AAP Section on Emergency Medicine
Scientific & Educational Program
Abstract & Poster Presentations

AAP National Conference
October 10-12, 2014
San Diego, CA
H0010 – SECTION ON EMERGENCY MEDICINE PROGRAM & RECEPTION – DAY 1
Marriott Marquis, San Diego Ballroom B

9:00 AM – 12:00 PM

COMMITTEE FOR THE FUTURE (C4F) PROGRAM & POSTERS
Moderator: Steven Rogers, MD, FAAP

SAILING IN UNCHARTERED WATERS: INNOVATORS IN PEDIATRIC EMERGENCY MEDICINE

Achieving Innovation in a Pediatric Emergency Department
Amy Pasmann, MS, RN; Douglas Nelson, MD, FACEP, FAAP

The Wave of the Future: Building a Pediatric Emergency Ultrasound Program
Alyssa Abo, MD; Joanna Cohen, MD

Academic Entrepreneurship: How to Bring Your Innovation to the Marketplace
David Mathison, MD, MBA, FAAP

C4F posters for the morning program should be set up in Ballroom B by 9am and removed at 7pm. Posters for the afternoon program should be set up in Ballroom C by 1 pm and removed at 7pm.

12:00 – 1:00 PM

LUNCH

1:00 – 1:30 PM

SCIENTIFIC ABSTRACT PRESENTATIONS, POSTERS & AWARDS
Moderator: Javier Gonzalez del Rey, MD, MEd, FAAP

KEN GRAFF RESEARCH AWARD 2014 – KELLY M. OCHOA, MD, FAAP
LA Phonospirometry Technique Compared to Pediatric Respiratory Assessment Measure as a Novel Technique to Assess the Severity of an Asthma Exacerbation
Award Presented by: Prashant Mahajan, MD, MPH, MBA, FAAP

KEN GRAFF 2012 PROJECT REPORT
Minimum Effective Dose of Rapidly Administered Ketamine for Brief Pediatric Procedural Sedation
Sri Chinta, MD

1:30 – 3:30 PM

ABSTRACT SESSIONS I
Moderators: Molly W. Stevens, MD, MSCE, FAAP & Matthew R. Mittiga, MD, FAAP

1:30 pm 1. #24018  
K. Leonard, MD
The St. Louis PEM Bootcamp: An Educational Intervention for Pediatric Emergency Medicine Fellows

1:45 pm 2. #25906  
Halden F. Scott, MD
Late-Onset Hypotension in Pediatric Sepsis: Frequency, Outcomes and Quality of Care

2:00 pm 3. #26571  
David O. Kessler, MD, MSc
Implementation and Impact of a Just-in-Time Assessment to Determine Intern Readiness to Perform Their First Infant Lumbar Puncture

2:15 pm 4. #26854  
Mary Kate Funari, MSN, RN, CPEN
Utilization of Bagged Urine Screening for Urinary Tract Infections in Infants and Toddlers in the Emergency Department
2:30 pm  5. #27269  Mohsen Saidinejad, MD, MBA, FAAP  
Leadership Rounding in the Emergency Department: An Opportunity for Real-Time  
Actionable Feedback from Patients

2:45 pm  6. #27427  Graham C. Thompson, MD, FRCPC  
Test Characteristics of Appendicitis Scores with and without Laboratory Investigations

3:00 pm  7. #27429  Allison Mak, BS  
Pediatric Resuscitation Data Cataloguing and Implications for Physician Competence

3:15 – 3:45 PM  
COFFEE BREAK/VIEW POSTERS

3:45 – 5:30 PM  
ABSTRACT SESSIONS II  
Moderators: Melissa K. Miller, MD, FAAP & Rakesh D. Mistry, MD, MS, FAAP

3:45 pm  8. #24492  Alexander L. Thai, MSII  
Financial Model for a Point-of-Care Ultrasound Program in a Pediatric Emergency  
Department

4:00 pm  9. #24847  David C. Sheridan  
Impact of an Inpatient Psychiatric Unit on Pediatric Emergency Mental Health Care

4:15 pm  10. #25580  Rami S. Sunallah, MD  
Varying Intubation Position and Immobilization Methods to Assess Cervical Spine  
Movement during Endotracheal Intubation in a Pediatric Airway Manikin

4:30 pm  11. #25591  Patricia Lee  
Radiological Discrepancies in a Pediatric Emergency Department

4:45 pm  12. #25830  Jill Dreyfus, PhD, MPH  
Characteristics and Complications of Motor Vehicle Collision Injuries among Children  
Treated at General versus Pediatric Trauma Centers

5:00 pm  13. #26333  Jessica E. Starck, MD  
Does BMI Alter Diagnostic Accuracy of Ultrasound in Childhood Appendicitis?

5:15 pm  14. #26393  James Burhop, DO  
The Difficult Pediatric Airway: Randomized Comparison of Videolaryngoscopy versus  
Direct Laryngoscopy among Pediatric Emergency Medicine Physicians in Simulated  
Airway Model

5:30 – 7:00 PM  
SECTION ON EMERGENCY MEDICINE RECEPTION  
Moderator: Javier Gonzalez del Rey, MD, MEd, FAAP

VIEWING OF POSTERS  
Presenters should stand by their posters from 5:30 – 6:30 pm and remove posters at 7:00 pm.

#23550  Allison Ast, MD  
Decreasing Time to Antibiotic Delivery for Febrile Immunocompromised Patients in a  
Pediatric Emergency Department

#24355  Delia L. Gold, MD  
Implementing & Evaluating the Pews Scoring System in the Emergency Department to Predict Patient  
Deterioration in the Hospital

#24906  Atim Uya, MD  
Ultrasound Confirmation of Endotracheal Tube Position Using a Saline Filled Cuff
H1029 – SECTION ON EMERGENCY MEDICINE PROGRAM – DAY 2
Marriott Marquis, San Diego Ballroom B

8:00 AM – 5:00 PM

EMERGIQUIZ, STATE OF THE SECTION & SUBCOMMITTEES, PEMNETWORK, SERVICE AWARDS, QUALITY PRESENTATION, PEMPIX, TOP 10 PAPERS
Moderator: Marc Gorelick, MD, MSCE, FAAP

8:00 – 9:00 AM

EMERGIQUIZ PRESENTATIONS – PART I
Christine Cho, MD, MPH, MEd, FAAP

9:00 – 9:45 AM

STATE OF THE SECTION - Marc Gorelick, MD, MSCE, FAAP – Chair, SOEM Executive Committee
Committee for the Future (C4F)
Steven Rogers, MD, FAAP

Emergency Medical Services (EMS)
Manish Shah, MD, FAAP

Pediatric Emergency Medicine
Collaborative Research Committee (PEM CRC)
Anupam Kharbanda, MD, MSc, FAAP

Disaster Preparedness
Deanna Dahl-Grove, MD, FAAP

Fellowship
Connie McAneney, MD, FAAP

Quality Transformation
Charles Macias, MD, MPH, FAAP

PEMNETWORK
Angela Lumba-Brown, MD, FAAP

9:45 – 10:00 AM

JIM SEIDEL DISTINGUISHED SERVICE AWARD – M. DOUGLAS BAKER, MD, FAAP
Presented by: George A. Woodward, MD, MBA, FAAP

10:00 – 10:15 AM

STEVE MILLER AWARD FOR EXCELLENCE IN EDUCATION & MENTORSHIP – STEVE SELBST, MD, FAAP
Presented by: George A. Woodward, MD, MBA, FAAP

10:15 – 10:30 AM

BREAK

10:30 – 11:30 AM

DEVELOPING PEM QUALITY MEASURES
Rita Mangione-Smith, MD, MPH, FAAP

11:30 – 12:30 PM

PEMPix PHOTO COMPETITION
Todd Chang, MD, FAAP

12:30 – 1:30 PM

LUNCH

1:30 – 2:30 PM

EMERGIQUIZ PRESENTATIONS – PART II
Christine Cho, MD, MPH, MEd, FAAP

2:30 – 2:50 PM

BREAK

2:50 – 3:00 PM

EMERGIQUIZ AWARDS PRESENTATIONS
Christine Cho, MD, MPH, MEd, FAAP

3:00 – 5:00 PM

TOP 10 PEM PAPERS
Peter Dayan, MD, FAAP; Bema Bonsu, MD
### H2027 – SECTION ON EMERGENCY MEDICINE PROGRAM – DAY 3

*Marriott Marquis, San Diego Ballroom B*

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>8:30 AM – 12:00 PM</td>
<td><strong>SECTION EDUCATIONAL PROGRAM CONTINUED</strong>&lt;br&gt;Moderator: Robert Schremmer, MD, FAAP</td>
</tr>
<tr>
<td>8:30 – 9:30 AM</td>
<td><strong>IMPACT OF HEALTHCARE REFORM ON PEM</strong>&lt;br&gt;Joan Shook, MD, MBA, FAAP</td>
</tr>
<tr>
<td>9:30 – 9:45 AM</td>
<td><strong>BREAK</strong></td>
</tr>
<tr>
<td>9:45 – 12:00 PM</td>
<td><strong>UNNATURAL DISASTERS</strong>&lt;br&gt;Marie Lozon, MD, FAAP; Sarita Chung, MD, FAAP; Tien Vu, MD, FAAP</td>
</tr>
</tbody>
</table>

### SUBCOMMITTEE MEETING SCHEDULE

<table>
<thead>
<tr>
<th>Committee</th>
<th>Date/Times</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>Committee for the Future</td>
<td>TBA</td>
<td></td>
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<tr>
<td>Disaster Preparedness</td>
<td>Fri, Oct 10 12:00-1:00 pm</td>
<td>Balboa</td>
</tr>
<tr>
<td>EMS</td>
<td>Sat, Oct 11 5:15-6:45 pm</td>
<td>La Costa</td>
</tr>
<tr>
<td>PEM CRC</td>
<td>Sun, Oct 12 12:00-4:00 pm</td>
<td>Chicago/Atlanta Room</td>
</tr>
<tr>
<td>PEM Fellowship Directors</td>
<td>Fri, Oct 10 11:00 am-1:00 pm</td>
<td>Oceanside</td>
</tr>
<tr>
<td>Pediatric Septic Shock Collaborative</td>
<td>Fri, Oct 10 9:00 am-12:30 pm</td>
<td>Santa Rosa</td>
</tr>
<tr>
<td>Quality Transformation Committee</td>
<td>Sat, Oct 11 11:00 am-12:30 pm</td>
<td>San Diego</td>
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</tbody>
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Use the AAP National Conference Event Planner to Search for Other Sessions by Topic (Critical Care, Disasters, Emergency Medicine, Transport, Etc.)

ABSTRACT SESSION I

Friday, October 10, 2014: 1:30 PM-3:30 PM

Presentation Time: 1:30 PM - 1:45 PM

THE ST. LOUIS PEM BOOTCAMP: AN EDUCATIONAL INTERVENTION FOR PEDIATRIC EMERGENCY MEDICINE FELLOWS

K. Leonard, MD¹, D.B. Jeffe, PhD¹, A. Lumba-Brown, MD¹, C. Eldridge, MD¹, T. Tredway, MD², R. Flood, MD² and D. Schnadower, MD, MPH², (1)Washington University in St. Louis, St. Louis, MO, (2)Saint Louis University, St. Louis, MO

Purpose: Pediatric Emergency Medicine (PEM) fellows are faced with high-acuity clinical situations and complex procedures that they may not have encountered during residency. Other sub-specialties have addressed similar training deficiencies by developing orientation “boot camps.” However, to our knowledge, the efficacy of such programs in PEM has not been evaluated. We therefore describe the development of an intensive, front-loaded educational intervention to help PEM fellows acquire basic cognitive and technical skills necessary for the practice of pediatric emergency medicine. We hypothesized that a boot camp-style curriculum would increase fellows' confidence and clinical knowledge immediately after and in the initial six months following completion.

Methods: Faculty from Washington University in St. Louis and Saint Louis University developed a boot camp curriculum, consisting of didactic lectures, high-fidelity simulations and procedural skill laboratories, designed to address high-acuity clinical situations and core competencies for PEM fellowships. The curriculum was divided into weekly sessions over a 6-week period at the beginning of the academic year. Ten PEM fellows from both institutions participated. Using a pre-post design, we assessed self-perceived confidence in managing a variety of clinical scenarios using a 5-point Likert scale survey prior to, immediately after and 6 months following participation in the boot camp. We also assessed clinical knowledge with multiple-choice tests administered before and immediately following the boot camp. Mean test scores (percentage correct) were analyzed using paired t-tests. Finally, to inform future iterations of the curriculum, we asked fellows to evaluate each session and the overall perceived impact of the boot camp.

Results: Fellows reported increased confidence in nine out of ten patient-care areas immediately after the boot camp (Figure 1). After six months, fellows reported that the boot camp’s effectiveness for improving clinical decision-making and confidence in these ten areas was high (mean score 4.0 ± 0.3). Clinical knowledge for all fellows increased following the boot camp (mean score 60% ± 10% vs. 68% ± 14%; p = 0.04) (Figure 2). Overall, participants believed that the material presented was useful for PEM fellows (mean score 4.5 ± 0.5) and they would recommend a similar boot camp to other PEM programs (mean score 4.5 ± 0.5). Useful suggestions included condensing the curriculum and increasing the simulation and procedural skills content.

Conclusion: A boot camp-style curriculum for PEM fellows was associated with improvements in self-confidence and clinical knowledge. Overall, the program was evaluated highly. Based on these results, we plan to modify and expand the curriculum with the goal of developing a national PEM Boot camp.
Figure 1: Fellows’ Confidence Before and Immediately after Boot camp

![Bar chart showing confidence ratings before and after boot camp.]

Figure 2: Fellows’ Clinical Knowledge Assessment: Mean Percentage Correct

![Bar chart showing mean percentage correct for different years.]

Presentation Time: 1:45 PM - 2:00 PM

LATE-ONSET HYPOTENSION IN PEDIATRIC SEPSIS: FREQUENCY, OUTCOMES AND QUALITY OF CARE

Halden F. Scott, MD, Children's Hospital Colorado, University of Colorado School of Medicine, Aurora, CO, Lina Brou, MPH, Children's Hospital Colorado, Aurora, CO, Sara J. Deakyne, MPH, Pediatric Emergency Medicine, Children's Hospital Colorado, Aurora, CO and Lalit Bajaj, MD, MPH, Pediatric Emergency Medicine, Children's Hospital Colorado, University of Colorado School of Medicine, Aurora, CO

Purpose: Conventional wisdom teaches that hypotension is a “late” finding in children, but little data exists about the timing of hypotension in pediatric sepsis. We sought to identify the prevalence and outcomes of patients with delayed hypotension (not present upon arrival) in pediatric sepsis, and hypothesized that delayed hypotension would be associated with worse quality of care compared to patients with hypotension at the outset of emergency department (ED) care.
Methods: This cohort study utilized a prospective electronic sepsis registry of patients at a tertiary pediatric hospital and its five satellite urgent care sites. The registry included ED patients identified by clinicians as requiring sepsis care and automatically populated into the database through electronic health record of sepsis system activation, as well as identification of missed cases through standardized chart review methodologies. All patients in the registry over a 22-month period were included in this study; patients <60 days and ≥18 years were excluded. Electronic extraction was used to ascertain vital signs, treatment, timing and clinical outcomes. Published sepsis definitions were used to define age-specific hypotension; hypotension after the first 30 minutes of the ED course was considered delayed. Quality outcomes were defined using the 2012 Children’s Hospital Association Sepsis Collaborative quality metrics.

Results: Of 1047 patients in the study population, 124 (11.8%) had hypotension within 24 hours of ED presentation. 69% of hypotensive patients had delayed hypotension. Delayed hypotension patients were less likely to have care concordant with the bolus quality metric, but there was no significant difference in the antibiotic metric. Delayed hypotension patients were less likely to require critical care during hospitalization than early hypotension patients.

<table>
<thead>
<tr>
<th>QUALITY METRIC COMPLIANCE</th>
<th>All Hypotension</th>
<th>Early Hypotension</th>
<th>Delayed Hypotension</th>
<th>Difference Between Early/Delayed*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antibiotic Within 60 Min of Arrival</td>
<td>(n=124)</td>
<td>(n=38)</td>
<td>(n=86)</td>
<td>(p-value)</td>
</tr>
<tr>
<td>(25.8%)</td>
<td>32</td>
<td>13</td>
<td>19</td>
<td>0.26</td>
</tr>
<tr>
<td>Bolus Within 30 Min of Arrival</td>
<td>(29.8%)</td>
<td>(47.4%)</td>
<td>(22.1%)</td>
<td>0.02</td>
</tr>
<tr>
<td>ICU Admission</td>
<td>(n=124)</td>
<td>(n=38)</td>
<td>(n=86)</td>
<td>(p-value)</td>
</tr>
<tr>
<td>(152.9)</td>
<td>115.1</td>
<td>134.1</td>
<td>116.9</td>
<td>0.26</td>
</tr>
<tr>
<td>(74.2%)</td>
<td>92</td>
<td>29</td>
<td>63</td>
<td>0.72</td>
</tr>
<tr>
<td>Critical Care in Hospital</td>
<td>(n=124)</td>
<td>(n=38)</td>
<td>(n=86)</td>
<td>(p-value)</td>
</tr>
<tr>
<td>(46.0%)</td>
<td>57</td>
<td>24</td>
<td>33</td>
<td>0.01</td>
</tr>
<tr>
<td>(30-D Mortality)</td>
<td>(1.6%)</td>
<td>(2.6%)</td>
<td>(1.2%)</td>
<td>N/A**</td>
</tr>
</tbody>
</table>

*tested using Chi-Squared test or Mann-Whitney U test, p<0.05 considered significant

**Did not meet requirements for Chi-Squared test

Conclusion: Critical care is required more often in patients with early hypotension, suggesting it does represent more advanced or “late” stage pathophysiology. Delayed ED hypotension is common in pediatric sepsis and associated with decreased concordance with a sepsis quality metric. Improved early identification of patients at risk for delayed hypotension may allow improved quality and outcomes of care.

Presentation Time: 2:00 PM - 2:15 PM

IMPLEMENTATION AND IMPACT OF A JUST-IN-TIME ASSESSMENT TO DETERMINE INTERN READINESS TO PERFORM THEIR FIRST INFANT LUMBAR PUNCTURE

David O. Kessler, MD, MSc, Pediatrics, Columbia University College of Physicians & Surgeons, New York Presbyterian Morgan Stanley Children’s Hospital of New York, NY, NY, Marc Auerbach, MD, MSc, Pediatrics, Section of Emergency Medicine, Yale University School of Medicine, New Haven, CT, Daniel M. Fein, MD, Pediatrics, Albert Einstein College of Medicine, Children’s Hospital at Montefiore, Todd P.
Chang, MD, Pediatrics, Children’s Hospital Los Angeles, Moon Lee, MD, Tufts Medical Center, Renuka Mehta, MBBS, MRCP, Georgia Regents University, Augusta, GA, James M. Gerard, MD, Pediatrics, Saint Louis University School of Medicine, St. Louis, MO, Jennifer Trainor, MD, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL and Martin Pusic, MD, PhD, New York University, NY

**Purpose:** Resident readiness to perform procedures is germane to patient safety and quality of outcomes. We have previously described a pragmatic assessment instrument to help supervisors determine when an intern is ready to perform their first supervised infant lumbar puncture (LP). A high rating on this tool is predictive of clinical success. We explored the implementation and impact this just-in-time assessment on interns’ clinical success rates with LP.

**Methods:** This prospective observational study enrolled cohorts of interns in pediatric and emergency medicine over two academic years (2012-2014). All interns completed a simulation-based mastery learning session with individually coached deliberate practice until a predefined mastery performance standard was achieved.

**Intervention:** When the intern had a patient requiring an LP the supervisor conducted a just-in-time simulation-based assessment of their performance. A score of greater than 2 on the 4 point scale was defined as representing readiness to perform the clinical procedure (with supervision). Interns that did not achieve a passing score were not supposed to perform the clinical procedure. Residency program directors were approached to sign attestations in support of this requirement.

**Comparison:** Individuals that did not comply with the assessment pathway and historical cohorts whom did not have the assessment.

**Outcome measure:** Interns self-reported on their first LP via on-line questionnaire (success was defined as obtaining cerebrospinal fluid with <1000 red blood cells or described as clear on the first needle insertion).

**Results:** Over 2 academic years, 1577 interns from 48 sites participated reporting a total of 663 procedures. The LP success rate for intern’s complying with the assessment pathway was 166/410 (40%) compared to 89/253 (35%) for those who did not comply with the pathway prior to their first LP attempt (Difference = 5%, 95% CI -2%, to 12%). 410/663(62%) of interns were compliant with the assessment pathway prior to their first LP. There was improvement in both pathway adherence and success rate between the first and second year of this new intervention (table 1).

**Conclusion:** Just-in-time simulation based competency assessment is feasible in the work environment. However, requiring interns to pass an assessment prior to performing the procedure did not produce a large clinical effect on success rates with LP. Larger sample size is needed to detect smaller clinical effect sizes while concurrently working to improve compliance and cultural acceptance of a competency assessment pathway.

| Table 1. Clinical Success Rates with the Infant Lumbar Puncture Procedure over Time and Adherence to Competency Pathway |
|--------------------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Clinical Success (Historical Control)            | 2010-2012       | 2012-2013       | 2013-2014       | Difference (95%CI) |
|                                                   | 152/399         | 68/199          | 21/54           | 5%               |
| (No Assessment)                                  | (38%)           | (34%)           | (39%)           | (-9% to 19%)*    |
| Clinical Success                                 | 102/277         | 64 /133         | 11%             |
| (After Assessment)                               | (37%)           | (48%)           | (1% to 20%)     |
| Competency Pathway Adherence                     | 277/477         | 133/187         | 13%             |
|                                                   | (58%)           | (71%)           | (5% to 20%)     |

*Comparison between 2012-2013 and 2013-2014 cohorts*
UTILIZATION OF BAGGED URINE SCREENING FOR URINARY TRACT INFECTIONS IN INFANTS AND TODDLERS IN THE EMERGENCY DEPARTMENT

Mary Kate Funari, MSN, RN, CPEN, Christine Roper, BSN, RN, CPEN, Patricia Lopez, MSN, CRNP, Aileen P. Schast, PhD, Mercedes M. Blackstone, MD, Catherine Botos, BA, BS, Xianqun Luan, Kathy N. Shaw, MD, MSCE and Jane Lavelle, MD, The Children’s Hospital of Philadelphia, Philadelphia, PA

Purpose: The majority of febrile ED infants 6 month to 2 years have urine obtained by invasive catheterization to evaluate for UTI, yet only 7% have a positive screen. Our aim was to reduce catheterization rates by first screening urine obtained by a bagged specimen to determine if a catheterization for culture was indicated (positive LE of moderate or large leukocyte esterase or nitrite) in a high volume ED.

Methods: A multidisciplinary quality improvement (QI) team conducted this multi-staged QI project involving nursing and physician education, scripting for parents, and trials of how and when to place a urine bag. Data was collected from the EMR with chart review and control charts generated to determine catheterization rate (initial or as a result of a positive screen from bagged urine) and to monitor for unintended consequences such as missed UTI, prolonged length of ED stay (LOS), and return ED visits.

Results:

Between October 18, 2013 and March 8, 2014, 433 children with fever were evaluated. Data showed a marked and steady reduction of catheterization rate from a baseline of 70% (2759/3943) to 24% (43/179) in March (difference=46%, 95% CI [39%-52%]) with no change in the revisit rate, no missed UTIs in a subset followed in our healthcare system (170/433 children seen), no urine cultures inappropriately sent from bagged specimens, or increased ED length of stay (296 minutes for patients screened with bag vs. 321 minutes for those screened with a catheterization (t(365)= -1.147, 95% CI [-6.6, 17.3])). An unintended positive effect was an increase in point of care testing (47% vs 65%). To date, more than 350 children have been spared a catheterization.

Conclusions: Initial screening by means of urine bag placement was shown to successfully reduce unnecessary catheterization in febrile infants without increasing ED LOS or decreasing screening or detection of febrile UTI in this high-risk group.

LEADERSHIP ROUNDING IN THE EMERGENCY DEPARTMENT: AN OPPORTUNITY FOR REAL-TIME ACTIONABLE FEEDBACK FROM PATIENTS

Mohsen Saidinejad, MD, MBA, FAAP1, Sephora N. Morrison, MD, MBA, FAAP1, Sabah F. Iqbal, MD, FAAP1, Shilpa Patel, MD, MPH, FAAP1, Kristen A. Breslin, MD, MPH, FAAP1 and James M. Chamberlain, MD, FAAP2, (1)Children’s National Health System, Washington, DC, (2)Emergency Medicine Trauma Center, Children’s National Health System, Washington, DC

Purpose: Close involvement of leadership with daily operations is an important strategy for top performing companies. In healthcare, leadership rounding has been used in the inpatient setting to better understand patient experience and staff satisfaction. The purpose of this study is to determine if the use of leadership rounding in the emergency department (ED) can generate real time actionable feedback to help improve patient experience and to recognize staff for excellent care.
Methods: We conducted a cross-sectional convenience sample of ED patients with length of stay greater than 2 hours during a 6-month study period (October 1, 2013 - March 31, 2014). We used a leadership rounding survey tool consisting of the 5 main validated components of rounding (greeting and introduction by providers, informing patients about treatment plan and delays in care, recognizing excellent care by a staff member, overall patient experience with the visit, and opportunities for improvement. We report overall results in each element of rounding, the number of real-time interventions resulting from the rounding, and associations with ED length-of-stay. We will also compare our overall patient experience results with the current post-visit survey during the same time period.

Results: A total of 438 rounds were completed during the study period. In 427 (97%) of these, the providers had greeted the patient and introduced themselves, and in 433 (99%), patients were kept informed about treatment plan and delays in care. A specific staff member was recognized for excellent care in 89 (21%) of the rounds. Overall, 403 (92%) had a positive ED experience, 33 (7.5%) had a neutral experience, and 2 (0.5%) had a negative experience. Specific opportunities for improvement were identified in 112 (26%). In 31 (7%) rounds, an intervention was provided (child life specialist, activity and entertainment for the patient and family, pain medication, food, and expediting of disposition decision) as a direct result of leadership rounding.

Length of ED stay was longer in patients with a neutral or negative experience compared to those with a positive experience (4.1 +/- 2.6 versus 2.7 +/- 1.2 hours, p<0.001). The proportion of those reporting a positive experience was significantly higher in our leadership rounds than in our current post-visit patient satisfaction survey (92% versus 61%, p<0.001).

Conclusion: Leadership rounding provides valuable, real-time, actionable patient feedback. While negative and neutral overall ED experience was associated with longer length of stay, more patients had a positive ED experience than reported through our post-visit patient satisfaction survey. Further studies are needed to determine the causes of these differences.

Presentation Time: 2:45 PM - 3:00 PM

TEST CHARACTERISTICS OF APPENDICITIS SCORES WITH AND WITHOUT LABORATORY INVESTIGATIONS

IJab Khanafer, MD1; Dori-Ann Martin, RN2; Tatum Mitra1; Robin Eccles, MD, FRCSC3; Mary E Brindle, MD MPH FRCSC4 and Graham C. Thompson, MD, FRCPC5. (1)University of Calgary, Calgary, AB, Canada. (2)Emergency Medicine, Alberta Children’s Hospital/University of Calgary, Calgary, AB, Canada. (3)Surgery, Alberta Children’s Hospital, Calgary, AB, Canada

Purpose: Though the test characteristics of a white blood cell count (WBC) and neutrophil count (NC) are sub-optimal in the diagnosis of appendicitis, the Pediatric Appendicitis Score (PAS) and Alvarado Score (AS) include these laboratory investigations while the Lintula Score (LS) is strictly clinical. The objective of this study was to determine the test characteristics of the PAS with and without (modified PAS – mPAS) laboratory investigations (LI), the AS with and without (modified AS – mAS) LI and the LS.

Methods: A prospective cohort study of children aged 5-17 years presenting to a tertiary pediatric ED with suspected appendicitis. Clinical care of the patient was left to the discretion of the managing physician after completion of study forms to calculate the scores. Risk for appendicitis with was defined as PAS >=5; AS >=5; LS >=4; mPAS >=4; mAS >=4. Appendicitis was defined as acute inflammation, rupture or abscess of the appendix on pathologic evaluation.

Results: Of the 236 eligible children, 134 (56.8%) were female. The average age was 11.1 years (SD 3.2). Appendectomy was performed in 71 (30.1%) of children, while 67 (28.9%) of the population had pathology-proven appendicitis. Median scores for the eligible population were PAS 5 (IQR 3-7), AS 6 (IQR 4-8), LS 11 (IQR 7-17), mPAS 4 (IQR 4-6) and mAS 4 (IQR 3-5). Sensitivity and specificity of the PAS (85.4%, 50.8%) and mPAS (86.2%, 45.5%) were not significantly different. Test characteristics were also similar for the AS (85.5%, 43.1%) and mAS (85.0%, 40.4%). Test characteristics of the LS were poor (58.3%, 18.8%).

Conclusion: Removing the laboratory components of the PAS and AS appears to have minimal effect on the test characteristics of these scores. Children presenting to the ED with abdominal pain and an mPAS or mAS of >=4 warrant further observation and/or investigation with imaging studies. Delaying imaging until WBC or NC are obtained in children with mPAS or mAS >=4 may be unnecessary, as these investigations do not appear to improve the test characteristics of the scores. In addition, mPAS and mAS may be of significant value in community physician offices as a strategy for identifying those children who should be further evaluated in the ED.
PEDiatric RESuscitation DATA CATALOGUING AND IMPLICATIONS FOR PHYSICIAN COMPETENCE

Allison Mak, BS², Aaron J. Donoghue, MD², Jane Lavelle, MD¹ and Sage Myers, MD, MSCE³, (1)The Children's Hospital of Philadelphia, Philadelphia, PA, (2)Emergency Medicine, Children's Hospital of Philadelphia, Philadelphia, PA, (3)Children's Hospital of Philadelphia, Philadelphia, PA

Purpose: Pediatric medical resuscitation is a high-stress, fast-moving endeavor with multiple competing priorities and simultaneous task completion. Included in this milieu is the performance of high-risk, but potentially life-saving, procedures, including; intubation, central line placement and defibrillation. As with many motor tasks, competency and efficiency with the completion of these procedures requires repetitive practice.

Methods: Data collection occurred between January 1, 2011 and December 31, 2013 at a tertiary-care pediatric hospital with level 1 pediatric trauma accreditation that sees over 90,000 ED visits a year with 40 attending physicians and 12 pediatric emergency medicine fellows. A one-page form was created to obtain data from the resuscitation physician leader in immediately following the care of a patient in the resuscitation room. This form was supplemented with chart review when necessary. A REDCap database was used for data collection and storage.

Results: Over the course of the 3 years of data collection, 506 pediatric medical resuscitations occurred in the resuscitation room. Total number of procedures completed can be found in Table 1.

Conclusion: Over the course of 3 years, only 6 chest tubes and 14 central lines were placed and only 3 patients required defibrillation. Divided among 40 attending physicians, this means that it is likely that many attending physicians had no first-hand experience with these relatively complex procedures over this time period. Even intubation, which occurred 120 times, leads to an average of 1 intubation per attending physician per 12 months. With PEM fellows present and, rightfully, completing most of the procedures to gain initial competence, many of these attending “experiences” are likely in the supervisor/observer role. Therefore, given the relative paucity of direct practice during routine patient care, it is important for all hospitals to consider how to best supplement attending physician experiences to allow for maintenance of competency. This could include; experiences outside of the ED, such as in the operating room, high-fidelity simulation and task training exercises, and even video review of actual resuscitations in which low-frequency procedures take place. Here we identify procedures at risk for competency lapse due to low rates of exposure. Further study should focus on determining the best means by which to maintain competency in these areas and hospitals should focus on means by which to support clinicians in these endeavors.

Table 1

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Number of Occurrences (2011 and 2012)</th>
<th>Number of Occurrences (2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airway</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intubation</td>
<td>79</td>
<td>41</td>
</tr>
<tr>
<td>≥2 attempts or change in intubator</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Ventilator used</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td><strong>Circulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest compressions</td>
<td>43</td>
<td>20</td>
</tr>
<tr>
<td>Defib/pacing</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Interventions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥5 different medications used</td>
<td>47</td>
<td>21</td>
</tr>
<tr>
<td>Medication infusion used</td>
<td>36</td>
<td>31</td>
</tr>
<tr>
<td>ECMO</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Blood product used</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Chest tube</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Central line</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>IO</td>
<td>49</td>
<td>24</td>
</tr>
</tbody>
</table>
ABSTRACT SESSION II

Friday, October 10, 2014: 3:45 PM-5:30 PM

Presentation Time: 3:45 PM - 4:00 PM

FINANCIAL MODEL FOR A POINT-OF-CARE ULTRASOUND PROGRAM IN A PEDIATRIC EMERGENCY DEPARTMENT

Alexander L. Thai, MSII1, Alyssa Abo, MD, FAAP2, Joanna Cohen, MD, FAAP2, Keith Cross, MD, MSC, MS2, Ben Foster, PhD2, Russ Horowitz, MD2, David O. Kessler, MD, MSC6, Cheung Kim, MD2, Dave McLario, MD3, Brad Sutton, MD, MBA6, Fred Warkevitive, MD, MSC2 and In Kim, MD, MBA3, (1)University of Louisville School of Medicine, Louisville, KY, (2)George Washington University School of Medicine, Children's National Medical Center, Washington, DC, (3)University of Louisville School of Medicine, Kosair Children's Hospital, Louisville, KY, (4)University of Louisville School of Business, Louisville, KY, (5)Northwestern University School of Medicine, Lurie Children's Hospital, Chicago, IL, (6)Pediatrics, Columbia University College of Physicians & Surgeons, New York Presbyterian Morgan Stanley Children's Hospital of New York, NY, NY, (7)Thomas Jefferson University School of Medicine, Philadelphia, PA, (8)University of Louisville Schools of Medicine and Business, Louisville, KY

Purpose: Point-of-care ultrasound (POCUS) has been implemented by many pediatric emergency departments (EDs). In contrast, revenue collection for POCUS has not been implemented at many pediatric EDs. To date, little is known about how best to model return on investment for revenue collection in POCUS. Our aim was to create a financial model to conduct predictive modeling for revenue collection for POCUS in a pediatric ED.

Methods: A retrospective review was done using a local trauma registry over 12 consecutive months for ED patient visits presenting for Level I or II trauma. In addition, current procedural terminology (CPT) codes were used to identify ED patient visits over 12 consecutive months for abscess evaluation and femur fracture.

From these patient visits, we constructed a financial model using hospital reimbursement payment values for 4 POCUS procedures: Focused assessment with sonography for trauma (FAST) exam, US evaluation of abscess, US-guided abscess drainage, and US-guided femoral nerve block. Hospital reimbursement payment values were acquired from two sources: the American Medical Association CPT Code Value Search and GE Healthcare™. Annual operating costs were determined based on Q-path™ software costs.


For a sensitivity analysis, we varied collection rates from 20% to 50%. For a second sensitivity analysis, we also varied billing rates by quartiles: 100%, 75%, 50%, and 25%.

Results: Using our model, $102,932 was generated in annual estimated net revenue based on a 30% collection rate. The annual estimated net revenue for the sensitivity analysis for collection rates of 20% and 50% was respectively $73,022 and $290,835. The annual estimated net revenue for the sensitivity analysis of 75%, 50%, and 25% billing rates was respectively $77,199, $51,466, and $25,733.
Based on a 30% collections rate, the revenue generated per FAST exam was $93.59 and per femoral nerve block was $18.82. On average, the revenue generated per study for US evaluation for abscess was $126.37 and for US-guided abscess drainage was $89.62.

**Conclusion:** Our financial model suggests that implementing POCUS billing in a pediatric ED can lead to positive net revenue, even using conservative estimates of collection rates and billing rates. Pediatric EDs should consider implementing billing for POCUS procedures to build long term sustainability.

**Presentation Time:** 4:00 PM - 4:15 PM

**IMPACT OF AN INPATIENT PSYCHIATRIC UNIT ON PEDIATRIC EMERGENCY MENTAL HEALTH CARE**

David C. Sheridan, MD; Kyle P. Johnson, MD; Rochelle Fu, PhD; David Spiro, MD, MPH, FAAP; and Matthew L. Hansen, MD MCR, (1)Oregon Health & Science University; Randall Children’s Hospital at Legacy Emanuel, Portland, OR, (2)Oregon Health & Science University, Portland, OR

**Purpose:** Mental health complaints are a frequent presentation to the pediatric emergency department (PED) with limited outpatient and inpatient resources. A number of pediatric tertiary emergency departments do not have associated inpatient psychiatric units. To our knowledge this is the first study to analyze whether the presence of an onsite inpatient psychiatric unit impacts pediatric mental health care in the PED. The objective of this study was to compare mental health care between a pediatric tertiary care center with an inpatient child & adolescent psychiatric unit onsite (Psych PED) to one that does not (Non-Psych PED) in the same geographical area.

**Methods:** This was a retrospective, observational study of all pediatric mental health presentations to 2 tertiary care PEDs from 03/2012-06/2013. All patients aged 1-18 with an ICD-9 code of 291, 292, 295-309 and 311-314 were included. Data collected included demographics, length of stay (LOS) in hours, diagnosis, final disposition and daily PED operational variables. The two groups were compared by mental health visit volume, LOS and final disposition. Mental health patients accepted to the inpatient psychiatric unit were able to board on the general pediatric floor at the Psych PED. All mental health patients requiring inpatient treatment from the Non-Psych PED required transfer which was considered an admission for analysis.

**Results:** 1138 mental health encounters comprised 3.88% of the Psych PED volume during the study period. The Non-Psych PED had 271 mental health encounters which comprised 1.7% of the overall PED volume. The average age at both centers was 14 years with similar gender proportions. The Psych PED had a significantly higher rate of admission 41.3% vs. 18.8% (p<0.0001). The LOS was significantly longer at the Non-Psych PED compared to the Psych PED with a visit of 15.6 hrs vs 6.3 hrs respectively (p<0.0001) even when controlling for boarding on the pediatric ward, (15.6 hrs. vs. 11.4 hrs; p=0.017). When LOS was stratified based on need for admission vs discharge, patients requiring admission from the Non-Psych PED had a significantly longer LOS in the PED of 33.4 hrs compared to 8.1 hrs in the Psych-PED (p<0.0001). When time boarding on the inpatient ward is added to time in the PED, the LOS remains significantly higher at the Non-Psych PED (20.6 hrs. vs 33.4 hrs; p<0.001).

**Conclusions:** In this regional study, mental health care in the PED is different when there is an onsite inpatient child & adolescent psychiatric unit. Though the patient populations are similar by demographics, the ED length of stay is significantly shorter and admission rate is significantly higher when an inpatient psych unit is onsite. Larger-scale studies need to be done to confirm our regional findings.

**Presentation Time:** 4:15 PM - 4:30 PM

**VARYING INTUBATION POSITION AND IMMOBILIZATION METHODS TO ASSESS CERVICAL SPINE MOVEMENT DURING ENDOTRACHEAL INTUBATION IN A PEDIATRIC AIRWAY MANIKIN**

Rami S. Sunallah, MD; Christopher M. Pruitt, MD; Collin King, MD; Chad Epps, MD; Nancy M. Tofil, MD, MED; Samuel R. Misko, BSEE; Jerome Arceneaux, BS; Tariq Alrasheed, MD; Margo Lorbecke, BS and ML White, MD, MPPM, MA; (1)Department of Pediatrics, Division of Emergency Medicine, University of Alabama at Birmingham, Birmingham, AL, (2)University of Alabama at Birmingham, Birmingham, AL, (3)Pediatrics, Children’s of Alabama Simulation Center, University of Alabama at Birmingham, Birmingham, AL, (4)Pediatrics, Emergency Medicine, University of Alabama at Birmingham, Birmingham, AL

**Purpose:** Definitive evidence is lacking on the best methods for protecting the cervical spine during endotracheal intubation (ETI) in the pediatric trauma setting. Our purpose was to determine the optimal patient position and in-line stabilization method for ETI of patients with suspected cervical spine injuries.
Methods: This was a single-center, pilot exploratory study of ETI utilizing a static pediatric airway manikin. After a standardized practice session, board-certified pediatric emergency physicians attempted (in randomized order) ETI a total of six times. Three spinal immobilization methods were used: manual in-line stabilization from in front of and behind the manikin; and cervical collar. Two attempts per immobilization method were performed: one with the bed horizontal (0 degrees), and one at 15 degrees. ETI was performed with a video laryngoscope, and these videos were used for analysis. Primary endpoints included time to intubate; time to best view; glottis exposure, as measured by both modified Cormack and Lehane (MCL) and Percentage of Glottic Opening (POGO) scores; and maximal cervical extension. Two board-certified anesthesiologists, blinded to manikin position and immobilization method, independently assigned time and exposure grades. For each attempt, continuous endpoints were averaged between reviewers. Discrepancies in the MCL score were resolved with a third, blinded, expert reviewer. Cervical extension angle was measured by a computerized inclinometer that was uniquely designed for this study. Dichotomous comparisons were made utilizing the Mann-Whitney U test, and those among more than two groups were analyzed with Friedman’s analysis of variance. All tests were two-tailed, with P < 0.05 considered statistically significant.

Results: 19 physicians were enrolled. There was excellent agreement between reviewers, as measured by their assignment of MCL score (kappa = 0.842). While no method of immobilization or position was associated with a significantly faster time to intubate or time to best view, there was a trend towards shorter times at 0 degrees vs. 15 degrees (P = 0.095). MCL scores trended towards better visualization at 15 degrees (P = 0.108). POGO scores were significantly different across all subgroups (P = 0.014); pairwise comparisons with adjusted P values showed that the 15 degrees position, holding from the back, led to optimal view. Cervical extension was significantly less at 15 degrees versus 0 degrees (P = 0.037), and in a collar versus the two manual in-line stabilization methods (P = 0.021).

Conclusions: In respect to cervical extension and glottis visualization, our data suggest that pediatric ETI is optimal with the head of the bed at 15 degrees. While visualization may be improved with manual in-line stabilization from the back, keeping the patient in a cervical collar leads to less neck extension.

Presentation Time: 4:30 PM - 4:45 PM

RADIOLOGICAL DISCREPANCIES IN A PEDIATRIC EMERGENCY DEPARTMENT

Patricia Lee1, Hollie A. Jackson, MD1, Leighton John2 and Karen Y Kwan, MD2, (1)Department of Radiology, Children’s Hospital Los Angeles, Los Angeles, CA, (2)Children’s Hospital Los Angeles, Los Angeles, CA

Background: Radiological studies ordered in a pediatric emergency department are initially interpreted by emergency department attendings (ED) and subsequently by the attending radiologist. (AR). During after-hours, radiology residents (RR) make interpretations, which are reviewed by the AR the next day. Previous studies conducted in adult emergency departments have found discrepant interpretation rates ranging from 1.1%-45%. Few studies have been conducted in the pediatric emergency medicine setting.

Purpose: To review radiological interpretations made by EDA, AR, and RR in order to describe radiological discrepancies and their clinical significance.

Methods: A retrospective review was performed on a radiology department quality improvement database containing discrepant interpretations made between the emergency and radiology departments in an urban, academic pediatric hospital. Radiographic images reviewed are from 10 select months November 2005-January 2006. Inclusion criteria were x-rays (XR) categorized as chest, abdominal, head, upper extremity, and lower extremity. All cross-sectional imaging studies including CT, US, MRI, interventional radiology and contrast studies, skeletal surveys, spine XR, and pelvic XR were excluded. The abnormalities not confirmed by the AR were classified as false positives and the remainder of discrepant interpretations were abnormalities identified by the AR and not by the ED and/or RR were classified as false negatives.

Results: During the study period approximately 24,891 images were ordered. 10,160 XR were included in the study. Of the total, 117 XR were identified by the AR as having abnormalities discordant from the RR or ED interpretations. Discrepant interpretations were found, producing a discrepancy rate of 1.15%. The most commonly misinterpreted XR were chest XR, constituting 34.2% of total discrepancies, followed by upper extremity XR (33.3%), lower extremity (16.2%), abdominal (8.5%), and head (76.8%). If upper and lower extremity XR are combined, extremity XR are misinterpreted more than chest XR (Figure 1).

Conclusion: In a pediatric emergency department with radiology residents reading after hours a discrepant interpretation rate of 1.15% was found, with chest XR as the most commonly misinterpreted category of XR.
CHARACTERISTICS AND COMPLICATIONS OF MOTOR VEHICLE COLLISION INJURIES AMONG CHILDREN TREATED AT GENERAL VERSUS PEDIATRIC TRAUMA CENTERS

Jill Dreyfus, PhD, MPH, Andrew Flood, PhD, Gretchen Cutler, PhD, MPH, Henry Ortega, MD and Anupam B. Kharbanda, MD, MSc, Children’s Hospitals and Clinics of Minnesota, Minneapolis, MN

Purpose: Motor vehicle collisions (MVC) are the primary cause of death among children and adolescents aged 5-17 years. Trauma center designation has been identified as a marker of higher quality care. Yet, limited data exists on the characteristics and outcomes of pediatric MVC patients treated at different types of trauma centers. We aimed to describe characteristics of pediatric patients treated for MVC-related injuries at a sample of trauma centers from across the United States, and to compare the frequency of preventable complications at general vs. pediatric level I trauma centers. We hypothesized that complications would be less frequent at pediatric-designated centers.

Methods: Analyses included children (≤18 years of age, not transferred from another facility or dead on arrival) treated at ACS-certified trauma centers contributing to the 2010 National Trauma Data Bank (NTDB). MVC-related injuries were defined as ICD-9 e-codes 810-819. We used t-tests or chi-square tests to compare patient characteristics between types of trauma centers. We accounted for correlation by facility using GEE models to estimate odds ratios (OR) for preventable complications (i.e. potentially related to the care delivered, such as infection, ulcer, or unplanned intubation) after admission comparing general to pediatric level I trauma centers, adjusting for age, gender, injury severity, injury mechanism, and type of payment.

Results: We identified a total of 12,364 pediatric MVC-related injuries (mean age 14.0±4.6 yrs). Approximately 70% of children (n=8,641) were treated at level I trauma centers. The majority (62%) of patients were 15-18 years of age. The most common mechanisms of injury were occupant (67%) and pedestrian (20%), but the distribution differed by age group. Injuries to the head and neck and/or extremities were most common (64% and 44%, respectively), and 43% of patients had injuries to multiple regions. Restricting analyses to level I trauma centers, patients at pediatric-designated centers (n=3,439) were younger (11.6±5.0 vs. 14.2±4.6 yrs, p<0.0001), more likely to have pedestrian mechanism of injury (26.4% vs. 20.6%, p<0.0001), and to have government-funded insurance (34.5% vs. 28.9%, p<0.0001), compared with general level I trauma centers (n=5,202). The frequency of at least one preventable complication was slightly higher at general vs. pediatric designated centers (4.2% vs. 3.2%, p=0.02), but the difference was not statistically significant in adjusted models (p=0.27). Examining individual complications, we found greater odds of unexpected intubation (OR=5.75, 95% CI 1.32-24.34) and wound disruption (OR=4.33, 95% CI 0.97-19.2) at general vs. pediatric level I centers in adjusted models.

Conclusion: There are important differences in the characteristics of children treated for MVC-related injuries at pediatric vs. general trauma centers to consider when comparing outcomes and best practices. After considering these differences, we found that some preventable complications may be more common at general level I centers, highlighting potential opportunities for improvement in care.
DOES BMI ALTER DIAGNOSTIC ACCURACY OF ULTRASOUND IN CHILDHOOD APPENDICITIS?

Jessica E Starck, MD, Janet Flores, Jennifer Trainor, MD and Mary C. Pierce, MD, FAAP, (1)Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL, (2)Ann & Robert H Lurie Children’s Hospital of Chicago, Chicago, CA

Background: Limited pediatric data suggest obesity decreases the accuracy of ultrasound in identifying acute appendicitis.

Purpose: The purpose of this study was to determine the impact of BMI on the reported visualization of the appendix via ultrasound in children with pathologically confirmed appendicitis and to determine if there was a BMI range in which the appendix was unlikely to be identified.

Methods: This was a retrospective study (January 1, 2008 through December 31, 2010) of pediatric patients (<18 years) who underwent appendectomy and had pathologically confirmed appendicitis and had a preoperative ultrasound of the abdomen. We defined as “positive” the report stating the appendix was adequately visualized and consistent with appendicitis, as “equivocal” the appendix not adequately visualized but secondary inflammatory signs present, or as “negative” the appendix not visualized and no inflammatory signs present. We calculated BMI for age-percentile (BMI-FAP) using patient weight and height. Patients were grouped into 3 categories based on BMI-FAP definitions: under or normal weight (<85th percentile), overweight (85-94th percentile), and obese (>95th percentile). Descriptive analyses were performed for obesity variables and ultrasound outcome variables. Standardized BMI (zBMI) scores were calculated and graphically analyzed against ultrasound sensitivity for trend.

Results: 265 children met inclusion criteria. 183 had documented heights needed for BMI-FAP. The mean patient age was 9.3±3.9 years, 69% were Hispanic and 51% were male. Ultrasound was “positive” in 150 (57%) of the patients; resulting in an overall sensitivity of 57%. It was “equivocal” in 49 (18%) of the patients, and “negative” in 66 (25%) of the patients. Ultrasound results in 3 BMI-FAP based groups (Table) show no difference in ultrasound positive by weight group (p=0.15). When zBMI scores were compared to percentage ultrasound success no definite trend was seen.

<p>| Weight Status by BMI Percentile with Ultrasound Findings in Confirmed Appendicitis |
|----------------------------------|----------------|----------------|----------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Under/normal weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound Positive</td>
<td>N=117</td>
<td>N=29</td>
<td>N=37</td>
</tr>
<tr>
<td>n=101</td>
<td>70 (60%)</td>
<td>13 (45%)</td>
<td>18 (49%)</td>
</tr>
<tr>
<td>Ultrasound Equivocal</td>
<td>N=36</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 (20%)</td>
<td>4 (14%)</td>
<td>8 (22%)</td>
</tr>
<tr>
<td>Ultrasound Negative</td>
<td>N=46</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23 (20%)</td>
<td>12 (41%)</td>
<td>11 (30%)</td>
</tr>
</tbody>
</table>

Conclusions: Among children with confirmed appendicitis, the accuracy of ultrasound was not different by BMI-FAP group. Ultrasound sensitivity was lower than previous reports. Based on these results, we would recommend that all children, regardless of BMI-FAP, continue to undergo diagnostic ultrasound as the first imaging modality in suspected appendicitis.

THE DIFFICULT PEDIATRIC AIRWAY: RANDOMIZED COMPARISON OF VIDEOLARYNGOSCOPY VERSUS DIRECT LARYNGOSCOPY AMONG PEDIATRIC EMERGENCY MEDICINE PHYSICIANS IN SIMULATED AIRWAY MODEL

James Burhop, DO, Michael P. Poirier, MD and Joel Clingenpeel, MD, The Children’s Hospital Of The King’s Daughters & Eastern Virginia Medical School, Norfolk, VA

Purpose: It has been established that the videolaryngoscope is a valuable tool in securing the successful tracheal intubation of difficult airways in adult patients. However, there is minimal available evidence to gauge its efficacy within the infant, child and adolescent populations with
anatomically difficult airways. Furthermore, the literature is virtually devoid of simulation studies in individuals with specific syndromes such as trisomy 21. The purpose of our study is two-fold; first to develop an anatomically challenging model followed by comparison of video vs. direct laryngoscopic techniques to secure a tracheal intubation. Additionally our study looks to enhance safety and improve patient outcome through simulation of difficult pediatric airway scenarios with an emphasis on laryngoscopic technology, curriculum development and education.

Methods: The performance features of direct laryngoscopy were compared with videolaryngoscopy. The study participants were randomized with scenario performed within a large tertiary children's hospital simulation center. A difficult infant model was designed for the purpose of this study. The starting point was a standard newborn airway model. Macroglossia was achieved with tongue modification and decreased oral cavity size. The mentum was retracted, along with atlantoaxial instability through neck rivet alterations. Vocal cord anatomy was retained to provide the intubation participant with a standard point of completion for securing the tracheal airway. Study participants were pediatric emergency medicine physicians with fellowship training and difficult airway experience. Difficult pediatric airways were simulated with macroglossia, atlantoaxial instability and neck immobilization. Study participants had pre-scenario videolaryngoscopy training in video format that was unique to the specific simulation equipment available in our simulation laboratory. Each study participant performed intubations during a difficult airway scenario on a difficult airway infant manikin. The time to successful tracheal intubation was recorded along with prevalence of first-attempt tracheal intubation using direct laryngoscopy as compared to videolaryngoscopy.

Results: Time to vocal cord visualization, successful intubation and lung inflation was superior with direct laryngoscopy as compared to videolaryngoscopy alone (table n=39 intubations per device).

<table>
<thead>
<tr>
<th></th>
<th>Cords (P&lt;0.05)</th>
<th>Intubation (P&lt;0.05)</th>
<th>Breath (P&lt;0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Videolaryngoscopy (sec)</td>
<td>15.7±3.2</td>
<td>25.6±5.6</td>
<td>36.7±7.2</td>
</tr>
<tr>
<td>Direct Laryngoscopy (sec)</td>
<td>6.5±2.3</td>
<td>15.1±3.8</td>
<td>20.6±4.1</td>
</tr>
</tbody>
</table>

Conclusion: Clinical encounters involving pediatric intubation are less common when compared with adults, which highlights the importance of developing realistic airway simulation scenarios that create opportunities for practice with video and direct laryngoscopes, in addition to providing adequate education and guidelines for pediatric and emergency physicians working in the acute care setting. When a simulated difficult airway was encountered direct laryngoscopy was superior to videolaryngoscopy when focusing on time to cord visualization, tracheal intubation and lung inflation. Newer technology incorporates systems that can be performed using both direct and videolaryngoscopy with the same device which is potentially ideal when faced with difficult pediatric airways in the emergency setting.
POSTER SESSION

Friday, October 10, 2014: 5:30 PM-7:00 PM

DECREASING TIME TO ANTIBiotic DELIVERY FOR FEBRILE IMMUNOCOMPROMISED PATIENTS IN A PEDIATRIC EMERGENCY DEPARTMENT

Allison Ast, MD, Pediatric Resident, Gainesville, FL

Purpose: Infections are common complications in immunocompromised patients (ICPs). Morbidity and mortality are increased in ICPs with fever if antibiotics are not received in a timely manner. We designed a quality improvement project to reduce antibiotic delivery time in a pediatric emergency department (ED) for this high risk population.

Methods: Four key drivers were identified to decrease time to antibiotic delivery: patient knowledge, patient identification, antibiotic preparation and patient acuity awareness. To increase patient knowledge, the hematology/oncology service (Heme/Onc) encouraged patients to call with fevers and put EMLA cream on their port site. To increase patient identification, we facilitated direct communication between Heme/Onc and ED attendings. Attending physicians then added the patient to an expected list. “Febrile, immunocompromised” was added to the EMR list of chief complaints for use with ICPs. To address timeliness of antibiotic preparation, a weight-based antibiotic dosing chart was created and displayed at every workstation and in the nursing medication room. The nurses worked simultaneously to triage, obtain blood samples and prepare drugs. To improve awareness of this project, all residents are given a one page summary prior to the start of their ED rotation. Weekly, data driven, informal meetings were held to provide feedback. As further incentive, nursing staff was provided coffee cards for delivering antibiotics in less than 60 minutes.

Results: Mean time to antibiotic delivery in febrile ICPs decreased from 93.32 (SD=63.16) minutes in the pre implementation period to 35.83 (SD=19.50) minutes in the 3 months post implementation (p<.01). Effect size associated with the interventions was ‘large’ (Cohen's d=1.22). The percentage of patients meeting the target for time to antibiotics rose from 33.3% to 96.6%. Specifically, during the post implementation phase, 3 of 90 (3.3%) febrile ICPs received antibiotics in greater than 60 minutes.

Conclusions: Our study demonstrates that education of healthcare providers and standardization of a process of care reduced antibiotic delivery time for febrile ICPs. Timely delivery of antibiotics can be achieved through implementation of patient education, a treatment algorithm and staff buy in. Administering antibiotics in less than one hour is feasible and should become the standard of care for all febrile ICPs.

IMPLEMENTING & EVALUATING THE PEWS SCORING SYSTEM IN THE EMERGENCY DEPARTMENT TO PREDICT PATIENT DETERIORATION IN THE HOSPITAL

Delia L. Gold, MD, Leslie Mihalov, M.D. and Daniel M. Cohen, MD, Emergency Medicine, Nationwide Children’s Hospital, Columbus, OH

Purpose: The Pediatric Early Warning Scores (PEWS) were developed to provide a reproducible assessment of a child’s clinical status while hospitalized. PEWS has been extensively studied in the inpatient setting, but there is limited data on its utility in the pediatric emergency department.
department (ED). The study goals are: (1) To effectively integrate PEWS into the flow process and electronic medical record (EMR) of a busy ED; and (2) to explore the test characteristics of an ED assigned PEWS for ICU admission or clinical deterioration in admitted patients.

**Methods:** This is a prospective 12-month study of patients, aged 0-21 years, admitted from the ED of an urban, tertiary care children’s hospital. ED nurses were instructed in PEWS assignment and documentation. PEWS were measured at initial assessment (P₀) and admission (P₁). Patients were stratified into outcome groups: those admitted to the ICU either from the ED or as transfers from the floor; and those admitted to the floor only. Clinical deterioration was defined as transfer to the ICU within 6 hours or 6-24 hours of admission. PEWS scores and ROC curves were compared for patients admitted to the floor, ICU, and with clinical deterioration.

**Results:** 12,306 consecutively admitted patients were evaluated, with 99% having a PEWS score in the EMR. Inter-rater reliability was excellent (Cronbach’s alpha coefficient = 0.97). 1300 (10.6%) patients were admitted to ICU and 11,066 (89.4%) to the floor. P₀ and P₁ were higher for the ICU group (2.8 +/- 2.4, 95% CI=2.6-2.9; 3.2 +/- 2.4, 95% CI=3.1-3.4; p<0.0001) versus ward patients (0.7 +/- 1.2, 95% CI=0.62-0.67; 0.5 +/- 0.9, 95% CI=0.51-0.55; p<0.0001). To predict the need for ICU admission, the optimal cutoff points on the ROC are P₀ = 1 and P₁ = 2 with an AUC of 0.79 and 0.86 respectively. Sensitivity and specificity were 0.78/0.68 and 0.72/0.88, respectively. For every unit increase in P₀ and P₁, the odds of admission to the ICU is 1.9 times (95% CI=1.8-1.9, p<0.0001) and 2.9 times (95% CI=2.7-3.1, p<0.0001) greater than to the floor. 89 patients were in the clinical deterioration group, with 36 (0.3%) patients transferred to the ICU within 6 hours of admission, and 53 (0.4%) patients transferred within 6-24 hours. In this group, P₀ and P₁ were statistically associated with increased risk of transfer and optimal cutoff points were similar to above, but with poorer AUCs and test characteristics.

**Conclusion:** PEWS was successfully implemented into the ED EMR with excellent data capture and inter-rater reliability. An elevated PEWS is associated with ICU admission directly from the ED and as a transfer, but lacks the necessary test characteristics to be used independently in this environment. Specifically, the use of PEWS to determine disposition from the ED would result in significant over-triage to the ICU.

**ULTRASOUND CONFIRMATION OF ENDOTRACHEAL TUBE POSITION USING A SALINE FILLED CUFF**

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**Purpose:** Point of care ultrasound (POCUS) is a potential tool for the rapid assessment of endotracheal tube (ETT) position. Inflating the ETT cuff with saline overcomes interface increasing the ease of visualization. There are no studies that have evaluated ultrasound identification of a saline-filled cuff for the verification of correct ETT placement (≥ 1cm above carina for our study purposes) in pediatric patients. The objectives of the study are:

1) Determine the reliability of ultrason in visualizing a saline-filled cuff of the ETT in pediatric patients.

2) Determine if visualization of a saline-filled cuff at the suprasternal notch (STN) agrees with correct ETT position as determined by cinefluoroscopy

**Methods:** The study was performed on infants and children who had an elective cardiac catheterization requiring endotracheal intubation. Study participants were intubated at a depth approximately 3 times the internal diameter of the ETT. A cinefluoroscopic image was obtained to determine ETT depth. A linear probe was placed at the patient’s STN in the transverse axis and the cuff of the ETT was inflated with saline (0.5-7ml depending on ETT size). Once the cuff was visualized, its position was documented. If the cuff was not seen in the STN, scanning was done in a cephalad direction until the cuff was visualized. If the cuff was not seen in the neck, a single retraction of the ETT to the thoracic inlet level was made, as permitted by the cinefluoroscopic image and a second scan performed.

**Results:** The ages of 34 study subjects were 3 months to 17 years with ETT sizes ranging from 3.5-8mm. The ETT was visualized in 100% of study participants either just above or at the suprasternal notch. The distance of ETT to carina was between 1.2-5.9 cm for all patients that the cuff was seen at the STN except for one patient where it was 0.3 cm. The overall mean distance of the ETT to the carina for was 3.1 cm (± 1.5). Statistical difference between male and female was not significant(P value 0.61). Visualization of the cuff at the STN agreed with correct ETT positioning for an overall agreement of 95%.

**Conclusion:** Preliminary results show that in pediatric patients, following accepted practice of placing the ETT at a depth of 3 times the ETT internal diameter, POCUS can identify the saline filled cuff at the level of the suprasternal notch. This shows promise as a surrogate for correct positioning of the ETT.
SHOCK INDEX AS A PREDICTOR OF MORBIDITY AND MORTALITY IN PEDIATRIC TRAUMA PATIENTS

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Purpose: To evaluate the shock index as an early predictor of morbidity and mortality in traumatically injured pediatric patients

Methods: Employing a cohort study design, we used data from the National Trauma Data Bank Admission Year 2010. Inclusion criteria were patients’ ≤14 years, transferred directly from the scene, and alive with signs of life on arrival to the ED. We excluded patients whose primary type of injury was burn, whose records contained missing data necessary to calculate the shock index (heart rate/systolic blood pressure) and physiologic variables considered inconsistent with signs of life. We defined the cutoff for elevated shock index as high normal heart rate divided by low normal systolic blood pressure according to age. We used multiple logistic regression to examine the relationship between abnormal shock index and mortality, adjusting for age, gender, race, injury type, trauma center, and payment. Morbidity was defined as Intensive Care Unit stay, transfusions, ventilation, and procedures. We also compared abnormal shock index to Injury Severity Score (ISS), a validated anatomic scoring system that is associated with mortality, morbidity, and hospital stay. Values of ISS range from 0-75, with >15 defined as major trauma.

Results: A total of 28,289 subjects met the inclusion criteria. The most frequent (43.9%) age group of the subjects were aged 5 to <12 (12,418). Race was identified as white in 53.7% and sex as male in 64.4%. Of the total population, 488 subjects (1.7%) had an elevated shock index, and 172 subjects (0.6%) died. Of patients with an abnormal shock index, 9.9% (44/444) died, compared to 0.45% (128/28,289) with a normal shock index. Adjusting for confounders revealed a persistent association between elevated shock index and death (OR = 21.7, 95% CI 14.8-31.8). Of patients with morbidity or mortality, 4.4% (253/5,775) had an elevated shock index compared with 1.0% (235/22,514) of patients without. Patients with an elevated shock index had a median injury severity score of 10 (IQR:4-25) versus subjects with a normal shock index of 5 (IQR:4-9), p < 0.001.

Conclusion: In a large, national, trauma database we have found that an elevated SI is correlated with morbidity, mortality, and elevated Injury Severity Score among pediatric trauma patients. The shock index is a quick, readily available tool that may serve to improve prediction of outcomes among pediatric trauma patients.

EVALUATION OF A SCREENING TOOL FOR SEXUAL ABUSE REFERRALS TO THE PEDIATRIC EMERGENCY DEPARTMENT (ED)

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Purpose: A screening tool to identify children who may not require emergent evaluation for sexual abuse correctly identified patients on retrospective review in a single pediatric ED (Floyd RL et al, Pediatrics, 2011). The current study objective was to implement and evaluate this triage tool prospectively in our ED.

Methods: In phase one, we conducted a retrospective review of all alleged sexual abuse visits in our tertiary care ED from 1/2011-12/2011 and applied the screening tool to confirm effectiveness in our population. Answering “yes” to any screening question yielded a positive screen, indicating an emergent evaluation. Answering “no” to all questions yielded a negative screen, indicating a non-emergent evaluation. We defined cases retrospectively as high risk if an evidence collection kit was performed or physical exam documented infection or trauma. In phase two, we implemented the tool prospectively and reviewed ED referrals from outlying hospitals that underwent screening from 3/2013-3/2014. We reviewed the medical records of patients with a positive screen and referred to our ED. Patients with negative screens, not referred, were called within 1 business day by our Child Advocacy Center.

Results: In phase one, our ED evaluated 114 patients for alleged sexual abuse. The mean ED length of stay was 3 hours 44 minutes (SD 1 hour 27 minutes). Of the 23 (20%) referred patients, 4 (17%) had negative screens, and none of the 4 were high risk. Post-implementation (phase 2), we received 42 referrals over one year. Of these, 22 patients (52%) had a negative screen, and were directed to non-emergent evaluation. Phone follow-up did not identify any patients that required immediate medical attention contradicting the recommendation of the triage tool to have non-emergent evaluation.

Conclusion: We implemented and tested a retrospectively developed screening tool for referrals of alleged sexual abuse prospectively in our ED. More than one-half of patients referred and screened were appropriately directed to non-emergent care.
FACTORS ASSOCIATED WITH MISPLACED ENDOTRACHEAL TUBES DURING INTUBATION IN PEDIATRIC PATIENTS

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Purpose: The aims of this study were: 1) to describe the prevalence of misplaced endotracheal tubes (ETTs) associated with intubation in the pediatric emergency department (ED), 2) to identify predictors of tube misplacement, and 3) to determine the risk of associated complications.

Methods: We performed a retrospective cross-sectional cohort study of children undergoing intubation in the ED between January 2009 and July 2013. Endotracheal tip position was evaluated using chest radiograph (CXR) reports. Misplaced tubes were further categorized as: 1) low placement (at or below the carina), 2) high placement (at or above the thoracic inlet), or 3) esophageal. Chest radiographs were reviewed directly in indeterminate cases. Univariate analyses were used to identify significant predictors. Multivariate analyses were then used to evaluate the associations between the significant patient and procedural characteristics and misplaced ETT tubes. The risk of complications associated with ETT misplacement (hypoxemia, atelectasis, difficult ventilation, pneumothorax, pneumomediastinum and aspiration) was determined.

Results: During the study period, 201 intubations were performed in the ED, of which, 76 (37.8%) were misplaced. Of these, 46 (22.8%) were identified as low and 30 (14.9%) were high. There were no unrecognized esophageal intubations. In multivariate analyses, female gender was associated with increased risk of a low placed tube (RR 2.6, 95%CI 1.2-5.4), while increasing age (in years) was associated with a decreased risk (RR 0.9, 95% CI 0.8-0.99). No patient or procedural factors were associated with high tube placement in multivariate analyses. The following predictors were not associated with misplacement, and therefore not included in the multivariate model: indication for intubation, acuity, the training level of the proceduralist, use of videolaryngoscopy, use of a cuffed ETT, intubation during off-hours, or number of attempts. Low tube placement was associated with an increased risk of an ETT complication (OR 2.5, 95%CI 1.1, 5.9). Of the 46 patients with low tube placement the most common complications were hypoxemia (17.4%), atelectasis (13.0%), and difficult ventilation (4.3%).

Conclusion: Misplacement of the ETT is relatively common in the pediatric ED, with low placement being most prevalent, particularly among girls and younger children. Given the associated increased risk of complications related to tube misplacement, measures to improve correct tube placement should be considered.

PRE-HOSPITAL PEDIATRIC ARRESTS RECEIVING EPINEPHRINE (PREPARE) IN THE UNITED STATES

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Purpose: The AHA and PALS algorithm for cardiac arrest clearly state that epinephrine should be administered and repeated every 3-5 minutes (Class I, LOE B). Survival from out-of-hospital cardiac arrest in infants and children is poor; 3% for infants and 9% for children and adolescents. Despite emphasis on improving pre-hospital care in children, there has been no increase in survival rates over the past 20 years. In contrast, survival from in-hospital cardiac arrest, in infants and children, has improved from 9% in 1980 to 27% in 2006. The purpose of this study was to evaluate the current rate of pre-hospital epinephrine administration in pediatric and adult cardiac arrest patients.

Methods: We analyzed data from the National Emergency Medical Services Information System (NEMSIS) Public-Release Data Set. We identified two groups of patients with a prehospital diagnosis of cardiac arrest, pediatric patients aged 0-18 years of age and adults ( >19 years of age). We used descriptive statistics to report the percentages of out-of-hospital pediatric cardiac arrest patients that received epinephrine in the field in all ages and stratified by pediatric age groups and compared them to the adult cohort. Patients were classified as arrest prior to EMS arrival and after EMS arrival.

Results: NEMSIS 2012 data accessed on 4/10/14 had 19,831,189 patient files from 42 of 50 participating states. Data was extracted for patients coded as cardiac arrest. There were 5,318 patients 0-18 years and 154,306 patients >19 years. The overall rate of epinephrine administration is much lower in pediatric patients compared to adults. Epinephrine 1:10,000 administration was documented in 31% of patients 0-18 years and 45% for patients >19 years of age. In patients 0-18 years, the rate of epinephrine administration for cardiac arrest prior to EMS arrival was much higher at 38% when compared to 16.5% for patients with cardiac arrest after EMS arrival and on independent sample t test, this difference is statistically significant (p < 0.0005).

Conclusions: The rate of epinephrine administration in out-of-hospital pediatric cardiac arrest patients is low, averaging 31% in all pediatric age groups, and even lower (16.5%) in the setting of cardiac arrest after EMS arrival. Further investigation is required to evaluate the reasons for such low rate of epinephrine administration in out-of-hospital cardiac arrests and to determine if an association exists between low epinephrine rate and survival.
THE EFFECT OF A COMBINATION MODULE-BASED AND DIDACTIC PEDIATRIC ECG CURRICULUM ON IMPROVING ACCURACY OF ECG INTERPRETATION BY PEM PROVIDERS

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Purpose: Electrocardiograms (ECGs) are frequently ordered in the pediatric emergency department (ED). Pediatric emergency medicine (PEM) physicians are often responsible for the initial reading and management, with a cardiologist finalizing the reading after ED disposition. Studies have shown that emergency medicine and pediatric residency programs do not adequately train residents to read ECGs and this lack of training continues through to PEM physicians. Our aim was to improve the ability of PEM fellows to accurately interpret pediatric ECGs through a combination module-based and didactic ECG curriculum.

Methods: Participants included PEM fellows at a large urban pediatric teaching hospital (N=9). The previous ECG curriculum consisted of monthly didactic sessions by a cardiologist (EAG). An anonymous pre-test consisting of 20 ECGs was administered to all PEM fellows and a self-selected group of PEM attendings. Participants were asked to identify the abnormality in free text responses. A module-based ECG curriculum was created. Modules were released one week prior to an interactive session with a pediatric cardiologist (EAG). During the sessions, small groups worked through unknown ECGs related to the module. At the completion of the curriculum, a post-test designed similarly to the pre-test was administered to assess improvement in the accuracy of ECG interpretation. A satisfaction survey was also administered.

Results: The overall accuracy of identifying the ECG abnormality was 42.8% [PEM Fellows 40.6% (N=9), PEM Attendings 45.7% (N=7)]. All nine fellows completed the post-test. There was a statistically significant improvement in the ability of PEM fellows to accurately interpret ECG findings that had been taught through dedicated modules (42.0% v 53.1%, p = 0.047 using a Wilcoxon Signed-Rank test). No statistically significant improvement was found in the accuracy of interpretation of ECG abnormalities without dedicated teaching modules. Of the PEM fellows and attendings who responded to the satisfaction survey, 100% would recommend the curriculum to a colleague and 76.5% thought the ECG modules could stand alone in teaching ECG interpretation to the PEM provider.

Conclusion: The implementation of a combined module-based and didactic pediatric ECG curriculum improves the ability of PEM fellows to accurately interpret ECGs with abnormalities specifically addressed in the curriculum.

LEARNING TO BEAT THE SHOCK CLOCK: A LOW-FIDELITY SIMULATION INTERVENTION FOR PEDIATRIC AND EMERGENCY MEDICINE RESIDENTS

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Purpose: Septic shock is a major source of morbidity and mortality in children. The ability to recognize and initiate early and aggressive management for septic shock is key to improving outcomes. However, residents may have difficulty identifying and managing septic shock due to low case volume or limited exposure to Pediatric Intensive Care Units (PICU) or Pediatric Emergency Departments (PED). In lieu of these experiences, simulation-based interventions can serve as training adjuncts to enhance medical knowledge, improve competency, and generate diagnostic confidence. In this study, we implemented a novel low-fidelity tabletop simulation to improve the recognition and management of septic shock by Pediatric and Emergency Medicine residents.

Methods: Pediatric and Emergency Medicine residents anonymously completed a comfort-level survey and validated knowledge test in RedCap. The survey asked 7 questions using Likert scale responses from 1-5, with 5 being extremely comfortable or able to independently manage. The knowledge test contained 11 questions on case-based scenarios. Residents subsequently participated in a 1-hour small group, low fidelity simulation on septic shock identification and initial management. They then completed the same RedCap test and survey. Simulation learning objectives included differentiating compensated from decompensated shock; recognizing warm versus cold shock; and implementing appropriate fluid resuscitation, antibiotic therapy, and vasopressor support. Pre-intervention and post-intervention test and survey scores were compared with Student’s t-tests and 95%CI.

Results: Forty-four residents completed the pre-intervention survey and test, thirty-nine (89%) completed the simulation, and thirty-two (73%) finished the post-intervention survey and test. This included 23 Pediatric and 9 Emergency Medicine residents. Most residents had managed ≤ 2 pediatric shock patients, had completed ≤ 1 PICU rotation and had completed ≤ 2 PED rotations. The overall rate of correct answers for the pre-intervention test questions was 71% (250/352) compared to the post-intervention rate of 83% (291/352). The difference in the rates was 12%, 95% CI 5 to 18, p-value <0.001. Mean score for comfort survey was 2.94 pre-intervention vs 3.72 post-intervention with higher scores indicating greater comfort level, difference of the means 0.78, 95% CI 0.63 to 0.94, p value < 0.001. The 12 residents who did not
complete the post-intervention survey or test had mean comfort scores not significantly different from the 32 residents who completed the pre and post-intervention questions, mean scores 2.81 vs 2.94 respectively, mean difference 0.13, 95% CI -0.09 to 0.34, p-value 0.243. Residents rated this modality as more useful than lectures or reading, and equivalent to bedside teaching and high-fidelity simulation.

Conclusion: Our low-fidelity simulation was effective in improving resident knowledge and comfort with septic shock identification and management. Further studies are needed to address the impact of low-fidelity simulations on patient outcomes.

THE SONOGRAPHIC ASSESSMENT OF SPINAL FLUID FOR INFANT LUMBAR PUNCTURE

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Purpose: The lumbar puncture (LP) procedure is performed routinely in the pediatric emergency department (PED) on infants with suspected sepsis. It is widely accepted that the appropriate interspaces for LP needle insertion are located at L3-L4 and L4-L5, which corresponds with an imaginary line between the posterior superior iliac crests. Current medical practice on which interspace to insert the LP needle relies on clinician palpation of this anatomic landmark and prior experience with the procedure, however expert success rates are only 60-75% compared to novice rates of 34%. Given this knowledge of LP procedural success, we looked to answer four questions:

1. Using the palpation technique, how often do MDs choose an appropriate interspace for LP needle insertion as confirmed by ultrasound?
2. Can direct visualization with ultrasound reveal additional spaces for LP needle insertion that palpation did not identify?
3. Are there differences in spinal fluid characteristics in the sitting vs. lateral positions confirmed by ultrasound?
4. Are calculations of spinal fluid characteristics easily reproducible?

Methods: A prospective convenience sample of 46 infants <3 months-of-age were evaluated in the PED. Exclusion criteria included clinically unstable infants or those with spinal dysraphism. Using a cotton swab to simulate a spinal needle with non-toxic UV paint on the tip, Pediatric Emergency Medicine (PEM) trained attending/fellows marked the infant’s back where they would insert a needle using standard technique by palpation. A different PEM sonologist then imaged the spine using a linear high frequency probe in two orthogonal planes at the marked level in both the lateral and sitting positions. Static images and movie clips were saved for each subject and calculations were done on fluid characteristics. A second blinded PEM sonologist performed these calculations and intra-class correlation was used to measure inter-rater reliability. Paired t-tests were used to compare any differences in parametric data with position changes. Statistical tests were performed using IBM SPSS Statistics 21.

Results: see figures
Conclusions: Ultrasound can be used to confirm appropriate interspace choice for LP needle insertion and can locate safe additional interspaces, even above anatomic landmarks, for LP needle entry. Ultrasound revealed increased fluid area, including a larger dorsal fluid pocket, in the sitting position. Ultrasound calculations showed high intra-class correlation. Further research is now needed to assess these fluid characteristics on sick infants, if ultrasound technique can be generalized to multiple users, and whether these findings and the use of ultrasound can help guide LP procedural success.

UTILITY OF PEDIATRIC APPENDICITIS SCORE IN FEMALE ADOLESCENT PATIENTS

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Purpose: Acute appendicitis is the most common surgical emergency in the pediatric population. It can be difficult to diagnose in female adolescents because of potential gynecologic pathology, which results in increased testing and rates of negative appendectomies in this population. The validated Pediatric Appendicitis Score (PAS) has shown benefit in identifying pediatric patients at high and low risk of acute appendicitis in general, but its utility in female adolescents is unclear. The purpose of this study is to determine sensitivity and specificity of the Pediatric Appendicitis Score (PAS) for the subset of female adolescent patients.

Methods: This study is a retrospective observational cohort study of patient’s ages 3 to 21 years old in a pediatric emergency department with prospectively assigned PAS scores from an existing database. We compared the sensitivity and specificity of the PAS score (based on the gold standard of operative pathology) for acute appendicitis between female adolescent patients (13 to 21 years) and all others.

Results: Of the 1228 patients enrolled, 901 (73.4%) patients had complete PAS scores; the others were missing laboratory data, thus were excluded. In the analysis group, 242 (26.9%) had pathology-proven appendicitis, 494 (54.5%) were female, and 272 (30.2%) were adolescent females. Fifty-five (6.1%) of the complete PAS scores fell within the low risk category, 456 (50.6%) were in the equivocal category, and 390 (43.3%) were in the high risk category. The average PAS score was 6 +/- 2. Sensitivities and specificities for clinically important cutoffs in female adolescents vs. all other patients are listed in Table 1. All other patients in the high risk strata were 32 times more likely to have a positive appendectomy than those in lower risk strata, while the odds ratio for female adolescents in the high risk strata vs. those in the low risk strata was 8.47.

Conclusion: There was a significantly lower sensitivity yet higher specificity in the pediatric appendicitis scoring among female adolescents in the high risk strata as compared to all other pediatric patients.

Table 1: Sensitivities and specificities of the PAS in female adolescents vs all other patients.

<table>
<thead>
<tr>
<th>PAS score**</th>
<th>Females 13-21yrs</th>
<th>All other patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low ≥ 0</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Equivocal ≥ 3</td>
<td>97.7%</td>
<td>99.5%</td>
</tr>
<tr>
<td>High ≥ 7</td>
<td>58.1%</td>
<td>75.9%</td>
</tr>
</tbody>
</table>

a: p=0.018, b: p=0.031

** Risk strata based on prior validation studies and according to our institutional appendicitis clinical pathway

MANAGEMENT OF BRONCHIOLITIS IN INFANTS: A COMPARISON OF GENERAL AND PEDIATRIC EMERGENCY DEPARTMENTS IN THE UNITED STATES

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Purpose: Despite the fact that the majority of infants in the United States (US) with bronchiolitis receive care in general emergency departments (GEDs), there is a paucity of data exploring the management of bronchiolitis in GEDs compared to pediatric-focused emergency
departments (PEDs). This study compared rates of hospitalization, diagnostic testing and medication use for children with bronchiolitis between GEDs and PEDs.

Methods: This is a cross-sectional study of children <24 months of age with bronchiolitis seen in the ED from 2007-2010 using the National Hospital Ambulatory Medical Care Survey (NHAMCS). Bronchiolitis was defined as presence of an ICD-9 code for bronchiolitis (466.11, 466.19) in any of the 4 diagnosis codes provided. The primary variable of interest was ED type (PEDs vs. GEDs), with PEDs defined as EDs in which ≥75% of patients evaluated were <18 years of age. Outcomes included hospitalization, diagnostic testing (complete blood count [CBC], blood culture, urinalysis, chest radiography) and medication use (albuterol, racemic epinephrine, corticosteroids, antibiotics). Analyses accounted for the complex survey design of NHAMCS to provide nationally representative estimates.

Results: There were an estimated 819,825 visits for bronchiolitis among children younger than 24 months of age in US EDs from 2007-2010, with 73% of visits occurring in GEDs. There were no significant differences in age, sex, race, insurance status, time of day of ED visit, triage level, triage vital signs and triage oxygen saturation between GEDs and PEDs. Weighted percentages of hospitalization, diagnostic testing and medication use are shown in the Table. Multivariable logistic regression demonstrated increased odds of CBC use, radiograph use, corticosteroids administered in the ED and prescribed at discharge, and antibiotics prescribed at discharge in GEDs compared with PEDs. There was no significant difference in odds of hospitalization between GEDs and PEDs.

<table>
<thead>
<tr>
<th>PEDs,%</th>
<th>GEDs,%</th>
<th>Adjusted OR* 95%CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitalization</td>
<td>27.7</td>
<td>14.3</td>
</tr>
<tr>
<td>CBC</td>
<td>16.7</td>
<td>26.2</td>
</tr>
<tr>
<td>Blood Culture</td>
<td>8.4</td>
<td>9.6</td>
</tr>
<tr>
<td>Radiography</td>
<td>29.0</td>
<td>54.4</td>
</tr>
<tr>
<td>Urinalysis</td>
<td>7.1</td>
<td>10.9</td>
</tr>
</tbody>
</table>

Medication(ED)

| Antibiotics | 7.6 | 16.7 | 3.5 | 0.8,16.0 |
| Albuterol | 35.5 | 38.9 | 1.1 | 0.5,2.7 |
| Racemic Epinephrine | 2.4 | 1.9 | 0.5 | 0.2,1.7 |
| Corticosteroids | 1.9 | 16.5 | 15.0 | 3.3,68.8** |

Medication(Rx)

| Antibiotics | 1.9 | 26.4 | 16.8 | 2.0,142.0** |
| Albuterol | 37.6 | 30.1 | 0.6 | 0.2,2.0 |
| Corticosteroids | 1.0 | 14.2 | 17.4 | 1.8,171.2** |

*PED is reference group; adjusted for age, sex, race, academic hospital, triage level. **p<0.05

Conclusion: In infants with bronchiolitis, there is significantly higher utilization of CBC, radiography, corticosteroids and antibiotics in GEDs compared with PEDs without differences in vital signs, oxygen saturation, and hospitalization. Considering that the 2006 American Academy of Pediatrics' bronchiolitis guideline recommends against routine use of these resources, there is an opportunity to reduce unnecessary utilization in GEDs, where the majority of infants with bronchiolitis seeking emergency care in the US are treated.
VARIATION IN CARE OF THE FEBRILE YOUNG INFANT < 90 DAYS OF AGE AT U.S. PEDIATRIC EMERGENCY DEPARTMENTS

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Purpose: Various criteria are used to identify febrile young infants at low risk for serious bacterial infection; however these criteria differ in age cut-offs and testing and treatment recommendations. We aimed to evaluate the variation in testing, treatment, and disposition of febrile young infants in U.S. pediatric emergency departments (EDs).

Methods: Cross-sectional study of infants < 90 days of age with a diagnosis of fever evaluated between July 1, 2011 and June 30, 2013 in one of 37 pediatric EDs included in the Pediatric Health Information System database. We measured patient and hospital level variation in testing, treatment and disposition overall and across 3 distinct age groups: 0-28, 29-56, and 57-89 days. Bivariate analysis was used to evaluate correlations between index visit admission rate and 3-day revisits and revisits resulting in hospitalization.

Results: Over the 2-year study period, 17,057 infants met inclusion criteria. There was significant inter-hospital variation in testing and treatment across all 3 age groups (Table). Hospitalization rates also ranged widely: from 56.8% to 95.3% in neonates 0-28 days, 18.7% to 77.2% in infants 29-56 days, and 3.1% to 56.5% in patients 57-89 days. Hospitalization rate did not correlate with 3-day revisits (R²=0.05, p=0.16) or revisits requiring hospitalization (R²=0.04, p=0.24) in the overall cohort but was weakly associated with 3-day revisits (R²=0.27, p<0.001) and revisits resulting in hospitalization (R²=0.23, p=0.002) in neonates 0-28 days of age.

Conclusions: Wide variation was observed in the ED management of febrile young infants aged < 90 days at children’s hospitals. Further study is needed to explore strategies to standardize the management of the febrile young infant without compromising outcomes.

Table. Hospital level variation in management of Febrile Young Infants across 37 U.S. pediatric EDs.

<table>
<thead>
<tr>
<th>Testing2</th>
<th>0-28 days</th>
<th>29-56 days</th>
<th>57-89 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory testing3</td>
<td>Urine+Blood+CSF</td>
<td>74.2 (67.8, 80.2)</td>
<td>49.0 (35.1, 59.4)</td>
</tr>
<tr>
<td></td>
<td>Urine+Blood</td>
<td>5.8 (2.4, 7.1)</td>
<td>25.9 (21.8, 34.6)</td>
</tr>
<tr>
<td></td>
<td>Urine only</td>
<td>2.0 (0.9, 2.9)</td>
<td>2.4 (1.9, 4.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment2</th>
<th>0-28 days</th>
<th>29-56 days</th>
<th>57-89 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted</td>
<td>Ampicillin+3rd gen cephalosporin</td>
<td>76.3 (56.4, 86.3)</td>
<td>44.2 (26.4, 60.6)</td>
</tr>
<tr>
<td></td>
<td>Ampicillin+gentamicin</td>
<td>7.8 (4.4, 46.4)</td>
<td>5.8 (2.6, 9.0)</td>
</tr>
<tr>
<td></td>
<td>3rd gen cephalosporin alone</td>
<td>1.2 (0.9, 3.3)</td>
<td>30.0 (13.0, 48.9)</td>
</tr>
<tr>
<td></td>
<td>Acyclovir</td>
<td>25.8 (16.9, 43.4)</td>
<td>7.6 (5.1, 17.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Discharged from the ED</th>
<th>0-28 days</th>
<th>29-56 days</th>
<th>57-89 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone</td>
<td>7.7 (3.7, 14.3)</td>
<td>12.4 (6.2, 22.9)</td>
<td>9.9 (6.7, 15.6)</td>
</tr>
</tbody>
</table>

1Median proportion of patients undergoing testing and/or treatment at the 37 pediatric EDs.

2Testing or treatment performed on 1st or 2nd day of hospitalization

Urine testing defined as urine dipstick, urinalysis or urine culture; blood testing as CBC or blood culture; CSF testing as cell count, culture, or performance of a lumbar puncture

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SOCIODEMOGRAPHIC TRENDS IN EMERGENCY DEPARTMENT VISITS AND POST-EMERGENCY DEPARTMENT HEALTH CARE UTILIZATION FOR SELF-HARM IN YOUNG PEOPLE IN A UNIVERSAL HEALTH CARE SYSTEM

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Purpose: We examined trends in emergency department (ED) visits and post-ED health care utilization for self-harm in young people in a universal health care system.

Methods: A 9-year long, population-based cohort analysis of emergency department visits for self-harm (n=5,939) by children <18 years was conducted using administrative databases from the province of Alberta, Canada. Health services use by First Nations status or type of health care premium subsidy (family receipt of government subsidy, human services program subsidy, or no subsidy received) were described using directly standardized visit rates (per 100,000 children) and multivariable survival analyses with 95% confidence intervals to estimate time to ED return for mental health crises and inpatient hospitalization within 90 days of the index ED visit among children who were not admitted to hospital based on the index ED visit.

Results: From 2002 to 2011, annual ED visit rates for self-harm decreased. The largest decreases occurred for girls (53.93 visits per 100,000 children; p<0.001) and children aged 15–17 years (104.21 visits per 100,000 children; p<0.001). First Nations children (adjusted hazard ratio [HR] 1.74, 95% CI: 1.45–2.08) and those from families receiving subsidy (human services: HR 1.50, 95% CI: 1.17–1.92; government: HR 1.47, 95% CI: 1.24–1.74) had a higher risk of returning to an ED for mental health care earlier than children from families receiving no subsidy. Young people who visited a physician in the month prior to the index ED visit were 1.46 times more likely to return to the ED sooner (95% CI: 1.26–1.68) and had a 1.60 times higher risk of an inpatient hospitalization sooner within the 90 days that followed the index ED visit (95% CI: 1.24–2.07) compared to those without a prior physician visit. A visit to a psychiatrist after the index ED visit was protective against time to ED return (HR 0.70, 95% CI: 0.57–0.86). A physician visit in the 30-day period after the index ED visit was protective against time to inpatient hospitalization (HR 0.61, 95% CI: 0.39–0.97). However, young people had a higher risk of being hospitalized sooner if this physician visit was mental health related (HR 1.45, 95% CI: 1.06–1.97).

Conclusion: ED visits for self-harm in children have decreased in Alberta. Sociodemographics and health care utilization predicted an earlier return to the ED but time to inpatient hospitalization was not predicted by sociodemographics.

SKIN TO INTRAMUSCULAR COMPARTMENT THIGH MEASUREMENT BY ULTRASOUND IN PEDIATRIC POPULATION

Myto Duong and Albert Botchway, PhD, Southern Illinois University, School of Medicine, Springfield, IL

Purpose: The objective of the study is to determine needle length requirements for intramuscular injections of medication or vaccines by using an ultrasound to measure the distance from skin to muscle compartment of the thigh in pediatric patients of various weight and body mass indexes (BMI).

Background: Recent studies have shown that certain life-saving medications, such epinephrine in anaphylaxis, should be given intramuscularly for quicker onset of action (1, 2). Blood levels of epinephrine are therapeutic at 8 minutes if it is given intramuscularly in the anterolateral aspect of the thigh versus 22 minutes when it is given subcutaneously (1).

It is also well known that obesity is a growing issue in the pediatric population in the United States. With the increase in body habitus, problems of appropriate intramuscular medication delivery via standard needle lengths (1/2", 5/8", 1" and 1.5") to these children is a great concern and potentially deadly. Stecher et al 2009 found that the epinephrine auto-injector lengths were too short to reach the muscle compartment for most pediatric patients (3). The ultimate goal of this study will be generate a graph of BMI versus distance to the muscle compartment which physicians can use to select appropriate needle lengths for intramuscular injections. Epinephrine auto-injectors may be revised to allow for adjusting the needle lengths based on the patient’s BMI.

Methods: This is a prospective pilot feasibility study involving a convenience sampling of 117 pediatric patients (< 18 years of age without chronic illness which may impede normal growth and development) who present to the emergency department. Ultrasound measurements (cm) from the skin to the surface to bone and muscle layer of the vastis lateralis muscle was obtained while the child is in a supine position with the legs in extension. Patient’s age (in months), height (cm) and weight (kg) will be recorded in order to calculate each patient’s BMI. Other patient information collected include, age, gender and ethnicity. Pearson correlation coefficient was calculated.

Results: Pearson correlation coefficient for BMI to bone and muscle were 0.80 and 0.60 with p-values <0.001, respectively. The mean BMI was 19 with standard deviation of 5.3. Mean depths to bone and muscle were 3.84 and 0.72 cm.
Conclusions: Although there is a linear correlation between skin to muscle and bone depth with body mass index, with more data, a non-linear curve may be more apparent. More data points are also required to further establish correlation for different age groups and gender. The graph will be useful in determining appropriate size needles required for patients of variable BMI to ensure intramuscular administration of medications or vaccines.
PARENTAL KNOWLEDGE OF CONCUSSION

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Purpose: Since concussions commonly occur during play and sport, parents may have a key role in identification, and advocating for sport removal and assessment by a physician. However, information on parental knowledge of recognizing and understanding concussion is currently very limited. We determined the proportion of parents who identified concussion as an injury to the head that causes non-hemorrhagic brain injury and presents with brain-related symptoms. We also examined the association between parental knowledge of concussion and their demographic variables, parental awareness of appropriate actions if concussion is suspected, and compared parent versus physician diagnosis of concussion for the child’s head injury.

Methods: Parents of children aged 5-18 years presenting to a pediatric emergency department within 2 weeks of a head injury were asked to participate in a 24-item questionnaire. Survey questions were derived and validated using expert opinion, available literature, and pre- and pilot-testing of questions on the target audience.

Results: Of 593 eligible parents, 511 (86.2%) were enrolled. Of these, 350 (68.4%) were female, 411 (80.5%) were aged 31-50 years, 437 (85.5%) had post-secondary education, and 370 (72.5%) reported a history of participation in an organized sport. Importantly, 242 (47.7%; 95% CI 43.4, 52.1) parents correctly identified concussion as an injury to the head that causes non-hemorrhagic brain injury and presents with brain-related symptoms. There were no parental demographics (age, sex, education, prior history of organized sport participation) that were significantly predictive of concussion knowledge. Of the respondents, 40.0% believed their child’s current head injury may be a concussion, while physician diagnosed concussion for this population was 29.3% (p = 0.45). The inter-rater agreement between physicians and parents in labeling the child’s head injury as a concussion was poor, kappa = 0.011. If a parent thought their child had a concussion, 460 (91.5%) would appropriately stop the child’s play and see a physician. Although 502 (98.2%) understood that a concussion would lead to restricted activities for the child, only 135 (26.4%) were familiar with Return-to-Play guidelines.

Conclusion: About 50% of parents were able to correctly identify concussion, but the correlation between physician and parent perception of diagnosis of concussion was poor. Furthermore, most parents were aware of proper immediate actions once a head injury occurred but were not aware of Return-to-Play guidelines. These results support the strengthened recommendation of an early physician visit to provide families with an assessment for the correct diagnosis and to educate families on appropriate anticipatory guidance and follow up for their child’s injury.

SEPSIS IN CHILDREN ADMITTED TO HOSPITAL FOLLOWING TRAUMATIC BRAIN INJURY

Anjali Pandya, MD, FRCPc1, Ari Joffe, MD FRCPc2, Jonathan Guilfoyle, MD FRCPc3, Sherry MacGillivray, RN3, Jessica McKee, BA, MSc4 and Graham C. Thompson, MD, FRCPc1, (1)University of Calgary, Calgary, AB, Canada, (2)Emergency Medicine, Stollery Children’s Hospital/University of Alberta, Edmonton, AB, Canada, (3)Emergency Medicine, Alberta Children’s Hospital/University of Calgary, Calgary, AB, Canada, (4)University of Alberta, Edmonton, AB, Canada

Purpose: Sepsis is the primary cause of death in 5.6% of adult trauma patients overall, but up to 33% in those with Traumatic Brain Injury (TBI) suggesting an interruption in the neuro-immune axis. While TBI is an important contributor to morbidity and mortality in the pediatric population, it is unknown whether children with neurologic injury have higher risk for sepsis similar to adults. The objective of this study was to identify the association between traumatic brain injury (TBI) and infection/sepsis in pediatric patients.

Methods: In this province-wide cohort of children with significant trauma (Injury Severity Score ≥12), all patients under 18 years of age entered into the Alberta Trauma Registry (ATR) between January 1st 2003 and December 31st 2012 were reviewed. Patients who died within the first 24 hours were excluded. Hospital admissions occurring within 1 year of the index trauma were linked to ATR records to identify those with ICD-10-CA diagnostic codes for sepsis. Primary outcomes included the proportion of children with any TBI who developed a) sepsis and/or b) any infection. Secondary outcome included the proportion of children with isolated TBI who developed sepsis and infection.

Results: 1460 eligible children were identified including 933 (63.9%) patients with any TBI. Isolated TBI occurred in 242 (16.6%). Sepsis was reported in 9/933 (1.0%) children with any TBI compared to 15/527 (2.8%) children without TBI (OR 0.33 95%CI 0.13 – 0.82). Infection was documented in 237/933 (25.4%) of those with any TBI compared to 165/527 (31.3%) of those without TBI (OR 0.75 95%CI 0.59 – 0.95). In children with isolated TBI, the odds of sepsis (0/242, 0%) and infection (7/242, 2.9%) were significantly different than in those children without TBI (OR 0.00 95%CI 0.00 – 0.54 and OR 0.07 95%CI 0.03 – 0.14 respectively).

Conclusion: Pediatric patients with any TBI and those with isolated TBI have lower rates of infection and sepsis than those without TBI, contrary to previously reported adult cohorts. Our results support the need for future studies investigating the differences between children and adults regarding the function of the neuro-immune axis following TBI and its impact on patient outcomes.
IMPROVING THE PHYSICIAN HANDOFF PROCESS AT SHIFT CHANGE IN A PEDIATRIC ED


Purpose: Handoffs of care at shift change are part and parcel of care in any ED. Poor communication during handoffs can lead to low quality of care and can compromise patient safety. Good quality handoffs, however, can improve quality along multiple domains and lead to reduction in adverse events.

Methods: We instituted improvement of handoff of care in the ED using IHI rapid cycle improvement principles. We devised specific aims, instituted changes to achieve them, and matrices to measure them. We set goals to make our handoff rounds multi-disciplinary (physicians as well as nurses, RTs, and child life staff to be present to improve communication among the staff), patient and family centered (near the rooms; involve patient and family) equitable (all patients treated in the same way); efficient (concise but all relevant information in a structured format), timely (rounds begin punctually at shift change time), and to aid in improving ED safety culture and situational awareness by having a safety tip or story and the nurse team lead provide information about the current state of the ED/hospital. The ED staff filled out an evaluation form regarding the handoff process over two one–month periods. After the first round of data collection and analysis, we learnt lessons and instituted changes to further improve performance on all parameters.

Results: Data were collected for 56 and 67 handoff sessions respectively during the two periods, by 20 clinicians. The data for the various matrices for the 2 periods are shown in the Table. The performance improved significantly for review of teaching point, family involvement, and for overall handoff (Figure)

<table>
<thead>
<tr>
<th></th>
<th>First Evaluation Period (Nov-Dec 2013)</th>
<th>2nd Evaluation Period (Feb-Mar 2014)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=56</td>
<td>N=67</td>
<td></td>
</tr>
<tr>
<td>Survey completed by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Å Attendings</td>
<td>34</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Å Fellows</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Å NPs</td>
<td>12</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Å RNs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal introduction of team members</td>
<td>55/56 (98%)</td>
<td>63/64 (98%)</td>
<td>0.92</td>
</tr>
<tr>
<td>Review of safety tip</td>
<td>39/53 (74%)</td>
<td>55/66 (83%)</td>
<td>0.19</td>
</tr>
<tr>
<td>Review of teaching point</td>
<td>32/56 (57%)</td>
<td>57/67 (85%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Bedside RN present for &gt;50% of patients</td>
<td>34/55 (62%)</td>
<td>36/67 (54%)</td>
<td>0.37</td>
</tr>
<tr>
<td>Active RN participation (when bedside RN present for &gt;50% of patients)</td>
<td>12/33 (36%)</td>
<td>32/36 (89%)</td>
<td>0.000</td>
</tr>
<tr>
<td>Mobile computer with EMR used</td>
<td>49/54 (91%)</td>
<td>55/63 (87%)</td>
<td>0.55</td>
</tr>
<tr>
<td>Average score for overall quality of handoff (Likert score from 0-9, 9 being best)</td>
<td>8.13 (SD 0.62)</td>
<td>8.49 (SD 0.82)</td>
<td>0.000</td>
</tr>
<tr>
<td>Eligible patients introduced to incoming team</td>
<td>119/140 (85%)</td>
<td>138/139 (99%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Average handoff time</td>
<td>16 min (range: 5-33)</td>
<td>16 min (range: 3-32)</td>
<td>0.39</td>
</tr>
</tbody>
</table>
Conclusion: We were successful in achieving efficient, high quality multidisciplinary rounds in the ED with significant improvement in the overall quality score of handoff and in communication with families over the two test periods.

A MULTI-CENTER, RANDOMIZED, OPEN-LABEL, PARALLEL, ACTIVE-COMPARATOR TRIAL TO DETERMINE THE EFFICACY AND SAFETY OF INTRAVENOUS IBUPROFEN IN PEDIATRIC PATIENTS

Corrie E. Chumpitazi, MD1, Barry J. Hahn, MD2, Charles G. Macias, MD, MPH2 and Samia N. Khalil, MD3, (1)Texas Children’s Hospital-Baylor College of Medicine, Houston, TX, (2)Staten Island University Hospital, Staten Island, NY, (3)The University of Texas Medical School at Houston, Houston, TX

Purpose: Fever in children is a clinical manifestation of a variety of diseases and a common presenting complaint in the Emergency Department. The choice of medication for fever treatment and route of administration is variable. An intravenous (IV) formulation of ibuprofen was approved by the Food and Drug Administration (FDA) to treat pain and fever in adults in 2009. This study was designed to evaluate efficacy and safety of IV ibuprofen when compared to oral or suppository acetaminophen in the treatment of febrile pediatric patients.

Methods: A total of 100 children, aged 6 months to 16 years, with a new onset of fever ≥ 38.3°C were randomized to receive a single dose of 10 mg/kg IV ibuprofen (maximum single dose 400 mg) or 10 mg/kg acetaminophen oral or suppository (maximum single dose 650 mg). Additional doses of study medication were administered, if needed, over a five day treatment period. The primary outcome was the area under the curve for change in temperature versus time from baseline to two hours after the start of dosing. Assessments of temperature, vital signs, laboratory measurements and adverse events were performed throughout the six day study period. Blood samples were obtained for pharmacokinetic analysis.

Results: The groups were similar with 47 patients receiving IV ibuprofen and 53 receiving acetaminophen. All subjects received a minimum of one dose of study medication. There was a significant decrease in area under the curve in temperature when comparing baseline versus two hours in patients receiving IV ibuprofen compared to those receiving acetaminophen (figure 1, -1.5 ± 1.11 vs. -0.9 ± 0.89, p=0.012). A significant difference between the groups was also observed after four and 24 hours. Significantly more patients were afebrile after four hours when receiving IV ibuprofen compared to acetaminophen (91% vs. 75%, p=0.036). More patients receiving IV ibuprofen experienced infusion site pain, but there was otherwise no difference in the adverse events between the groups. The pharmacokinetic data of the IV ibuprofen patients revealed the highest temperature occurred at the end of the infusion and the elimination half-life was short (0.79 - 2.87 hours, mean 1.55 hours). As expected, the clearance and volume of distribution increased with age.

Conclusion: Intravenous ibuprofen significantly reduced temperature in pediatric patients compared to those receiving acetaminophen (oral or suppository). Both single and multiple doses of intravenous ibuprofen were well tolerated and no serious adverse events were noted.