American Academy of Pediatrics
SECTION ON EMERGENCY MEDICINE

Scientific Abstract & Educational Program
Basic & Advanced Point-of-Care Ultrasound Workshops
Subcommittee-SIG Meetings

SEPTEMBER 15-18, 2017
MCCORMICK PLACE WEST
CHICAGO, ILLINOIS

Updated: August 25, 2017
AAP Section on Emergency Medicine

SUBCOMMITTEE-SIG MEETING SCHEDULE

September 2017

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<td>Fri, Sept 15 (8am-9am)</td>
<td><strong>National Pediatric Readiness Project SIG</strong></td>
<td>McCormick Place West – W192 A</td>
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<td>Fri, Sept 15 (9am-11am)</td>
<td><strong>PEM North American Division Chiefs (invite only)</strong></td>
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<td>Sat, Sept 16 (1:00pm-3:00pm)</td>
<td><strong>PEM Collaborative Research Committee</strong></td>
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<td>Sat, Sept 16 (4:00pm-5:30pm)</td>
<td><strong>Urgent Care</strong></td>
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SECTION ON EMERGENCY MEDICINE PROGRAM & RECEPTION – DAY 1 (H0016) – ROOM S101

9:00 AM – 12:00 PM  COMMITTEE FOR THE FUTURE PROGRAM
Moderator: Angela Lumba-Brown, MD, FAAP & Javier Gonzalez del Rey, MD, MEd, FAAP

CAREERS IN PEDIATRIC EMERGENCY MEDICINE

9:00 AM – 10:30 AM  FINDING MY CAREER PATH: THOUGHTS FROM JUNIOR, MID-LEVEL AND SENIOR FACULTY
A Panel Discussion
Brian Wagers, MD, FAAP
Mimi Lu, MD
Joseph Wright, MD, MPH, FAAP

10:30 AM – 12:00 PM  FINDING MY CAREER: SMALL GROUP DISCUSSIONS
1) Advocacy (co-facilitators: Lenore Jarvis, Joseph Wright)
2) Urgent Care/Community PEM (co-facilitators: Brian Wagers, Jeff Schor)
3) Education (co-facilitators: In Kim, Javier Gonzalez Del Rey)
4) Research (co-facilitators: Todd Florin, Lise Nigrovic)
5) Pre-hospital Care/EMS (co-facilitators: Karen O’Connell, Toni Gross)
6) Administration (co-facilitators: Sandra Herr, Steve Krug)

You will have 25 mins in a small group of your choice and then rotate to another group of your choice. There will be 3 rotations.

12:00 – 1:00 PM  LUNCH

1:00 – 5:30 PM  SCIENTIFIC ABSTRACT PRESENTATIONS, POSTERS & AWARDS
Moderator: Prashant Mahajan, MD, MPH, MBA, FAAP

1:00 PM – 1:15 PM  KEN GRAFF RESEARCH AWARD: NIDHI VAIDYA, MD, FAAP
Presented by: David Schnadower, MD, MPH, FAAP
Project Title: Sucralfate to Improve Oral Intake in Children with Infectious Oral Ulcers: A Randomized, Double-blind, Placebo-Controlled Trial

1:15 PM – 1:30 PM  KEN GRAFF 2015 PROJECT REPORT
Project Title: Development of a Decision Tool to Decrease Unnecessary Antibiotic Prescription Changes Due to Reported Penicillin Allergies
David E. Vyles, DO, FAAP

1:30 PM – 3:15 PM  ABSTRACT SESSION I
Moderators: Lois Lee, MD, MPH, FAAP / Elizabeth Powell, MD, FAAP

1:30 PM 1. Heather Kelker, MD
Variation in the Use of Mechanical Ventilation and Medications for Pediatric Status Asthmaticus

1:45 PM 2. Jennifer F. Anders, MD, FAAP
Creating an Evidence-Based Pediatric Prehospital Destination Tool (PDTree): An Expert Panel Process Using a Modified-Delphi Method

2:00 PM 3. Elizabeth R. Alpern, MD, MSCE, FAAP
Time to Positive Blood and Cerebrospinal Fluid Cultures in Febrile Infants ≤ 60 Days-old

2:15 PM 4. Michele Nypaver, MD, FAAP
The Michigan Emergency Department Improvement Collaborative: A Novel Model for Implementing Large Scale Practice Change in Pediatric Emergency Care
2:30 PM  5. **Amanda Stewart, MD, MPH, FAAP**
Pediatric Emergency Department Visits for Homelessness After Shelter Eligibility Policy Change: An Interrupted Time Series Analysis

2:45 PM  6. **Jennifer Thull-Freedman, MD, MSc, FAAP (QUALITY IMPROVEMENT)**
Improving the Pain Experience for Children with Limb Injury in the City of Calgary, Alberta: A Multi-Site Quality Improvement Collaborative

3:00 PM  7. **Shilpa J. Patel, MD, MPH, FAAP**
Geographic Regions with Stricter Gun Laws Have Fewer Emergency Department Visits for Pediatric Firearm-Related Injuries: A Five-Year National Study

3:15 PM – 3:30 PM

**INTRO TO THE POSTERS (1 MINUTE PRESENTATION BY EACH POSTER PRESENTER)**

3:30 PM – 3:45 PM

**BREAK/VIEW POSTERS**

(1) **Erika O. Bernardo, MD, FAAP**
Kidney Injury Detection and Prevention in Children (KIDPIC)

(2) **Holly Depinet, MD, MPH, FAAP (QUALITY IMPROVEMENT)**
Pediatric Septic Shock Collaborative: Description of Early Improvement?

(3) **Monika Goyal, MD, MSCE, FAAP**
Patient and Caregiver Attitudes Towards Comprehensive Behavioral Health Screening in the Emergency Department

(4) **Lenore Jarvis, MD, MEd, FAAP (QUALITY IMPROVEMENT)**
Domestic Safety Screening in a Pediatric Emergency Department: QI Measures for Improved Screening

(5) **Amanda Jichlinski, MD**
Rates of HIV and Syphilis Testing Among Adolescents Diagnosed with Pelvic Inflammatory Disease

(6) **Seth W. Linakis, MD**
Factors Associated with Interventions for Intra-Abdominal Injuries in Children after Motor Vehicle Crashes

(7) **Tara L. Neubrand, MD, FAAP (QUALITY IMPROVEMENT)**
Rapid Sequence Intubation Standardization and Improvement Process in the Pediatric Emergency Department

(8) **Shilpa J. Patel, MD, MPH, FAAP**
A Machine-Learning Approach to Predicting Need for Hospitalization for Pediatric Asthma Exacerbation at the Time of Emergency Department Triage

(9) **Lauren C. Riney, DO, FAAP**
Geographical Variation in Pediatric Emergency Medical Services Utilization

(10) **Alexandre T. Rotta, MD**
A Nationwide Analysis of Emergency Department Utilization of Head CT in Children with Closed Head Injury

(11) **Bashar Shihabuddin, MD, FAAP**
Clinical Findings Increase the Specificity of the FAST Exam: A Strategy to Guide Imaging in Blunt Pediatric Trauma

(12) **Muhammad Waseem, MD, MS, FAAP**
High Proportion of False Negative Urinary Tract Infections Among Dilute Urine Samples

(13) **Sheryl E. Yanger, MD, FAAP**
Firearm Safety: A Survey on Practice Patterns, Knowledge and Opinions of Pediatric Emergency Medicine Providers

(14) **Tania Ahluwalia, MD, FAAP (QUALITY IMPROVEMENT)**
Reducing Rapid Streptococcal Pharyngitis Testing in Patients Less than 3 Years Old
3:45 PM – 5:30 PM

**ABSTRACT SESSION II**

*Moderators: Lei Chen, MD, MHS / Lise Nigrovic, MD, MPH, FAAP*

3:45 PM  
8. **Kathleen M. Adelgais, MD, MPH, FAAP**  
   A Randomized Double Blind Trial of a Needle-free Injection System to Topical Anesthesia for Infant Lumbar Puncture

4:00 PM  
9. **Paul C. Mullan, MD, MPH, FAAP (QUALITY IMPROVEMENT)**  
   A Quality Improvement Project to Decrease Blood Culture Contaminants in a Pediatric Emergency Department: An Interrupted Time Series Analysis

4:15 PM  
10. **Jay Pershad, MD, MMM, FAAP**  
   Optimal Imaging Strategy for Suspected Acute Cranial Shunt Failure: A Cost-Effectiveness Analysis

4:30 PM  
11. **Stephen Freedman, MDCM, MSc, FAAP**  
   Relationship between Enteric Pathogen and Acute Gastroenteritis Disease Severity: A Prospective Cohort Study

4:45 PM  
12. **Fran Balamuth, MD, PhD, MSCE, FAAP**  
   Predictive Modeling for Organ Dysfunction in Children with Suspected Sepsis in the Emergency Department

5:00 PM  
13. **David Piechota, MD, FAAP**  
   Refinement of Appendix Ultrasound Interpretation to Limit Equivocal Results

5:15 PM  
14. **Rohit P. Shenoi, MD, FAAP**  
   The Pediatric Submersion Score Predicts Children at Low Risk for Injury Following Submersion

5:30 PM – 7:00 PM

**SECTION ON EMERGENCY MEDICINE RECEPTION**  
*Sponsored by EBSCO Health/PEMSOFT*

5:30 PM  
**VIEWING OF POSTERS**

6:15 PM  
**PRESENTATION OF TOP 5 POSTERS**

6:30 PM  
**EBSCO-PEMSOFT AWARD FOR TECHNOLOGICAL INNOVATIONS IN PEDIATRIC EMERGENCY MEDICINE**  
2017 **AWARDEE:** **MARIA CARMEN G. DIAZ, MD, FAAP, FACEP**  
*Presented by: John Loiselle, MD, FAAP*

6:45 PM  
**ABSTRACT AWARDS:**

- **BEST OVERALL ABSTRACT**
- **BEST QUALITY IMPROVEMENT ABSTRACT**
- **BEST POSTER**
- **WILLIS WINGERT AWARD FOR OUTSTANDING RESIDENT-FELLOW PAPER**

7:00 PM  
**ADJOURN**
8:00 AM – 9:00 AM  
**EMERGQUIZ PRESENTATIONS – PART I**  
Thuy Ngo, DO, MEd, FAAP  

Case 1: “Can’t Poop, Can’t Pee...What’s Wrong with Me”  
Case 2: “More than Just Teenage Angst”

9:00 AM – 9:45 AM  
**STATE OF THE SECTION**  
Prashant Mahajan, MD, MPH, MBA, FAAP – Chair, SOEM Executive Committee

**SUBCOMMITTEE-SIG CHAIR REPORTS**  
Committee for the Future (Angela Lumba-Brown, MD, FAAP)  
Disaster Preparedness (Deanna Dahl-Grove, MD, FAAP)  
Education (Deborah Hsu, MD, MEd, FAAP)  
Emergency Medical Services (Toni Gross, MD, MPH, FAAP)  
Fellowship Directors (In Kim, MD, FAAP)  
National Pediatric Readiness Project (Kate Remick, MD, FAAP)  
PEM Collaborative Research Committee (Lise Nigrovic, MD, MPH, FAAP)  
PEM North American Division Chiefs (Paul Sirbaugh, DO, MBA, FAAP)  
Quality Transformation (Paul Mullan, MD, MPH, FAAP / Meg Wolff, MD, FAAP)  
Urgent Care (Jeff Schor, MD, FAAP / Usha Sankrithi, MD, MPH, FAAP)

9:45 AM – 10:00 AM  
**JIM SEIDEL DISTINGUISHED SERVICE AWARD:** KATHY N. SHAW, MD, MSCE, FAAP  
Presented by: Elizabeth Alpern, MD, MSCE, FAAP

10:00 AM – 10:15 AM  
**MICHAEL SHANNON HUMANITARIAN AWARD:** CHARLES J. SCHUBERT, MD, FAAP  
Presented by: Richard Ruddy, MD, FAAP

10:15 AM – 10:30 AM  
**BREAK**

10:30 AM – 11:30 AM  
**JUSTIFICATION FOR BUILDING A QI PROGRAM & SPENDING RESOURCES ON QI IN THE ED**  
Richard Ruddy, MD, FAAP

11:30 AM – 12:30 PM  
**PEMPix PHOTO COMPETITION** (Audience Response)  
Brad Sobolewski, MD, MEd, FAAP

12:30 PM – 1:30 PM  
**LUNCH**

1:30 PM – 2:30 PM  
**EMERGQUIZ PRESENTATIONS – PART II**  
Thuy Ngo, DO, MEd, FAAP  

Case 3: “Two-Year Old with Emesis and Abdominal Pain”  
Case 4: “Hindsight is 20/20”

2:30 PM – 2:50 PM  
**BREAK**

2:50 PM – 3:00 PM  
**EMERGQUIZ AWARD PRESENTATIONS** (Audience Response)  
Thuy Ngo, DO, MEd, FAAP

3:00 PM – 5:00 PM  
**MANAGING BRONCHIOLITIS: THE GUIDELINES VS. THE PRACTICE** (Audience Response)  
Todd Florin, MD, MSCE, FAAP / Julia Fuzak Freeman, MD, FAAP
SECTION ON EMERGENCY MEDICINE MORNING PROGRAM – DAY 3 (H2025) – ROOM S101

JOINT PROGRAM: SECTION ON EMERGENCY MEDICINE & SECTION ON TELEHEALTH CARE

Moderator: Pavan Zaveri, MD, MEd, FAAP

8:30 AM – 9:30 AM  HOW TO SET UP A TELEMEDICINE PROGRAM
Joshua Alexander, MD, FAAP

9:30 AM – 10:30 AM  THE EFFECTS OF DIRECT TO CONSUMER TELEMEDICINE ON PEDIATRIC EMERGENCY DEPARTMENTS
Mordechai Raskas, MD, EdM, FAAP

10:30 AM – 11:30 AM  THE USE OF TELEMEDICINE IN INTERFACILITY TRANSPORTS
Alison Curfman, MD, FAAP

11:30 AM – 1:00 PM  LUNCH

SECTION ON EMERGENCY MEDICINE AFTERNOON PROGRAM – DAY 3 (H2012) – ROOM S102 A-C

PEDISONOFEST ULTRASOUND COMPETITION

1:00 PM – 3:00 PM  PediSONOFest
Stephanie Leung, MD, FAAP / Monisha Shah, MD, FAAP
**SECTION ON EMERGENCY MEDICINE PROGRAM – DAY 4 (C3016) – ROOM S102 A-C**

**REGISTRATION REQUIRED**

**JOINT PROGRAM: SECTION ON EMERGENCY MEDICINE & SECTION ON HOSPITAL MEDICINE**

*Course Co-Directors: Fred Warkentine, MD, FAAP & Aaron Kornblith, MD*

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<td>Welcome &amp; Introduction</td>
<td>Fred Warkentine, MD, FAAP</td>
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<td>8:15 AM – 8:30 AM</td>
<td>Principles of Ultrasound: Physics and Artifacts</td>
<td>Joanna Cohen, MD, FAAP</td>
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<td>8:30 AM – 9:00 AM</td>
<td>Evaluation of Skin and Musculoskeletal System</td>
<td>Aaron Kornblith, MD</td>
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<td>9:00 AM – 9:30 AM</td>
<td>Integrating Ultrasound with Routine and Critical Procedures</td>
<td>Keith P. Cross, MD, FAAP</td>
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<td>9:30 AM – 9:45 AM</td>
<td>Break</td>
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<tr>
<td>9:45 AM – 10:45 AM</td>
<td>Hands On: System Basics, Skin and Soft Tissue, Musculoskeletal, Procedures</td>
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<td>10:45 AM – 11:15 AM</td>
<td>Approach to the Trauma Patient: e-Fast</td>
<td>Lorraine Ng, MD, RDMS</td>
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<td>11:15 AM – 11:45 AM</td>
<td>Approach to the Patient with Abdominal Pain</td>
<td>Adam Sivitz, MD, FAAP</td>
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<td>11:45 AM – 1:15 PM</td>
<td>Lunch</td>
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<tr>
<td>1:15 PM – 2:00 PM</td>
<td>Hands On: e-Fast and Abdominal</td>
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<td>2:00 PM – 2:30 PM</td>
<td>Cardiac Cases from the Emergency Department</td>
<td>Kiyetta, Alade, MD, RDMS, FAAP</td>
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<td>2:30 PM – 3:00 PM</td>
<td>Evaluation of Patients in Respiratory Distress</td>
<td>Dave Teng, MD</td>
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<td>3:00 PM – 4:00 PM</td>
<td>Hands On: Cardiac and Thoracic</td>
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<td>4:00 PM – 4:15 PM</td>
<td>Break</td>
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<td>4:15 PM – 4:30 PM</td>
<td>Point-Of-Care Ultrasound Now and The Future</td>
<td>Erika Constantine, MD</td>
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<td>4:30 PM – 5:30 PM</td>
<td>Ultrasound Games</td>
<td>Monisha Shah, MD FAAP and Stephanie Leung, MD, FAAP</td>
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**Hands-on Instructors:** Joanna Cohen, MD, FAAP; Erika Constantine, MD, FAAP; Sasha Dubrovsy, MD; Marla Levine, MD; Rachel Rempell, MD; Rebecca Starr, DO, FAAP; Matthew Kusulas, MD, FAAP
SECTION ON EMERGENCY MEDICINE PROGRAM – DAY 4 (C3015) – ROOM S101
(REGISTRATION REQUIRED)

JOINT PROGRAM: SECTION ON EMERGENCY MEDICINE & SECTION ON CRITICAL CARE

Advanced Point-of-Care Ultrasound Workshop: US-Guided Resuscitation: Precision Care for the Critically Ill Child

Course Co-Directors: Russ Horowitz, MD, RDMS & David Kessler, MD, MSC, RDMS, FAAP

8:00 AM – 8:15 AM          ORIENTATION TO ASSESSMENT AND EDUCATION STATIONS
                             Russ Horowitz, MD, RDMS

8:15 AM – 9:00 AM          HANDS ON ROTATION #1

9:00AM – 9:45 AM           HANDS ON ROTATION #2

9:45 AM-10:45 AM           ULTRASOUND IN THE CRITICALLY ILL PATIENT - Atim Uya, MD
                             Audience driven interactive case based discussion

10:45 AM – 11:30 AM        HANDS ON ROTATION #3

11:30 AM – 12:15 PM        HANDS ON ROTATION #4

12:15 PM – 1:00 PM         HANDS ON ROTATION #5

1:00 PM – 1:30 PM          FEEDBACK AND EVALUATION

Hands-on Instructors:
  Advanced Echocardiography #1 - Jeff Burzynski, MD
  Vascular Access (central and peripheral) - Jen Marin, MD; Dave Kessler, MD, MSC, RDMS, FAAP
  IVC and Lung - Atim Uya, MD; Lei Chen, MD, MHS; Sasha Dubrovsky, MD
  Ultrasound Simulated Resuscitation - Amanda Green Toney, MD, FAAP; Keith Cross, MD, FAAP
  Advanced Echocardiography #2 - Daniel Park, MD
Variation in the Use of Mechanical Ventilation and Medications for Pediatric Status Asthmaticus

Heather Kelker, MD1; Rachel Stanley, MD MHSA2; Julie C. Leonard, MD MPH3; Daniel Cohen, MD3; David Kline, PhD4; Songzhu Zhao, MS5; Kristin Stukus, MD6, (1) Nationwide Children’s Hospital, Indianapolis, IN, (2) The Ohio State University / Nationwide Children’s Hospital, Columbus, OH, (3) The Ohio State University/ Nationwide Children’s Hospital, Columbus, OH, (4) Department of Biomedical Informatics, The Ohio State University, Columbus, OH, (5) Center for Biostatistics The Ohio State University College of Medicine Department of Biomedical Informatics, Columbus, OH, (6) Nationwide Children’s Hospital, Columbus, OH

Purpose: Practice variation exists in the management of children with status asthmaticus. There are no explicit recommendations for the intensive treatment of asthma, particularly for the use of invasive and non-invasive positive pressure ventilation. Our purpose was to describe national practice and trends in the use of invasive positive pressure ventilation (IPPV), non-invasive positive pressure ventilation (NiPPV), and second-line medications; and, to report treatment complications for children with status asthmaticus.

Methods: We conducted a retrospective cohort study of children ages 2-18 years admitted with status asthmaticus to 46 pediatric hospitals participating in the Pediatric Health Information System from 2010 to 2015. We excluded children who had complex chronic conditions, no asthma treatments, and/or missing NiPPV data. Patient demographics, clinical characteristics, and medications were obtained and compared using generalized estimating equations and non-parametric Kruskal Wallis testing. We calculated quarterly rates of IPPV and NiPPV using generalized estimating equations that accounted for clustering by hospital. Results: There were 121,714 children admitted for status asthmaticus over the study period. After applying exclusion criteria, 90,777 children were eligible for analysis: 2,793 (3.1%) received IPPV; 3,039 (3.3%) received NiPPV; and, 84,945 (93.6%) received medications without PPV. There was no change in IPPV and NiPPV use (Figure 1), however, there was wide practice variation across hospitals (Figure 2). Children who received IPPV were younger than those who received NiPPV (p < 0.0001), and had higher risk of mortality (p < 0.0001). There were no significant differences in pediatric intensive care unit and hospital length of stay between those who received IPPV and NiPPV. Most received inhaled beta-agonists (98.3% IPPV; 93.9% NiPPV), and ipratropium bromide (72.5% IPPV; 76.5% NiPPV). Magnesium sulfate use was higher in those children who received IPPV and NiPPV versus those who did not (63.5%, 69.1% vs. 29.8%, p=0.003). Administration of intravenous bronchodilators was higher in those children who received IPPV and NiPPV versus those who did not: terbutaline (21.5%, 27.2% vs. 2.9%, p=0.0001), aminophylline (8.7%, 7.0% vs 0.6%, p=0.00008), and epinephrine (29.0%, 17.5% vs. 4.9%, p=0.0123). Use of second-line asthma medications also varied across hospitals (data not presented). Sedative medication use was more common for children receiving IPPV: ketamine (21.5% IPPV; 8.4% NiPPV), dexmedetomidine (29.3% IPPV; 11.2% NiPPV), midazolam (24.4% IPPV; 6.0% NiPPV), and lorazepam (19.7% IPPV; 7.6%). Complication rates were low, however, children who received IPPV had higher rates for pneumothorax (1.5%, p=0.0002) and aspiration pneumonia (0.97%, p=0.0004).

Conclusion: IPPV and NiPPV use in children with status asthmaticus did not change during the study period; however, there was wide variability in the use of PPV and second-line medications at the hospital level. There is a need to create national guidelines for the management of status asthmaticus in order to reduce practice variation.
Figure 1. Rates of IPPV and NiPPV Use Over Time

This is a graphical representation of invasive positive pressure ventilation (IPPV) and non-invasive positive pressure ventilation (NiPPV) rates of use over time, expressed as a percentage of total asthma hospital admissions by quarter, by year. Points represent the rate and bars represent the 95% confidence intervals.

Figure 2. Rates of IPPV, NiPPV, and Medications by Hospital

This is a graphical representation of invasive positive pressure ventilation (IPPV; red bars) use, non-invasive positive pressure ventilation (NiPPV; blue bars), and medications without positive pressure ventilation (Medication; green bars) by hospital, expressed as a percentage of total asthma admissions over the 6-year study period.
Creating an Evidence-Based Pediatric Prehospital Destination Tool (PDTree): An Expert Panel Process Using a Modified-Delphi Method

Jennifer Anders, MD; Jennifer Fishe, MD; Kyle Fratta, NRP, Johns Hopkins University, Baltimore, MD

Background: For select conditions, prehospital destination decision algorithms are widely adopted by Emergency Medical Services (EMS). Those evidence-based protocols improve patient outcomes and reduce overuse and underuse of resources. The PDTree project is a HRSA targeted issues project to develop an evidence-based tool to guide destination choice for pediatric EMS patients.

Objective: To create a pediatric prehospital destination tool (PDTree) using an expert panel of key stakeholders. Methods An expert panel was created to include key stakeholders from pediatric emergency medicine, emergency medicine, EMS medical directors, prehospital providers, and family/patient advocates. A summary of the literature, rated using a modified GRADE methodology provided the panel with the available evidence base. Unpublished data specific to the statewide EMS system that would serve as the decision tool testing region was also provided, including: the ten most frequent pediatric interfacility transfer conditions, summary of focused interviews with prehospital providers, and risk factors for pediatric secondary transport. From those data, 18 conditions were presented for possible inclusion on the PDTree. In a modified-Delphi process, the panel discussed all conditions in an in-person meeting, followed by anonymous voting on whether to include the item in the PDTree tool and where to place the item in the template. The threshold to include a condition was at least 75% agreement. Following the in-person meeting, a second round of consensus voting was held to refine terminology and destination decisions of items for which consensus was not yet reached. Four initial drafts of a pediatric decision tool were created, and a third round of voting selected the consensus draft. Results The consensus draft PDTree tool is presented in Figure 1.

Conclusions: Using a modified-Delphi method, an expert panel crafted a consensus draft PDTree tool for pediatric prehospital destination choice. The PDTree tool will be tested by computerized resource modeling, prehospital provider simulation, and finally pilot testing in three selected EMS agencies.

Consensus draft of the PDTree decision support tool for prehospital pediatric destination choice.
Background: Young febrile infants are often hospitalized awaiting blood and cerebrospinal fluid (CSF) culture results to exclude bacteremia and bacterial meningitis. Our objective was to determine time to positivity for pathogenic and contaminated blood and CSF cultures in a cohort of febrile infants ≤60 days old.

Methods: We performed a secondary analysis of a prospective observational study within the Pediatric Emergency Care Applied Research Network (PECARN). We enrolled a convenience sample of non-toxic-appearing infants <60 days old with rectal temperatures >38°C who had a blood culture obtained in a participating ED between 12/2008 – 5/2013. For this sub-analysis, we included infants with a positive blood or CSF culture for any bacterial species and documentation of notification time for positive Gram stain or culture. Time to positivity for blood or CSF cultures was summarized using medians and inter-quartile-ranges (IQR), compared with Wilcoxon Rank-Sum, and presented as Kaplan Meier curves.

Results: 169 of 301 positive blood cultures (56%) and 42 of 83 positive CSF cultures (51%) had documentation of notification times and met inclusion criteria. The median time to positive blood culture for pathogenic bacteria (N=49) was 18.6 hours (IQR 12.0, 21.9) and for contaminated cultures (N=120) was 25.6 hours (IQR 20.7, 34.1; p < 0.001). Pathogenic blood cultures from patients 0-28 days-old had similar time to positivity (18.6 hours, IQR 11.8, 21.5) as those 29-60 days-old (18.3 hours, IQR 12.4, 24.4; p=0.431). Median time to positive CSF culture for pathogenic bacteria (N=14) was 5.8 hours (IQR 1.1, 18.7) and for contaminated cultures (N=28) was 38.2 hours (IQR 25.1, 59.9; p < 0.001.) Figure 1 demonstrates time to positivity of pathogenic or contaminated blood and CSF cultures with proportion of pathogens that would be positive by 18, 24, 36, and 48 hours. Median time to positivity for blood and CSF cultures depended on type of bacterial species (Figure 2). For E. coli, the most common blood pathogen, time to positivity was 13.0 hours (IQR 11.8, 20.6). For Staph species, the most common blood contaminant, time to positivity was 27.0 hours (IQR 23.6, 32.9). For Group B strep, the most common CSF pathogen, time to positivity was 1.7 hours (IQR 1.0, 5.8). Staph species in CSF cultures had median time to positivity of 43.8 hours (IQR 19.0, 61.8).

Conclusions: Bacterial pathogens were identified more quickly than contaminants in both blood and CSF cultures and time to positivity varied by bacterial species. Our findings have direct implications that might reduce hospital length of stay.
Presentation Time: Friday, September 15, 2017: 2:15 PM – 2:30 PM

The Michigan Emergency Department Improvement Collaborative: A Novel Model for Implementing Large Scale Practice Change in Pediatric Emergency Care

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Purpose: Quality measurement and performance evaluation lead to better patient care. Despite the importance of emergency care in the U.S. health system, large scale quality measurement and performance evaluation efforts are lacking, particularly for children. Complicating these efforts is that children are cared for more frequently in general emergency departments (EDs) rather than specialized pediatric hospitals. We describe development of the Michigan Emergency Department Improvement Collaborative (MEDIC), an integrated pediatric and adult, emergency physician-led quality improvement project advancing emergency care across Michigan.

Methods: MEDIC was formed in 2015 through a Value Partnerships Program funded by Blue Cross Blue Shield of Michigan/Blue Care Network. General and children’s hospital EDs are recruited annually to the collaborative. Each site selects an emergency physician (EM) or pediatric emergency medicine (PEM) physician champion serving as the liaison between the central coordinating center and their local emergency care providers. All participating sites contribute operational data from every ED visit and abstracted data from charts for collaborative selected QI initiatives. Data are submitted to a data registry hosted by a third party. Collaborative pediatric QI initiatives include CT imaging for minor traumatic head injury and chest x-ray utilization for minor respiratory illnesses (asthma, croup, and bronchiolitis). A consensus driven process within the collaborative governance structure was used to define the gold standard by which MEDIC measures pediatric head injury CT appropriateness based on the PECARN decision rule. Inter-institutional performance on pediatric operational and clinical QI initiatives is measured and shared. Performance is reported in blinded fashion at both the site and individual physician level relative to peers. Two additional pediatric quality initiatives are in presently in development.

Results: Current membership in MEDIC includes 15 hospital EDs, including 3 children’s tertiary care centers. When fully operational, sites will contribute data from approximately 1.2 M total annual ED visits of which approximately 25% are pediatric cases < 18 years old. This total ED volume represents about 30% of all ED visits in Michigan. In the first nine months of data collection, the registry contains 420,000 ED visit operational data, including 108,000 pediatric visits. Additionally, to date there are 4,600 child head injury cases screened with 2,500 head CTs performed and 8,100 pediatric respiratory cases with 3,400 CXRs performed. MEDIC reports detailed CT appropriateness performance for all 3 head injury risk groups as defined by PECARN based on low, intermediate and high risk criteria.
Conclusions: Because most emergency care for children occurs in general EDs, we believe quality improvement requires collaboration between specialized pediatric, community and academic hospitals. MEDIC demonstrates the feasibility of these efforts with a robust platform for general emergency and PEM physician engagement across a variety of practice settings working together to improve pediatric emergency care.

**Presentation Time: Friday, September 15, 2017: 2:30 PM – 2:45 PM**

**Pediatric Emergency Department Visits for Homelessness After Shelter Eligibility Policy Change: An Interrupted Time Series Analysis**

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**Purpose:** Family homelessness in the U.S. is a growing problem, with one in thirty children homeless annually. Massachusetts is the only “right to shelter” state in the U.S., where eligible families cannot be denied placement. In December 2012, a policy was implemented which requires families to prove risk of homelessness by spending a night in a place “not fit for human habitation,” including the emergency department (ED), to qualify for emergency assistance shelter. The aim of this study is to analyze the frequency and costs of ED visits by homeless children presenting for homelessness, before and after this policy.

**Methods:** This is a retrospective cohort study of ED visits to an urban children’s hospital by homeless children from March 2010 to February 2016. We included all children 0-18 years old for whom homelessness was a presenting complaint or affected disposition. We excluded children already housed in a homeless shelter at the time of the ED visit. A natural language processing tool was used to identify cases by searching for key terms in the electronic medical records. Identified records were manually reviewed to determine if they met inclusion/exclusion criteria. We calculated frequencies of visits and demographics. We conducted an interrupted time series analysis to compare rates of homeless children per 1,000 ED visits before and after implementation of the policy in December 2012. We reviewed payment data for each record as a measure of cost to the healthcare system.

**Results:** During the study period there were 312 ED visits for homelessness; 94% were after the 2012 policy (Figure 1). The median age was 3.2 years. The overall rate of visits for homelessness per month increased over 6 times from the pre- to the post-policy period (IRR 6.5, 95% CI 2.10, 20.24) (Figure 2). This increase is not explained by an increase in homeless children in Massachusetts or in general ED volume. Sixty-five percent of children after 2012 had no medical complaint, compared to 32% before 2012 (IRR 2.06, 95% CI 1.06, 4.02). The median ED length of stay increased from 6 hours (range 3-17) to 13 hours (range 1-97) between the pre- and post- period. These visits cost $173,950 (inflation adjusted to 2016 dollars): $17,264 before the policy and $156,686 afterwards. Ninety percent of payments ($156,062) were by state-based insurance plans. These costs averaged $566 per ED visit, nearly 5 times more than a night in emergency shelter.

**Conclusion:** These findings suggest a policy changing Massachusetts’ emergency assistance shelter eligibility increased the number of children presenting to the ED for homelessness, with substantial associated costs to the healthcare system. The cost of this allocation of healthcare resources should be taken into account when evaluating policies to address and alleviate family homelessness.

**Total number of ED visits for homelessness by year before and after policy change**

<table>
<thead>
<tr>
<th>Year</th>
<th>Pre-Policy</th>
<th>Post-Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>50</td>
<td>300</td>
</tr>
<tr>
<td>2011</td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>2012</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>2013</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>2014</td>
<td>250</td>
<td>100</td>
</tr>
<tr>
<td>2015</td>
<td>300</td>
<td>50</td>
</tr>
<tr>
<td>2016</td>
<td>350</td>
<td>0</td>
</tr>
</tbody>
</table>

Light blue 2016 data are extrapolated based on data from January and February 2016
After

Comfort.”

Methods:

Background: Limb injuries are a common painful condition in emergency department (ED) patients, accounting for 12% of ED visits by children in the city of Calgary, Alberta, Canada. Calgary has one pediatric ED in a freestanding children’s hospital and 3 general ED’s that treat both adults and children. 68% of pediatric limb injuries in Calgary are treated in the pediatric ED and 32% are treated in a general ED.

Local Problem: Baseline data revealed that only 28% of children who visited a Calgary ED with limb injury received an analgesic medication, and the median time from triage to analgesia was 37 minutes. Patient experience surveys suggested that 40% of children with limb injury desired analgesia.

Methods: A quality improvement (QI) initiative was developed at the children’s hospital ED in April 2015 focusing on "Commitment to Comfort.” Tests of change included education, process improvement, and engaging patients and families as partners in improving care. After achieving aims at the children’s hospital (Figure 1), a QI collaborative was formed among the pediatric ED and the 3 general ED’s to 1) improve the proportion of children citywide receiving analgesia for limb injuries to 40% and 2) reduce the median time to analgesia to under 15 minutes, during the time period of April-October, 2016.

Results: Data were obtained from computerized order entry records for children 0-17.99 years visiting any Calgary ED with a chief complaint of limb injury. Project teams from each site met monthly to discuss aims, develop key driver diagrams, plan tests of change, and share learnings. Patient and family consultation was obtained. Site-specific run charts were used to detect special cause variation. Data from all sites were combined at study end to measure city-wide impact using χ² and interrupted time series analysis. Results: During the 3-year time period studied, there were 36,231 visits to Calgary ED’s children 0-17.99 years with limb injury. All visits were included in analysis. Comparing the year prior to implementation at the children’s hospital in April 2015 to the year following implementation at the 3 general hospitals in April 2016, the proportion of patients with limb injury receiving analgesia increased from 28% to 41% (p < 0.01, Figure 2), and the median time from arrival to analgesia decreased from 37 to 12 minutes (p < 0.01, Figure 2).

Conclusion: This multisite initiative emphasizing "Commitment to Comfort” was successful in improving pain outcomes for all children with limb injuries seen in Calgary ED’s. A QI collaborative can be an effective method for spreading improvement. Next Steps: The project team is now spreading the “Commitment to Comfort” initiative to 40+ rural and regional ED’s in the province of Alberta by developing a provincial QI collaborative.
Figure 1

Proportion of children with limb injury at Alberta Children's ED receiving who receive one or more doses of analgesic medication

Figure 2

Implementation of “Commitment to Comfort” in all Calgary ED’s

Child pain measures during study period, noting start of implementation at children’s hospital (ACH) and at 3 general hospitals (PLC, RGH, SHC)
Geographic Regions with Stricter Gun Laws Have Fewer Emergency Department Visits for Pediatric Firearm-Related Injuries: A Five-Year National Study

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Purpose: Firearm-related injuries are a leading cause of morbidity and mortality among children and adolescents. States with more restrictive gun laws have fewer firearm-related pediatric fatalities. Our objective was to investigate the association between regional firearm legislation and pediatric firearm-related injuries presenting to the emergency department (ED).

Methods: Repeated cross-sectional analysis using the Nationwide Emergency Department Sample (NEDS) from 2009-2013. National estimates of rates of firearm-related visits in children ≤21 years were calculated using annual census data to evaluate trends over time and by geographic region (Northeast, South, West and Midwest). State-level Brady Gun Law Scores were used to calculate median regional scores and measure the association between median regional gun law scores and firearm-related ED visits through multivariable linear regression.

Results: During the 5-year study period, there were 111,839 [95% CI: 101,248,122,431] ED visits for pediatric firearm-related injuries nationwide (22,368 per year). The mean age was 18.0 years (SD 17.9-18.0), majority were male (89.3%), and publicly insured (38.5%); 6.1% (6,866) resulted in death, and 30% (33,280) resulted in hospital admission. Overall, firearm-related ED visits remained consistent over time, at a rate of 65 per 100,000 pediatric ED visits, until 2013, when there was a slight decrease to 51 per 100,000 (p-trend = 0.048). Rates of firearm-related pediatric ED visits varied by geographic region (Figure 1). Rates in the Northeast decreased during the study period (p-trends.0001). The Northeast had the lowest rate, representing 40 (95% CI 34, 45) per 100,000 ED visits. This was followed by the Midwest, with a rate of 62 (95% CI 26, 66) per 100,000. The West (68; 95% CI 61, 74) and the South (71; 95% CI 64, 77) had the highest rates of ED visits for pediatric firearm injuries per 100,000 visits. In comparison to the Northeast, odds of firearm related-ED visits were higher in the South (aOR 1.8; 95% CI 1.4, 2.3) and the West (aOR 1.7; 95% CI 1.3, 2.2). There were no observed differences over time in mortality rates, overall or by region. A higher regional median Brady Gun Law Score (Northeast-45, South-8, West-9, Midwest-9), indicating stricter gun laws, was associated with a lower rate of firearm-related ED visits (p=0.03; Figure 2).

Conclusions: Regional differences exist in pediatric firearm related injuries. Furthermore, regional differences in ED visit rates are associated with gun law scores. Regions with higher scores, and thus stricter gun laws, had fewer ED visits for pediatric firearm-related injuries than those with lower scores, and therefore, weaker laws. Studying the role of regional gun culture and its impact on firearm legislation at the regional level is an important next step in advocating for changes to firearm legislation and reducing pediatric firearm-related injuries.

Figure 1. Incidence of ED Visits for Firearm Injuries per 100,000 US Population 21 and Under per year by Region
Figure 2. Association Between ED Firearm Injury Visits per 100,000 Children and Regional Median Brady Gun Law Score

[Graph showing the association between ED firearm injury visits per 100,000 children and median Brady gun law score from 2009-2013. The graph demonstrates a negative correlation, with regions having stricter gun laws (higher scores) having fewer ED visits. The p-value is 0.03.]
Presentation Time: Friday, September 15, 2017: 3:45 PM – 4:00 PM

A Randomized Double Blind Trial of a Needle-free Injection System to Topical Anesthesia for Infant Lumbar Puncture

Kathleen Adelgais, MD, MPH1; Vidya Raghavan, MD2; Ryan Caltagirone, MD2; Genie Roosevelt, MD, MSPH1; (1) University of Colorado School of Medicine, Section of Pediatric Emergency Medicine, Aurora, CO, (2) University of Colorado School of Medicine, Aurora, CO, (3) Denver Health and Hospital Authority, Denver, CO

Purpose: Lumbar punctures (LP) are commonly performed in febrile infants to evaluate for meningitis. Prior studies demonstrate a positive association between LP success and the use of local anesthesia. Traditional methods of local anesthesia require injection or topical application, which may be painful and time consuming. Recent advances in needle-free jet injection may offer an alternative. The objective of this study was to compare a needle-free jet-injection system with 1% buffered lidocaine (J-Tip) to topical anesthetic cream (TA) for local anesthesia prior to infant LP.

Methods: This is a randomized double-blind trial of TA versus J-Tip for infant LPs. Patients aged 0-4 months received either J-Tip syringe containing saline and TA or a placebo topical cream with J-Tip containing 1% lidocaine. The primary outcome was the difference in the neonatal faces coding scale (NFCS) during LP needle insertion. Secondary outcomes included in heart rate (HR) and NFCS across 5 procedural time points (pre-procedure, J-Tip application, needle insertion, needle in place, and post-procedure), skin changes, provider impression of pain control, and likelihood of LP success. LP success was defined as obtaining CSF on the first attempt with < 1,000 RBC/mm3. NFCS was scored using videotapes of LPs. Inter-rater reliability was assessed on 30% of videos using a Kappa statistic. For 80% power in detecting a 1-point difference on the NFCS at needle insertion (assuming a standard deviation of 1.3) a sample size of 27 patients was needed for each study arm.

Results: During the study period, we enrolled 58 patients, 29 receiving J-Tip and 29 receiving TA. Age and gender were similar. There was no difference between the two groups in NFCS or HR during the 5 steps of the procedure (Table 1). Kappa for NFCS was 0.8 indicating excellent inter-rater reliability. There was no difference between groups with regard to skin changes or provider impression of degree of pain control (median score 3 = somewhat controlled). Median number of LPs performed was higher for TA (Table 2). LPs performed with J-Tip were more likely to be successful (OR 2.9, 95% CI 1, 9.2) despite no difference in number of previous LPs completed or provider years of training.

Conclusion(s): In a randomized double-blind trial of J-Tip versus TA for infant LP, there is no difference in pain control or physiologic changes. Infant LPs performed with J-Tip are more successful. Future research is necessary to explore nature of success in infant LP when performed with J-Tip.
**Table 1: NCFS and HR Changes**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>J-tip n=29</th>
<th>TA n=29</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR, mean (SD)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-procedure</td>
<td>153 (28)</td>
<td>156 (40)</td>
<td>0.84</td>
</tr>
<tr>
<td>J-tip application</td>
<td>159 (29)</td>
<td>167 (37)</td>
<td>0.47</td>
</tr>
<tr>
<td>Needle insertion</td>
<td>169 (35)</td>
<td>170 (49)</td>
<td>0.93</td>
</tr>
<tr>
<td>Needle in place</td>
<td>171 (40)</td>
<td>178 (53)</td>
<td>0.69</td>
</tr>
<tr>
<td>Post-procedure</td>
<td>157 (26)</td>
<td>159 (30)</td>
<td>0.84</td>
</tr>
<tr>
<td>NFCS, median (IQR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-procedure</td>
<td>0 (0,3)</td>
<td>0 (0,4)</td>
<td>0.45</td>
</tr>
<tr>
<td>J-tip application</td>
<td>5 (4,5)</td>
<td>5 (4,5)</td>
<td>0.82</td>
</tr>
<tr>
<td>Needle insertion</td>
<td>5 (4,5)</td>
<td>5 (4,5)</td>
<td>0.82</td>
</tr>
<tr>
<td>Needle in place</td>
<td>2 (0,5)</td>
<td>2.5 (0,5)</td>
<td>0.25</td>
</tr>
<tr>
<td>Post-procedure</td>
<td>0 (0,1)</td>
<td>0 (0,2)</td>
<td>0.95</td>
</tr>
</tbody>
</table>

**Table 2: Lumbar Puncture Outcomes**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>J-tip n=29</th>
<th>TA n=29</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of attempts</td>
<td>1</td>
<td>2</td>
<td>0.626</td>
</tr>
<tr>
<td>Skin changes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>1</td>
<td>1</td>
<td>0.401</td>
</tr>
<tr>
<td>Redness</td>
<td>7</td>
<td>1</td>
<td>0.256</td>
</tr>
<tr>
<td>Bruising</td>
<td>0</td>
<td>1</td>
<td>0.313</td>
</tr>
<tr>
<td>Rash</td>
<td>0</td>
<td>1</td>
<td>0.313</td>
</tr>
<tr>
<td>Petechiae</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
<tr>
<td>LP successful, %</td>
<td>16 (55%)</td>
<td>8 (27%)</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*OR 2.9, 95% CI 1.9, 2.2

**Presentation Time: Friday, September 15, 2017: 4:00 PM – 4:15 PM**

A Quality Improvement Project to Decrease Blood Culture Contaminants in a Pediatric Emergency Department: An Interrupted Time Series Analysis

**Paul C. Mullan, MD, MPH; Sara Scott, RN; Kathy Brown, MD; Asha Payne, MD, MPH; Jeanne Pettinichi, MSN, RN, CPN, CPEN; Anastasia Weber, RN; Katura Palacious, RN; James M. Chamberlain, MD, (1) Children’s Hospital of the King's Daughters, Norfolk, VA, (2) Children's National Health System, Washington, DC, (3) Children's National Health System, Washington, DC, (4) Children's National Medical Center, Washington DC**

Introduction: High blood culture contaminant rates (BCCR) in the emergency department (ED) contribute to unnecessary tests and expenses. The national benchmark for BCCR is 2%. We had a baseline BCCR of >3% in our ED. Using the Model For Improvement framework, our global aim was to decrease the number of blood culture contaminants in our ED. Our specific aim was to decrease the BCCR by 50% within 12 months (Fig.1). We hypothesized that two key drivers would help achieve our specific aim: increasing venipuncture sterility and reducing the number of blood cultures.

Methods: This prospective, single-center, quasi-experimental study was performed in an academic pediatric ED (90,000 patients/year volume). A multi-disciplinary team of front-line nurses and physicians formed a quality improvement team and created a Key Driver Diagram with multiple Plan-Do-Study-Act cycle interventions based on various change concepts (Fig.1). For our specific aim calculations, we included all peripheral blood cultures drawn in the ED except those from patients with cancer, central lines, ventriculo-peritoneal shunts, neutropenia, or transplant history. We classified positive cultures as pathogens or contaminants based on published guidelines. We used an interrupted time series design and applied validated tests to detect special cause variation with a statistical process control T chart. For secondary aims, we measured: (1) the differences in blood culture ordering rates (BCOR; = number of included blood cultures /
number of patients with temperature ≤35.5 or ≥38.0) between the baseline and PDSA3 periods, and (2) the estimated annual savings in patient charges based on differences in BCCR and BCOR between the baseline and PDSA3 periods. We used an inflation-adjusted value from our previously published study ($1494 charges/contaminant).

Results: Our one-year baseline period, PDSA1, PDSA2, and PDSA3 BCCRs were 3.02%, 2.30%, 1.58%, and 1.17%, respectively. We achieved our specific aim (61% BCCR decrease). Our T chart had special cause variation in PDSA1 and PDSA3, and demonstrated improvement from one contaminant culture every 1.87 days (baseline) to one every 7.32 days (PDSA3). The BCOR decreased from 26.2% (baseline) to 17.4% (PDSA3); p < 0.001. We estimate that we are annually preventing 19 contaminants, sending 1,615 fewer blood cultures, and saving patients with contaminant cultures a total of $28,332 in patient charges.

Discussion: By standardizing our blood culture ordering and collection processes, we have decreased the number of blood culture contaminants in our ED. Our processes could be tested in other EDs to determine generalizability. We are now measuring for any differences in a balance measure: the rate of ED bounce back admissions for bacteremia who did not have a blood culture drawn on the first ED visit. Future PDSA cycles will aim to continue to improve our processes using other high reliability principles (e.g., clinical decision support) and change concepts.

Figure 1

**KEY DRIVER DIAGRAM**

Reducing Peripheral Blood Culture Contamination Rates (BCCR) in the Emergency Department

**SMART AIM**

- Decrease BCCR in ED by 50% within 12 months of project implementation
- Decrease number of blood culture orders

**KEY DRIVERS**

1. Increase venipuncture sterility
2. Decrease number of blood culture orders

**INTERVENTIONS**

1. Adopt evidence-based nursing policy for drawing cultures
2. Include sterile venipuncture technique in annual nursing competency signoffs
3. Online nursing education & quiz on new practice procedures
4. “Superuser” techs to teach others in the new technique
5. Engineer venipuncture carts to contain everything in checklist

**GLOBAL AIM**

- Decrease blood culture contaminants in ED

Change Concepts:
- Standardization
- Cross-training
- Setup-time reduction
- Overtkill reductions
- Reminders

Fig 1: Key Driver Diagram. Interventions for Key Driver 1 (KD1: Increase venipuncture sterility) occurred in our first Plan-Do-Study-Act cycle (PDSA1; 7/1/15-11/30/15) and included piloting a blood culture phlebotomy checklist and publicizing the quality improvement initiative via meetings, huddles, and emails. Other interventions for KD1 occurred in PDSA2 (12/1/15-6/30/16): converting the pilot checklist into nursing policy, annual checklist competency training using simulation models, two-person accountability for checklist compliance, online nursing education modules. Interventions for Key Driver 2 (decrease number of blood culture orders) occurred in PDSA3 (7/1/16-Current): an evidence-based blood culture ordering guideline based on recommendations for low-risk and high risk bacteremia conditions, an online physician education tool regarding guideline content, and multi-disciplinary shared accountability.

**Abbreviations:** BCCR = Blood Culture Contamination Rate. ED = Emergency Department. KD = Key Driver. PDSA = Plan-Do-Study-Act

Optimal Imaging Strategy for Suspected Acute Cranial Shunt Failure: A Cost-Effectiveness Analysis

**Jay Pershad**, MD, MMM, FAAP; Andrew Taylor, MD, MHS; Kennedy Hall, MD, MHS; Paul Klimo, MD, MPH, (1) Le Bonheur Children’s Hospital and UTHSC, Memphis, TN, (2) Yale School of Medicine, New Haven, CT, (3) University of Washington School of Medicine, Seattle, WA, (4) University of Tennessee Health Sciences Center, Memphis, TN

Objective: We compared cost-effectiveness of cranial computed tomography (CT), fast sequence magnetic resonance imaging (fsMRI), and ultrasonographic measurement of optic nerve sheath diameter, for suspected acute shunt failure, from a healthcare organizational perspective.

Methods: We modeled 4 diagnostic imaging strategies: 1) CT scan; 2) fsMRI; 3) screening optic nerve sheath diameter (ONSD) using point of care ultrasound (POCUS) first, combined with CT (POCUS-CT); and 4) screening ONSD using POCUS first, combined with fsMRI (POCUS-fsMRI). An initial plain radiography (shunt series) screen was performed on all patients. Short and long-term costs of radiation-induced cancer were assessed with a Markov model. Effectiveness was measured as quality adjusted life years (QALYs). Utilities and inputs for clinical variables were obtained from published literature. Sensitivity analyses were performed to evaluate the effects of parameter uncertainty.

Results: At a prior probability of shunt failure of 30%, a screening POCUS in patients with a normal shunt series, was the most cost-effective. For children with abnormal shunt series or ONSD measurement, fsMRI was the preferred option over CT. Performing fsMRI on all patients would cost $269,770 to gain 1 additional quality-adjusted life-year, compared with POCUS. An imaging pathway that involves CT alone was dominated by ONSD and fsMRI as it was more expensive and less effective.
Conclusions: In children with low pretest probability of cranial shunt failure, an ultrasonographic measurement of ONSD is the preferred initial screening test. In the young child with suspected shunt failure, fsMRI is the more cost-effective definitive imaging test when compared with cranial CT.

Decision analysis model assessing 3 imaging strategies for a hypothetical population of patients with suspected cranial shunt malfunction

Cost Effectiveness Acceptability Curve at various Willingness-to-Pay Thresholds
Background: Acute gastroenteritis is one of the top reasons children are brought for emergency department care. Little is known about the association between specific pathogens and disease severity in children with vomiting/diarrhea in the outpatient setting. Recent advances in diagnostic approaches enabling the simultaneous detection of common pathogenic enteric bacteria, viruses, and parasites have become readily available. Clinicians can request testing be performed to rapidly and comprehensively identify etiologic pathogens. While such knowledge can be used to optimize therapy, it also has the potential to predict disease severity. Such knowledge can aid clinical decision making, can clarify guidance and expectations provided to families, and can guide public health policy.

Objective: To evaluate the relationship between individual enteric pathogens and disease severity in outpatient children with acute gastroenteritis.

Methods: We conducted a prospective cohort study of children with acute gastroenteritis who were brought for ED care. The outcome for this study was the Modified Vesikari Scale (MVS) score. Clinical data and outcomes were collected to quantify disease severity from symptom onset until the day-14 follow-up (total MVS score). The MVS scores were categorized as severe (i.e. ≥ 11 points on the MVS score) vs. non-severe (i.e. < 11 points on the MVS score). Stool and/or rectal swab specimens were collected and analyzed for 28 unique pathogens by molecular diagnostic assays and/or culture. A patient was classified as positive for an enteric pathogen if any specimen tested positive with any methods of test. We performed logistic regression analysis to assess the association between pathogens and disease severity with the dependent variable being the total MVS score (severe vs. non-severe) adjusted for age, presence of chronic disease, antibiotic use in the preceding 60 days and the duration of acute gastroenteritis symptoms at the time of ED presentation.

Results: Between December 2014 and August 2016, we enrolled 1102 participants of whom MVS scores and specimen combinations were available for the study. The mean total MVS score was 12.8 ± 3.2. 73.0% (807/1102) of participants had severe disease during the illness. A pathogen was identified in 72.8% (802/1102) of study participants; 584 (53.0%) children had one pathogen identified, and 218 (19.8%) had ≥ 2 pathogens identified. Rotavirus, Norovirus G2 and Adenovirus were identified in 26.6%, 23.0% and 16.0% of participants respectively. Significant predictors of severe disease were: rotavirus OR=8.0 (4.8, 13.2), Salmonella OR=5.4 (1.2, 24.4), adenovirus OR=2.1 (1.3, 3.3), norovirus G2 OR=1.8 (1.3, 2.6) and age (month) OR=0.99 (0.99, 0.99). Clostridium difficile and Aeromonas were not found to have association with severe disease.

Conclusion: We found children with acute gastroenteritis in Alberta, Canada, the most common enteric pathogens included rotavirus, norovirus G2 and adenovirus that were found to have strong association with severe disease.
Presentation Time: Friday, September 15, 2017: 4:45 PM – 5:00 PM

Predictive Modeling for Organ Dysfunction in Children with Suspected Sepsis in the Emergency Department

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Purpose: Sepsis recognition is a key challenge in the pediatric emergency department (ED). Targeting aggressive therapy to those at highest risk of morbidity and mortality may help to improve outcomes. We sought to develop a predictive model for the development of organ dysfunction in the first three hospital days among children with suspected sepsis in the ED.

Methods: Prospective cohort study in a tertiary care emergency department with over 90,000 visits annually. Subjects were children 57 days to < 18 years of age treated with an institutional sepsis protocol in the ED or who developed severe sepsis in the intensive care unit within 24 hours of ED stay between 6/1/15-5/31/16. Primary outcome was organ dysfunction defined by international consensus criteria and determined daily for three days by medical record review. Candidate predictors were determined a priori and included age, sex, race, abnormal triage heart rate, respiratory rate, blood pressure, lactate >4 mmol/L, procalcitonin >0.5 mg/ml, white blood cell count >15,000/\(\mu\)l, c-reactive protein >3 mg/dl, and time to initial antibiotic and intravenous fluid treatment. Gradient boosted machines (GBM), an ensemble machine learning method, was used for model development in the R statistical environment.

Results: There were 372 subjects during the study period. Of these, 77 (20.7%) had organ dysfunction in the first 3 hospital days. One hundred sixty nine (45.5%) were admitted to the pediatric intensive care unit. There were 8 deaths (2.2%). The final model weighted white blood count, procalcitonin, time to initial IV antibiotics, and shorter time to initial IV fluid bolus as having highest importance for predicting organ dysfunction. GBM modeling had the following test characteristics: sensitivity 92.5%, specificity 72.7%, positive predictive value 92.9%, negative predictive value 71.2%, with area under the receive operating characteristic (ROC) curve of 0.90 (95% CI: 0.86-0.94) and an accuracy (proportion of correct predictions) of 0.88 (95% CI : (0.85, 0.91)).

Conclusions: Using a GBM machine learning algorithm, we identified a highly accurate predictive model based on a derivation data set to predict organ dysfunction in the first three hospital days among children with suspected sepsis in the ED. Future steps will be to validate this model in a larger, multicenter sample.
Presentation Time: Friday, September 15, 2017: 5:00 PM – 5:15 PM
Refinement of Appendix Ultrasound Interpretation to Limit Equivocal Results

David R. Piechota1; Molly Raske2; Patricia Valusek, MD2; Ernest Krause, BA3; Anupam Kharbanda, MD2; (1) Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, (2) Department of Radiology - Children’s Hospitals and Clinics of Minnesota, Minneapolis, MN, (3) General Surgery - Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, (4) Research and Sponsored Programs - Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, (5) Emergency Department - Children’s Hospitals and Clinics of Minnesota, Minneapolis, MN

Background: In children with acute abdominal pain, equivocal ultrasound (US) interpretations of the appendix provide a diagnostic dilemma for clinicians. The use of a standardized US interpretation may improve the utility of US and reduce equivocal interpretation. Objective: To determine if a standardized appendix US interpretation could reduce the number of equivocal US results and to determine which secondary findings on US were most useful.

Design/Methods: We implemented a standardized appendix US assessment tool in July 2015. To assess utility, we performed a pre/post implementation study of children aged 3-18 who underwent an appendix US in our emergency department (ED) for possible appendicitis. Patients were excluded based on pre-defined criteria. Ultrasound reports were abstracted and coded as positive, negative or equivocal. For patients with an equivocal US, we further abstracted demographic, historical and physical exam findings. We used descriptive statistics to compare our cohort. Primary outcome was the presence or absence of appendicitis.

Results: Data abstraction is on-going. 528 patients were included between 01/2014 and 07/2016; 318 pre-implementation and 210 post. Age, gender, and rate of non-visualized appendix were similar pre/post implementation. Among those with a non-visualized appendix US, rate of appendicitis was lower in the post period (11.9% vs 21.1% p=0.004). Among patients with appendicitis and a non/partially visualized appendix on US, the most common secondary signs noted were: non-compressible appendix (4/21), echogenic fat (5/21), and RLQ tenderness (13/21). If > 1 secondary sign was present, the rate of appendicitis was 30.2% vs 6.5% if no secondary signs seen (p < 0.001). Using our structured US format, we classified an equivocal appendix US as low risk, indeterminate or high risk for appendicitis. The actual rate of appendicitis among these groups is provided in Table 1.

Conclusions: Non-visualization of the appendix remained unchanged through our study period. Application of a standardized appendix US interpretation allowed for more nuanced interpretation. Increasing number of secondary signs on US correlated with greater risk for appendicitis.

Table 1

<table>
<thead>
<tr>
<th>Equivocal Ultrasound</th>
<th>Number Identified n</th>
<th>Rate of Appendicitis n (%)</th>
<th>Follow up with CT n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Risk</td>
<td>104</td>
<td>7 (6.7%)</td>
<td>33 (31.7%)</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>23</td>
<td>4 (17.4%)</td>
<td>3 (13.0%)</td>
</tr>
<tr>
<td>Elevated Risk</td>
<td>83</td>
<td>14 (16.9%)</td>
<td>32 (38.5%)</td>
</tr>
</tbody>
</table>

*p-value comparing low versus elevated risk

Impact of Structured Ultrasound Interpretation on Equivocal Reads

Presentation Time: Friday, September 15, 2017: 5:15 PM – 5:30 PM
The Pediatric Submersion Score Predicts Children at Low Risk for Injury Following Submersions
Rohit P. Shenoi, MD; Sachin Allahabadi; Daniel M. Rubalcava, MD; Elizabeth Camp, PhD, Baylor College of Medicine, Houston, TX

Introduction: Drowning is an important cause of unintentional childhood death. Pediatric submersion victims are often admitted to hospital for observation. We created a scoring tool to identify pediatric submersion victims at low risk for injury who do not require hospital admission after 8 hours of observation in the emergency department (ED).

Methods: This was a single-center derivation and validation cross-sectional study of children aged 0-18 years who presented to a large, urban, tertiary-care, children’s hospital ED following a submersion event between the years 2008 to 2015. Pre-hospital, submersion characteristics and hospital data were collected through retrospective chart review consistent with established guidelines. The candidate
variables consisted of age (continuous), sex, race/ethnicity, prior health problems, body of water, submersion duration, type of resuscitation, vomiting during resuscitation, vital signs at the scene, ED and 8 hours post-submersion. The primary outcome was a safe discharge at 8 hours post-submersion based on expert review including the absence of respiratory distress or need for supplemental oxygen, normal mental status and normal vital signs (respiratory rate, systolic blood pressure, and oxygen saturation). Vital signs taken in the pre-hospital, hospital setting were recoded to reflect whether the result was abnormal or normal using PALS age-related parameters. Demographic and clinical variables of patients were compared using Chi-square (or Fisher Exact test) and the Mann-Whitney test. To identify potential scoring factors, any p-value ≤0.25 was considered for further modeling using the backward-step approach in binary logistic regression, with only factors of a p-value < 0.05 included in the final score. In the validation dataset, scores were generated using a one-point scoring system for each normal ED vital. A receiving operating characteristic (ROC) curve was generated along with the calculated area under the curve (AUC) to test sensitivity and specificity of the new tool.

Results: The derivation dataset consisted of 356 patients and validation dataset of 89 patients. Five factors were selected to generate the safe discharge score at 8 hours. These included: Normal ED mental status, Normal ED respiratory rate, absence of ED dyspnea, absence of need for airway support (BVM, intubation and CPAP) and absence of ED hypotension (Max. score: 5; Range 0-5). Only patients that had values for all five factors included in the sensitivity/specificity analysis. Eighty scores were generated. This resulted in an AUC = 0.81 (95% CI: 0.70 – 0.91; p-value < 0.001). Based on the sensitivity/specificity analysis, the discriminate ability peaks at 75% with a score ≥3.5. A score of 4 or higher in the ED would suggest a safe discharge at 8 hours.

Conclusions: A risk score can identify children at low risk for submersion related injury who can be discharged from the ED after 8 hours of observation.

Figure 1

\[ \text{Figure 1: Validation Receiver Operating Characteristic (ROC) Curve of ED Safe Discharge Score and 8 Hour Safe Discharge (n = 69)} \]

Area under the curve (AUC) = 0.81 (95% CI 0.70 – 0.91; p-value<0.001)
Presentation Time: Friday, September 15, 2017: 3:15 PM – 3:30 PM

(1) Kidney Injury Detection and Prevention in Children (KIDPIC)

Erika O. Bernardo, MD; Andrea Cruz, MD, MPH2; Ayse Akcan-Arikan, MD3; Laura Loftis, MD2; Greg Buffone, PhD2; Sridevi Devaraj, PhD, DABCC, FACB2; (1) Baylor College of Medicine/Texas Children’s Hospital, Houston, TX; (2) Texas Children’s Hospital/Baylor College of Medicine, Houston, TX; (3) Baylor College of Medicine/Texas Children’s Hospital, Department of Pediatrics, Houston, Texas; Section of Pediatric Critical Care Medicine; Section of Pediatric Nephrology, Houston, TX

Background: Acute kidney injury (AKI) increases morbidity and mortality, yet remains difficult to diagnose in clinical practice even in the inpatient setting, where fewer than 0.4% of inpatients are correctly diagnosed with AKI. Multiple AKI definitions, the lack of baseline creatinine data in many children, and age-related creatinine changes make recognition of AKI in the fast-paced clinical environment, such as the emergency department (ED), especially challenging. Almost all AKI investigations to date have focused on hospital-acquired AKI; community-acquired AKI (CA-AKI) remains under-investigated. Early recognition of CA-AKI can facilitate modification of nephrotoxic interventions to eventually decrease AKI-associated morbidity and mortality.

Methods: This was a retrospective cohort study conducted in the ED of a large children’s hospital with an annual ED volume of 75,000 visits. Children 1 month-18-years-old seen during the 1-year study period and in whom a creatinine level was obtained were included. Children with known chronic kidney disease were excluded. Laboratory database and medical records were used to identify patients with AKI and to determine if providers correctly identified AKI using Kidney Disease Improving Global Outcomes (KDIGO) criteria. Urine output, infrequently documented in the ED, was not used to define AKI.

Results: Community-acquired AKI was present in 275 of 12,249 (2.2%) pediatric patients seen in the ED. On preliminary review of a subgroup of patients, the diagnosis of AKI was missed in 93%. Thirty percent of these patients were exposed to nephrotoxic therapies in the ED such as antibiotics or non-steroidal anti-inflammatory drugs. Seventy-four percent of these patients were admitted to the hospital; half of them critically ill in the Pediatric Intensive Care Unit. CONCLUSION CA-AKI was under-diagnosed in the ED with patients exposed to nephrotoxic interventions. This data highlights the gap in provider recognition of CA-AKI and possible adverse consequences for patients. Quality improvement interventions, such as age-specific reference ranges, an electronic medical record alert, and a decision support tool to improve diagnostic accuracy and management of CA-AKI in the pediatric ED could improve patient safety in children with AKI.

(2) Pediatric Septic Shock Collaborative: Description of Early Improvement

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Purpose: Severe sepsis is a significant source of morbidity and mortality in children. Lack of adherence to evidence based treatment guidelines, including under-recognition and delayed resuscitation, contribute to increased morbidity. Single-site quality improvement (QI)
initiatives focused on early recognition and standardized care pathways have improved outcomes including time to interventions, as well as decreased end-organ dysfunction and mortality, but variation in their utilization remains.

Methods: The American Academy of Pediatrics Pediatric Septic Shock Collaborative (AAP-PSSC) was a multi-center quality improvement and learning collaborative with 20 participating US pediatric emergency departments (EDs), with an intervention period between November 2013 and May 2016. Collaborative efforts focused on improving early recognition of sepsis through the use of screening and other identification tools, and improving timely delivery of antibiotics and intravenous (IV) fluid therapy using standardized bundles of care. Subjects were children with presumed septic shock including those with ICD codes consistent with severe sepsis/septic shock and those receiving interventions consistent with the treatment of septic shock. In addition, we analyzed a more severe subgroup defined as children with presumed septic shock requiring intensive care unit (ICU) admission within 12 hours. Process metrics included time from arrival to clinical assessment, and time from sepsis recognition to initial IV antibiotics and IV fluids. Outcome metrics included 3 and 30 day mortality and hospital and ICU length of stay (LOS). Analysis was performed using statistical process control charts.

Results: There were 7491 children with presumed severe sepsis (range 64 to 2175 per site) and 3304 (44%) with severe sepsis plus ICU admission during the improvement period. Mean age was 7 years, 8% had hypotension upon ED arrival, 79% had chronic underlying conditions (though some sites focused on children with underlying conditions, potentially increasing this proportion); the median hospital LOS was 3 days and median ICU LOS was 1 day. Over the 31 months of implementation, time to antibiotic delivery (Figure 1) improved, especially in the more severe subset. Three-day in-hospital mortality for the entire cohort decreased, as demonstrated by a change from one death every 53 days to one death every 119 days (Figure 2); 30-day mortality for both the whole cohort and the ICU subset showed improvement as well.

Conclusion: We were able to implement a set of sepsis interventions in 20 pediatric emergency departments through AAP-PSSC. The goals of these interventions focused on early recognition and initiation of standardized care for children with suspected sepsis. We demonstrated improvements in timely delivery of antibiotics, and improved 3 day mortality. Barriers to implementation of ideal care and effective best practices are ongoing areas of study and will likely contribute to future national efforts to improve care.

Figure 1: Median minutes to receipt of IV antibiotics (ICU patient subset)

Figure 2: Cases between deaths (3 day in-hospital mortality, whole cohort)
(3) Patient and Caregiver Attitudes Towards Comprehensive Behavioral Health Screening in the Emergency Department

Steven Langerman, BA1; Gia M. Badolato, MPH2; Alexandra C. Rucker, MD, MPH1; Lenore Jarvis, MD, MEd1; Shilpa J. Patel, MD, MPH2; Monika K. Goyal, MD, MSCE3. (1) George Washington University, Washington, DC, (2) Children’s National Health System, Washington, DC, (3) Children’s National Medical Center, Washington, DC

Purpose: The American Academy of Pediatrics recommends routine screening for behavioral and mental health risk (BHS) in adolescents. Because adolescents who seek care in emergency departments (EDs) may have riskier behaviors than adolescents who access primary care, the ED may be a strategic setting for screening. The objective of this study was to assess patient and caregiver acceptance of a comprehensive behavioral health screen in the pediatric ED.

Methods: A cross-sectional study of 14- to 21-year old patients and their caregivers who presented to an urban pediatric ED. Participants completed a computer-assisted questionnaire to assess acceptance of ED-based screening for the following domains of behavioral health: depression, suicidality, access to firearms, substance use, sexual activity, violence, human trafficking, and housing instability. We calculated screening acceptability for each domain and performed multivariable logistic regression to assess differences in acceptance between adolescents and caregivers.

Results: The 516 study participants (347 adolescents and 169 caregivers) reported the following rates of screening acceptance: depression 70.0%; suicidality 78.1%; firearm access 50.4%; substance use 76.9%; sexual activity 73.8%; violence 71.9%; human trafficking 59.3%; housing insecurity 65.1%. After adjustment for race/ ethnicity, gender, and insurance status, patients were less likely than caregivers to support screening for depression (66.9% vs 76.3%; aOR 0.6 [0.4, 1.0]), firearm access(45.0% vs. 61.5%; aOR 0.5 [0.3, 0.7]), substance use (73.5% vs 84.0%; aOR 0.5 [0.3,0.8]), violence (69.2% vs 77.5%; aOR 0.6 [0.4, 1.0]) and human trafficking (55.3% vs 67.5%; aOR 0.6 [0.4,0.9]). Almost all caregivers would allow their children to participate in confidential screening (91.6%), allow physicians to speak privately with their children following screening (82.6%), extend their ED stay to speak with social work (77.3%) and follow up with resources provided (89.8%).

Conclusions: Comprehensive behavioral health screening in the ED is acceptable to both adolescents and caregivers. Acceptability of screening varies across domain areas, but the majority of adolescents and caregivers are in favor of screening in all areas. Across most domains, caregivers have higher rates of screening acceptance than adolescent patients.

(4) Domestic Safety Screening in a PED: QI Measures for Improved Screening

Lenore Jarvis, MD, MEd1; Kristen Breslin, MD, MPH1; Allison Jackson, MD, MPH2; Brooke Goodwin, LICSW1; Jeanne Pettinichi, MSN, RN, CPN, CPEN1; Sarah Taylor, MSW, LGSW1; Jaclyn Tapia, MSN, RN, CPEN, CEN1; Lori Donovan, RN1; Monika K. Goyal, MD, MSCE1; Gia M. Badolato, MPH1; James M. Chamberlain, MD2; Bobbe Thomas, BS1; Philip Sang, MS1; Kathy Brown, MD1. (1) Children’s National Health System, Washington, DC, (2) Children’s National Medical Center, Washington, DC

Background: One in three women and one in four men will experience intimate partner violence (IPV), and women between the ages of 16 and 24 experience the highest rate of IPV. Children who are exposed to IPV are at increased risk for child maltreatment and exposure is a toxic stress that may result in poor physical and brain health outcomes. Several federal agencies and professional societies recommend screening for IPV and other forms of violence. Although the pediatric ED (PED) often serves a high-risk vulnerable patient population, in our PED, domestic safety screening was rarely completed. Objective: To improve screening for domestic safety concerns and IPV in a PED.

Methods: 1) ED nurse focus groups; and 2) Interventions to improve IPV screening were developed based on focus group results. Quality measures were tracked pre- and post-implementation, including proportion of patients with domestic safety screening completed.

Results: 4 focus groups were conducted and the following themes emerged: 1) Nurses believe IPV screening should be conducted in the ED and that it should be mandatory; 2) The screening tool in the electronic health record (EHR) was not conducive to workflow, was ineffective as a way to alert social work (SW), and was therefore often ignored; 3) Nurses emphasized the need for standardized screening questions and SW resources/responses to address positive screens; and 4) Nurses want more formalized training in screening. As a result, the EHR questions were standardized with scripted language and moved to facilitate workflow. The screening fields became highlighted in yellow and put in a prominent place on the assessment page. A positive screen resulted in an automated SW consult. Staff training was provided. Pre-implementation screening rates in our PED were 13% from July to October 2016. Post-implementation screening rates were 92% from October 2016 to February 2017. SW responds to the majority of positive screens as a result of the automated SW consult order. Physician staff provides resources when SW is unavailable.
Conclusions: ED nurses identified a need for improved domestic safety screening and believe in mandatory, universal screening. Standardized EHR domestic safety screening questions, a resulting automated SW consult order, and staff training improved domestic safety screening and SW response rates in a PED. Additional training and QI measures are ongoing.

Domestic Safety Screening P Chart

(5) Rates of HIV and Syphilis Testing Among Adolescents Diagnosed with Pelvic Inflammatory Disease
Amanda Jichlinski1, Monika K. Goyal, MD, MSCE1; Gia M. Badolato, MPH1; William Pastor, MA, MPH2, (1) Children’s National Health System, Washington, DC, (2) Children’s National Medical Center, Washington, DC

Background: Almost 1 million cases of pelvic inflammatory disease (PID) are diagnosed annually, 20% occurring in adolescents. The majority are diagnosed in emergency departments. PID is a serious complication of undiagnosed or undertreated sexually transmitted infection (STI) and patients are at increased likelihood to test seropositive for syphilis and HIV. Current Centers for Disease Control (CDC) guidelines recommend HIV screening for all women diagnosed with PID and syphilis screening for all individuals deemed at high risk of infection. However, the frequency of HIV/syphilis screening in adolescent women diagnosed with PID has been under-investigated.

Objective: To calculate the frequency of HIV and syphilis screening among adolescents diagnosed with PID. Methods We performed a cross-sectional study using the Pediatric Health Information System database of 48 children’s hospitals from 2010 through 2015 of all ED visits by females ≤ 21 years with an ICD 9 or ICD 10 diagnosis of PID to calculate the frequency of HIV, syphilis, gonorrhea, and chlamydia testing. We performed separate multivariable logistic regression analyses to identify patient-level (age, race/ethnicity, insurance status, and disposition) and hospital-level (geographic region and bed number) factors associated with HIV and syphilis testing. We calculated rates of prescribed antibiotics that adhered to the published CDC PID treatment guidelines for the concurrent year.

Results: There were 11,564 diagnosed cases of PID (mean age 16.7 years, 53.9% non-Hispanic black race/ethnicity, 66.7% publically insured, 37.8% hospitalized). 22.0% (95% CI 21.2%, 22.8%) underwent HIV screening, and 27.7% (95% CI 27.1%, 28.8%) underwent syphilis screening. Gonorrhea and chlamydia testing occurred in 82.0% and 84.4% of cases, respectively. On adjusted analyses, HIV screening was more likely to occur among patients under age 17 (aOR 1.5, 95% CI 1.0, 1.3), non-Hispanic black patients compared to non-Hispanic whites (aOR 1.4 95% CI 1.2, 1.6), those with non-private insurance (aOR 1.3 95% CI 1.2, 1.5), hospitalized patients (aOR 6.9 95% CI 6.2, 7.7), and those admitted to hospitals with < 300 beds (aOR 1.4; 95% CI 1.2, 1.4). Syphilis screening was more likely in younger patients (aOR 1.1, 95% CI 1.0, 1.2), non-Hispanic black patients (aOR 1.8 95% CI 1.6, 2.0), patients with non-private insurance (aOR 1.4 95% CI 1.2, 1.6), hospitalized patients (aOR 4.6 95% CI 4.2, 5.1), and hospitals with < 300 beds (aOR 1.1, 95% CI 1.0, 1.2). Patients’ diagnosed with PID received antibiotics regimens concurrent with CDC guidelines in 45.3% (95% CI: 44.4%, 46.3%) of cases.

Conclusions: We found low rates of HIV and syphilis screening among adolescents diagnosed with PID, despite the high risk for these infections. Furthermore, we found low rates of adherence to the CDC recommended PID treatment guidelines. The results of this study indicate the need for increased dissemination and education of PID management in children’s hospitals.
Purpose: Motor vehicle crashes (MVCs) are a leading cause of abdominal injury in children, accounting for 32% of all intraabdominal injuries (IAIs) and 45% of IAIs undergoing medical or surgical intervention. A need exists to determine what factors identify children with MVC-related IAIs, particularly those undergoing acute intervention. The purpose of our study was to determine MVC characteristics, clinical findings, and laboratory results that are associated with IAIs undergoing intervention among children involved in MVCs.

Methods: This is a secondary analysis of the Abdominal Trauma Public Use Database, a large, prospective observational cohort study performed at 20 Pediatric Emergency Care Applied Research Network emergency departments between May 2007 and January 2010. Children in the cohort were < 18 years, experienced blunt abdominal trauma and were involved in MVCs (n=3,830). Children were categorized into 3 groups: patients without radiographic IAIs (IAI-negative, n = 3,571), patients with radiographic IAIs but not undergoing intervention (intervention-negative IAI, n = 171), and patients with IAIs undergoing intervention (intervention-positive IAI, n=88, defined as laparoscopy / laparotomy, embolization, red blood cell transfusion, or admission for >48 hours on IV fluids). Summary statistics were calculated and associations were examined using Chi-Squared, ANOVA, and Kruskal-Wallace tests as appropriate.

Results: All MVC characteristics, clinical findings or laboratory values that we assessed demonstrated statistically significant differences (p < 0.05) due to the large sample size (Table 1). Many of these variables were deemed less clinically useful based on the small magnitude of differences between groups or because of high rates of “unknown” responses. There were several variables, however, where the differences were deemed to be clinically relevant. Intervention-positive IAI patients were more likely to be restrained with a lap belt only (23.2% vs. 12.0% of intervention-negative IAI and 8.7% of IAI-negative patients). On presentation, intervention-positive IAI patients were more likely to have a lower GCS (GCS IQ range 7-15 vs. 15-15 for IAI-negative and 14-15 for intervention-negative IAI patients), be intubated (31.8% vs. 13.5% intervention-negative IAI and 3.4% IAI-negative) and have other distracting injuries (39.8% vs. 28.7% intervention-negative IAI and 17.9% IAI-negative). Intervention-positive IAI patients were more likely to have evidence of abdominal wall trauma (59.1% vs. 35.7% intervention-negative IAI and 17.1% IAI-negative) and severe abdominal tenderness (48.0% vs. 17.2% intervention-negative IAI and 7.9% IAI-negative). Transaminases, WBCs, lipase and hematocrit also differed among groups as detailed in Table 1.

Conclusion: MVC characteristics, clinical findings and laboratory values are associated with interventions in children with MVC-related IAIs. These factors can help guide development of trauma triage criteria and imaging guidelines.

Table 1: Data Summary
Rapid Sequence Intubation Standardization and Improvement Process in the Pediatric Emergency Department

Tara L. Neubrand, MD1; Michelle Alletag, MD2; Marcela Mendenhall, MD2; Sarah K. Schmidt, MD2, (1) University of Colorado/Children's Hospital Colorado, Denver, CO, (2) Pediatric Emergency Medicine, University of Colorado/Children's Hospital Colorado, Aurora, CO

Background: Rapid Sequence Intubation (RSI) is the standard definitive airway management in the pediatric emergency department (PED). There are limited data describing time to intubation (TTI), adverse events (AE), and process variation for RSI in the PED. Prior studies demonstrate the first pass intubation success rate (FPISR) is between 26-85% and, the RSI-associated AE rate is between 20-61% in this setting. We report a low cost, multidisciplinary initiative to improve the safety of RSI in the PED.

Methods: We conducted a single center quality improvement initiative (QII) at a tertiary care academic PED from 12/31/2015-1/31/2017. After reviewing charts to obtain baseline data on TTI, AE, and FPISR, we simultaneously tested: (1) a color-coded standard equipment chart, (2) a visual airway equipment schematic, (3) a standard RSI medication ordering/dosing sheet, (4) an RSI safety checklist, and (5) standard documentation of AE in the electronic medical records. All patients intubated in the PED were considered for inclusion. Patients initially intubated by an anesthesiologist, and those who required more than twice the standard dose of sedative were excluded. TTI was defined as the time from first RSI medication administered to time of successful intubation, as documented in the resuscitation record. A single reviewer abstracted data from the medical record for FPISR and AE. An intubation attempt was defined as any insertion of the laryngoscope blade into the oropharynx. AE were defined as any hypoxia (SaO2 < 88%), hypotension out of normal range for age, esophageal or mainstem intubation, emesis, dental trauma, dysrhythmia, or cardiac arrest. Goals of intervention were to achieve TTI of 4 minutes or less, and to decrease AE rate by 20%. Statistical process control charts were used to analyze the change in TTI.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No IAI</th>
<th>Radiographic IAI Only</th>
<th>IAI Undergoing Intervention</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Female Sex</td>
<td>1853 (51.9%)</td>
<td>99 (57.9%)</td>
<td>42 (47.7%)</td>
<td>0.2192</td>
</tr>
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<td>Age (years)</td>
<td>10.6 (5.48)</td>
<td>11.2 (5.23)</td>
<td>9.53 (4.89)</td>
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</tr>
<tr>
<td>Weight (kg)</td>
<td>46.2 (26.1)</td>
<td>46.9 (25.8)</td>
<td>42.5 (22.9)</td>
<td>0.4284</td>
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<td>Preverbal</td>
<td>428 (12.0%)</td>
<td>14 (8.19%)</td>
<td>6 (6.87%)</td>
<td>0.1257</td>
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<td>MVC Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Restrainted</td>
<td>2545 (71.3%)</td>
<td>100 (58.5%)</td>
<td>56 (63.6%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Lap + shoulder belt</td>
<td>1664 (65.4%)</td>
<td>63 (63.0%)</td>
<td>26 (46.4%)</td>
<td>-</td>
</tr>
<tr>
<td>Lap belt only</td>
<td>222 (8.72%)</td>
<td>12 (12.0%)</td>
<td>13 (23.2%)</td>
<td>-</td>
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<tr>
<td>Shoulder belt only</td>
<td>18 (0.73%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
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<tr>
<td>Infant car seat</td>
<td>245 (9.63%)</td>
<td>5 (5.00%)</td>
<td>3 (5.36%)</td>
<td>-</td>
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<tr>
<td>Booster seat</td>
<td>202 (7.94%)</td>
<td>3 (3.00%)</td>
<td>4 (7.14%)</td>
<td>-</td>
</tr>
<tr>
<td>Speed &gt; 40mph</td>
<td>1150 (52.2%)</td>
<td>63 (36.8%)</td>
<td>27 (50.7%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Unknown speed</td>
<td>1150 (52.2%)</td>
<td>73 (42.7%)</td>
<td>51 (58.0%)</td>
<td>-</td>
</tr>
<tr>
<td>Clinical Findings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total GCS Score Median (QRS)</td>
<td>15 (15)</td>
<td>15 (14.5)</td>
<td>15 (7.15)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>101 (24.1)</td>
<td>107 (23.9)</td>
<td>117 (25.6)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Systolic Blood Pressure</td>
<td>121 (17.4)</td>
<td>122 (21.6)</td>
<td>110 (27.1)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Respiratory Rate</td>
<td>22.2 (7.52)</td>
<td>24.3 (9.62)</td>
<td>23.6 (6.51)</td>
<td>0.0033</td>
</tr>
<tr>
<td>Severe Abdominal Pain</td>
<td>99 (9.30%)</td>
<td>15 (16.5%)</td>
<td>20 (46.5%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Severe Abdominal Tenderness</td>
<td>84 (7.88%)</td>
<td>15 (17.2%)</td>
<td>24 (48.0%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Evidence of Abdominal Trauma</td>
<td>611 (17.1%)</td>
<td>61 (35.7%)</td>
<td>52 (59.1%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Vomiting / Retching</td>
<td>200 (5.60%)</td>
<td>16 (9.36%)</td>
<td>13 (14.8%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Decreased Breath Sounds</td>
<td>62 (1.82%)</td>
<td>15 (8.77%)</td>
<td>14 (15.9%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Distracting Injury</td>
<td>639 (17.9%)</td>
<td>49 (28.2%)</td>
<td>35 (39.8%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Intubated</td>
<td>123 (3.4%)</td>
<td>23 (13.5%)</td>
<td>28 (31.8%)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Laboratory Values</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALT</td>
<td>32.8 (45.6)</td>
<td>161 (190)</td>
<td>150 (201)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>AST</td>
<td>58.1 (81.6)</td>
<td>236 (268)</td>
<td>254 (282)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Lipase</td>
<td>53.1 (123)</td>
<td>107 (149)</td>
<td>259 (739)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>WBC</td>
<td>11.4 (5.31)</td>
<td>16.8 (7.32)</td>
<td>16.9 (7.10)</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Hematocrit</td>
<td>37.9 (4.43)</td>
<td>36.9 (4.64)</td>
<td>34.0 (7.13)</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

Key: 1 = reported as N (% total); Chi-Squared used as test of significance. 2 = reported as Mean (SD); ANOVA used as test of significance. 3 = reported as Median (Q1, Q3); Kruskal-Wallis used as test of significance.
Results: There were 59 intubations that met inclusion criteria, 23 pre-QII and 36 post-QII. Of these, 47 had RSI (n=18 pre-QII, n=29 post-QII); the remaining patients were in cardiac arrest upon arrival and did not receive RSI. Historical data demonstrated median TTI with RSI of 7.0 minutes (mean 8.5, IQR 6). After QII, TTI was reduced by 43%, to 4.0 minutes (mean 5.3, IQR 2.5). Pre-QII, the rate of AE with RSI was 44% (10/23). Post-QII, the rate of AE was 28% (10/36), a relative reduction of 36%. FPISR was 14/23 (61%) pre-QII and 22/36 (61%) post-QII. Estimated total materials cost was $300.

Conclusions: After simultaneous initiation of 5 low-cost interventions to standardize the RSI process in a PED, we found a reduction in TTI. Further study is required to investigate whether achievements are sustainable and if AEs decrease with a larger sample. QII to standardize RSI in the PED may improve patient safety and decrease morbidity and mortality among pediatric patients who require intubation.

Airway by Broselow

<table>
<thead>
<tr>
<th>Color</th>
<th>Age (kg)</th>
<th>Mask ETT</th>
<th>Stylette/Blade</th>
<th>NG/OG</th>
<th>LMA</th>
<th>Gilderscope Blade</th>
<th>Gilderscope Stylette</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey (3-5)</td>
<td>0-3 mos</td>
<td>0-1</td>
<td>3.5 blue muller</td>
<td>8F</td>
<td>1</td>
<td>2 blue colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Pink (6-7)</td>
<td>3-6 mos</td>
<td>1</td>
<td>3.5 blue muller</td>
<td>8F</td>
<td>1.5</td>
<td>2 blue colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Red (8-9)</td>
<td>6-12 mos</td>
<td>1</td>
<td>3.5 blue muller</td>
<td>8F</td>
<td>1.5</td>
<td>2 blue Colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Purple (10-11)</td>
<td>12mos-18 mos</td>
<td>2</td>
<td>4 gray muller 1</td>
<td>8-10F</td>
<td>2</td>
<td>2.5 green colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Yellow (12-14)</td>
<td>18 mos-3 yr</td>
<td>2</td>
<td>4.5 gray muller 2</td>
<td>10F</td>
<td>2</td>
<td>2.5 green colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>White (15-18)</td>
<td>3yr-4.5yr</td>
<td>3</td>
<td>5 gray muller 2</td>
<td>10F</td>
<td>2</td>
<td>2.5 green colorimeter</td>
<td>(ped/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Blue (19-23)</td>
<td>4.5yr-7yr</td>
<td>3</td>
<td>5.5 gray muller/mac 2</td>
<td>10F</td>
<td>2.5</td>
<td>2.5 green colorimeter</td>
<td>(adult/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Orange (24-29)</td>
<td>7yr-9yr</td>
<td>3</td>
<td>6 gray muller/mac 3</td>
<td>10F</td>
<td>2.5</td>
<td>3 rigid Colorimeter</td>
<td>(adult/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Green (30-37)</td>
<td>9yr-12yr</td>
<td>4</td>
<td>6.5 gray muller/mac 3</td>
<td>12F</td>
<td>3</td>
<td>3 rigid colorimeter</td>
<td>(adult/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Brown (37-50)</td>
<td>12yr-15yr</td>
<td>6-5</td>
<td>7 green muller/mac 3</td>
<td>12F</td>
<td>4</td>
<td>4 rigid Colorimeter</td>
<td>(adult/suction/tape)</td>
<td></td>
</tr>
<tr>
<td>Black (&gt;50)</td>
<td>&gt;15yr</td>
<td>5</td>
<td>8 green muller/mac 3</td>
<td>12F</td>
<td>5</td>
<td>4 rigid Colorimeter</td>
<td>(adult/suction/tape)</td>
<td></td>
</tr>
</tbody>
</table>

Color coded and standardized airway equipment chart

Time to Intubation

Run chart of time to intubation after initiation of quality improvement initiative
A Machine-Learning Approach to Predicting Need for Hospitalization for Pediatric Asthma Exacerbation at the Time of Emergency Department Triage

Shilpa J. Patel, MD, MPH; Daniel Chamberlain, MS; James M. Chamberlain, MD; (1) Children's National Health System, Washington, DC, (2) Digital Shadows, Bethesda, MD, (3) Children's National Medical Center, Washington, DC

Purpose: Pediatric asthma is a leading cause of emergency department (ED) utilization and hospitalization. Several asthma severity scores predict admission several hours into the ED stay. Earlier identification of need for hospital level care could triage patients more efficiently to high- or low-resource ED tracks. In addition to the rich clinical data available in the electronic health record (EHR), geographic location can also be leveraged to access epidemiologic, weather, and socio-demographic (e.g. neighborhood) data. Our objective was to use a machine-learning approach to build and validate various models to predict need for hospital level care in pediatric patients presenting with asthma exacerbation at the time of ED triage.

Methods: Retrospective analysis of patients ages 2-18 years seen at two urban pediatric EDs with asthma exacerbation between 1/2010 and 12/2016. We included patients who received both albuterol and systemic corticosteroids. We included patient features (gender, race/ethnicity, age, weight), measures of illness severity available in triage (oxygen saturation, heart rate, respiratory rate, and triage acuity), weather features (rolling averages over 1, 2, 7 and 14 days prior to presentation), CDC influenza patterns, and socio-demographic features based on patient zip code (poverty, housing type, and occupancy) in the models. We tested four different models: decision trees, logistic regression, random forests, and gradient boosting machines. For each model, 80% of the data was used for training and 20% was used to evaluate the models. The area under (AUC) the receiver operator characteristic (ROC) curve (i.e. discrimination) was calculated for each model.

Results: There were 29,354 patients included in the analyses; mean age of 7.0 years (SD 4.3), 42% female, 77% non-Hispanic black, 76% public insurance. The AUCs for each model were decision tree 0.68 (95%CI 0.65-0.75), logistic regression 0.82 (95% CI 0.81-0.82), random forests 0.82 (95% CI 0.81-0.83), and gradient boosting machines 0.85 (95% CI 0.84-0.8). Figure 1 shows the AUC curves for each model. In the lowest quintile of risk, only 1% of patients required hospitalization; in the highest quintile this rate was 54%. After patient vital signs and acuity information, weather-related features were the most important for predicting asthma admission. (Figure 2)

Conclusion: The gradient boosting machines model was the most successful at predicting need for hospital level care at the time of triage in pediatric patients presenting with asthma exacerbation. The addition of weather data significantly improved the performance of this model. These models could be used for differential triage of low-risk patients and high-risk patients as a strategy to improve efficiency.

Figure 1. AUC for each model. A) Decision Tree B) Gradient Boosting C) Logistic Regression D) Random Forest. [red line represents ranges (25%, 75%)]
(9) Geographical Variation in Pediatric Emergency Medical Services Utilization

**Lauren C. Riney**, DO1; Richard C. Brokamp, PhD2; Andrew Beck, MD, MPH3; Wendy J. Pomerantz, MD, MS2; Hamilton P. Schwartz, MD2; Todd A. Florin, MD, FAAP2, (1) Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, (2) Cincinnati Children’s Hospital Medical Center, Cincinnati, OH, (3) UC Department of Pediatrics, Cincinnati Children’s Hospital Medical center division of General and Community Pediatrics and Hospital Medicine, Cincinnati, OH

**Background:** Pediatric transport by emergency medical services (EMS) is costly and resource-intensive. Significant variation in pediatric EMS utilization exists across large-scale geographies. Identifying geographic factors associated with EMS utilization will allow for targeted community-based interventions to minimize unnecessary use and focus services on those at greatest need. **Purpose:** To determine if pediatric EMS utilization varied geographically across Hamilton County, Ohio and whether that variability was associated with underlying neighborhood-level socioeconomic characteristics.

**Methods:** We performed a retrospective analysis of children transported by EMS to Cincinnati Children’s Hospital Medical Center (CCHMC) Emergency Department (ED) between July 1, 2014 and July 31, 2016. Study participants included children < 16 years of age, transported via EMS for any reason to the CCHMC ED. Analysis was limited to Hamilton County, Ohio, where CCHMC is located. Participants’ residential addresses collected from electronic health records were geocoded. An EMS utilization rate was calculated for each Hamilton County census tract by normalizing the total number of EMS transports by the total population under 18 years of age. A previously-constructed deprivation index, created using a principal components analysis of eight different socioeconomic census tract-level measures from the 2015 American Community Survey, was assigned to each child transferred by EMS based on the census tract to which they had been geocoded. The deprivation index ranges from 0 to 1, with a higher number correlating with increased socioeconomic deprivation. Pearson’s correlation coefficient was used to evaluate the association of the deprivation index and EMS utilization rate.

**Results:** During the study period, 4,877 children were transported by EMS to CCHMC from 219 of the 222 census tracts in Hamilton County. The overall rate of EMS utilization within Hamilton County was 2.4 per 100 children, with rates varying more than 10-fold across census tracts (range, 0 to 11.1 per 100) (Figure 1). Amongst the census tracts, an increased deprivation index correlated with a higher EMS rate of utilization (r=0.72, 95%CI: 0.65-0.77) (Figure 2).

**Conclusion:** Increased EMS utilization is associated with higher rates of neighborhood-level socioeconomic deprivation. Further study and community-based interventions should target areas of high EMS use to minimize non-critical transports, while focusing use on those with greatest need.
These four maps, representing increasing deprivation index quartiles, show continuous EMS utilization by census tracts, with orange/red coloring signifying a higher EMS utilization rate per 100 and green/yellow coloring signifying a lower EMS utilization rate.
10) A Nationwide Analysis of Emergency Department Utilization of Head CT in Children with Closed Head Injury

Alexandre T. Rotta; Onyinyechi Ukwuoma, MD, MPH1; Veerajalandhar Allareddy, MD, MBA, FAAP, FACP 2; Veerasathpurush Allareddy, BDS MBA MHA PhD MMSc 2; Sankeerth Rampa; Jerri Rose, M.D., F.A.A.P. 1, MD 4; (1) Rainbow Babies and Children's Hospital, Cleveland, OH, (2) University of Iowa, Iowa City, IA, (3) University of Nebraska Medical Center, Omaha, NE, (4) UH Rainbow Babies & Children's Hospital, Cleveland, OH

Purpose: While closed head injuries (CHI) occur commonly in children, most cases do not result in clinically important traumatic brain injury (cTBI). The 2009 PECARN Pediatric Head Injury algorithm is a well-validated clinical decision guide that enables physicians to safely exclude cTBIs in children with CHI without obtaining neuroimaging, thus decreasing unnecessary exposure to radiation and other health risks, in addition to healthcare costs. We sought to assess the prevalence of and trends in head CT utilization in children visiting an Emergency Department (ED) with CHI across the United States using a nationally representative sample.

Method: We analyzed 2008-2013 data from the Nationwide ED Sample (NEDS) to examine patterns in head CT utilization for children visiting an ED with CHI. All patients < 18 years who visited an ED with CHI were selected. Utilization of head CT was identified using CPT codes. We examined multiple patient and hospital characteristics including the types of injuries. Multivariable logistic regression analysis was used to identify predictors of head CT use in this cohort.

Results: From 2008 to 2013, a total of 4,552,071 children visited an ED with CHI, of which 1,181,659 (26%) received a head CT. The majority of these children were treated and released from the ED (97.1%). Rates of head CT utilization per year analyzed were 24.5%, 24.7%, 27%, 26.8%, 25.9% and 26.5%, respectively. Most subjects were males (61.5%) and in the 0-9 year age group (58.6%). Teaching hospitals (THs) (43.7%) treated the majority of children. Females (OR=0.98 [95% CI: 0.96-0.99], p < 0.01) and uninsured children (0.86 [0.82-0.91], p < 0.01) were less likely to receive a head CT. Patients treated in non-teaching hospitals (1.63 [1.35-1.96], p < 0.01) were more likely to receive a head CT. No significant change in annual head CT utilization rates was noted in the years pre- versus post-publication of the PECARN Pediatric Head Injury algorithm (2009) (y2009: OR 1[0.86-1.16]; y2010: 1.1[0.96-1.34]; y2011: 1.1[0.92-1.35]; y2012: 1.1[0.94-1.3]; y2013: 1.1[0.92-1.31]; Reference: y2008). Although head CT utilization rates remained stable in THs, a significant increase was observed in both non-teaching hospitals and suburban hospitals (Figure).

Conclusion: In this large nationwide pediatric sample, approximately 1 in 4 children who visited an ED with CHI received a head CT; the vast majority of these children did not require hospital admission or surgical intervention. Children treated at non-teaching hospitals were more likely to receive a head CT, while girls and uninsured children were significantly less likely to undergo head CT. Overall rates of head CT utilization did not decrease after publication of the 2009 PECARN Pediatric Head Trauma algorithm in this sample. In fact, head CT utilization actually increased in suburban hospitals and metropolitan non-teaching hospitals.

Hospital Location/Teaching Status and Use of Head CT Scans by Year

![Graph showing head CT utilization percentages by year and hospital location/teaching status]
Purpose: Our objective was to develop a set of physical exam and laboratory findings that in selected pediatric patients, combined with the FAST exam results, were sensitive and specific in detecting intra-abdominal injuries that correlated with CT scan results.

Methods: This was a retrospective chart review of all trauma patients aged 0-17 years who were evaluated at an academic American College of Surgeons (ACS) verified Level 1 Adult and Pediatric Trauma center between January 1, 2015 and December 31, 2015. Inclusion criteria were: 1) complaint of blunt abdominal trauma; 2) a FAST exam and an abdominal CT scan performed; and 3) lab diagnostics completed. The included laboratory diagnostics were: complete blood count, liver function tests and lipase. After reviewing 302 patient records, 133 were included in the final analysis. We reviewed the literature and determined the history, physical exam and cutoff laboratory results to be used in the final analysis. The sensitivity and specificity of the FAST exam alone and in combination with the predetermined diagnostic criteria were calculated and the results were analyzed for correlation with CT scan results then reported using the phi-coefficient of correlation.

Results: Figure1 summarizes our chart review findings. The FAST exam alone had a sensitivity of 97.8% (95% CI: 86.8-99.9) and a specificity of 3.7% (95%CI: 0.9-11.0) for detecting intra-abdominal injury. The FAST exam, combined with our clinical criteria, had a sensitivity of 96.9% (95%CI: 82.5%-99.8) and a specificity of 68.9% (95%CI: 58.1-78.0) for detecting intra-abdominal injuries. When combined with the clinical criteria, the FAST exam correlated with the CT scan results ($\Phi$= +0.53; p < 0.0001), while the FAST exam alone did not ($\Phi$=0.1; p=0.55).

Conclusion: When combined with clinical findings, the FAST exam is highly sensitive and specific for detecting intra-abdominal injuries and correlates with abdominal CT scan findings. These results may be used to guide further imaging decisions in the assessment of pediatric blunt abdominal trauma.

Figure 1

Study flow diagram showing the results of the chart review.
(12) High proportion of false negative urinary tract infections among dilute urine samples

Yudil Velez, MD1; Muhammad Waseem, MD, MS, FAAP, FACEP2; Euripides Roques, MD3; Erin Ciummo, MD; Linda Gerber, PhD3; (1) Lincoln Medical Health Center, Bronx, NY, (2) Lincoln Medical Center, Bronx, NY, (3) Weill Cornell Medical College New York, New York, NY

Objective Observation has led us to believe that urinary tract infections (UTI) may be difficult to diagnose from a dilute urine specimen. We conducted this study to determine the effect of urine concentration on identifying UTI based on urinalysis (UA) results.

Methods: We reviewed the UA results of febrile children under 36 months of age with positive urine cultures. We classified UA into positive and negative categories based on the following: the number of WBCs, presence of Leucocyte Esterase (LE) and nitrites. We defined a UA as negative if < 5 WBCS, and LE and nitrites were negative. A positive UA was defined if any of the above criteria were present. Urine specific gravity < 1010 was considered dilute urine. We calculated the difference in proportions of specific gravity levels within groups categorized as positive or negative by chi-squared test.

Results: In this study, samples from 384 children under 36 months of age with culture proven UTI were included. 195 (50.8%) were Hispanic, 56 (14.6%) were African American and 133 (34.6%) were others. 150 (39.1%) were male and 234 (60.9%) were female. UA was positive in 219 (57.0%) and negative in 165 (43.0%). In terms of urine specific gravity, the following was noted: < 1005 [57 (14.8%)], 1006-1010 [86 (22.4%)], 1011-1015 [66 (17.2%)], 1016-1020 [70 (18.2%)], 1021-1025 [91 (23.7%)], and > 1026 [14 (3.7%)]. UA was negative in 35 (61.4%) with specific gravity < 1005, 48 (55.8%) with 1006-1010, 15 (22.7%) with 1011-1015, 26 (37.1%) with 1016-1020, 33 (36.3%) with 1021-1025 and 8 (57.1%) with > 1026 sample (Chi-Square p = 0.0001).

Conclusion: Among those with dilute urine samples, 58.0% had negative UA results. Urine concentration should be considered when interpreting UA in the emergency department when making a diagnosis of UTI due to the observed high proportion of missed positive results.

(13) Firearm Safety: A Survey on Practice Patterns, Knowledge and Opinions of Pediatric Emergency Medicine Providers

Sheryl E. Yang, MD, FAAP; Kate Remick, MD, FAAP, FACEP, FAEMS; Matt Wilkinson, MD, FAAP; (1) Northwestern University Feinberg School of Medicine, Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, IL, (2) Dell Medical School at the University of Texas at Austin, Austin, TX

Background and Objectives: Firearm injuries continue to be one of the top three leading causes of death in American youth, and access to firearms remains an important focus for primary injury prevention efforts in children. Emergency departments (EDs) often serve as a center for screening and education on injury prevention as injuries are the most common reason for pediatric ED visits. Our study sought to examine the knowledge, opinions, and practice patterns of pediatric emergency medicine (PEM) providers in regard to firearm safety counseling and assessment in the ED.

Methods: We conducted a prospective cross-sectional survey of pediatric emergency providers through the AAP Section on Emergency Medicine (SOEM) Pediatric Emergency Medicine Collaborative Research Committee (PEM CRC) list-serve. Results: A total of 465 members of the SOEM received an invitation to complete the survey.

Results: Of 185 responses were available for analysis, giving an overall response rate of 40%. The majority of respondents were attending physicians (90%), had completed PEM fellowship (83%), and practice in academic university based (78%), urban (87.9%), free-standing children’s hospitals (69.4%). Most clinicians self-identified as Democrat (66.8%) and only 11.6% reported owning or having a firearm in the home. Ninety percent of providers agreed that information they provide families can help reduce pediatric injuries in general and 70% agreed that information they provide may help prevent firearm injuries. However, only half as many clinicians reported providing counseling on firearm injury prevention “sometimes” or “frequently” when compared with other injury prevention topics, such as helmet use and child passenger safety. When asked about barriers to firearm safety counseling, more respondents reported political restraints, lack of physician awareness, and legal constraints compared with barriers to general injury prevention counseling. About a third of respondents were unsure if the law in their state permitted them to have discussions about firearms. The results of logistic regression analysis showed that the biggest predictors of clinicians providing firearm safety counseling were: 1) feeling that information they provide families helps to reduce pediatric injuries (AOR 2.19, p = 0.04), 2) confidence in their ability to provide firearm injury prevention information (AOR 4.05, p = 0.002), 3) feeling that it is their responsibility to counsel on firearm safety (AOR 5.13, p < 0.001), and 4) age > 45 yr. (AOR 3.37, p = 0.002).
Discussion: This survey, while of a select population of PEM providers, suggests that future efforts to increase firearm safety screening and counseling by PEM providers in the ED should focus on interventions that improve clinician confidence and increase the feeling of personal responsibility for providing this information. This, as well as analyzing barriers to both general injury prevention and firearm safety in the ED, may lead to increased counseling among PEM providers.

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information that I provide families can help to reduce pediatric injuries.</td>
<td>35.7 (66)</td>
<td>54.6 (101)</td>
<td>0.7 (16)</td>
<td>0.5 (1)</td>
<td>0.5 (1)</td>
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<tr>
<td>Information that I provide families can help to reduce pediatric firearm injuries.</td>
<td>26.6 (45)</td>
<td>47 (86)</td>
<td>23 (42)</td>
<td>3.3 (6)</td>
<td>2.2 (4)</td>
</tr>
<tr>
<td>I feel confident in my ability to provide firearm injury prevention information and counseling.</td>
<td>20.8 (38)</td>
<td>40.1 (73)</td>
<td>27.4 (50)</td>
<td>10.4 (19)</td>
<td>1.1 (2)</td>
</tr>
<tr>
<td>I feel that it is my responsibility to counsel patients and families about firearm safety.</td>
<td>17.5 (32)</td>
<td>43.2 (79)</td>
<td>30.6 (56)</td>
<td>7.1 (12)</td>
<td>1.6 (3)</td>
</tr>
<tr>
<td>I ask my patients/families about the presence of or access to firearms in the home.</td>
<td>15.5 (28)</td>
<td>40.5 (73)</td>
<td>39.4 (71)</td>
<td>4.4 (9)</td>
<td></td>
</tr>
<tr>
<td>I ask my patients/families about how they store firearms in the home.</td>
<td>10.0 (18)</td>
<td>45.3 (82)</td>
<td>31.5 (57)</td>
<td>4.4 (8)</td>
<td></td>
</tr>
<tr>
<td>I counsel patients and families on proper safe storage of firearms in the home.</td>
<td>22.4 (41)</td>
<td>43.7 (80)</td>
<td>30.1 (55)</td>
<td>3.8 (7)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2:
Variables Influencing PEM Provider Counseling on Safe Firearm Storage in the Home

<table>
<thead>
<tr>
<th>Variable (Response)</th>
<th>OR</th>
<th>p value</th>
<th>AOR</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information that I provide families can help to reduce pediatric injuries (Strongly agree)</td>
<td>3.03</td>
<td>0.001</td>
<td>2.19</td>
<td>0.04</td>
</tr>
<tr>
<td>I feel confident in my ability to provide firearm injury prevention information and counseling (Agree or Strongly Agree)</td>
<td>5.46</td>
<td>&lt;0.001</td>
<td>4.05</td>
<td>0.002</td>
</tr>
<tr>
<td>I feel that it is my responsibility to counsel patients and families about firearm safety (Agree or Strongly Agree)</td>
<td>6.4</td>
<td>&lt;0.001</td>
<td>5.13</td>
<td>0.000</td>
</tr>
<tr>
<td>Age &gt; 45 years</td>
<td>2.04</td>
<td>0.026</td>
<td>3.37</td>
<td>0.002</td>
</tr>
</tbody>
</table>
Reducing Rapid Streptococcal Pharyngitis Testing in Patients Less than 3 Years Old
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Background: Pharyngitis is common; however, in patients < 3 years of age, Group A streptococcus (GAS) is an uncommon etiology and sequelae such as acute rheumatic fever are rare. Inappropriate testing leads to increased cost of healthcare and unnecessary exposure to antibiotics. Thus, rapid streptococcal testing (RST) for GAS pharyngitis is not routinely indicated in this age group unless the patient meets clinical criteria and has a household contact with documented streptococcal pharyngitis. Our objective was to reduce RST at the emergency department (ED) in patients < 3 years old by 50% in 12 months.

Methods: We initiated this project in October 2016 at an urban tertiary pediatric ED. We surveyed all pertinent disciplines to identify factors leading to RST in this age group: lack of knowledge/retention, family expectations, and education driven by adult literature. We conducted multiple interventions: (1) provider (attendings, fellows and nurse practitioners) education; (2) nurse education; (3) reporting at daily management systems; (4) resident education; and (5) ordering process alert. We collect weekly data to inform PDSA cycles, in addition to data on family complaints and return visits for poor outcome. The project is ongoing, and we use statistical process control for analysis.

Results: The mean RSTs ordered per month in patients < 3 years old has declined by 34% over 6 months. Most tests were ordered by nurse practitioners (64.6%), residents (18.5%) and faculty (13.8%). Tests were ordered for patients aged 25-36 months (66.2%), 13-24 months (30.8%) and < 12 months (3.1%). There has been no identifiable change in family satisfaction, or poor outcome with the reduced RST.

Conclusion: We used QI methodology to identify barriers and study interventions to reduce RST in patients < 3 years old. Our interventions led to a substantial decline in RST in patients < 3 years old. We are in the process of implementing further systems changes including an alert when ordering RST, and are developing a clinical practice guideline as our next step. We are also expanding the scope to include all outpatient settings at the hospital.

Number of rapid strep tests ordered per month

The mean RSTs ordered per month in patients <3 years old has decreased by 34% over 6 months.