements in supported sitting) were also related to WM FA.

Results: FA in left corpus callosum (CC), left uncinate fasciculus (UF), and inferior frontal---occipital fasciculus (IFOF) contributed significantly to total STEP score at term in predicting motor outcomes. FA in CC, IFOF and PLIC contributed to the 3mo STEP model. For individual motor items, performance on rolling leg at term positively predicted CC FA, while rolling leg score at 3mo predicted PLIC FA and right CC. At 3 months rolling arm predicted CC FA. Performance on head movements in supported sitting at term predicted PLIC FA, and at 3 months, CC and left PLIC FA. Rolling leg and supported sitting require thoracic tone and head control, while rolling arm requires pelvic muscle control. The progressive recruitment of WM tracts important in performance of these items, reflects the cephalad to caudal development of muscle strength, tone, and coordination.

Conclusion: Microstructural integrity in CC, IFOF, UF and PLIC significantly improve the early STEP predictive model for later outcomes. A combination of neuroimaging and early motor test may predict 12 month motor outcomes. This is the first study to link function in specific muscle groups with injury in specific WM tracts in infants after preterm birth.
imipenem/cilastatin, & neomycin) or vehicle (VEH), from age 6-12 wks. Tibiae were imaged for cortical / trabecular uCT analyses and processed for histomorphometry. Flow cytometric immune cell analyses was performed in bone marrow, mesenteric lymph nodes (MLNs) and spleen. Bone marrow gene expression was assessed by qRT-PCR & nCounter, and serum markers by ELISA. ABX-induced changes in gut microbiota composition were validated by 16S rDNA qPCR. ABX alterations in bone mass and skeletal morphology were blunted in ABX vs. VEH mice. TRAP+ osteoclast numbers, size, and bone interface were enhanced in ABX mice, revealing ABX disruption of gut microbiota upregulates osteoclastogenesis. Elevated TNFα and CCL3 in ABX serum imply the ABX-induced pro-osteoclastic phenotype is driven by increased systemic inflammation. Findings that T-cell and B-cell subsets, inflammatory monocyte & dendritic cell frequencies were not different in marrow, but all increased in ABX MLNs and spleens, suggest ABX perturbation of indigenous gut microbiota induces a dysbiotic hyper-immune response state at secondary lymphoid tissues draining local gut and systemic circulation. Myeloid-derived suppressor cells (MDSCs), an immature myeloid progenitor known for immunosuppressive properties in inflammatory conditions, were upregulated in marrow of ABX-treated mice. Recognizing evidence that MDSC-mediated T-cell suppression occurs in an antigen-specific manner, broad suppression of MHC Class II antigen presentation genes in marrow of ABX mice provides mechanistic insight indicating that ABX alteration of gut microbiota dysregulates critical osteoimmune crosstalk.

**Funding:** NIH/NIDCR K08DE025337; NIH/NIDCR R01DE021423; NIH/NIGMS P30GM103331; NIH/NIDCR T32DE017551; NIH/NIDCR R25DE022677

18-104 (Poster #18)
Vacation Sedation: Improving the Experience of Procedural Sedation in the Pediatric Emergency Department

**AUTHOR:** Henderson, Jonathan, Engel, Sarah, Stone, Currina, Marvin, Whitney, Birdsong, Sara, Jackson, Benjamin

**Background:** Procedural sedations are frequently performed in the Pediatric Emergency Department (PED) to provide analgesia and anxiolysis during procedures. Ketamine is commonly used for procedural sedation in the pediatric population with a strong safety profile. However, literature is sparse regarding the quality of the sedation experience for the pediatric patient in the emergency department. The American College of Emergency Physicians (ACEP) clinical practice guideline provides recommendations in this area. Anecdotally, stimuli during the procedure shape the patients dissociative experience.

**Methods:** Initially, a survey on current practice to improve the quality of the sedation experience was sent out to local PED nursing staff. PED nursing staff and clinicians involved in procedural sedation were educated on a guideline to improve the quality of the sedation experience, with focus on the patient and family centered aspect of sedation, while supporting safety and effectiveness. After the education period was complete, the guideline was implemented. Post education and implementation, the survey was repeated.

**Analysis:** There were 15 and 11 respondents in the initial and follow up surveys respectively. Providers discussing positive thoughts prior to sedation increased from 33.3% to 72.5%. Unnecessary conversation during sedation improved from 20% to 63%. Post procedure agitation improved from 26.6% to 54.5%.

The second portion of the survey assessed the perceived importance of sedation quality to the provider performing the sedation and provider performing the procedure. The importance of the sedation experience to the provider performing the sedation increased from 86.6% to 100%, and 86.6% to 90.9% for the provider performing the procedure.

**Implications/Conclusions:** A sedation checklist, including steps to continue improvements in the patient and family centered aspects while furthering safety and effectiveness, is currently under
Further research looking into the impacts of pre-procedural, intra-procedural and post-procedural stimuli on the quality of the sedation experience is needed.

**18-130 (Poster #19)**
**Preoperative Imaging of Pulmonary Arteries in Neonates with Ductal Dependent Congenital Heart Disease**
Gerding BE¹, Bradley SM², Popp TJ³, Hlavacek AM³
¹ Academic Magnet High School
² Department of Surgery, Pediatric Cardiothoracic Surgery
³ Department of Pediatrics, Cardiology

**Background:** Certain neonates with congenital heart disease are ductal dependent for adequate pulmonary blood flow and, therefore, require neonatal surgery. A subset of these infants develop pulmonary artery (PA) stenosis after surgical intervention. Cardiac imaging, including echocardiography and computed tomographic angiography (CTA), is used before and after surgery in these patients. Imaging findings that are predictive for the development of PA stenosis after surgery in this population have not been defined.

**Objectives:** The goal of this project is to determine if there are preoperative imaging findings that are predictive for the development of PA stenosis in neonates with ductal dependent pulmonary blood flow.

**Methods:** Medical records for patients who underwent CTA prior to neonatal cardiac surgery between 2011-2016 were reviewed. Patients were excluded if they did not have ductal dependent pulmonary blood flow or died prior to receiving a subsequent CTA, catheterization, or surgical intervention. In addition to recording demographic and baseline hemodynamic data, the preoperative echocardiogram and CTA reports and neonatal surgical reports were reviewed for relevant qualitative and quantitative descriptors. The presence of postoperative PA stenosis was identified using subsequent CTA, catheterization, and/or surgical reports. Patients with and without postoperative PA stenosis were compared using Chi square analysis for categorical data and T-tests for continuous data (p-value ≤0.05).

**Results:** Thirteen patients were included in the study. There was no significant difference in sex, patient size, ductal size, oxygen saturation, primary diagnosis, ductal insertion/morphology, or surgical intervention. Although quantitative measurement of PA size did not reach statistical significance, patients with pulmonary arteries categorized as hypoplastic on preoperative imaging were more likely to develop PA stenosis (p<0.001). Patients that either had discontinuous PA or were described as having potentially discontinuous PA on preoperative imaging were also more likely to develop PA stenosis (p=0.002).

**Conclusions:** The presence of PA hypoplasia or discontinuity on preoperative imaging is associated with the development of PA stenosis in neonates with ductal dependent pulmonary blood flow. A larger sample size may allow identification of additional imaging findings or demographic factors that are predictive for postoperative PA stenosis.

**18-168 (Poster #20)**
**The Integrity of Specific White Matter Tracts Relates to Early and Late Motor Performance in Preterm Neonates**
Jenkins, Dorothea, Moss, Hunter, Lowe Danielle, Jenkins Dorothea, Coker-Bolt Patricia

Preterm infants are at high risk for developmental delays, but do not receive any developmental screening at discharge, due to lack of validated, feasible early motor tests. We previously developed the Specific Test of Early Infant Motor Performance (STEP), to quantify term and 3 month infant motor performance, and have shown the STEP predicts 12 month motor and cognitive outcomes. In
this project, we utilized Diffusion Tensor imaging (DTI) data collected on preterm neonates at term age equivalent, who were assessed with the STEP, to quantify microstructural integrity of white matter tracts by fractional anisotropy (WM FA). We hypothesized that a combination of WM FA in specific white matter tracts and STEP scores, would predict 12-month motor outcomes in preterm infants better than early motor performance alone, and that higher FA values indicating higher WM integrity, would relate to higher scores on individual motor items.

Methods: 23 preterm infants received DTI (term), STEP (term, 3mo), and Bayley III (12mo). Tract-based spatial statistics measured WM FA. We tested individual WM FA with total STEP scores, in predicting Bayley Gross Motor Scaled Scores using generalized linear models. Individual STEP item scores (rolling leg, rolling arm, head movements in supported sitting) were also related to WM FA.

Results: FA in left corpus callosum (CC), left uncinate fasciculus (UF), and inferior frontal-occipital fasciculus (IFOF) contributed significantly to total STEP score at term in predicting motor outcomes. FA in CC, IFOF and PLIC contributed to the 3mo STEP model. For individual motor items, performance on rolling leg at term positively predicted CC FA, while rolling leg score at 3mo predicted PLIC FA and right CC. At 3 months rolling arm predicted CC FA. Performance on head movements in supported sitting at term predicted PLIC FA, and at 3 months, CC and left PLIC FA. Rolling leg and supported sitting require thoracic tone and head control, while rolling arm requires pelvic muscle control. The progressive recruitment of WM tracts important in performance of these items, reflects the cephalad to caudal development of muscle strength, tone, and coordination.

Conclusion: Microstructural integrity in CC, IFOF, UF and PLIC significantly improve the early STEP predictive model for later outcomes. A combination of neuroimaging and early motor test may predict 12 month motor outcomes. This is the first study to link function in specific muscle groups with injury in specific WM tracts in infants after preterm birth.

18-105 (Poster #21)
Pediatric Chiari I Malformation: Age Stratified Literature Review

AUTHORS: S.E. Johnson and R. Eskandari

Objective: The main goal of this study was to compare Chiari I Malformation (CM-I) preoperative signs and symptoms, surgical intervention, and outcomes among stratified age groups to determine any variation in these factors among younger versus older children.

Methods: A literature search of PubMed, CINHAL, Scopus and ClinicalTrials.gov was completed using 'Chiari I malformation', ‘Chiari malformation Type I’, ‘children’, ‘pediatric’, and ‘surgical decompression’ for studies published from 2000-2017. Only studies meeting the following criteria were included: 1) pediatric population (≤18 years old); 2) diagnosed with CMI; 3) underwent surgical decompression for CM-I; 4) comparison of or opportunity for extraction of available data for different age groups.

Results: Nine retrospective cohort studies met all criteria and were included in this review. These studies included 278 patients, 199 of whom underwent PFDD and 68 PFD. Study patients were divided into age groups (Groups I, II, & III). Mean follow-up ranged from 0 to 250 months. Inconsistency in reporting among studies made for difficult comparison of surgical treatment, complications, and outcomes by age group. Only the presence of syringomyelia was reported across all studies. A 61.9% incidence of syringomyelia existed among all patients. Oropharyngeal symptoms and higher rates of CSF leak tended to be present among the younger groups, I and II. Improvement and resolution of symptoms was seen in anywhere from 37-91.7% postoperatively

Conclusions: A difference in the manifestations of CM-I is apparent between stratified age groups. Pathophysiological differences seem to be present between the groups with younger children exhibiting more CSF related complications. Younger patients may benefit from earlier
surgical intervention when syrinx is present. Possibly, the most valuable take away from this review is the fact that inconsistencies are clearly exhibited among variable reporting in the CM-I pediatric literature.

18-115 [Presentation]
S-Nitrosoglutathione Increases Benefit of Motor Exercise on Functional Recovery and Stimulates Neurorepair Mechanisms Following Experimental Stroke in Rats

Mushfiquddin Khan, Tajinder S Dhammu, Inderjit Singh
Charles P Darby Children’s Research Institute, Department of Pediatrics, Medical University of South Carolina, Charleston, SC

Background: Stroke is the leading cause of long-term physical disability and neurologic deficits. The disability stems from acute neurovascular injury and injury-induced compromised neuroplasticity. This neuroplasticity can be restored by stimulating neurotrophic factors via two possible modalities: rehabilitation activity and neurorepair therapy. Improvement of neurologic function has been achieved following brain trauma by the neurovascular protective agent S-nitrosoglutathione (GSNO).

Objective: To investigate whether GSNO stimulates the expression neurotrophic factors and enhances the benefits of motor exercise, leading to functional recovery in a rat model of stroke.

Methods: Ischemic stroke was induced by middle cerebral artery occlusion (MCAO) for 60 min followed by reperfusion in adult male rats. Injured animals were either treated with vehicle (IR group), GSNO (0.25 mg/kg, GSNO group) or underwent rotarod exercise (EX group). In the third treatment group, GSNO was combined with rotarod exercise (GSNO+EX group). The groups were compared in terms of neuroprotection, tissue structure, the expression of neurorepair mediators and functional recovery.

Results: All three treated groups (GSNO, EX and GSNO+EX) showed reduced infarction, improved motor and neurological functions, and decreased apoptotic neuronal cell death compared to the IR group. However, the combination group GSNO+EX showed a trend toward greater recovery than the GSNO or EX group alone. All the three treated groups also showed enhanced expression of neurotrophic factors. A delayed intervention (24 h after IR) by GSNO also aided the functional recovery. Furthermore, the protective effect of GSNO and exercise was blunted in another set of animals by an inhibition of AKT activity using the PI3 kinase inhibitor LY 294002 compound.

Conclusion: GSNO, like exercise, aids recovery of functions in a long-term treatment by stimulating the expression of neurotrophic factors, reducing infarctions, and decreasing cell death. A combination of exercise and GSNO shows a greater degree of improvement in neurobehavioral function. Clinical relevance of the therapy is supported by an improved functional recovery even when GSNO was administered 24 h following IR.

18-126 [Presentation]
Genomic Analysis and Precision Therapy for High Risk Neuroblastoma at Diagnosis and Relapse

1 Medical University of South Carolina, Charleston SC; 2 Cardinal Glennon Children’s Medical Center, St Louis, MO; 3 Helen DeVos Children’s Hospital, Grand Rapids, MI; 4 Rady Children’s Hospital San Diego, CA; 5 Levine Children’s Hospital, Charlotte, NC; USA; 6 Translational Genomics Research Institute, Phoenix, AZ
Background:
Despite recent advances, high risk neuroblastoma accounts for 15% of all pediatric cancer deaths. Many patients will attain remission but approximately half of patients relapse within five years of diagnosis. Those who relapse often transiently respond to additional therapy but have a high rate of subsequent relapse. Further genomic understanding and novel therapies are needed.

Methods:
Patients were either enrolled on Beat Childhood Cancer precision medicine trials: NMTRC008/009 studies “Feasibility Trial Using Molecular Guided Therapy for the Treatment of Patients with Relapse and Refractory Childhood Cancer” (NCT0182567, NCT02168732) or “PEDS-PLAN – Pediatric Precision Laboratory Advanced Neuroblastoma Therapy” (NCT02559778). Whole-exome sequencing and RNA-Seq were performed at The Translational Genomics Research Institute on the Illumina HiSeq. The RNA expression levels were compared to a normal whole body reference composed of normal tissues as well as a pediatric cancer reference. Differential expression data was interpreted in the context of systems biology annotation for the purpose of identifying activated cellular processes targetable by drugs.

Results:
74 patients with High Risk NB were sequenced, 46 with relapsed disease and 28 at diagnosis. DNA analysis exhibited similar Copy Number Alterations but fewer mutations in primary diagnosis relative to relapse patients. At primary diagnosis the tumor mutation burden was low (median 53 coding sequence changes per subject, range 26-78) relative to the relapse patients (median 164 coding sequence changes per subject, range 28-5,000). RNA mutation analysis identified a subset of patients with high overexpression of SSX1 as well as separate subset of patients with high overexpression of MYCN and one with high overexpression of TERT. Most commonly differentially expressed genes seen were PHOX2B, FEV, ALK, MYCN, and CDK6 in 40-50%. Of the patients treated with molecular guided therapy with relapsed disease there were 3CR(13%), 1PR(4%), 11SD(48%), and 8PD(35%). Patients at diagnosis treated with induction chemotherapy combined with a targeted agent had induction responses of 2CR(12%), 10VGPR(59%), 3PR(18%), 1SD(6%), 1PD(6%). The 3 most common medications chosen in relapse patients include HDAC inhibition (70% of patients: 2CR, 7PR, 7PD), ALK inhibition (48%: 2CR, 7SD, 1PR,1PD) and Oxaliplatin (43%: 1CR, 8SD, 1PD), which was comparable to patients at primary diagnosis in which ALK inhibition (19%) and HDAC inhibition (69%) were combined with induction therapy.

Conclusion:
Genomic sequencing for precision therapy was feasible both at diagnosis and relapse in neuroblastoma. Sequencing of relapsed patients showed an increase in tumor mutation burden relative to primary diagnosis. RNA analysis resulted in identification of novel therapies for patients who have exhausted standard therapies resulting in therapeutic benefit is 65% of relapsed patients. In order to improve outcome and decrease long term toxicities of current chemotherapy, the further study of genomic guided treatments at diagnosis is warranted.

18-146 (Poster #24)
Lysosomal Acid Lipase is a Potential Therapeutic Target for Controlling GVHD after Allogeneic Hematopoietic Cell Transplantation in Mice

Sandeepkumar Kuril1*, Hung Nguyen2*, Hong Du3, Cong Yan3, and Xue-Zhong Yu2,4

1Department of Pediatric Hematology-Oncology, 2Department of Microbiology and Immunology, Medical University of South Carolina; 3Department of Pathology and Laboratory Medicine, Indiana University School of Medicine, Indianapolis, Indiana; 4Department of medicine, Medical University of South Carolina, Charleston, SC 29425.

Background: Graft-versus-host disease (GVHD) is a main barrier for the success of allogenic hematopoietic cell transplantation (allo-HCT). Lysosomal acid lipase (LAL) mediated cell-intrinsic lipolysis to generate free fatty acids and cholesterol in the cells. It plays an essential role in the
development, proliferation and function of T cells. LAL deficiency decreases Th1 and Th2
differentiation while inducing the generation of myeloid-derived suppressor cells (MDSC) and
regulatory T cells (Tregs). Treg and MDSC are suppressive and Th1/Th2/memory CD8 cells are
pathogenic in GVHD. LAL is also required for CD8 memory T cells development.

Objective: Due to its importance in alloreactive T cell metabolism, we hypothesize that LAL is a valid
potential target for the control of GVHD.

Methods: Using murine models of allo-HCT, we show here that transfer of reconstituted donor LAL-/-
T-cells is associated with significantly less GVHD, compared with LAL+/+ donors in
MHCMismatched (B6->BALB/c or FVB->B6) and haploidentical (B6->BDF1) model (Figure 1A &B). To
investigate the effect of pharmacologic LAL inhibition, Orlistat, a specific LAL inhibitor was
chosen. Oral treatment of transplanted recipients with Orlistat significantly reduced GVHD severity
and improves mortality of recipient mice in B6-BDF1 model (Figure 1B). Mechanistically,
LAL-- donor T cells significantly reduced proliferation in allogeneic recipients compared to WT
counterpart. Furthermore, LAL deficiency in donor T cells also reduced T cell activation and Th1
differentiation after transplantation. Strikingly, we observed that LAL-- T-cells or Orlistat treatment
largely preserved graft-versus-leukemia (GVL) activity against P815 mastocytoma in B6->BDF1
model (Figure 1C&D).

Results: Taken all together, our current study provides evidences that LAL can be a valid target for
the treatment of GVHD while maintaining GVL effect.

Conclusion: Lipid lipase inhibitors could be potential pharmacological agents for treating GVHD. Our
findings thus explore a novel therapeutic strategy for the control of GVHD by altering lipid
metabolism in donor T cells.

*Hung Nguyen and Sandeepkumar Kuril contributed equally to this work

18-109 (Poster #25)
Factors Associated with Delayed Transition to Oral Feeding in Infants with Single Ventricle
Physiology

Kurtz JD, Chowdhury SM, Woodard FK, and Zyblewski SC

Background: Feeding tube (FT) dependence after stage 1 palliation (S1P) is common in infants
with single ventricle physiology (SVP) and associated with worse outcomes. There is a paucity of
data describing risk factors associated with delayed transition from FT to oral feeds. This study aims
to identify those risk factors after S1P.

Methods: This was a single center, retrospective study that examined all S1P infants discharged
between 01/2012-03/2017. The primary outcome was transition time from FT to oral feeds. Early
transition was defined as by stage 2 palliation (S2P), mid as by to 1 year of age, and late as after 1
year of age. ANOVA with Bonferroni post-hoc analysis and Fishers exact test detected differences
between groups. Stepwise multinomial logistic regression identified independent risk factors for
delayed transition.

Results: Differences between groups are reported in the table. No pre-op oral feeding (OR = 0.08, p
= 0.01), lower weight-for-age Z-score (WAZ) at S1P discharge (OR = 0.22, p < 0.01) and more
cardiac medications at S1P discharge (OR = 0.08, p = 0.01) were associated with failure to achieve
early transition. No pre-op oral feeding (OR = 0.04, p < .01) and lower WAZ at S1P discharge (OR =
0.2, p < 0.01) were associated with failure to achieve mid transition.

Conclusion: Absence of pre-op oral feeding, lower WAZ and more cardiac medications at
S1P discharge were associated with a delayed transition to oral feedings. Future studies are required to determine if modifying these risk factors are associated with improved outcomes.

Early (n = 41)

<table>
<thead>
<tr>
<th></th>
<th>Early</th>
<th>Mid</th>
<th>Late</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orally fed pre-op</td>
<td>29 (71%)*#</td>
<td>3 (25%)</td>
<td>2 (13%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Any Enteral feeding pre-op</td>
<td>32 (78%)</td>
<td>5 (42%)</td>
<td>9 (60%)</td>
<td>0.07</td>
</tr>
<tr>
<td>WAZ score at S1P discharge</td>
<td>-1.25 ± 1.0 *#</td>
<td>-2.31 ± 0.68</td>
<td>-2.34 ± 1.0</td>
<td>0.03</td>
</tr>
<tr>
<td>Number of intubations S1P</td>
<td>1 (1-2)</td>
<td>1 (1-2)</td>
<td>1 (1-4)</td>
<td>0.54</td>
</tr>
<tr>
<td>Days of intubation during S1P</td>
<td>9.2 ± 10.8#</td>
<td>15.0 ± 12.1</td>
<td>22.6 ± 20.7</td>
<td>0.01</td>
</tr>
<tr>
<td>Presence of extra cardiac anomalies</td>
<td>4 (10%)</td>
<td>1 (8%)</td>
<td>6 (40%)</td>
<td>0.02</td>
</tr>
<tr>
<td>Vocal Cord paralysis</td>
<td>1 (2%)</td>
<td>1 (8%)</td>
<td>2 (13%)</td>
<td>0.17</td>
</tr>
<tr>
<td>Prolonged sedative use</td>
<td>15 (37%)*</td>
<td>10 (83%)</td>
<td>8 (53%)</td>
<td>0.02</td>
</tr>
<tr>
<td># of cardiac meds at S1P d/c</td>
<td>2 (2-2)</td>
<td>2 (2-4)</td>
<td>2 (2-3)</td>
<td>0.01</td>
</tr>
<tr>
<td># of GI meds at S1P d/c</td>
<td>1 (0-2)</td>
<td>2 (1-2.75)</td>
<td>2 (1-3)</td>
<td>0.04</td>
</tr>
<tr>
<td>Length of S1P ICU course, days</td>
<td>22.4 ± 12.1#</td>
<td>43.1 ± 32.7</td>
<td>60.8 ± 33.3</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Length of S1P hospitalization, days</td>
<td>35.5 ± 14.8*#</td>
<td>71.6 ± 41.3</td>
<td>70.3 ± 32.4</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>O2 saturation at S1P discharge</td>
<td>87.2 ± 3.6+*</td>
<td>82.7 ± 4.5</td>
<td>85.9 ± 6.0</td>
<td>0.01</td>
</tr>
<tr>
<td>NEC</td>
<td>2 (5%)</td>
<td>3 (25%)</td>
<td>3 (20%)</td>
<td>0.08</td>
</tr>
<tr>
<td>Received therapies after S1P^</td>
<td>22 (56%)</td>
<td>10 (83%)</td>
<td>10 (67%)</td>
<td>0.24</td>
</tr>
<tr>
<td>WAZ at S2P admission</td>
<td>-1.0 ± 0.9*#</td>
<td>-2.1 ± 1.0</td>
<td>-2.0 ± 1.2</td>
<td>0.81</td>
</tr>
<tr>
<td>AVVR at S2P Admission^</td>
<td>0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>18 (51%)</td>
<td>6 (50%)</td>
<td>5 (36%)</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>16 (46%)</td>
<td>3 (25%)</td>
<td>9 (64%)</td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>1 (3%)</td>
<td>3 (25%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Received therapies after S2P^</td>
<td>15 (44%)</td>
<td>9 (75%)</td>
<td>12 (86%)</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Categorical variables are listed n (%), continuous are mean ± sd or median (IQR)

* = Statistically significant difference between early and mid-transition feeding groups
# = Statistically significant difference between early and late transition feeding groups
^ = Some data not available, therefore some columns may not add to same N
Correlation and Agreement of Cardiac MRI and Balloon Waist Diameter of the Right Ventricular Outflow Tract for Percutaneous Pulmonary Valve Replacement

Kurtz, JD

Background: Percutaneous pulmonary valve replacement (PPVR) candidacy is limited by right ventricular outflow tract (RVOT) diameter. We examined the correlation and agreement of RVOT minimal diameter measured by pre-procedural MRI and balloon waist diameter (BWD) made during PPVR.

Methods: This is a single center, retrospective study of patients undergoing PPVR with a pre-procedural cardiac MRI in the previous year. All MRI measurements were made by a single investigator at the narrowest location of the RVOT during peak systole in two orthogonal planes using cine steady-state free procession, MR angiography, and three-dimensional steady-state free procession sequences. BWD was defined as the narrowest point in the sizing balloon at full inflation within the RVOT. The primary outcome was the agreement of MRI and BWD measurements of the RVOT.

Results: Twenty-three patients were included in the analysis. Twelve (52%) were male, 17 (74%) had a diagnosis of tetralogy of Fallot, 3 (13%) did not have a valve placed due to RVOT size. The average age was 31 years (9-56 years old). BWD measurements had a significant correlation with
both planes of cine MRI and the long axis of MR angiography. BWD had significant agreement with both cine MRI planes by Bland-Altman analysis. See figure 1 for details.

Conclusions: MRI measurements show moderate correlation and agreement with BWD of the RVOT. While the mean difference is low, the lines of agreement are quite wide. This suggests MRI is only moderately effective in determining RVOT diameter candidacy in PPVR. Further study is warranted to determine the most effective method for RVOT diameter selection in PPVR.

18-135 (Poster #27)
Common Links between Fetal Cardiac and Placental Development

Clark, Christopher D., Kymbreana Coley, Andrea Creech, Wayne Fitzgibbon, Evelyn T. Bruner, Christopher G. Robinson, Donna Johnson, Kyu-Ho Lee

OBJECTIVES: Overall, this project seeks to define similarities in the function of the Nkx2-5 gene network during development of the placenta, and of the right heart, which potentially coordinate overall feto-placental circulatory development during pregnancy.
We have found that the cardiac homeobox transcription factor, Nkx2-5, which plays a major role in the development of the cardiac right ventricle and outflow tract, is also expressed in developmentally regulated fashion in several placental trophoblast populations during development. Additionally, we have found that high levels of expression of Nkx2-5 are linked to high levels of expression of the anti-angiogenic factor, sFlt-1 in placentae of women with Early Onset and Severe Preeclampsia (EOSPE).

METHODS: Using qPCR, western blot and IHC assays, we analyzed the expression of Nkx2-5 and Nkx2-5 target genes in normal mouse placenta, and in placenta of women with EOSPE. We have developed placental trophoblast-specific loss-of-function and gain-of-function Nkx2-5 mouse models for morphologic, physiologic and transcriptomic analysis of the consequences of varying Nkx2-5 expression on placental development.

RESULTS: We have detected related spatiotemporal expression of Nkx2-5, and two previously identified Nkx2-5 target genes, the RNA splicing factor Khdrbs1/Sam68, and the coiled-coil protein Ccdc117 in both villous and decidual placental trophoblasts. These profiles begin at mid-gestation in mouse, and peak between embryonic day E12.5 (Nkx2-5) and E14.5 (Sam68 and Ccdc117) before falling to low levels at parturition (E19.5-21.5). Preliminarily, Sam68 shows evidence of being an Nkx2-5-activated regulator of sFlt-1 transcript levels through alternative splicing, both in EOSPE human placentae, and in mouse Nkx2-5 placental overexpression models. In parallel, Ccdc117 potentially regulates both cardiac progenitor and placental trophoblast proliferation during development, through the facilitation of DNA synthesis and repair processes critical for cell cycle progression.

CONCLUSIONS: We have found unexpected commonalities in the regulation of cell proliferation and angiogenic signaling by Nkx2-5 in feto-placental development. Ongoing experiments in this project will both further delineate the extent of these parallels, and examine their dependent vs. independent function in the feto-placental unit.

18-122 (Poster #28)
CHLOROMA CAUSING CORD COMPRESSION DETECTED IN A PATIENT WITH 3RD CENTRAL NERVOUS SYSTEM (CNS) RELAPSE OF ACUTE LYMPHOBLATIC LEUKEMIA (ALL)

Mamatha Mandava, MD, Mayra Robinson, MD, and Jennifer Jaroscak, MD
Pediatric Hematology/Oncology-Medical University of South Carolina, Charleston, SC

Background: ALL is the most common malignancy in children accounting for 30% of pediatric cancers. With current treatments CNS relapse is rare.

Objectives: We present a unique patient with visual changes on routine clinic visit to illustrate and review the CNS signs and symptoms.

Materials and methods: We reviewed and will present his history, prior treatments, clinical presentation and unique radiological findings.

Results: Our 9yo male with history of ALL presented to clinic with a 2 week history of visual changes. Ophthalmology exam revealed bilateral grade 4 disc edema. CT scan showed infiltrates of cranial nerves 3 and 5, and thinning of the sphenoid sinus. He underwent Lumbar puncture (LP) and cerebrospinal fluid (CSF) showed an elevated nucleated cell count 2619/mm3, elevated red blood cells 917/mm3, elevated protein 145(mg/DL), decreased glucose 4 (MG/DL), and 86% blasts. His opening pressure was 6 mm H2O, which is low for such an elevated WBC. Bone marrow was negative. CSF flow cytometry was performed which was positive for B cell ALL. Six hours after the LP procedure he developed bowel, bladder incontinence and bilateral lower extremity weakness. His exam showed bilateral motor weakness with decreased rectal tone. His acute changes prompted an MRI that showed clumping of cauda equina nerve roots into a chloroma at L3, resulting in cord compression symptoms. His low CSF pressures were likely a result of sampling below the chloroma, and did not reflect the increased pressure causing papilledema. He was started on decadron for cord compression, and he received palliative radiation (12Gy) to the chloroma. There are few data on isolated CNS relapses, and we advised his family that his disease was not curable. He and his
family wanted to begin treatment, and an ommaya reservoir was placed. We began treatment per Mosner et al., (Cancer 1999, Volume 85:511-516). This regimen has been shown to control symptoms, avoid systemic chemotherapy and provide good quality of life. His clinical symptoms improved and he was able to walk independently prior to discharge.

**Conclusion:** Isolated CNS relapses are rare. We presented this case to illustrate clinical findings at relapse. Because these events are rare it is important to be aware of findings indicative of relapse. During his diagnostic procedures we identified extremely unusual finding of chloroma at L3 level of spinal cord. It is important to vigilantly monitor CNS signs and symptoms in patients with ALL. We need to continue CNS directed therapy and develop more effective treatments for isolated relapse.

18-163 (Poster #29)

**Efficacy of Regulatory T Cell Transplantation in a Mouse Model of Osteogenesis Imperfecta**

Inhong Kang, Shilpak Chatterjee, Uday Baliga, Shikhar Mehrotra, Meenal Mehrotra

Osteogenesis imperfecta (OI), most common hereditary bone disease, is characterized by reduction in quantity of bone matrix that leads to repeated fractures and bone deformity. Incidence of OI in United States is estimated to be 1 per 20,000 live births, but there is no cure at present. Long-term treatment with drugs, to prevent fractures, have their own side effects; therefore several strategies are being tested to enhance bone remodeling. It is known that skeletal homeostasis can be dynamically influenced by the immune system. Recent studies have shown that T lymphocytes could be essential in regulating homeostasis, survival and function of not only osteoclasts but osteoblasts as well, thus playing an important role in bone turnover. Using mice lacking functional lymphocytes, it has been demonstrated that T cells play a role in bone regeneration with fracture calluses of deficient mice exhibiting lower levels of bone markers leading to poor bone quality. A previous study also demonstrates improved bone formation after delivery of anti-inflammatory regulatory T cells (Treg’s) during mesenchymal stem cell based bone regeneration. However, whether T cells, specifically Treg’s, play a role in OI, a disease with high turnover and high fracture rates, has never been investigated before. For our studies we used B6C3Fe a/a-Col1a2oim/J (oim) model, which resembles Type III OI, a non-lethal but severe form. Characterization of T lymphocytes demonstrated that splenic T cells derived from oim mouse exhibited a more activated phenotype as compared to wild type (WT) T cells, which also correlated with higher secretion of effector cytokines such as IFN-γ and TNF-α. Furthermore, we also determined that oim mouse exhibited a quantitative decrease in CD4+CD25+Foxp3+ Treg’s. Enhanced improvement in the trabecular parameters was observed by Micro-CT when the oim mice were transplanted with WT bone marrow (BM) + WT Treg’s as compared to those transplanted with WT BM alone. To determine the mechanism of how Treg’s mediate the healing of bone, we examined their effects on osteoblasts and osteoclasts. Conditioned media from ex vivo programmed iTreg’s from WT mice not only suppressed osteoclast formation, but also caused an increase in osteoblast mineralization in oim. Thus, understanding the contribution of Treg’s to osteogenesis in OI could help to develop immunotherapy based treatment modalities for OI.

18-143 (Poster #30)

**Expected and Unexpected Disclosures in the Forensic Interview**

John Melville, MS, MDb, Kathryn Reid-Quinonesb, Ph.D., Trevor Morrisc, Carole C. Swiecickid, Ph.D.
ab Division of Child Abuse Pediatrics, Medical University of South Carolina, Charleston, SC
b Dee Norton Child Advocacy Center, Charleston, SC
c Medical University of South Carolina, Charleston, SC
d Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, Charleston, SC

**Objective** Forensic interviews are a standard of care for verbal children who have disclosed, or are suspected to have experienced, abuse or neglect. Many children, however, fail to disclose abuse
during a forensic interview, at times despite overwhelming evidence of abuse. This study presents
the first analysis of forensic interview outcomes in a clinically representative sample utilizing modern
forensic interview techniques.

**Methods** A retrospective chart review was conducted of forensic interviews involving 600 children
age 3-17 with disclosure or suspicion of abuse or neglect. Forensic interviews followed the Child
First protocol and inquired about multiple types of maltreatment. Results were analyzed using
descriptive statistics and logistic regression.

**Results:** 582 patients had complete information recorded in the chart. Of these 284 (48.8%)
children made 357 disclosures of some form of abuse during the forensic interview. Logistic
regression found disclosure to be correlated with age, prior disclosure, and another person having
witnessed the abuse. Disclosure was inversely correlated with prior denial of abuse or being
interviewed as a sibling of an abused child. Of 357 disclosures made, 152 (42.6%) disclosed a type
of abuse not mentioned in the referral information requesting an interview. These unanticipated
abuse typologies were nearly all non-sexual in nature. A single child disclosed sexual abuse not
previously disclosed.

**Conclusions:** Unanticipated disclosures of physical abuse, neglect, domestic violence, and parental
substance use frequently occur during forensic interviews. Disclosures of sexual abuse are
uncommon among children who are reported to have not disclosed abuse to anyone.

18-154 (Poster #31)
Perinatal Risk Factors and Outcomes for Social Emotional Difficulties in High Risk Infants

Mittal, Shruti; RUDDY, AMY L.; Poon, Jennifer; Katikaneni, lakshmi D

Background: Children with social emotional difficulties (SED) are at an increased risk for academic
underachievement, strained peer relationships, and behavioral problems. Infants with high-risk
perinatal factors are a vulnerable population given the increased incidence of neurobehavioral
disabilities. Early detection is vital to implementing evidence-based interventions, but data examining
risk factors for SED in high-risk infants is limited. Objective: Our aim is to identify perinatal risk factors
and outcomes that are associated with SED in high-risk infants.

Design/Methods: This study was a retrospective review of 701 children ages 0-5 seen at our hospital's NICU
Graduate Clinic from January 1, 2008 to January 1, 2015. Major follow up categories included:<1500
gm birth weight, SGA/IUGR(wt. <10%), IVH grade III/IV, High frequency ventilation(HFV), in utero
drug exposure, multiples <33wk GA. The remaining graduates were grouped into Neurosuspect(NS)
category with either HIE, abnormal neuro examination, or late preterm infants needing
cardiorespiratory interventions and hyperbilirubinemia. The Ages and Stages Questionnaire –Social
Emotional(ASQ:SE) was used to identify infants “at risk” for SED. Data were analyzed using chi-

Results: 701 patients had 1780 patient evaluations. ASQ:SE screen identified 56% (395) as at risk
for SED. Significant association was noted with Grade III/IV IVH (78%), HFV (76%), IUGR/SGA
(63%) and NS groups (64%). Further bivariate analysis of major neonatal and maternal variables for
SGA (N=168, mean GA 31 wks) and NS (N=145, mean GA 33.6 wks) groups with and without SED
indicated only prolonged ventilation >20 days to be a significant contributor for SED (p < .0001).
Figure 1 and 2 show the significant differences for VT days (SGA 22.8 vs. 6.37), and NS (23.7 vs.
5.17). Of children at risk for SED, 1 in 10.6 had ADHD (n=37) and 1 in 28 (n=14) had Autism
Spectrum Disorder (ASD). Of the 307 children who scored “not at risk” for SED, no child was
diagnosed with ASD but 9 were diagnosed with ADHD (1 in 38 children).

Conclusion(s): ASQ: SE questionnaire identified SED in 56% in high-risk NICU graduates and
increased risk for diagnosis of ADHD or ASD. Prolonged ventilation >20 days was a significant indicator for SED in
SGA and NS infants. NICU identification of prolonged ventilation and close monitoring for SED is
Belhassen tachycardia, also known as fascicular tachycardia, is the most common form of idiopathic ventricular tachycardia (VT), classically characterized by ECG findings of right bundle branch block and left superior QRS axis. Diagnosis can be challenging, as it is uncommon, and ECG findings discriminating it from other more common tachycardias, such as supraventricular tachycardia (SVT) with aberrancy, permanent junctional reciprocating tachycardia, or even monomorphic ventricular tachycardia, can be subtle and difficult to detect by the practitioner inexperienced with this rare entity. Accurate diagnosis of Belhassen VT is essential to its management, as it is classically refractory to vagal maneuvers, synchronized cardioversion and many commonly used antiarrhythmic medications including adenosine, lidocaine, metoprolol, and amiodarone. It is, however, exquisitely sensitive to verapamil through inhibition of a localized reentry circuit via slow-conducting verapamil-sensitive fibers within the posterior fascicle, hence its alternative name of verapamil-sensitive VT. Here, we present the case of a 17-year old otherwise healthy Hispanic male who initially presented to an outside hospital where he was diagnosed and managed as SVT, receiving multiple rounds of adenosine and ultimately several attempts at cardioversion prior to conversion to normal sinus rhythm. Upon follow up at MUSC, he was once again in a wide complex tachycardia, and after failed response to adenosine and amiodarone, demonstrated rapid and sustained conversion with verapamil. This response, along with closer evaluation of his ECG (Figure), confirmed the diagnosis of Belhassen VT. Through dissection of his case, we highlight key elements and common pitfalls in the diagnosis and management of Belhassen VT, and review the underlying pathophysiology, prognosis, and long-term management options for Belhassen VT. We further provide tips on approaching the pediatric patient presenting with a wide-complex tachycardia, with emphasis on maintaining a high index of suspicion for rare entities such as Belhassen VT, especially when common treatments have failed.

ECG at Presentation

**18-124** [Presentation] Novel Method for Systemic Removal of Thermosensitive Liposomal Doxorubicin to Reduce Toxicities

Motamarry, Anjan

Background/Purpose: Pediatric cancer patients treated with chemotherapy regimens consisting of anthracyclines such as doxorubicin are at risk of developing late-term morbidities such as cardiomyopathy or arrhythmias due to systemic drug uptake. Currently there are limited methods for targeted delivery of drugs to the cancer sites, since following systemic infusion, chemotherapeutic agents distribute and are taken up by all bodily tissues. Thermosensitive liposomes (TSL) are a promising nanoparticle drug delivery system that rapidly releases the contained drug in response to hyperthermia (>40 °C). Combined with localized hyperthermia, TSL allow highly localized delivery (~10-30x local dose compared to unencapsulated drug). As the release of the drug only takes place in the heated tissues, only a small fraction of administered drug is released in the target tissue. Most of the drug is eventually taken up by non-targeted tissues due to gradual drug leakage from TSL in systemic circulation, and by other mechanisms, leading to unwanted toxicities. The goal of this study was to demonstrate the ability to rapidly remove the drug not released in the targeted tissues by filtration in an extracorporeal circuit (ECC). Methods:
Norway brown rats were anesthetized and catheters were implanted into the jugular vein and carotid artery. After allowing 48 hours for recovery, blood was drawn for baseline analysis. Then, TSL encapsulated doxorubicin (TSL-dox) at a dose of 7mg/kg was infused via venous catheter in anesthetized animals. 15 min after the infusion was completed, an ECC was established between arterial and venous catheters. The ECC consisted of a novel device designed to remove TSL-dox from systemic circulation by first heating the blood for 5-10 seconds to 42ºC to release drug from TSL, followed by filtration of the released drug. Blood from the artery was passed through a lab-made heating element to achieve almost complete release of drug from TSL, passed through an activated charcoal filter to remove released drug, and finally returned to the animal through the catheterized vein (Fig. 1). ECC filtration was performed for 1 hour at a flow rate of 0.35 ml/min in 3 animals. Blood samples were collected before and after the charcoal filter every 20 min after completed drug infusion. ECC filtration was performed in 3 animals, and TSL pharmacokinetics was measured in 2 control animals without filtration.

Results:
20% and 29% of the infused dose were removed from systemic circulation within 40 and 60 min of ECC. The activated carbon filter efficacy was between 90% (start of ECC) and 60% (end of ECC).

Conclusions:
The proposed method can rapidly remove TSL encapsulated chemotherapy from systemic circulation, potentially reducing systemic toxicities by removing drug that is not delivered to targeted tissues. This method is most effective in TSL that have good plasma stability (i.e. with limited systemic drug leakage before filtration is complete).

Figure 1: Extracorporeal circulation with heating element and activated carbon filter

30 min after systemic infusion of TSL-Dox an ECC was established. Blood from the catheterized carotid artery (red arrow) was drawn out, passed through a lab-made heating element (43ºC) for complete release of doxorubicin from TSL (yellow arrow). Blood was then passed through a lab-made activated carbon filter (green arrow) to remove the released drug before being returned to the animal.
BACKGROUND: Continuous renal replacement therapy (CRRT) is used to optimize fluid status during extracorporeal life support (ECLS), but the effect of CRRT on lung opacification during ECLS has not been studied.

OBJECTIVE: We aimed to determine the association between early CRRT use in infants receiving ECLS and severity of lung disease, estimated by degree of lung opacification on chest radiography (CXR). We hypothesized that early CRRT use during infant ECLS decreases lung opacification on CXR.

METHODS: We conducted a case-control study comparing CXRs from infants receiving ECLS and concurrent early CRRT (Cases; n=7) to case-matched infants who received ECLS alone (Controls; n=7). Early CRRT was defined as CRRT initiation within 48 hours of cannulation. The CXR obtained prior to ECLS, all CXRs obtained within the first 72 hours of ECLS, and daily CXRs for the remainder of the ECLS course were analyzed. The outcome measure was the degree of lung opacification, determined by independent assessment of 2 pediatric radiologists using the Edwards lung opacification scoring system (score 0: no opacification-score 5: complete opacification).

RESULTS: 220 CXRs were assessed, 93 from Cases and 127 from Controls. Inter-rater reliability was established with a Cohen’s weighted k=0.74 (p<0.0001) suggesting good agreement between radiologists. At baseline, the mean opacification score difference between Cases and Controls was 1 point (Cases: 1.8, Controls: 2.8; p=0.049). Using repeated measures analysis and mixed modeling accounting for differences at baseline, the average overall opacification score was 1.2 points lower in Cases than Controls (Cases: 2.1, Controls: 3.3; p<0.0001). The overall distribution of scores was lower in Cases than Controls (see Figure), and there was a significant difference when comparing the frequency of patients with “mild” opacification scores (0-1.5), “moderate” scores (2-3.5), and “severe” scores (4-5) between groups (p<0.0001).

CONCLUSIONS: Early CRRT utilization during infant ECLS significantly decreases lung opacification on CXR.

FIGURE. Distribution of Mean Lung Opacification Scores between Cases and Controls

Continuous renal replacement therapy removes cytokines during infant extracorporeal life support

BACKGROUND: Continuous renal replacement therapy (CRRT) is used during extracorporeal life support (ECLS) to optimize fluid management but may result in removal of cytokines from the circulation. Studies in vitro and in vivo in animals and adults demonstrate hemofiltration of cytokines via CRRT; this has not demonstrated in infants receiving ECLS.

OBJECTIVE: We aimed to determine if CRRT results in filtration of cytokines in infants receiving ECLS. We hypothesized that CRRT during infant ECLS removes cytokines from the circulation resulting in quantifiable cytokines in the ultrafiltration fluid (UF), specifically interleukin 6 (IL-6), IL-10, IL-13, and TNF-alpha (TNF-α).
METHODS: We conducted a prospective study with data collected from infants who received ECLS with concurrent CRRT. Whole blood was collected at cannulation and every 6hrs during the initial 24hrs of ECLS, then every 24hrs for the remainder of concurrent therapy; blood was collected from the ECLS circuit, pre-CRRT filter. UF was sampled every 6hrs throughout concurrent therapy beginning 6hrs after CRRT initiation; UF was collected directly from CRRT device, post-CRRT filter. Cytokine concentrations were quantified by ELISA.

RESULTS: 9 infants were enrolled; 151 UF and 28 blood samples were analyzed. In all 9 patients, quantifiable amounts of IL-6 were found in the UF at most time points (range: 0-13.7 pg/ml in 151 samples). TNF-α was found in the UF of all 7 infants in which it was analyzed (range: 0-28.3 pg/ml in 68 samples). UF concentrations of both IL-6 and TNF-α were dependent upon sampling time and clinical course. For proof of concept testing, blood was analyzed in 2/9 patients, and measureable amounts of IL-6 were found in serum (range: 0-185.1 pg/ml in 28 samples; see example in Figure). IL-10 and IL-13 were not found in the UF in the 7 patients in which these were analyzed.

CONCLUSIONS: CRRT during infant ECLS results in quantifiable cytokine removal, particularly IL-6 and TNF-α, suggesting that CRRT-mediated cytokine removal may modulate inflammatory responses in these infants. To our knowledge, this is the first report demonstrating cytokine quantification in UF in infants treated with CRRT during ECLS.

Figure. Interleukin 6 concentrations in blood and UF from a single enrolled patient throughout course of concurrent ECLS and CRRT.

18-125 (Poster #36)
Effect of Physical Activity of Vitamin D (VitD) Status in Pregnant Women Participating in a Randomized Controlled Trial (RCT)

Neiger, Christina (MS4), Hall, Jordan, Ebeling, Myla, Wagner, MD, Carol

Background: A positive association exists between vitD status in pregnant women and the health of both mothers and their babies as well as a positive association between physical activity and vitD status.

Objective: This study aimed to determine the effect of physical activity intensity and duration on vitD status in pregnant women.

Methods: A post-hoc analysis of an existing RedCap database of a prospective RCT involved pregnant women beginning at 10-14 weeks’ gestation randomized to one of two treatment groups: 400 or 4400 IU/day of vitD (the Kellogg Foundation VitD Pregnancy Study HR#20570). Data were analyzed from baseline and subsequent
monthly study visits. VitD status, as defined by total circulating 25(OH)D concentration, was measured monthly in each participant. Physical activity was subjectively measured monthly using the Paffenbarger Physical Activity Questionnaire, and responses were then categorized by exercise intensity of 2.5 hrs/week at 3 time points—visits 2, 5, and 7 (trimesters 1, 2 and 3). Statistical analyses were performed using SAS. Linear Regression and Mixed Models, controlling for physical activity, race, treatment group, BMI, perceived stress score, and visit, were created.

Results: At baseline, vigorously exercising more than 2.5 hrs/wk was associated with older women (p=0.0004), Caucasian women (p=0.0112), women with private insurance (p=0.0182), and women with a planned pregnancy (p=0.0306). At visit 5, vigorously exercising >2.5 hrs/wk was associated with Caucasian women (p=0.0033), private insurance (p=0.0062), planned pregnancy (p=0.0145), and being married (p=0.0120). At visit 5, an association existed between vigorously exercising >2.5 hours/week and higher 25(OH)D concentrations (p<0.0001). At visit 7, vigorously exercising >2.5 hrs/wk was associated with Hispanic women (p<0.0001), gravidity (p=0.0468), private insurance (p=0.0017), and being married (p=0.0422), but no longer with higher 25(OH)D concentrations (p=0.2538). When analyzed in a mixed model, a positive association existed between vigorously exercising >2.5 hrs/wk and maternal 25(OH)D concentration (p=0.0382).

Conclusion(s): Women who vigorously exercised >2.5 hrs/wk had higher 25(OH)D concentrations than those who did not. Women who were most likely to vigorously exercise >2.5 hrs/wk tended to be older, married, privately insured, and purposefully pregnant. Encouraging women to develop and maintain an appropriate exercise program can improve their VitD status and that of their developing fetus.

18-128 [Presentation]
Vitamin D Binding Protein Polymorphisms Significantly Impact Responses to Vitamin D Supplementation in Children

Danforth A. Newton¹, John E. Baatz¹, Mark S. Kindy², Judy R. Shary¹, Bruce W. Hollis¹ and Carol L. Wagner¹
Depts. of ¹Pediatrics/Neonatology and ²Regenerative Medicine & Cell Biology, Medical University of South Carolina, Charleston, SC, USA

Background: Vitamin D deficiency is present in nearly 50% of the U.S. population, with much higher rates occurring in African-American and Hispanic communities. Common polymorphic alleles of the vitamin D binding protein (VDBP) gene have been shown to affect circulating concentrations of vitamin D metabolites, including 25-hydroxyvitamin D (25OHD), the defined barometer of vitamin D status.

Objectives: Since the frequencies of these alleles vary widely by race/ethnicity, this study was designed to test the hypothesis that VDBP genetic variability could affect the correlations between vitamin D intake (diet/supplementation) or endogenous synthesis (sunlight exposure) with the clinical measurement of vitamin D status in children.

Methods: VDBP genotypes for 3 alleles of VDBP (Gc1S, Gc1F and Gc2) were determined for 123 ethnically-diverse children clinically-followed for up to 4 years each. Statistical analyses were then used to determine significant relationships between VDBP genotypes, race/ethnicity, vitamin D intake, sunlight exposure, and serum 25OHD levels.

Results: Dramatic differences in VDBP genotype frequencies were seen between African-American, Caucasian and Hispanic children. Among the study population as a whole, recommended vitamin D intake (400-600 IU/day) resulted in vitamin D sufficiency (serum 25OHD >75 nmol/L), and serum 25OHD was significantly higher in children who took vitamin D supplements compared to those who did not (78.0 ± 32 vs. 64.4 ± 21 nmol/L, respectively; p<0.01). Also, as commonly found in other studies, Caucasians had higher 25OHD levels than either African-American or Hispanic children. However, these differences were determined to be closely-associated with the presence of the Gc1S VDBP allele, and children with the Gc1S/1S genotype had the largest responses to vitamin D supplementation (mean increase of 37 nmol/L 25OHD; p<0.01). Conversely, vitamin D
supplementation in the 75% of these African-American children with the Gc1F/1F genotype was associated with a minor response (mean increase <4 nmol/L), while Gc1S/1F individuals were brought into the range of sufficiency (mean increase of 25 nmol/L 25OHD; p<0.05).

**Conclusion:** VDBP genotypic variability was found to be a significant factor affecting childhood vitamin D sufficiency when following currently-recommended dietary intake guidelines for vitamin D. These results may help inform future public health policy concerning the uniformity in recommended vitamin D dosage among children, especially with regard to racially/ethnically-associated disparities.

**18-148 (Poster #38)**
Commensal Gut Bacterium Impairs Bone Modeling in Post-natal Skeletal Development

NA Poulides, JD Hathaway-Schrader, C Westwater, CM Novince

Osteoimmunology investigations have recently highlighted that the commensal gut microbiota is a critical regulator of osteoclast-osteoblast mediated bone modeling processes in the healthy developing skeleton. We have previously shown that the commensal gut microbiota enhances osteoclastogenesis and suppresses osteoblastogenesis, which intriguingly appears to be attributed to TH17/IL-17 immune response effects in the bone marrow and liver. Of interest, Segmented Filamentous Bacteria (SFB) is a genomically distinct commensal gut bacterium, which potently directs TH17/IL-17 mediated immunity. The current study purpose was to delineate the influence of SFB on gut microbiota immunomodulatory actions regulating post-natal skeletal development. Nine week-old, female, C57BL/6T murine-pathogen-free (MPF) mice (*SPF mice colonized by SFB) and excluded-flora (EF) mice (*SPF mice devoid of SFB) were euthanized, and tissues collected. Proximal tibia trabecular bone was analyzed by uCT and histomorphometric analyses (n=4-5/gp). Mesenteric & liver lymph nodes (LNs), spleen, and bone marrow cells were isolated for flow cytometric analyses (n=5/gp). Ileum, liver, spleen, and bone marrow were assessed for target genes by qRT-PCR and nCounter (n=5/gp).

EF vs. MPF mice had decreased body weight and tibia length, which implies that SFB impairs endochondral bone formation. Increased proliferative and hypertrophic chondrocyte zone widths in EF mice suggests reduced tibia length is due to delayed linear bone growth. MPF mice had decreased trabecular bone volume fraction, reduced trabecular number and increased trabecular separation. Osteoclast numbers lining bone were enhanced in MPF vs. EF mice. MPF mice had increased MLN and LLN weights per body weight, upregulated % cytotoxic T-cells in MLNs, and enhanced % helper T-cells in LLNs. Il17 was substantially increased in the ileum of MPF mice, which is in line with SFB induction of TH17/IL-17 immunity. Paralleling the increased osteoclast numbers lining bone, the critical osteoclastic transcription factor Nfatc1 was increased in marrow of MPF mice. Decreased Col1a1, but no difference in Ocn and Opn in MPF vs. EF mice, indicate that suppressed early osteoblast activity contributes to the osteopenic trabecular bone phenotype found in MPF mice. C3, C5a and Lcn2 (innate immune factors having pro-osteoclastic / anti-osteoblastic actions) were upregulated in liver and marrow of MPF mice, which provides novel mechanistic insight about the role of SFB in commensal gut microbiota actions regulating post-natal skeletal development.

**18-103 (Poster #39)**
Treatment of Early Onset Scoliosis and its Emotional Effects on Patients and Their Families: An EOSQ Analysis

Thomas Offerle, James F. Mooney, III, MD, Robert F. Murphy, MD

Background: Patients with early onset scoliosis and their families are exposed to significant emotional, psychological, and financial burdens. Many patients undergo years of multiple interventions, including casting, bracing, and surgery. The Early Onset Scoliosis Questionnaire (EOSQ-24) is a patient reported outcome measure which was developed and validated to measure quality of life and patient/parent reported outcomes in s population. The EOSQ-24 uses a 5-point scale and comprises 11 domains, including general health, pain, pulmonary function, transfers,
physical function, daily living, fatigue, emotion, parental impact, financial impact, and satisfaction.

Methods: The EOSQ-24 was administered to all eligible patients with early onset scoliosis who qualified for inclusion into a multicenter registry at our institution. Scoliosis etiology (neuromuscular, idiopathic, congenital/other), treatment type, and length of time in the treatment plan were queried. Results of all answered questions from the EOSQ-24 domains were tabulated. Average reported scores were calculated and statistically analyzed for significance.

Results: 42 total EOSQ-24 were collected from 27 patients, which included 12 patients with idiopathic, 13 patients with neuromuscular, and 2 patients with congenital/other scoliosis. Of these 27 patients, 3 were casted, 7 were braced, and 17 had surgical intervention. Fifteen were male and 12 were female. On average, patients were in a treatment plan for 37 months. For those patients who had multiple surgeries, the average was 4.8 surgeries over an average of 40 months (range of 1-13 surgeries and 1-102 months). The average scores for the daily living and physical function EOSQ-24 domains had the lowest values of 3.43 and 3.00, respectively.

When comparing neuromuscular scoliosis patients to those with other etiologies, we found that they had statistically lower scores on the EOSQ-24. (Neuromuscular 3.29, Congenital 4.22, Idiopathic - 4.39) (Neuromuscular vs. non-neuromuscular p-value<0.000). Furthermore, those patients who have been in an active treatment plan for longer than 35 months had a trend toward lower EOSQ-24 scores. (Treatment length ≥ 35 months – 3.59, Treatment length < 35 months – 3.94, p-value 0.077).

Conclusion: The EOSQ-24 is a reliable assessment of the patient and parent reported outcomes surrounding early onset scoliosis. Neuromuscular patients/parents report lower scores, likely reflecting a larger burden placed on these families. Further research is needed to understand this patient reported outcome measure and the effects of early onset scoliosis on patients and families.

18-136 (Poster #40)
Prescribing Patterns of High-Risk Medications in Pediatric Patients with Pneumonia and Sinusitis

Phang, Karina, Roberts, James, Garner, Sanda, Ebeling, Myla, Basco, William

Background: Prescription steroids and opioids have a high potential for adverse effects and misuse, particularly among young children and adolescents. Clinical guidelines recommend against use of systemic steroids and opioids in treating pediatric pneumonia or sinusitis, citing risks of systemic adverse effects with steroids and respiratory depression with opioids.

Objective: The purpose of the study was to compare the frequency of systemic steroid or opioid prescribing for children with pneumonia or sinusitis based on location of care. We hypothesized that prescription of two high-risk drug classes (systemic steroids and opioids) for pediatric pneumonia or sinusitis was greater in the emergency department than other clinical sites.

Methods: The study evaluated paid claims for visits and medications using 2016 South Carolina Medicaid data. Subjects were 5 to 18 years old with a primary diagnosis of pneumonia or sinusitis, selected using the ICD-10 Clinical Classification Software Category System and the Agency for Healthcare Research and Quality. Use was defined as a systemic steroid or an opioid dispensed within 7 days of a visit claim. Medicaid visits were associated with one of 3 locations: emergency department (ED), urgent care (UC), or ambulatory site. Patient demographic data available included race/ethnicity, gender and age in months. Chi square analysis was used to compare frequencies. A
multivariate logistic regression model was estimated to examine differences in opioid and steroid prescribing by clinical location, and controlled for age, gender, race, chronic conditions, and acute conditions.

Results: A total of 16,480 visits met inclusion criteria from all 3 settings. Of 2,153 visits in the ED, 273 (13%) included a systemic steroid and 98 (5%) included an opioid. Of 14,149 visits in the ambulatory setting, 974 (7%) included a systemic steroid and 376 (3%) included an opioid. Of 178 visits in the UC, 15 (8%) included a steroid. Too few patients were prescribed an opioid in the urgent care setting to perform statistical analysis. ED visits were associated with a higher steroid prescription rate (p<0.0001) when compared to ambulatory and UC visits. ED visits were associated with a higher opioid prescription rate (p<0.0001) when compared to ambulatory visits. Based on regression data: Being a younger child, being seen in the ED, and having an acute condition are associated with receiving a steroid prescription. Being a younger child, being seen in the ED, and not having an acute condition are associated with receiving an opioid prescription.

Conclusions: Our results suggest that school-age children and adolescents received steroid and opioid prescriptions when seen for pneumonia or sinusitis at higher frequency when seen in the ED versus the ambulatory setting in the state of South Carolina. Given safety concerns of steroids and opioids in pediatric patients, improved prescribing and stewardship practices for these medications are needed.

<table>
<thead>
<tr>
<th>Table 1: Adjusted Association between Patient Variables &amp; Prescription of Opioids &amp; Steroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
</tr>
<tr>
<td>White/Caucasian</td>
</tr>
<tr>
<td>Black/African American</td>
</tr>
<tr>
<td>Hispanic</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Clinical Site</td>
</tr>
<tr>
<td>ED</td>
</tr>
<tr>
<td>UC</td>
</tr>
<tr>
<td>Ambulatory</td>
</tr>
<tr>
<td>Acute Condition</td>
</tr>
<tr>
<td>Chronic Condition</td>
</tr>
</tbody>
</table>

18-116 [Presentation]
A Family-Centered Self-Management Program for Young Children with Sickle Cell Disease: Phase I

Phillips, Shannon

Background: Sickle cell disease (SCD) affects ~100,000 individuals in the US and can result in multiple acute and chronic negative health outcomes including: symptoms such as pain and fatigue, organ damage, and increased hospital admissions and ED visits. It is critical that children and families develop effective self-management strategies to promote preventive health maintenance and reduce negative outcomes. This study was designed to 1.) build a multi-component, web-based application to facilitate development of self-management behaviors in children with SCD and their families and 2.) Obtain end-user feedback on the app to inform revisions. The multi-component app
consists of three main parts: 1.) continuous access to targeted educational resources on SCD 2.) a series of tools for tracking and monitoring SCD symptoms, primarily pain, and 3.) secure messaging through which caregivers/children can communicate pain symptoms and home treatment to providers.

Methods: Key informant interviews were conducted with 10 healthcare providers and 27 dyads of caregivers/children with SCD to obtain feedback on the app. Data were collected using qualitative description, and were analyzed using a deductive-inductive approach and NVivo 11 qualitative data analysis software to determine themes, including an assessment of usability.

Results: (See table for sample demographic characteristics.) Dyad and provider participants perceived the app provided valuable tracking tools for self-management of SCD. A key factor of perceived usability was the child/caregiver – provider communication. The majority of participants reported no barriers to perceived usefulness, and more than 80% of dyads reported they would use the app regularly. Subthemes emerged in the categories: attractiveness, controllability, efficiency, helpfulness, and learnability. Subthemes included commonalities among participant likes, dislikes, recommendations for improvement, and perceived usefulness.

Conclusions: While participants suggested improvements to the intervention, they also perceived it would be useful and acceptable for children with SCD and their families. Findings informed revisions to the app, and will inform phase II of the study, in which feasibility testing of the intervention will be conducted with 60 caregiver/child dyads. This intervention has potential for improving self-management and reducing symptoms such as pain and fatigue in a broad population of children with SCD.

<table>
<thead>
<tr>
<th>Table: Sample Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Healthcare providers (n = 10)</strong></td>
</tr>
<tr>
<td>Years’ experience with children with SCD</td>
</tr>
<tr>
<td>Profession</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
</tr>
<tr>
<td><strong>Parents/Caregivers and Children (n = 27 dyads)</strong></td>
</tr>
<tr>
<td>Parent/Caregiver age</td>
</tr>
<tr>
<td>Child age</td>
</tr>
<tr>
<td>Parent gender</td>
</tr>
<tr>
<td>Child gender</td>
</tr>
<tr>
<td>Race/ethnicity</td>
</tr>
<tr>
<td>Relationship to child</td>
</tr>
<tr>
<td>Type SCD</td>
</tr>
<tr>
<td>Insurance</td>
</tr>
</tbody>
</table>

18-137 [Presentation]
A Novel Role for Iron Sulfur Trafficking in the Genesis of Congenital Heart Disease

W. Scott Streitfeld¹, Anthony J. Horton², John Brooker², Meaghan E. Flessa², Raychel Simpson², Christopher D. Clark², Monika B. Gooz², Ann C. Foley², and Kyu-Ho Lee²

¹College of Graduate Studies, Medical University of South Carolina
²Department of Pediatrics and OB-GYN, Medical University of South Carolina

Introduction: Congenital heart disease (CHD) occurs in approx. nine out of every 1000 live births.
Mutations in the Nkx2-5 gene are associated with ~4% of all CHD. Defects in Nkx2-5 function result in CHD due to a proliferation deficiency of embryonic cells, but the mechanism underlying this deficiency is unknown. We have found that a novel Nkx2-5 target gene, Ccdc117, is expressed in both developing heart and placenta, and associates with CIA2B, a component of an elemental iron sulfur cluster (FeS) transfer complex. Transfer of mitochondrially-produced FeS is required for the function of multiple DNA synthesis and repair enzymes. Here we show that knockdown (KD) of either Ccdc117 or CIA2B results in cell cycle stalling, decreased proliferation, and increased expression of DNA damage markers. These observations provide a novel mechanism for the genesis of prevalent forms of CHD.

**Methods:** HeLa and HTR8 cells were treated with siRNA oligonucleotides targeting either Ccdc117 or CIA2B, in parallel experiments. Loss of protein was confirmed by immunoblot. Cell cycle profiling was performed using PI staining and flow cytometry (FC). DNA synthesis rates were determined using EdU incorporation, followed by FC. DNA damage markers and proliferation markers were assayed using IHC followed by confocal fluorescence microscopy.

**Results:** Cell cycle progression was significantly delayed in both cell lines following KD of either Ccdc117 or CIA2B. In both cases, increased expression of DNA damage makers and decreased expression of proliferation markers was observed; however, observed changes were more consistent and of greater magnitude following Ccdc117 KD as compared to CIA2B KD.

**Conclusion:** Our data support our hypothesis that interaction between Ccdc117 and CIA2B is required for FeS transfer-dependent processes. Observed changes in cell cycle progression, mitosis, and DNA damage markers are consistent with a collaboration in FeS-to-target enzyme transfer. Detailed comparison of the effects of Ccdc117 vs. CIA2B KD raise questions regarding Ccdc117’s impact upon FeS-dependent processes beyond its collaboration with CIA2B-containing CIA machinery per se. Future experiments combining Ccdc117 and CIA2B KD may clarify these distinctions. Future experiments targeting Ccdc117 expression and/or function in specific cell lineages will also clarify its role in both heart and placenta development. Given the central role of mitochondrial function in FeS trafficking, these observations raise the further possibility that metabolic modifiers may prove effective in CHD prevention.

18-129 (Poster #42)
**NASA and Pediatric Echo Errors: Echo QA is Not Rocket Science**

Tarah J. Popp, Shahryar M. Chowdhury, Jason R. Buckley, Carolyn L. Taylor

**Background:**
A methodic approach to error assessment is important in pediatric echocardiography. At the Medical University of South Carolina (MUSC), quarterly echo quality assurance (QA) conferences are structured according to the Boston Children’s taxonomy (BCH-T) (Benavidez, 2008). In contrast, our pediatric cardiology morbidity and mortality conference is organized according to the National Aeronautics and Space Administration (NASA) aviation model of “threat and error” (NASA-T) (Hickey, 2015). Our aim was to adopt a program-wide approach of error assessment and system improvement.

**Methods:**
We retrospectively reviewed reported echo QA cases at MUSC over two years (2/2016 through 2/2018) and applied both BCH-T and NASA-T models of error assessment. BCH-T categorizes errors by type (false negative, false positive, discrepant), severity (minor, moderate, severe, catastrophic), preventability (yes, no, possible), and cause. NASA-T distinguishes threats, errors, unintended states, and outcomes. Demographic data including patient age, sex, weight, and body surface area (BSA) was collected in addition to circumstantial variables.
Results:
For BCH-T case categorization, 76% (29/38) of errors were false negative, 24% (9/38) discrepant, and 0 false positive. Severity was 37% (14/38) minor, 53% (20/38) moderate, 8% (3/38) severe, and 0 catastrophic. Preventability was 58% (22/38) preventable, 42% (16/38) possible, and 0 not. One identifiable cause was found in 50% (19/38), and 50% had more than one cause. The most common cause was cognitive, followed by patient-related and procedural. Applying NASA-T, 34% (13/38) had one identifiable threat, 66% (25/38) more than one. Threats included patient-related factors (size, complex anatomy), inexperienced sonographer, and location. One primary error was established in 79% (30/38), while 21% (8/38) involved multiple errors. Echo contribution to system error chains was identified in 13% (5/38). On multivariable analysis, BSA was the only factor predictive for multiple errors (p<0.01). Unintended state involved factors including need for additional imaging, delay in diagnosis, or presence of a residual lesion. Outcome was determined to be minor in 42% (16/38), moderate in 53% (20/38), major in 3% (1/38), and catastrophic in 0 cases.

Conclusion:
In our experience, NASA-T provides an institutional framework for discussions of error assessment. We have found this beneficial for highlighting threats and system errors, including those specific to MUSC, identifying points for improvement, and evaluating for presence of error cycles.

Familial Polycythemia Vera

Mayra Robinson MD, Majd Ghanim MD, and Shayla Bergmann MD
Pediatric Hematology Oncology. Medical University of South Carolina. Charleston, SC.

Background. Chronic myeloproliferative neoplasms are derived from myeloproliferation of a single hematopoietic stem cell that may result in either erythrocythemia or thrombocytosis. Polycythemia Vera (PV) is defined by persistent proliferation of red cell mass in the peripheral blood and bone marrow with hemoglobin more than or equal to 6.5 gr/dL (49% Hematocrit (hct)) in males and 16 gr/dL (48% Hct) in females. Acquired Janus Kinase 2 mutation (JAK2V617F mutation) is present in 98% of cases. Other well described mutations also include the EPOR gene, Hypoxia-inducible factor 2 alpha (HIF2A) gene, PHD2 gene mutations and the rare Hb Tarrant. These mutations and other identified predisposing gene variants have all accounted for familial cases of PV. Presence of specific mutations can be associated with increased risk of myelodysplastic syndrome, progression of disease, and neoplasms which causes a decreased overall survival.

Methods: We reviewed the charts and collected clinical information of a family of 3 generations, including PV diagnostic testing.

Results: The proband, a 6-month-old female, presented to our clinic at 6 months of age with a hemoglobin of 16 gr/dl (upper limit of normal at 6 months of age is 12.5). Family consisted of 3 generations of related females (maternal grandmother, mother and daughter) with the clinical characteristics of PV as described above, requiring frequent phlebotomy. Genetic testing on the proband revealed no identifiable mutations, similar to the mother’s and grandmother’s. She had no other laboratory abnormalities and a bone marrow biopsy and aspirate examination was normal. The child, now 3 years of age, has been undergoing phlebotomy every 3 months since diagnosis.

Discussion. Final determination of predisposing gene mutations, using exome gene sequencing specifically for families with an unknown mutation may help clinicians identify prognosis, genetic counseling and possibly specific treatments. Identification of a specific familial inherited gene mutation resulting in PV may help improve quality of life and even determine risk of disease transformation.
Background: We previously reported that S-nitrosoglutathione (GSNO), an endogenous nitric oxide carrier, attenuated TH17-mediated immune responses in experimental autoimmune encephalomyelitis (EAE), an animal model for multiple sclerosis (MS). Cellular GSNO homeostasis is regulated via its synthesis by reaction between nitric oxide and glutathione and its enzymatic catabolism by GSNO reductase (GSNOR).

Objective: In this study, we evaluated potential of reversible inhibitor of GSNOR (N6022) in comparison with exogenous GSNO in immunopathogenesis of EAE.

Methods: EAE was induced in C57BL/6 mice and GSNO (1 mg/kg body weight/i.p.) and N6022 (1 mg/kg body weight/i.p. or 2.5 mg/kg body weight/oral) were given to the mice at the onset of the disease. The drug treatment was continued till the termination of the study (41 days post immunization). Histological analysis of the spinal cord sections was performed. Total lymphocyte count of blood was performed. Fluorescence flow cytometric analysis of TH1, TH2, TH17 and Treg cells in spinal cord and spleen were performed. ELISA and Western blot analysis were performed on the spinal cord sections of these animals. S-nitrosoylation experiment was performed on the spleen of these animals and biotinylated proteins were resolved using antibody specific to biotin.

Results: Daily treatment of EAE mice with N6022 or exogenous GSNO significantly attenuated the clinical disease of EAE, but N6022 treatment showed greater efficacy than GSNO. Both N6022 and exogenous GSNO treatments increased the spleen levels of GSNO, as documented by increased protein-associated S-nitrosothiols, and inhibited polarization and CNS effector function of proinflammatory CD4+ CD25+ FOXP3+ regulatory T (Treg) cells. Moreover, N6022 further attenuated TH1 while inducing TH2 and CD4+ CD25+ FOXP3+ Treg in their polarization and CNS effector functions. Similar to GSNO, the N6022 treatment protected against the EAE disease induced demyelination. However, neither exogenous GSNO nor N6022 treatment did not cause significant systemic lymphopenic effect as compared to FTY720.

Conclusion: Taken together, these data document that optimization of cellular GSNO homeostasis by GSNOR inhibitor (N6022) in NO metabolizing cells attenuates EAE disease via selective inhibition of pro-inflammatory subsets of CD4+ cells (TH1/TH17) while upregulating anti-inflammatory subsets of CD4+ cells (TH2/Treg) without causing lymphopenic effects and thus offers a potential treatment option for MS/EAE.

Plasma Neutrophil Gelatinase-Associated Lipocalin is Associated with Acute Kidney Injury and Clinical Outcomes in Neonates Undergoing Cardiopulmonary Bypass

Schroeder, Luke, Buckley, Jason, Stroud, Robert, Nadeau, Elizabeth, Barrs, Ryan, and Graham, Eric

Background: Plasma neutrophil gelatinase-associated lipocalin (NGAL) has been shown to correlate
with acute kidney injury and clinical outcomes in pediatric and adult populations, however, this finding has not been clearly established in neonates undergoing cardiac surgery. The objective of this study was to determine if plasma NGAL levels were associated with acute kidney injury and clinical outcomes in neonates with congenital heart disease undergoing cardiopulmonary bypass (CPB).

Methods: A secondary analysis of a prospective, randomized controlled trial of 63 neonates undergoing cardiac surgery with CPB was performed. Plasma NGAL levels were measured pre-operatively, at the cessation of CPB, 4, 12 and 24 hours post-operatively. Associations between these levels and clinical outcomes were explored.

Results: Plasma NGAL peaked at 12 hours post-CPB and more than doubled compared to pre-operative levels. Higher pre-operative and 24 hour post-operative NGAL levels were associated with acute kidney injury, longer duration of mechanical ventilation, ICU and hospital lengths of stay and total hospital charges (Table 1).

Conclusion: Both pre-operative and 24 hour post-operative plasma NGAL levels are associated with acute kidney injury and worse clinical outcomes in neonates undergoing cardiac surgery. Plasma NGAL levels may have a role in risk stratification for predicting post-operative renal dysfunction as well as providing a potential clinical trajectory in the post-operative period.

18-113c (Case Study #46)
A Child Presenting with Acute Unilateral Lower Extremity Weakness

Morgan J Sims, MD and Savanna G Dincman MD, MPH

Gait disturbances and neurologic deficits can be complicated to assess in a child. The differential diagnosis of limp, ataxia, or weakness in this population is broad and requires a thorough evaluation and consideration of rarer causes.

A 7-year-old female with no significant past medical history presented to the Pediatric Emergency Department with complaint of left leg weakness and numbness that had progressively worsened over two days. Family reported symptoms of viral upper respiratory infection and fever to 102°F during the preceding week. The day prior to presentation, the patient complained of left lower extremity weakness. At that time, family noted a limp but she was still able to ambulate. On the day of presentation, the patient was unable to move her left leg or stand. She described diffuse myalgia of the left leg but denied focal pain. On physical examination, sensation of the left lower extremity was intact but she demonstrated near complete loss of motor function of the extremity. Patellar and Achilles reflexes were unable to be elicited in either leg. The remainder of her neurological exam that could be assessed was within normal limits. Laboratory evaluation was significant for WBC 20 (RR 5-11), erythrocyte sedimentation rate >100 (RR 0-20), CRP 11.6 (RR 0-1.0), blood culture without growth, and non-elevated creatinine kinase. There were no significant electrolyte abnormalities. MRI of the brain and spinal cord revealed a 6mm right parafalcine fluid collection with mild mass effect on the right motor cortex, consistent with abscess. The patient was admitted to the pediatric intensive care unit and treated with intravenous ceftriaxone and vancomycin. Neurosurgery was consulted but no surgical intervention was required. The patient began to have improvement in symptoms shortly after antibiotics were initiated. She completed a 6-week course of antibiotics with complete resolution of symptoms.

This case illustrates an unusual presentation of a rare but potentially fatal condition. Cerebral abscess is a rare cause of gait disturbance in the pediatric population. Clinical manifestations may be easily attributable to more common causes. A high degree of clinical suspicion and thorough evaluation are necessary to allow rapid diagnosis and life-saving therapy.
18-110 (Poster #47)
S-Nitrosylation, a critical mechanism for functional recovery in experimental stroke

Inderjit Singh, PhD
Darby Children’s Research Institute, Department of Pediatrics, Medical University of South Carolina, Charleston, SC

**Background/objective:** Stroke is the leading cause of disability worldwide. It immediately sets into motion various neurodegenerative mechanisms including excitotoxicity and calcium dysregulation leading to inflammatory/nitroxidative-mediated injury mechanisms. Our studies with a rat model of ischemia and reperfusion (I/R) show that an exogenous treatment with S-nitrosoglutathione (GSNO), a multi-targeting naturally-occurring compound, provides neuroprotection, stimulates neurorepair process and aids in functional recovery.

**Methods/Results:** Stroke was induced by middle cerebral artery occlusion for 60 min followed by reperfusion followed by GSNO treatment at different time points after reperfusion. The studies show that GSNO-mediated targeting of neuronal nitric oxide synthase/peroxynitrite/calpains, caspase-3 and inflammatory NF-κB mechanisms provided protection against neurodegeneration during acute stroke injury. Furthermore, GSNO-mediated mechanisms also stimulated neurorepair process via targeting HIF-1α/VEGF/PECAM-1 as well as BDNF/CNTF signaling pathways to promote recovery of motor and neurological functions during the chronic disease of stroke injury.

**Conclusions:** These studies document that targeting of S-nitrosylating mechanisms is potentially attractive therapy for stroke patients. In clinical settings, GSNO is of even greater relevance to stroke therapy because it additionally shows antiplatelet, anti-embolization, and vasodilatory properties in humans. Based on the efficacy of GSNO in our preclinical studies using animal models of stroke and absence of toxicity in human uses, we submit that GSNO is a promising drug candidate to be evaluated for human stroke and other relevant neurodegenerative diseases therapy.

---

18-132 (Poster #48)
Development of an automated counting method for analysis of 3D cell cultures

**Background**
Cell counting procedures are used in most biomedical settings from basic research to clinical practice. For example, in the laboratory cell counts are important for initiating experiments and used to determine experimental results. In its most rudimentary form, cell counting is time consuming and potentially biased when done by hand. Automated cell counters exist, however, they are cost prohibitive and typically require cells to be suspended in a solution. To facilitate the counting of cells in 3D cultures, we have developed code to enhance an image analysis software suite to drastically reduce the time needed to obtain meaningful results from an experiment and reduce experimental bias. Here we report our initial findings examining the feasibility of enhanced image analysis software to calculate viability of central nervous system (CNS) cells suspended in a 3D matrix.

**Method**
Images of CNS cells embedded in 3D constructs were collected, and cell counts were conducted using hand counting, which were compared to the counts using the software. The software automatically determined contrast enhancement, removed large non-cell structures such as bubbles, set a brightness threshold to define a cell, then counted all particles matching certain size criteria.
The resulting cell viabilities were compared and the difference between hand-count viability and software viability was calculated.

Results
Compared to cellular viability calculated using the hand-counting method, the cellular viability calculated using the enhanced image analysis software was 12.68% greater. The discrepancy appears to be due to lower software counts from the images of dead cells. This may be due to a software issue, or inflated hand-counts of dead cell.

Conclusions
The enhanced image analysis software is a valuable tool for cellular viability studies. Counting 3D cultures can be inconsistent, especially when there are partially focused images, or images that have cells in more than one plane. The software has potential to drastically reduce experimental bias by taking the count out of the hands of the experimenter, and will add a level of consistency to the cell count numbers that cannot be expected when hand counting.

18-137 (Poster #49)
A Novel Role for Iron Sulfur Trafficking in the Genesis of Congenital Heart Disease

W. Scott Streitfeld¹, Anthony J. Horton², John Brooker², Meaghan E. Flessa², Raychel Simpson², Christopher D. Clark², Monika B. Gooz², Ann C. Foley², and Kyu-Ho Lee²
¹College of Graduate Studies, Medical University of South Carolina
²Department of Pediatrics and OB-GYN, Medical University of South Carolina

Introduction: Congenital heart disease (CHD) occurs in approx. nine out of every 1000 live births. Mutations in the Nkx2-5 gene are associated with ~4% of all CHD. Defects in Nkx2-5 function result in CHD due to a proliferation deficiency of embryonic cells, but the mechanism underlying this deficiency is unknown. We have found that a novel Nkx2-5 target gene, Ccdc117, is expressed in both developing heart and placenta, and associates with CIA2B, a component of an elemental iron sulfur cluster (FeS) transfer complex. Transfer of mitochondrially-produced FeS is required for the function of multiple DNA synthesis and repair enzymes. Here we show that knockdown (KD) of either Ccdc117 or CIA2B results in cell cycle stalling, decreased proliferation, and increased expression of DNA damage markers. These observations provide a novel mechanism for the genesis of prevalent forms of CHD.

Methods: HeLa and HTR8 cells were treated with siRNA oligonucleotides targeting either Ccdc117 or CIA2B, in parallel experiments. Loss of protein was confirmed by immunoblot. Cell cycle profiling was performed using PI staining and flow cytometry (FC). DNA synthesis rates were determined using EdU incorporation, followed by FC. DNA damage markers and proliferation markers were assayed using IHC followed by confocal fluorescence microscopy.

Results: Cell cycle progression was significantly delayed in both cell lines following KD of either Ccdc117 or CIA2B. In both cases, increased expression of DNA damage makers and decreased expression of proliferation markers was observed; however, observed changes were more consistent and of greater magnitude following Ccdc117 KD as compared to CIA2B KD.

Conclusion: Our data support our hypothesis that interaction between Ccdc117 and CIA2B is required for FeS transfer-dependent processes. Observed changes in cell cycle progression, mitosis, and DNA damage markers are consistent with a collaboration in FeS-to-target enzyme transfer. Detailed comparison of the effects of Ccdc117 vs. CIA2B KD raise questions regarding Ccdc117’s impact upon FeS-dependent processes beyond its collaboration with CIA2B-containing CIA machinery per se. Future experiments combining Ccdc117 and CIA2B KD may clarify these distinctions. Future experiments targeting Ccdc117 expression and/or function in specific cell lineages will also clarify its role in both heart and placenta development. Given the central role of
mitochondrial function in FeS trafficking, these observations raise the further possibility that metabolic modifiers may prove effective in CHD prevention.

18-141 (Poster #50)
Sustaining Preterm Infant Mother's Milk (MM) Intake Post-Hospital Discharge (HD): An Effectiveness-Implementation Hybrid Trial

Taylor, Sarah1; Mueller, Martina2; Roberts, James R.4; Wagner, Carol L.3

INSTITUTIONS (ALL):
1. Medical University of South Carolina, Charleston, SC, United States.
2. College of Nursing, Medical University of South Carolina, Charleston, SC, United States.
3. Pediatrics, Medical University of South Carolina, Charleston, SC, United States.
4. Pediatrics, Medical University of South Carolina, Charleston, SC, United States.

Background: For hospitalized preterm infants, MM is lifesaving, and they likely obtain at least the same benefits as term infants when receiving through the first 6 months. Unfortunately, preterm birth presents a barrier to breastfeeding and requires long-term maternal breast pumping and complicated feeding regimens. A post-HD intervention of home hospital-grade breast pump and baby weigh scale and pediatric practice lactation counseling was developed to support mother’s goal to sustain milk post-HD.

Objective: By randomized, controlled trial, investigate whether the Promoting Lactation Education, Access, and Support Efforts for Preterm Infants (PLEASE for Preterm Infants) intervention is associated with increased MM intake at 4 months post-HD and to identify the primary reasons for discontinuation.

Design/Methods: Fourteen South Carolina (SC) Pediatric Practice Research Network pediatric practices in 5 counties of Southeastern SC were randomized to provide lactation support or serve as control. Mother-infant dyads were recruited if infant was born <35 weeks’ gestation and mother planned to provide milk for at least 6 months and followup at study practice. Mother-infant dyads at intervention sites received a breast pump, weigh scale, and lactation counseling intervention. Maternal report of lactation experience were collected at 5 visits through 4 months post-HD. Results were analyzed by quantitative and qualitative methods.

Results: Of 59 infants (41% black, 78% WIC recipients), 51 completed 4-month post-HD survey. Intervention and control groups respectively did not differ significantly in race, gender, insurance status, or mean gestation at birth (30.5 and 29.6 weeks) or discharge (36.6 and 37.5 weeks). At 4 months post-HD, groups did not differ significantly in receiving MM [65.2% and 60.7%, relative risk (95% CI) 1.1 (0.7, 1.6)] or breastfeeding [68% and 87%, relative risk (95% CI) 0.8 (0.5, 1.5)]. Primary reasons for lactation cessation included low milk supply (57%), return to work (17%), inconvenient (11%), overwhelmed (9%), other reason (6%).

Conclusion(s): In this effectiveness study, both groups near 6 months of age demonstrated lactation rates greater than the 2016 CDC breastfeeding report card 6-month rate for SC of 44%, but the intervention was not associated with a higher rate of MM intake at 4 months post-HD. Most MM was discontinued due to low supply. Further analysis will evaluate individual intervention components, maternal self-efficacy and perceived support.
A Rare Tumor in A Rare Place

Allison Uber, MD; Shayla Bergmann, MD; Jennifer Jaroscak, MD

Background: Mediastinal masses present a diagnostic challenge in children. Delay in diagnosis leads to delay in treatment that may worsen outcomes. To illustrate this, our case is a 10 week old female that presented acutely ill with an anterior mediastinal mass and thrombocytopenia. The pathologic diagnosis was rare but its location in the anterior mediastinum was exceedingly rare.

Objectives: We discuss the differential of anterior mediastinal tumors in children. We illustrate a classic presentation of kaposiform hemangioendothelioma, highlight the clinical presentation of Kasabach-Merritt syndrome and discuss current treatment modalities.

Methods: We reviewed the patient’s medical record including exam, laboratory values, pathology slides/reports and imaging.

Results: Our patient is a 10 week old infant who presented with irritability and emesis. On exam she was hypoxic with tachypnea. Labs showed thrombocytopenia, platelet count of 24,000. A CXR showed cardiomegaly and an echocardiogram revealed a large circumferential pericardial effusion. She was admitted to the PCICU, her effusion was drained and a pericardial drain placed. A respiratory PCR, urine CMV and pericardial fluid cultures were negative. Pericardial drainage persisted and a CT/MRI revealed a heterogeneous anterior mediastinal mass engulfing the great vessels. Our differential included neuroblastoma and germ cell neoplasm due to patients age and mass location. Urine HVA/MVA, serum CEA, beta-hCG and AFP were normal. Pathology diagnosis confirmed Kaposiform Hemangioendothelioma (KHE). We initiated treatment with sirolimus. Due to clinical worsening and vascular compromise, prednisone and propranolol were added to her treatment regimen.

Conclusion: This case illustrates the clinical challenge posed by KHE, especially in the anterior mediastinum. KHE is a rare and locally aggressive vascular tumor of endothelial origin. Commonly, cutaneous manifestations of these lesions allow for earlier detection and intervention but there are often no cutaneous clues in deep tissue lesions. When large, KHE trap and destroy platelets, causing thrombocytopenia. This rare phenomenon is called Kasabach- Merritt syndrome, or hemangioma thrombocytopenia syndrome. Though rare, this is a classic element of vascular tumors and could have been a clue to image our patient sooner. Resection or embolization were not safe options due to the structure of the tumor and its involvement of major vessels. Sirolimus was chosen for treatment to minimize dangerous side effects of vincristine that have been favored in the past.

18-153 [Presentation]

ACUTE KIDNEY INJURY GUIDELINES IMPROVE RECOGNITION AND FOLLOW UP FOR NEONATAL PATIENTS

Katherine Vincent, NNP; Heidi J. Murphy, MD; Julie R. Ross, MD; Katherine E. Twombley, MD
Medical University of South Carolina, Charleston, SC

Purpose of Study: Studies demonstrate that neonatal acute kidney injury (AKI) is associated with increased morbidity and mortality. AKI survivors are at risk for renal dysfunction and chronic kidney disease and require long-term follow up. To maximize identification of infants with AKI and ensure appropriate referral, we created guidelines for diagnosis, evaluation and management of neonatal AKI in a single neonatal intensive care unit (NICU).

Methods Used: We conducted a retrospective cohort study, analyzing data from the electronic medical records (EMR) of infants admitted to the NICU within 48 hours of birth and hospitalized for >14 days. Neonatal AKI Guidelines were developed and implemented on 7/1/17. Comparisons were...
made between two Cohorts: Cohort 1- neonates treated prior to guideline implementation (n=175; 7/1/14-12/31/14) and Cohort 2- neonates treated after guideline implementation (n=52; 7/1/17-12/31/2017). Outcome measures included incidence of AKI, documented diagnosis of AKI (modified KDIGO criteria), pediatric nephrology inpatient and outpatient consultation.

**Summary of Results:** Based upon chart review, 68 episodes of AKI were found in 52 patients in Cohort 1 and 15 episodes were found in 12 patients in Cohort 2. Of the 68 AKI episodes in Cohort 1, 24 (35%) were diagnosed by the medical team and documented in the EMR. In Cohort 2, there was a significant increase in recognition of AKI with 12/15 (80%) episodes diagnosed and documented (p=<0.01). There was a significant increase in the incidence of inpatient pediatric nephrology consultation in Cohort 2 [C1: 12/68 (18%), C2: 12/15 (80%); p=<0.01]. In Cohort 1, 3/68 (4%) AKI episodes resulted in outpatient referrals. In Cohort 2, 7/7 (100%) of the patients discharged to date have had outpatient referrals.

**Conclusions:** Preliminary data analysis suggests neonatal AKI guideline implementation led to statistically significant improvements in recognition and diagnosis of AKI by the medical team with associated documentation in the EMR as well as higher rates of inpatient nephrology consultation. Early recognition and diagnosis along with specialist referral may improve outcomes among neonatal AKI survivors, ensuring appropriate future monitoring and long term follow up.

**18-156 (Poster #53)
Determining the time course of the ecto-ATPase inhibitor, ARL 67156**

von Asten, Max, Smith, Michael, Eskandari, Ramin

**Background**
Understanding the pathophysiology of elevated intracranial pressure (ICP) lies in the identification of biomarkers of cellular injury, which are likely released by the cells first to experience pathologic ICP. One potential biomarker is adenosine triphosphate (ATP), which is released from cells in response to pathological conditions including mechanical stress, hypoxia, and inflammation. ATP is hydrolyzed very rapidly, which requires that an inhibitor of ATP hydrolysis to be used to ensure that the levels ATP are measurable. We have used the ecto-ATPase inhibitor, 6-N, N- diethyl -beta, gamma-dibromomethylene-D-ATP (ARL 67156) in the past for short-term experiments, but future experiments using long-term, sustained pressure exposure required us to test the duration of efficacy of ARL 67156 in experiments that last up to 48 hours.

**Methods**
Human astrocyte cell cultures were maintained in 24 well plates, and known concentrations of ARL 67156 and ATP were added to the cell media. Samples of media were collected at different time points (1h, 2h, 4h, 6h, 24h, and 48h) and analyzed for ATP content using an ATP bioluminescence assay kit on a microplate reader. We also conducted a comparison trial between ARL 67156 and EGTA, a calcium chelator and known stressor. Experiments were replicated, except the 48 hour timepoint was omitted because the initial data indicated the time course for ARL 67156 to inhibit the hydrolysis of ATP was less than 24 hours.

**Results**
ARL 67156 was no longer effective at inhibiting the hydrolysis of ATP at six hours, as ATP concentrations were not different in sample of media with or without ARL 67156. Also, there was no difference between the ARL 67156 media or the stressor (EGTA) media.

**Conclusion**
This is the first attempt to examine the long-term efficacy of the ecto-ATPase inhibitor ARL 67156. Overall, we determined that ARL 67156 only inhibits ATP hydrolysis for approximately six hours, but it does not act as a stressor on human astrocytes. Knowing the time course for the inhibition of ATP hydrolysis will be helpful for the design of future experiments measuring ATP as a biomarker for cell injury.
Pediatric Obesity Management 2.0: Improving Management of Obesity and its Sequelae in a Resident Clinic

Wakefield, MD, Hannah

Background: Childhood obesity increases patients’ risk for sequelae including hyperlipidemia, type II diabetes mellitus, and hypertension. Guidelines on screening and managing pediatric obesity and its sequelae have been published for ten years, yet there is limited research on assessing primary care providers’ current management.

Objective: The objective of this study was to assess the current provider practices for identifying and managing pediatric obesity and its sequelae in a resident clinic.

Design/Methods: A retrospective chart review was performed of obese patients aged 3-18 who had clinic visits from March-June 2017. Exclusion criteria were genetic syndrome, familial dyslipidemia, chronic steroid use, or abnormal thyroid studies prior to visit. Data on visit type, demographics, vitals, labs, counseling, referrals, and planned follow up were collected. Appropriateness of management was determined via algorithms created based on current specialty-specific guidelines. Descriptive statistics and Chi-square analyses were performed in SPSS to assess physician practices in identifying and managing obesity and its sequelae.

Results: There were 427 patient visits collected. Patients were 51% female, 86.4% African American, and 49.2% of visits were well child checks. Residents identified obesity in 73.5% of encounters, provided counseling in 61.1% of encounters, and planned follow up 69.8% of the time. However, labs (28.3%), referrals (20.8%), and medicines (1.4%) were rarely ordered. BMI documentation was more likely among African American patients (76.2%) versus Caucasian (67.7%) and Hispanic (71.4%) patients, P <0.001. Counseling and planned follow up was more likely with African American (63.1%, 71.8%) and Hispanic (71.4%, 71.4%) versus Caucasian (51.6%, 64.5%) patients, all P<0.01. Patients with well child checks were more likely to have documented BMI (96.2%), ordered labs (47.6%) and referrals (28.1%), counseling (92.4%), and planned follow up (93%) than with other visit types, all P <0.001. Additionally, older children were more likely than younger children to receive documentation (78.1%), labs (33.7%), follow up (74.5%), and pharmacologic therapies (3.1%), all P<0.05.

Conclusion(s): While residents documented obesity in the majority of encounters, labs and referrals were sporadically ordered, and pharmacologic therapies were rarely started. Future research will focus on an obesity management curriculum with algorithms to assist residents in appropriately addressing and managing obesity and its sequelae.

DISCORDANT CONGENITAL CUTANEOUS CANDIDIASIS IN PRETERM TWINS: A CASE SERIES

Khawaja, Morgan, Ward, Price; Jester, Rachel; Fowler, Sandra; Wine Lee, Lara

Case Report: Preterm dichorionic/diamniotic twins were born at 25 5/7 weeks gestation via cesarean section secondary to transverse presentation of Twin B and preterm premature rupture of membranes (PPROM) in Twin B, 2 days prior to delivery. On day of life 5, Twin B developed generalized erythema and desquamation which progressed by day of life 8 to include the trunk, buttocks, perineum and arms, accompanied by acute respiratory failure. There were superficial erosions and maceration in the axillae and groin folds. Pediatric dermatology conducted potassium hydroxide skin scrapings which were positive for yeast and pseudohyphae and blood culture was positive for Candida albicans; she was diagnosed with invasive fungal dermatitis. Twin A was noted to have diffuse erythema and fine scale which was positive for yeast and pseudohyphae but blood culture was negative for yeast. Placental pathology for Twin B showed severe acute necrotizing
chorioamnionitis, panvasculitis and funisitis with a Grocott's methenamine silver stain was positive for pseudohyphae, whereas, Twin A only had mild acute chorioamnionitis and no pseudohyphae on silver staining. They were started on IV fluconazole, and completed 6 weeks (Twin B) and 3 weeks (Twin A) of therapy. Both twins had no recurrence of Candida, however, Twin B went on to develop erosive reticulated, supple scaring, a rare complication of congenital skin lesions.

Discussion: Congenital cutaneous candidiasis (CCC) is an extremely rare disease. Prematurity/very low birth weight is the most significant risk factor for developing CCC. A severe sequela, invasive fungal dermatitis, presents with widespread desquamating and/or erosive dermatitis leading to fungemia . This case demonstrates the clinical discordance between twins. We attributed this primarily to the PPROM of Twin B which illustrates the importance of intact membranes (amniotic sac) in protecting fetuses from ascending infections. Finally, when one twin is identified with CCC, it is prudent to assess the other twin, given they share the same degree of immaturity and in utero environment. to assess the other twin, given they share the same degree of immaturity and in utero environment.

18-134 (Poster #56)
NEONATAL ABSTINENCE SYNDROME: A LOOK AT THE MATERNAL-INFANT DYADS AT THE MEDICAL UNIVERSITY OF SOUTH CAROLINA

Ward, Price, Fields, Susan; Kapera, Olivia; Jenkins, Dorothea

Background: Neonatal Abstinence Syndrome (NAS) is a withdrawal syndrome experienced by infants after in utero exposure to opioids. The NAS birth prevalence rate in South Carolina has increased from 0.9 to 3.9 per 1000 births from 2000 to 2013, respectively. The mainstay of NAS treatment is morphine or methadone with common adjunct therapies being clonidine and/or phenobarbital. At MUSC, the standard therapy for NAS treatment is morphine monotherapy.

Objectives: Our aims were to describe (i) maternal-infant dyad demographics and (ii) the pharmacologic approaches for the management of NAS at MUSC. We hypothesized that more severe NAS (length of morphine treatment & length of stay) and maternal polydrug abuse is associated with adjunct clonidine use.

Methods: We performed a retrospective chart review using our local database at MUSC to identify infants born between 02/2012-02/2017, at 35-42 weeks gestation and with a diagnosis of NAS or documented maternal drug use. Of the 111 dyads identified, 59 were treated with morphine alone and 20 were treated with morphine plus clonidine. Of note, 32 were excluded (9 with iatrogenic NAS and 23 were drug exposed but untreated).

Results: Despite our NAS treatment protocol only recommending morphine therapy alone, clonidine was used as an adjunct in 25% of the infants. Clonidine adjunct therapy was associated with an increased length of morphine treatment and hospital length of stay (both p<0.001). No maternal characteristic were identified as risk factors for clonidine adjunct therapy except for maternal buprenorphine use (p=0.003). The degree of polydrug use was also not statistically significant between treatment groups (p=0.358). Only mean birth weight was identified as a risk factor for clonidine adjunct therapy (p=0.019).

Conclusions: As hypothesized, clonidine use was associated with an increased length of treatment and hospital length of stay. This is likely due to clonidine being used as a rescue therapy in more severe/refractory NAS. Since this study, clonidine has been added to our NAS treatment guidelines to improve practice consistency and treat refractory NAS earlier. This data will serve as part of a case-control study comparing these NAS treated infants to infants who were exposed to opioids in utero but did not require treatment for NAS to better identify risk factors for developing NAS.
Background: Procedural sedation for magnetic resonance imaging (MRI) is often required in children to achieve cooperation and immobility for high-quality imaging. Many institutions use propofol infusions alone or with other sedative drugs for sedation. There are ranges of propofol infusion rates reported in the literature (3-18mg/kg/hr) but few details have been reported about the effects of adjunctive midazolam on propofol dosing. The practice of our intensivist-led pediatric sedation team for children undergoing MRI typically includes 0.025-0.1mg/kg IV midazolam for anxiolysis followed by 1-2mg/kg propofol boluses and an infusion starting at 5mg/kg/hr, although several patients received propofol alone. We report our 10-year experience of deep sedation for MRI to assess the effect of midazolam on propofol dosing.

Methods: After IRB approval, records of patients who required sedation between 2007-2016 were retrospectively reviewed. A total of 2354 patients aged 6 months-18 years received sedation during this period. Administration doses were divided into induction (bolus doses in mg/kg given to achieve deep sedation pre-MRI) and total dose (sum of all propofol given during MRI + induction boluses expressed as mg/kg/hr since MRI imaging is time variable). Mean doses of propofol for both induction and total were compared to when midazolam was given as an adjunct to the propofol induction. Data was stratified by age groups and was analyzed using SAS 9.4.

Results: 2354 pediatric patients (ASA I&II) underwent sedation during the 10-year period. Of the patients, 8.5% (n=201) received propofol alone (P) and 75.7% (n=1781) received propofol + IV midazolam (P+M). Excluded patients received a combination of additional adjunct medications (morphine, ketamine, fentanyl). The mean propofol infusion duration for all patients was 46 min and the MRI completion rate was 99.3%. For all ages, the mean induction dose of propofol in P+M group was lower than in the P group. In age < 8 yrs, there was no statistical difference in total propofol dose (mg/kg/hr) between the P+M and P group. In the 8-18yr age, the mean total propofol dose was lower in the P+M group (p=0.004). Our data confirmed previous studies that report young patients require higher induction and total propofol doses, and that sedation was successful with relatively low infusion rates.

Conclusion: For procedural MRI sedation, the addition of anxiolytic doses of IV midazolam lowered the deep sedative induction dose of propofol in all age groups but lowered the total propofol dose only in older children.
Patients in the Neonatal Intensive Care Unit (NICU) are at high risk of growth failure, particularly in the early period following hospital discharge, with long-term consequences on their growth and development. We describe a cohort of patients discharged from our institution's Level III nursery with outpatient follow-up in a designated "Nutrition NICU Graduate Clinic" with a pediatric gastroenterologist and dietician, to identify nutritional deficits and early signs of growth failure with the goal of early intervention to improve outcomes in short-term growth and prevent hospital admissions for growth failure.

Over a period of six months, 85 patients were seen for initial visit, between 6-8 weeks after discharge. Patients were referred to clinic based on birth weight, feeding regimen, and/or practitioner concern. Data were retrospectively reviewed for birth demographics (Table 1), feeding regimens at discharge, and need for nutritional intervention. At initial follow up, 29 (34%) had adequate weight gain (growth velocity ≥30 g/d), 33 (39%) had moderate growth failure (20-29 g/d), 18 (21%) had severe growth failure (<20 g/d), 5 (6%) had weight loss since hospital discharge. In total, 62 of 85 patients (73%) received nutritional intervention in the form of a change in calories or formula. Of those with a recommendation to change nutritional regimen, the intervention was aimed to increase caloric intake in 62 (55%) and to decrease caloric intake in 18 (29%). Twenty (24%) received decrease in nutritional support due to appropriate growth velocity. After this initial clinic visit, 20 patients (24%) were discharged from clinic for pediatrician follow up alone. Of note, 11 of 85 (13%) of families received education due to inappropriate formula mixing. Six of 40 (47%) infants receiving maternal breastmilk at the time of discharge were no longer receiving breastmilk leaving 40% of the total population receiving breastmilk at their initial follow up.

Infants seen in our Nutrition NICU Graduate Clinic represent a high risk cohort with a diverse racial makeup and a high percentage with Medicaid as their primary insurance. Our preliminary results suggest an opportunity for quality improvement with emphasis on formula mixing education and working to sustain breastfeeding post-discharge. Prospective data collection will be continued to characterize the impact of these interventions on growth parameters and growth failure rates.
requiring hospital admission, with the goal of fulfilling an unmet need in this patient population to improve their healthcare outcomes.
Mark your Calendars!!

2019 Darby Children’s Research Institute & Pediatrics Research Symposium
Medical University of South Carolina

Celebrating discoveries in children’s research

Friday, April 12, 2019