



Texas EMSC State Partnership



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

1. External Inputs

Evidence synthesis processes
Existing prehospital guidelines and protocols
Prehospital components of existing multidisciplinary EBGs
EMS scope of practice and educational standards
EMS researchers and professionals

National Prehospital Evidence-Based Guideline Model

Approved by the Federal Interagency Committee on EMS and the National EMS Advisory Council

2. Guideline Initiation and Evidence Review

Accept/generate proposals
Identify existing evidence
Recommend need for (or conduct) new systematic reviews
All parties disclose affiliations and conflicts of interest

3. Evidence Appraisal

Evaluate quality of evidence and guidelines
Recommend topics for further guideline development
Archive material not selected for further development

4. Guideline Development

Prioritize outcomes
Weigh the risks and benefits of the interventions (GRADE methodology)
Assign a strength of recommendation for each intervention
If no recommendation can be made, outline the rationale
EMS contextualization
Write or endorse guideline
Provide feedback to originating source

5. Model EMS Protocol Development

EMS contextualization
Describe clinical implications of the strength of recommendations

pre-existing protocols

6. Guideline/Protocol Dissemination

Link to recommendations from the EMS Education Agenda for the Future and to the National EMS Education Program Accreditation
Publish in peer-reviewed journals, trade press, textbooks, and government reports
Produce new educational and quality improvement materials
Target stakeholder organizations
Use a multimedia approach

7. Implementation

Link to national EMS provider certification/recertification
Link to national EMS agency accreditation
Develop EBG implementation toolkits, webinars, manuals
Partner with national organizations to facilitate interpretation, application, and acceptance by medical direction authorities
Potentially link implementation to funding and reimbursement
Develop health informatics and clinical decision support software
Develop quality improvement measures and tools

8. Evaluation of Effectiveness, Outcomes, Clinical Research, QJ Evaluations

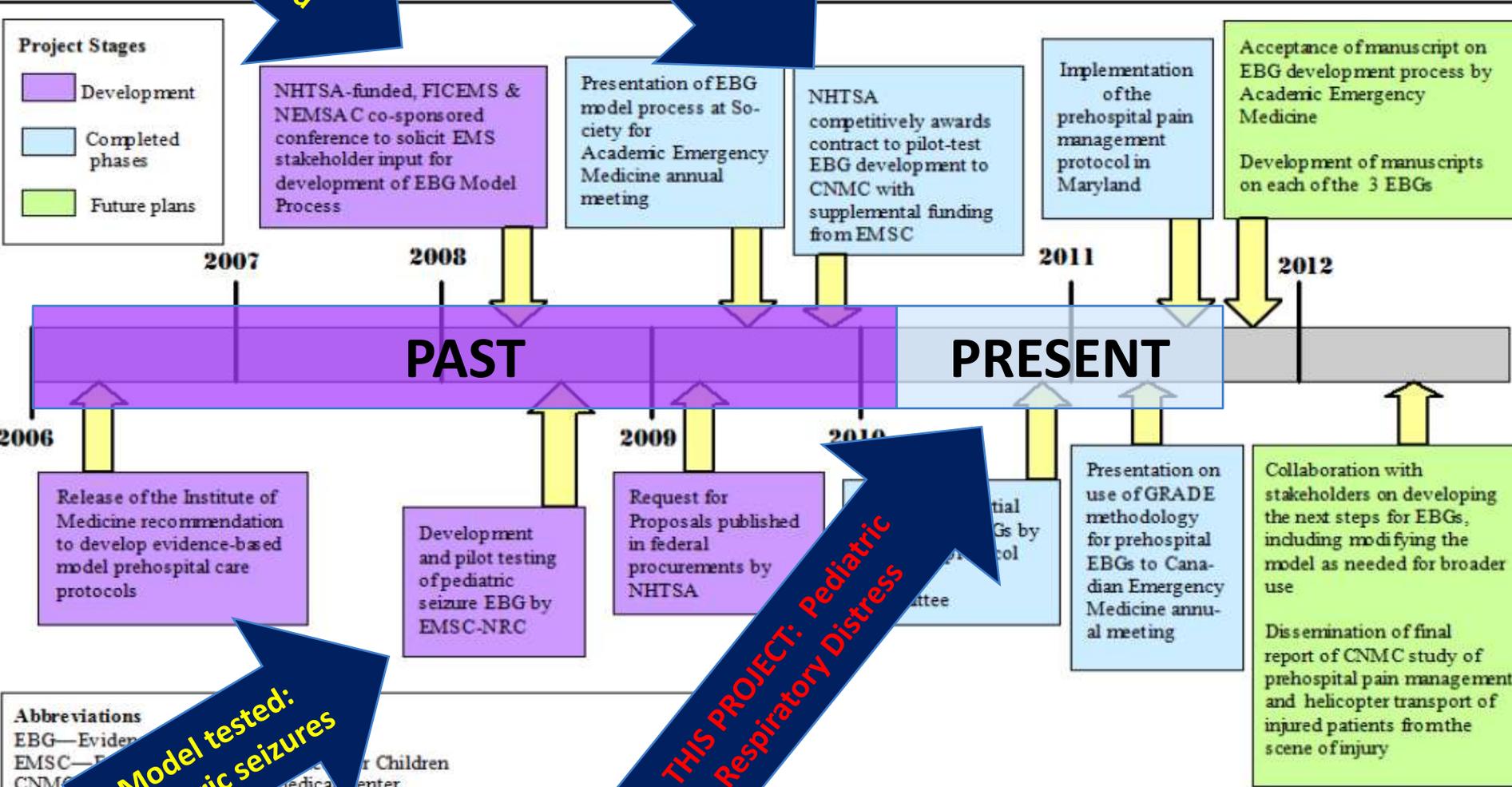
EBG/protocol pilot testing & feasibility studies
Monitor local quality improvement benchmarks
Apply NEMSIS data in evaluation process
Systems research (EMSOP II and IV)
Outcomes research (EMSOP)
Clinical research on specific questions
Cost effectiveness, utility, and benefit analyses (EMSCAP)
Implementation research - analysis of implementations barriers and facilitators

Figure 1. National prehospital EBG model. EBG = evidence-based guideline.

Appendix A TIMELINE

Project Stages

- Development (Purple box)
- Completed phases (Light Blue box)
- Future plans (Light Green box)



Prehospital EBG model created

Helicopter EMS and Pain

Model tested: Pediatric seizures

THIS PROJECT: Pediatric Respiratory Distress

Abbreviations

- EBG—Evidence-Based Guideline
- EMSC—Emergency Medical Services
- CNMC—Children's National Medical Center
- GRADE—Grading of Recommendations, Assessment, Development and Evaluation
- MIEMSS—Michigan Institute for Emergency Medical Services Systems
- NHTSA—National Highway Traffic Safety Administration
- NRC—National Resource Center

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**

Multi-Site Engagement of EMS

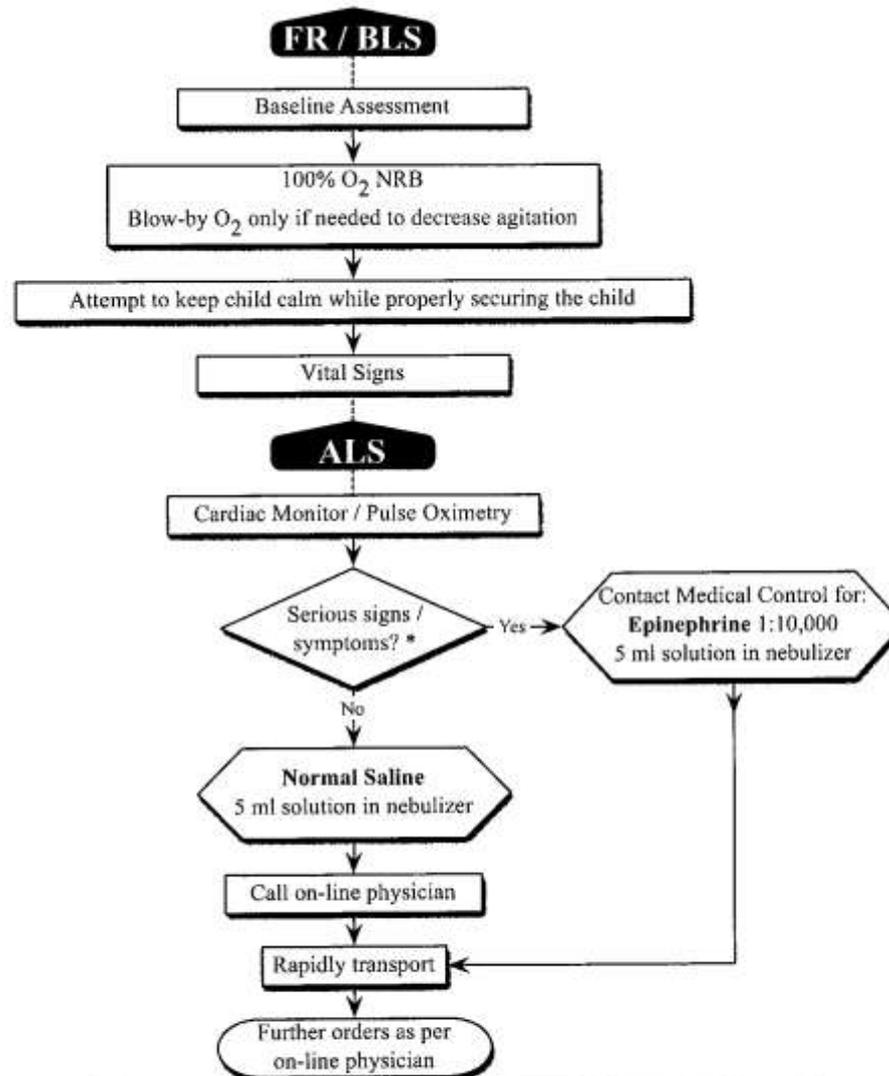
- 3 of the largest urban EMS systems in the U.S. participating
 - Houston Fire Department EMS
 - City of Austin / Travis County EMS
 - Bio Tel EMS (Dallas)
- Medical directors and paramedics from each system actively engaged in protocol development process
- Has potential to impact care for thousands 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



Croup usually affects children under the age of 3 and is associated with a low-grade fever and cold symptoms. Watch for signs or symptoms of foreign body aspiration.

- * *Serious signs / symptoms*
- *Significant inspiratory stridor at rest*
 - *Decreased responsiveness*
 - *Poor perfusion*
 - *Apnea or cyanosis*

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
 - **P**atient
 - **I**ntervention
 - **C**omparison
 - **O**utcome
- 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?

Clinically-relevant questions must drive guideline development

Guideline Development

Integrating Evidence-Based Pediatric Prehospital Protocols into Practice

Week/Dates	Objectives	Assignments	Important Dates
Week 1 January 24- January 28	Participate in Workshop A	Refine PICO questions	Research Specialists to submit PICO questions to Dr. Shah by Friday, February 4
Week 2 January 31- February 4	PICO Questions/Searching	Finalize PICO questions Begin search utilizing preidentified limits [Human, English, last 10 years, All children (0-18years)]	Research Specialist to submit PICO questions to Dr. Shah by Friday, February 4th Protocol Committee Members forward any/all literature needs to jmichol@texaschildrenshospital.org or tmurke@texaschildrenshospital.org
Week 3 February 7- February 11	Searching/Literature Review	Continue searching/article retrieval Begin evaluating the evidence	Conference Call #1 - Searching results
Week 4 February 14- February 18	Searching/Literature Review	Continue to evaluate the evidence	
Week 5 February 21- February 25	Evidence Appraisal	Continue to evaluate the evidence Begin drafting GRADE table and Review Summary	Protocol Committee Members submit a draft of GRADE table and EB summary to Research Specialist by Friday, February 25th
Week 6 February 28- March 4	Evidence Appraisal	Revise GRADE table and Review Summary	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
Week 7 March 7- March 11	Practice Recommendations	Revise GRADE table and Review Summary	Conference Call #3- Develop plan for workshop presentations
Week 8 March 14- March 18	Practice Recommendations	Finalize workshop presentations, EB summary and GRADE tables	Protocol Committee Members submit FINAL EB summary and GRADE tables to Research Specialist by Friday, March 18th
Week 9 March 21- March 25	Participate in Workshop B	Present Literature Review/Practice Recommendations	

Periodic conference calls to ensure progress:

- Literature search
- Literature appraisal
- Drafting recommendations

GRADE Approach

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

Brozek et al., *Allergy*, 2009.

Guideline Development



Texas Children's

DATE: July 201

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 ⁽¹⁻⁹⁾

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 ^(10,11)

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 ⁽¹²⁾

Measuring end-tidal CO₂ (ETCO₂) is safe, reliable and non-invasive and demonstrates a strong correlation with pulse oximetry; it should be used as an adjunct to other forms of respiratory monitoring. – Strong recommendation, Low quality evidence ⁽¹³⁻¹⁶⁾

Treatment

Supplemental oxygen should be provided to all children with respiratory distress. – Strong recommendation, Very low quality evidence ⁽¹⁷⁾

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 ⁽¹⁷⁾

Inhaled Medications

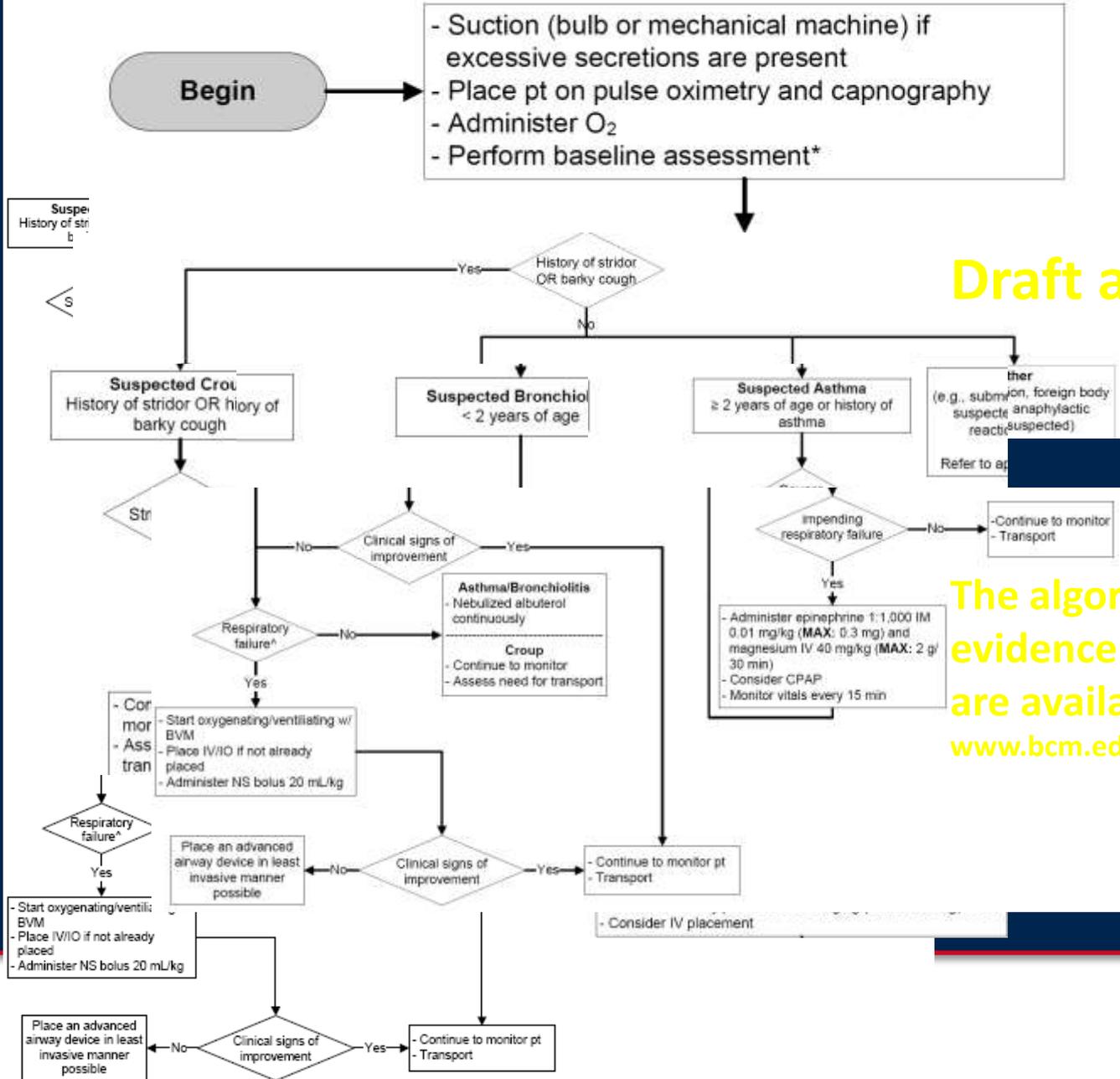
Beta-agonists should be administered to all children in respiratory distress with signs of bronchospasm (e.g. known asthmatics, quiet wheezers) in the prehospital setting, either via nebulized route or metered dose inhaler, by basic life support (BLS) or advanced life support (ALS) providers. – Strong recommendation, Moderate quality evidence ⁽¹⁸⁻²⁴⁾

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 ⁽²⁵⁻²⁷⁾

Summarize the recommendations

- Strength
- Quality

**Integrating Evidence-Based Pediatric Prehospital Protocols into Practice
Children with Respiratory Distress**



Draft a guideline

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

Implementation Timeline

Houston Control

T

Houston Intervention

Austin Control

T

Austin Intervention

Dallas Control

T

Dallas Intervention →

2011

2012

2013

D J F M A M J J A S O N D J F M A M J J A S O N D J F M A

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

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**

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

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

Prehospital EBG model created

Helicopter EMS and Pain

2014: Shock, airway management, spinal immobilization, allergic reactions

NASEMSO Model Clinical EMS Guidelines

Model tested: Pediatric seizures

THIS PROJECT: Pediatric Respiratory Distress

Anticipated publication 01/14

Project Stages

- Development
- Completed phases
- Future plans

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

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

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

Implementation

Acceptance of manuscript on EBG development process by

2007

2008

2011

2012

PAST

PRESENT

FUTURE

2006

2009

2010

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

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

Request for Proposals published in federal procurements by NHTSA

Final EBGs by

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

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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



Cunningham and Kamin

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

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