Integrating Evidence-Based Pediatric Prehospital Protocols into Practice

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Objectives

• To provide an **overview** of the past, present and future of national prehospital evidence-based guideline (EBG) development

• To describe **critical considerations** in developing, implementing and assessing outcomes for prehospital guidelines

• To define how prehospital guidelines relate to **pediatric readiness** in emergency departments
Role of Evidence-Based Guidelines

• What are they?
  - “Systematically developed statements to assist practitioner and patient decision(s) about appropriate health care for specific clinical circumstances” - Institute of Medicine

• Help translate research → practice

• Relevance to EMS: providers operate under the delegated practice of a physician medical director
Potential Benefits

• Summarize available evidence on broad clinical topics
• Improved effectiveness and safety of care
• Provide clinicians with relevant and reliable summaries of evidence
• Address treatment uncertainties
• Help maximize use of health care resources
• Enhance shared decision-making between patients and physicians

Penney and Foy. Best Practice and Research, 2007
Figure 1. National prehospital EBG model. EBG = evidence-based guideline.
Guideline Initiation: Topic Selection

- Aggressive behavior
- Allergic reactions
- Altered mental status
- Cardiac arrest
- C-spine immobilization
- Fever
- Heat exposure
- Injury
- Nontransport criteria

- Pain
- Poisoning
- Respiratory distress
- Restraint devices for transport
- Seizures
- Shock/Hypotension/Tachycardia
- Submersion
- Transition of care from EMS to EC
- Vomiting/Diarrhea

- High prevalence
- Variations in practice
- Resource intensive
- Morbidity/mortality risk for the patient
- Evidence exists
- Feasibility in collecting data
- Diagnostic and therapeutic options exist for the condition

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Multi-Site Engagement of EMS

• 3 of the largest urban EMS systems in the U.S. participating
  - Houston Fire Department EMS
  - City of Austin / Travis County EMS
  - Bio Tel EMS (Dallas)

• Medical directors and paramedics from each system actively engaged in protocol development process

• Has potential to impact care for thousands of children in respiratory distress

• Results will be generalizable to other urban EMS systems

Multi-disciplinary engagement is essential:
• EMS Med. Directors x3
• Pediatric Emergency Medicine (PEM) x3
• Paramedics x3
• Parent x1

Pediatric Readiness
Opportunity to engage with a prehospital care coordinator at local hospitals

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Need to look at existing protocols to ensure the following:

- Evidence exists on the topic
- Current evidence is not being applied in care
- Variability in care exists
Evidence Appraisal

- Evidence-based medicine course curriculum adapted to train protocol development committee
- Research specialists experienced in guideline development for hospital and clinic-based care
Evidence Appraisal

• **PICO questions** defined by a multidisciplinary committee
  - Patient
  - Intervention
  - Comparison
  - Outcome

• Recommendations made using the Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) approach

Use of consistent methodology is also necessary
Evidence Appraisal: PICO Questions

• In children with respiratory distress in the prehospital setting…

  - Which respiratory assessment tools have been validated?
  
  - Is a pulse oximetry sufficient in monitoring a child’s respiratory status?
  
  - Is electrocardiogram/cardiac monitoring necessary in monitoring a child’s respiratory status?
  
  - Is the routine application of oxygen in the absence of hypoxia clinically effective?
  
  - Is airway suctioning effective in improving:
    • Oxygenation?
    • Clinical signs of distress?
Guideline Development

<table>
<thead>
<tr>
<th>Week/Dates</th>
<th>Objectives</th>
<th>Assignments</th>
<th>Important Dates</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Participate in Workshop A</td>
<td>Refine PICO questions</td>
<td>Research Specialist to submit PICO questions to Dr. Shah by <strong>Friday, February 4</strong></td>
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<td>January 24 - January 28</td>
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<tr>
<td>Week 2</td>
<td>PICO Questions/Searching</td>
<td>Finalize PICO questions; Begin search utilizing preidentified limits (Human, English, last 10 years, All children (0-18 years))</td>
<td>Research Specialist to submit PICO questions to Dr. Shah by <strong>Friday, February 4</strong></td>
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<tr>
<td>January 31 - February 4</td>
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<td>Protocol Committee Members forward any/all literature needs to <a href="mailto:jmnichol@texaschildrenshospital.org">jmnichol@texaschildrenshospital.org</a> or <a href="mailto:timburke@texaschildrenshospital.org">timburke@texaschildrenshospital.org</a></td>
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<td>Week 3</td>
<td>Searching/Literature Review</td>
<td>Continue searching/article retrieval</td>
<td>Conference Call #1 - Searching results</td>
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<td>February 7 - February 11</td>
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<tr>
<td>Week 4</td>
<td>Searching/Literature Review</td>
<td>Begin evaluating the evidence</td>
<td>Conference Call #1 - Searching results</td>
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<td>Week 5</td>
<td>Evidence Appraisal</td>
<td>Continue to evaluate the evidence</td>
<td>Protocol Committee Members submit a draft of GRADE table and EB summary to Research Specialist by <strong>Friday, February 25</strong></td>
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<td>February 21 - February 25</td>
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<td>Week 6</td>
<td>Evidence Appraisal</td>
<td>Revise GRADE table and Review Summary</td>
<td>Research Specialist will forward feedback to Protocol Committee Members prior to Conference Call #2 Data Collectors Conference Call - December Pilot, Feasibility of proposed measures Conference Call #2 - GRADE tables and EB Summary</td>
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<td>February 28 - March 4</td>
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<td>Week 7</td>
<td>Practice Recommendations</td>
<td>Revise GRADE table and Review Summary</td>
<td>Conference Call #3 - Develop plan for workshop presentations</td>
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<td>March 7 - March 11</td>
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<td>Week 8</td>
<td>Practice Recommendations</td>
<td>Finalize workshop presentations, EB summary and GRADE tables</td>
<td>Protocol Committee Members submit FINAL EB summary and GRADE tables to Research Specialist by <strong>Friday, March 18</strong></td>
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<td>March 14 - March 18</td>
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<tr>
<td>Week 9</td>
<td>Participate in Workshop B</td>
<td>Present Literature Review/Practice Recommendations</td>
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GRADE Approach

- Grades of Recommendation, Assessment, Development, and Evaluation (GRADE)
- Classifies evidence
  - High
  - Moderate
  - Low
  - Very low
- Classifies strength of recommendations
  - Strong
  - Weak

Jaeschke et al., BMJ, 2008.
Brozek et al., Allergy, 2009.

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Guideline Development

Practice Recommendations

Respiratory Assessment Tools
Prehospital providers should be taught to assess and document components of the Respiratory Distress Assessment Instrument (RDAI), Pediatric Asthma Severity Score (PASS), and Westley Croup respiratory scores. – Strong recommendation, Moderate quality evidence

Monitoring
Pulse oximetry should be routinely used in children with respiratory distress as an adjunct to other forms of respiratory monitoring. – Strong recommendation, Low quality evidence

Electrocardiogram (ECG) should not be routinely used for children with respiratory distress. If there are no signs of clinical improvement after treating the respiratory distress, consider ECG monitoring to assess for cardiac concerns. – Weak recommendation, Very low quality evidence

Measuring end-tidal CO₂ (ETCO₂) is safe, reliable and non-invasive and demonstrates a strong correlation with pulse oximetry, it should used as an adjunct to other forms of respiratory monitoring. – Strong recommendation, Low quality evidence

Treatment
Supplemental oxygen should be provided to all children with respiratory distress. – Strong recommendation, Very low quality evidence

A child’s nose and/or mouth should be suctioned (via bulb, Yankauer, suction catheter) if excessive secretions are present. – Strong recommendation, Very low quality evidence

Inhaled Medications
Beta-agonists should be administered to all children in respiratory distress with signs of bronchospasm (e.g., known asthmatics, quiet wheezers) in the prehospital setting, either via nebulized route or metered dose inhaler, by basic life support (BLS) or advanced life support (ALS) providers. – Strong recommendation, Moderate quality evidence

Nebulized anticholinergic medication (i.e. ipratropium) should be administered in multiple doses with short acting beta-agonist to children ≥2 years of age with known asthma who are in severe respiratory distress in the prehospital setting. – Strong recommendation, Moderate quality evidence

Summarize the recommendations

• Strength
• Quality
The algorithm and evidence summaries are available at www.bcm.edu/pediatrics/emsc

Draft a guideline
# Implementation Timeline

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<th>2011</th>
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<td><strong>Houston Control</strong></td>
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<td><strong>Austin Intervention</strong></td>
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<td><strong>Dallas Control</strong></td>
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<td><strong>Dallas Intervention</strong></td>
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Protocol Implementation

• Adapted respiratory distress curriculum for paramedics to both paramedic and EMT-basic learner groups

• Modified in-person 8 hour curriculum to a <1 hour on-line curriculum

• Trained approximately 4000 EMT-Bs and 400 EMT-Ps in Houston; EMT-Ps mainly in Austin/Dallas

• Partnering with EMS educators for successful education implementation and adherence to module completion

• Coordinated timing of protocol implementation with EMS agencies

Pediatric Readiness
Opportunity to engage with hospital-based content matter experts to develop education

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Guidelines and Research

• Little known about the effectiveness of evidence-based guideline implementation
  - Especially in the prehospital setting
  - Even more so for prehospital pediatrics

• Therefore any pediatric prehospital guideline implementation should be studied

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**Pediatric Readiness**
Opportunity to develop a patient care review process for feedback between EMS and hospitals
Guidelines and Research

• **Research Question:** In pediatric patients who are transported by Emergency Medical Services (EMS) to an Emergency Department (ED) for presumed respiratory distress, do patients who are treated with a prehospital evidence-based, standardized protocol have shorter overall treatment times (prehospital + hospital) than those treated with existing protocols?
Refining Measures for Data Collection

• Initial measures developed by protocol development committee based on group input
• Measures refined based on feasibility of collecting data and clinical relevance
• Questions developed for further investigation related to ability to modify medical record to gather desired information

Data must be gathered and analyzed to demonstrate whether the change was effective or not
Outcomes

• **Primary Outcome**
  - Total time of care = Time from on-scene arrival to time of ED/hospital discharge

• **Secondary Outcomes**
  - ED length of stay (LOS)
  - Hospital admission rates
  - ED obs unit, inpatient, PICU LOS
  - Prehospital on-scene and transport times
  - Change in vital signs
  - Time to administration of interventions
  - Prehospital administration of accepted therapy
  - # of prehospital advanced airway attempts
  - Mortality

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Outcomes Assessment

• Through data that is *already collected* in the electronic patient care records
• **No data forms** required
• Match prehospital and hospital records using *probabilistic linkage*
• Charts will be reviewed for instances when data is missing from the electronic record
Additional Implications for Pediatric ED Readiness

Prehospital EBGs can be utilized to optimize pediatric ED readiness by...

• Providing guidance for triage and transport to minimize unnecessary transfers
• Studying patient outcomes to provide feedback to both EMS and hospitals for quality improvement
• Coordinating best practices for triage, transport, and transfer of patients in a disaster
2014: Shock, airway management, spinal immobilization, allergic reactions

NASEMSO Model Clinical EMS Guidelines

PAST

2006
Release of the Institute of Medicine recommendation to develop evidence-based model prehospital care protocols

2007
Model tested: Pediatric seizures

Present

2008
Development and pilot testing of pediatric seizure EBG by EMSC-NRC

2009
Request for Proposals published in federal procurements by NHTSA

Future

2011
NHTSA competitively awards contract to pilot-test EBG development to CNMC with supplemental funding from EMSC

2012
NHTSA funded, FICEMS & NEMSA co-sponsored conference to solicit EMS stakeholder input for development of EBG Model Process

2014
Presentation of EBG model process at Society for Academic Emergency Medicine annual meeting

2015
Presentation on use of GRADE methodology for prehospital EBGs to Canadian Emergency Medicine annual meeting

Collaboration with stakeholders on developing the next steps for EBGs, including modifying the model as needed for broader use

Dissemination of final report of CNMC study of prehospital pain management and helicopter transport of injured patients from the scene of injury

Anticipated publication 01/14

THIS PROJECT: Pediatric Respiratory Distress
NASEMSO Clinical Guidelines

• NASEMSO has 2 projects funded by NHTSA
  - Model EMS Guidelines
    • To develop national model EMS guidelines, intended to help state EMS systems ensure a more standardized approach to the practice of patient care, and to encompass evidence-based guidelines as they are developed
  - Statewide Implementation of Care
    • To support the use and further refinement of the National EBG Model Process, developed by FICEMS and NEMSAC

www.nasemso.org
NASEMSO Clinical Guidelines

Draft Core Clinical Guidelines Titles and Necessary Components
JUNE 2013

Draft Core Model Clinical Guidelines
APRIL 2014

Final Model Clinical Guidelines
AUGUST 2014

Cunningham and Kamin

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EMSC Targeted Issues Grants (9/13-8/16)

• **Category I award (1):** Development of an EMS research network, aligned with the Pediatric Emergency Care Applied Research Network
  - **CHaMP**: Charlotte, Houston, and Milwaukee Prehospital Research Node

• **Category II award (5):** Prehospital-focused topics by individual investigators
  - Pediatric Evidence-based Guidelines: Assessment of EMS Utilization in States (**PEGASUS**)  
  - EBG development of guidelines for shock, airway management, spinal immobilization, and allergic reactions
  - Pilot 2 guidelines in Houston, and implement them in New England with outcomes assessment

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Summary

• Multidisciplinary involvement is essential when using the Prehospital EBG Model Process

• Implementation requires provider training to ensure successful change

• Patient outcomes must be studied along the continuum of emergency care

• Every phase of the guideline process is an opportunity to engage with local hospitals to ensure pediatric readiness

• Ongoing national projects will lead to more prehospital EBGs soon