



STATEWIDE IMPLEMENTATION OF A PREHOSPITAL CARE GUIDELINE

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This report summarizes the findings of the National Association of State EMS Officials four-year project "Statewide Implementation of a Prehospital Care Guideline." The overarching objective was to refine and support the use of the National Evidence-Based Guideline Model Process. Using a pain management guideline (targeting pediatric patients), the project focused on the Dissemination and Implementation steps of the Model Process.

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I. EXECUTIVE SUMMARY

Historically, the management of acute traumatic pain in the prehospital setting has been highly variable, sub optimal, and relied on local expertise and consensus-based methodologies.^{1,2} Due to this variability and lack of evidence-based prehospital care, both the 2001 National EMS Research Agenda^{2,3} and the 2006 Institute of Medicine (IOM) report on the Future of Emergency Care in the United States⁴ called for the development and implementation of evidence-based protocols in prehospital care delivery.² In 2008 the National Highway Traffic Safety Administration (NHTSA) supported the establishment of a national ‘Model Process’ for developing and implementing evidence-based guidelines (EBGs) for emergency medical services (EMS).² This Model Process was subsequently approved by both the Federal Interagency Committee on EMS (FICEMS) and the National EMS Advisory Council. In 2012 Lang et al., described this eight-step Model Process which established mechanisms for the development, dissemination, implementation, and evaluation of prehospital EBGs.⁵

In September 2012, the National Association of State EMS Officials (NASEMSO) was awarded a four-year cooperative agreement from NHTSA with additional funding from the EMS for Children Program to study the *Statewide Implementation of a Prehospital Care Guideline*. A Project Team, working with five states, was assembled with the goal of monitoring individual state progress in the dissemination and implementation of an EBG for prehospital analgesia of traumatic pain.¹

As part of the project, each state was provided a Toolkit, guideline training, support and funding for the development of a statewide learning management system, and state-specific implementation and evaluation plans. The Project Team identified several state-specific, enablers and barriers to effective dissemination and implementation of the Pain Management EBG over the project period.

Through direct feedback and observation of state processes, it was evident that the following factors are necessary for successful statewide guideline implementation:

1. Engagement of the state office of EMS that has statutory authority to direct protocol development at the agency level and highly prioritizes guideline implementation.

2. A multi-disciplinary steering committee of invested stakeholders with representation from the state office, regional and ground level EMS providers, and subject matter experts.
3. Engagement of individual EMS agencies that can communicate their priorities and goals in the prehospital care of their local community.
4. The ability to pilot guidelines with a representative group of EMS agencies to identify any “micro-barriers” to implementation.
5. Development of an active regional infrastructure to support dissemination of guidelines and training across the state.
6. Implementation of a robust and granular data collection system to monitor data points according to the guideline recommendations.
7. Maintenance of an ongoing monitoring system and engagement of local agencies regarding ongoing challenges to guideline adherence.

Furthermore, four thematic barriers emerged from the five participating states that should be addressed prior to dissemination and implementation efforts:

1. Initial development of a learning management system (LMS) can be difficult, expensive, and requires information technology (IT) support and resources.
2. The delay between the project initiation and release of the EBG had many downstream effects.
3. The difficulty of guideline adoption without state-mandated protocols.
4. The lack of consensus among state, regional, and local EMS leadership.

The following report describes the findings of the Project Team and rationale behind the stated recommendations and highlights strategies for addressing barriers in future EBG dissemination and implementation.

III. PROJECT DESCRIPTION

Background

Historically, individual states and local emergency medical service (EMS) agencies have been responsible for the development, dissemination, and evaluation of prehospital patient care protocols.² This process has resulted in wide variation in prehospital patient care.^{1,2} The task of addressing variation in prehospital care has been evolving for more than 15 years. In 2001, the National EMS Research Agenda recommended that EMS providers use evidence-based protocols founded on scientific research to improve prehospital patient care.^{3,6} In 2006 the Institute of Medicine (IOM) recommended that NHTSA lead a multidisciplinary panel establish a model for developing evidence-based protocols for prehospital EMS care.⁴ In 2008 the National Highway Traffic Safety Administration (NHTSA) supported the establishment of a ‘Model Process’ for developing and implementing evidence-based guidelines (EBGs) for EMS.² This Model Process was subsequently approved by both the Federal Interagency Committee on EMS (FICEMS) and the National EMS Advisory Council. In 2009, NHTSA, with additional support from the Emergency Medical Services for Children Program, funded the Children’s National Medical Center to partner with the Maryland Emergency Medical Services System to develop an EBG and protocol for the treatment of acute traumatic pain in prehospital patients.¹ Finally, in 2012 Lang et al., described this eight-step Model Process which established mechanisms for the development, dissemination, implementation, and evaluation of prehospital EBGs.⁵

Project Overview

The goals of this project were to identify and evaluate strategies and barriers to the effective dissemination and implementation of an EBG for the clinical management of acute traumatic pain in the prehospital setting across five states with varying EMS system structures.¹ The Gausche-Hill et al¹ EBG for prehospital analgesia in trauma protocol was chosen by the Project Team to be disseminated and implemented in the five participating states. This EBG is based on the recommendations of a multidisciplinary panel of experts. The panel recommended that “all patients be considered candidates for analgesia, regardless of transport interval, and that opioid medications should be considered for patients in moderate to severe pain.” The panel also recommended that all patients should be reassessed at frequent intervals using a

standardized pain scale and that patients should be re-dosed if pain persists. Finally, the panel suggested the use of specific age-appropriate pain scales.¹

The project plan promoted statewide adoption, dissemination, and implementation of a prehospital EBG focusing on the Guideline/Protocol Dissemination and Implementation steps of the National EBG Model Process.⁵ The Project Team tracked the challenges and successes (“barriers and enablers”) encountered as each state engaged in dissemination and implementation of the guideline through various modalities of measurement and then evaluated the process from state and national perspectives.

The Project Team was a collective of individuals from NASEMSO who partnered with five states to disseminate and implement the prehospital analgesia EBG. The Project Team was comprised of two Principal Investigators who were state EMS medical directors, one pediatric emergency medicine consultant, a NASEMSO project lead, and a lead assessment and evaluation designer.* The Project Team created a general toolkit, state-specific action plans, training modules utilizing learning management systems (LMSs), and a plan to use statewide EMS databases to determine degree of guideline adoption. Each participating state designated a project leader to coordinate with the Project Team.

Dissemination & Implementation

The Project Team held monthly phone meetings with the designated state project leaders. The calls consisted of state updates on dissemination and implementation progress, and detailed discussions about successes and barriers for the project. These meetings provided opportunities for states to share their experiences with each other on an on-going monthly basis.

At the conclusion of the project, each state described their experience using an electronic self-assessment tool. States described the barriers and enablers they encountered to dissemination and implementation of the EBG. They also described the usefulness of the toolkit, training, the state-specific implementation plan, and the overall experience work with the project.

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IV. STRATEGY RATIONALE

The Project Team adopted the definition of dissemination as the “transfer of research results to EMS decision makers to change the behavior of patients or providers to improve health.”⁷ Implementation was defined as “the translation of best practices into common practice”⁷ and “identifying barriers to use and actively overcoming them.”⁷ The dissemination strategies were intended to share information and change behavior, while the implementation efforts were intended to actively evolve protocols and practice. Implementation steps may be *preemptive*, addressing known barriers, or may be *responsive*, focusing on newly discovered barriers. The Project Team directed its educational efforts at both dissemination and implementation, and attempted to assist states both preemptively and responsively during the project period.

The National EBG Model Process⁵ suggests multiple strategies for both dissemination and implementation of EBGs. These strategies were considered and, where applicable, were integrated into state dissemination and implementation plans (detailed in Section VIII).

State Selection

The Project Team solicited interest from all U.S. states and territories through NASEMSO communication channels including list-serves for state EMS medical directors and state EMS directors as well as presentations at national conferences where the Project Team was able to engender interest and support. Eighteen states and two territories expressed interest in participating in the project. Multiple state characteristics were reviewed by the Project Team including:

- The type of advanced life support (ALS) protocols. For the purposes of the project, the Project Team adopted the Kupas, et al⁸ definition of state protocols: Mandatory A/B/C, Model, and None
- The frequency of protocol updates
- The authority for statewide protocols
- The presence of a pain management protocol in any existing state protocol set
- The demographics of the state’s EMS system (percent volunteer, number of services, number of ALS services, state population, percent of the state meeting the definition of urban and rural)

- Whether the state is collecting data compliant with NEMSIS Version 2 (v2)
- The percent of services submitting data
- The percent of runs submitted to the data set
- Specific data elements collected
- Whether the state would be willing to share data for the project

The goal was to select a group of states that had the infrastructure in place to support the project but had varied statewide EMS clinical guidelines and EMS system characteristics. The Project Team recognized that states with mandatory state protocols in place had an inherent advantage in the dissemination and implementation process over those state that did not have mandatory protocols. In 2014, Brown, et al.² described the dissemination and implementation of the Pain Management EBG in Maryland, a state with mandatory protocols.^{2,8} Due to the evidence presented by Brown et al., and well documented variation in outcomes of guideline implementation due to practice variation⁹, the Project Team chose states without existing mandatory protocols to help ensure that findings across the states could be generalized. Of the selected states, Arizona, Idaho, and Tennessee had (or were actively rolling out) state model (but not mandatory) guidelines, while Kansas and Wyoming had no state-based guidelines. All participating states collected NEMSIS v2 data, and four states had at least 75% of services submitting to the state data collection system. All participating states were willing to share data with the Project Team. The characteristics of the selected states are presented in Table 1 below.

TABLE 1

Characteristic	Arizona	Idaho	Kansas	Tennessee	Wyoming
State EMS Medical Director	Yes	EMS Physician Commission	No	Yes	No
ALS Protocol Type⁸	Model	Model	Local	Model	Local
Current Pain Protocol?	No	Yes (allows for fentanyl)	No	No	No
Authority for statewide protocols	Have it; don't exercise it	Statute	None	None	None

Characteristic	Arizona	Idaho	Kansas	Tennessee	Wyoming
Smallest Geographic Service Area Licensed*	Local Response Area	Local Response Area	Township/Municipality	County/Municipality	Local Response Area
Licensed Agencies: 911 Scene Response, Transport*	101-150 (0% volunteer)	101-150 (11-50% volunteer)	151-300 (>50% volunteer)	151-300 (0% volunteer)	<100 (unknown volunteer %)
Licensed Agencies: 911 Scene Response, Nontransport	1-50 (0% volunteer)	1-50 (11-50% volunteer)	0	0	1-50 (0% volunteer)
Percent Urban[^]	89	66	80	74	30
Collecting NEMSIS v2 Data	Yes (75% of agencies submitting data & ~75% of runs submitted)	Yes (75% of agencies submitting data & 88% of runs submitted)	Yes (unknown % of agencies submitting data & % of runs submitted)	Yes (90% of agencies submitting data & majority of runs submitted)	Yes (95% of agencies submitting data & 76% of runs submitted)
*Information taken from: Federal Interagency Committee on Emergency Medical Services. 2011 National EMS Assessment. U.S. Department of Transportation, National Highway Traffic Safety Administration, DOT, Washington, DC, 2012. Available at www.ems.gov .					
[^] Information found on: US Department of Agriculture, Economic Research Service, http://www.ers.usda.gov/data-products/state-fact-sheets . Website accessed Fall 2012.					

Toolkit & Individualized Implementation Plans/Evaluation Roadmaps

In accordance with the recommendation of the EBG Model Process, the Project Team developed a guideline implementation, dissemination, and evaluation “Toolkit” to be used as a reference for the states. The Toolkit materials were chosen based upon previous projects described in the literature.¹⁰⁻¹⁵ Following this, the Project Team developed individual implementation plans and evaluation roadmaps (“individual state plans”) specific to each state’s unique needs and perspectives. The toolkit is described below with additional information included in Section IV; a copy can be found in Appendix A. The individual state implementation plans are described below; the template can be found in Appendix B.

To facilitate dissemination, the toolkit included information about the Pain Management EBG, age-specific pain scales, and an example of how the EBG was modified into a statewide protocol in Maryland.² Also included in the toolkit was

background information on pain management, a description of the project's place in the greater matrix of the EBG Model Process, and contextual information about the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) process.¹⁶

Inclusion of information specific to GRADE was important as a means to assist the end user in understanding and translating the meaning of the level of evidence and strength of recommendation. Furthermore, The Project Team provided a description of the distinction between strong versus weak recommendations and explained how strong recommendations can arise even from low or very low quality of evidence.

Along with the protocol and relevant literature, the Project Team included literature integral to the GRADE review by the EBG developers and literature concerning EMS pain management. This literature library was broken into essential articles, recommended articles, and supplemental articles, with either links to the full article or to the PubMed abstract, when open access was not available. The Project Team defined 'essential articles' as required reference and background information for the stakeholders, trainers, and individuals using the EBG. 'Recommended articles' provided a foundation for understanding prehospital pain management, and 'supplemental articles' provided background and information regarding prehospital pain management, including source references validating the use of pain scales. All Toolkit articles were included to facilitate a basic understanding and conceptualization of the current state of prehospital pain management, and known barriers and enablers to pain management by EMS providers.

To facilitate implementation, the toolkit included the Pain Management EBG itself, key elements of the EBG, the source literature supporting the EBG, training materials, and literature describing barriers and 'solutions to barriers' in prehospital pain management. Finally, the toolkit included content essential for guideline utilization, such as age specific pain scales, as well as, educational material for prehospital providers.¹ The toolkit included an assessment tool to help states evaluate the level of agency adoption of the EBG.

Additionally, the Toolkit included talking points for EMS system leadership and were designed as a quick guide to answer some of the most common questions about the project. The talking points included information about project funding, cost to participants, background and heritage of the project, baseline information about

prehospital pain management, and information about offering feedback to the Project Team.

The Project Team planned a multi-modal distribution of the individualized state plans based on evidence that multifaceted technological strategies are valuable methods of dissemination.^{5,17} Within each state EMS office, a local project lead was identified. The Project Team did not outline requirements for the project lead; therefore, each state determined who would serve in this capacity. Therefore, the role of this individual varied among participating states (i.e., state EMS director, EMS deputy director, hospital preparedness coordinator, strategic planning & communications section chief, and EMS field coordinator). The project lead acted as the project coordinator, facilitator, monitor, and “champion.” Prior research has indicated that a local ‘champion’ is critical for the implementation and dissemination of guidelines due to their role in creating alliances, coalitions, support, and accountability.^{7,18-22} The individualized state implementation plans and Toolkit were distributed directly to each state’s project lead. The Project Team used the NASEMSO’s website to disseminate the Toolkit to the five participating states and other interested states not participating directly in the project. The distributed resources included: the Kick Off Webinar (in audio and video formats), supplemental documents (data dictionary, references, fact sheet), educational resources, and bibliography.

Development of Training Materials

At the outset, the Project Team recognized the importance of addressing known barriers and enablers to prehospital pain management and devised strategies to address them in the educational materials. The Project Team determined that addressing known barriers and enablers to pain management was essential to successful implementation. A literature search was conducted to collate known barriers and enablers in prehospital care. The Project Team used the evidence from previous work to develop the educational materials in the Toolkit for the states.

Several barriers to providing analgesia to children were outlined in a study by Williams et al. In their study of prehospital analgesia for pediatric patients, the investigators found that paramedics reported anxiety, discomfort with pediatric patients, inadequate education, limited clinical experience with children, and concern regarding adverse drug effects as barriers to pediatric prehospital pain management in the field.²³ Furthermore, the investigators discovered that paramedics had varying beliefs

regarding the importance of pediatric pain control and uncertainty regarding their ability to evaluate the pediatric patient for pain.²³ Finally, the study described the effects of transport distance and parent interaction on the decision to manage pediatric pain. Additional barriers were identified by Hennes et.al.²⁴ who reported a number of barriers to pediatric pain control including: lack of vascular access, lack of comfort with administering morphine, and concerns for drug seeking behavior in the pediatric population.²⁴ Additionally, they reported that federal and state requirements for storage and use of controlled substances, and their potential for abuse limit their acceptance, particularly by smaller agencies. Regarding enablers, Williams et al.²³ discovered that the use of pain scales improved the ability to assess pain in children and contributed to improved compliance with existing pediatric pain management guidelines.

Many of the above concerns, particularly lack of vascular access and concerns for adverse drug effects, were addressed by the guideline development committee and in the resultant Pain Management EBG itself. The EBG includes the option for intranasal application of pain medications, obviating the need for intravenous access. Additionally, the EBG standardized contraindications for opioid pain control and opioid pain medication dosing, both efforts to address discomfort with adverse drug reactions.

The Project Team described the barriers and enablers to pain management at the individual EMS service level as “micro-barriers” or “micro-enablers” and defined larger, system-level barriers and enablers to the implementation of the EBG as “macro-barriers” or “macro-enablers”. This delineation between micro and macro barriers/enablers helped to identify when a barrier was due to the subject matter of the EBG (e.g., provider discomfort in managing pain in pediatrics) or due to the system (e.g. difficulty in developing an LMS). System leaders implementing EBGs should incorporate similar strategies to address known barriers or enablers that occur on the micro or macro scale.

Development and Implementation of Pain Management Training

A training module was developed in collaboration with the Project’s Lead Educator (Jeff Lindsay, PhD, PM, EFO), who assisted with creation of the training outline, PowerPoint presentation, instructor talking points, and the pre- and post-test.

The Project Team envisioned a number of possible technologic strategies to assist in both the dissemination and implementation of the guideline, such as hosting material on a website, providing education online using the Learning Management System (LMS), and dissemination of the guideline on novel platforms including social media and smart phone applications. After preliminary meetings with the states to identify existing state-specific resources and determine their preferred strategies for dissemination and implementation, the Project Team focused on deployment of state-specific LMSs. Along with developing state-based LMS for hosting project education, the Project Team also included standard slide sets, simulation scenarios, train-the-trainer materials, trainer evaluation material, and post-training evaluation and feedback tools.

At the project onset, three states had an LMS that could be used by the EMS office (TRAIN[†]). The Project Team determined that assisting the other two states in deploying an online LMS would be an important tool for both dissemination of the project materials and implementation of the project's key elements. It was anticipated that the newly developed LMS could be used as a resource for future statewide training projects.

The focus on LMS strategies was, in part, based on information gathered from research performed in a separate project by the NASEMSO Medical Directors Council. The Council sent questionnaires to state EMS directors and medical directors through NASEMSO list-serves, asking participants what educational activities had been most useful for either dissemination or implementation of guidelines/protocols in their respective states. The responses indicated that on-line didactics delivered via an LMS was the most productive strategy.²⁵ LMSs have been demonstrated to overcome many of the major geographic, temporal, and financial barriers common to EMS education. Allowing EMS providers to complete educational programs at any time and location obviates geographic and temporal barriers.²⁵ In turn, financial barriers are overcome by cutting down on travel expenses commonly required for traditional in-person conferences/training events.²⁵ EMS providers can utilize the educational program during “down time” while at work, minimizing the need to pay a provider to attend in-

[†]TrainingFinder Real-time Affiliate Integrated Network (TRAIN); <https://www.train.org>.

person education or ask volunteer providers to take time away from their primary employment to attend training.²⁵

In light of these findings, the Project Team envisioned utilizing a web-based LMS to create a common messaging system to reduce “pollution” (unintended alterations of the message) and “dilution” (unintended de-emphasis of a vital element) of project messaging, thus ensuring consistent training took place across all participating states. Using the educational materials created by the Project Team as a guide, Arizona created their own customized training program, delivered via their LMS. This allowed them to create a training module very specific to their needs. Their program included all of the critical elements of the Project Team’s presentation.

Initial Implementation Plan

The Project Team planned to use a four-phase approach to the Pain Management EBG implementation in each state. The approach and strategy is analogous to the quality improvement and assurance methods of the “Plan-Do-Study-Act cycles” developed by Edward W. Deming.²⁶ Similar models have been applied in other implementation efforts and have been successful for implementation and improving the guideline’s intended outcomes.⁷ This approach was intended to begin with EBG (Plan) implementation (Do), followed by measuring the success of implementation (Study) and revise (Act) if necessary based on the findings. Success was to be measured by:

- Reviewing the number of providers within a geographic region who completed the project education
- The number of areas where the protocol was not being used as measured by: fewer patients undergoing pain measurement, lack of pain management when treatment was indicated, or incorrect dosing of pain medication

Following the initial assessment, the Project Team intended to target educational efforts in regions with poorer than expected implementation. The final phase of the implementation process was intended to re-assess implementation and determine if focused attention on the areas identified in phase two had improved implementation success. Ultimately, due to a variety of factors including: challenges with using an LMS for training, delays in EBG publication and dissemination, difficulty of guideline adoption without state-mandated protocols, and lack of consensus among state, regional, and local EMS leadership the Project Team had difficulty tracking the entire

implementation process in every state. The primary barrier was technical difficulties in operationalizing the statewide LMS. This resulted in adjustments to the project schedule and implementation goals. Despite this setback, the Project Team determined there was merit in the “implement, test, re-implement, retest” or “Plan-Do-Study-Act cycles.”²⁶ strategy. In our case, however, the barriers encountered precluded having sufficient time to exercise the entire cycle during our study period.

Evaluation

The Project Team used both subjective and objective evaluation methods to assess guideline dissemination and implementation. Subjective measures included an assessment by each state’s project lead, including:

- Summary of the experience with the EBG Implementation Process
- Description of barriers and challenges encountered during the process
- Description of successful implementation strategies
- Assessment of the usefulness of the tools provided by the Project Team (toolkit, individual state plan, training materials, LMS)

This subjective evaluation attempted to ascertain impressions of protocol adoption on a personal and system basis, evaluate barriers to implementation, and garner a first-person appraisal of the resources necessary to promote successful protocol implementation.

The objective measures of implementation were designed to ascertain whether the EBG was used and employed accurately. Specifically, the Project Team had chosen to utilize Prehospital Care Report (PCR) data elements including: age, age units, pain scale, medication type, medication route, medication dosage, medication response, medication complication, and type of protocol used.

Other objective measures of implementation evaluated included:

- Increased use of pain medication (adults and children)
- Increased documentation of pain scales
- Increased documentation of re-assessment of pain

Information was to be collected from each state's EMS run registry. Specific NEMSIS data elements were to be collated and reported for a pre (April-June 2014) post (April-June 2016) test of effective project implementation and dissemination.

The Project Team's evaluation plan defined program success on both final implementation of the guideline and a measurable integration of the protocol.⁷ Ultimately, the success of any EMS guideline is predicated on the number of providers employing the guideline (e.g., adopted as a protocol), the providers' ability to use the guideline easily and safely, to improved outcomes (higher rates of analgesia administration when indicated and improved pain scores among patients receiving analgesia). If integrating the intended protocol is too onerous, difficult to operationalize in the prehospital environment, or EMS providers are not empowered to execute the protocol, it will not be employed. Fundamentally, EMS protocol implementation is predicated on the system's ability to educate providers regarding the "best" way to care for patients with a certain health care need. The educational process is subject to various inherent barriers including financial (cost to perform education), geographic (location of education may be remote from the provider) and temporal (education may occur while the provider is working or otherwise not available). The implementation model must account for these barriers and others that arise during the project. The Project Team attempted to gauge the implementation method's success, discern implementation barriers and enablers at each level, discover what toolkit elements were not found to be helpful and what operational, educational, and fiscal impacts the protocol implementation process had on the EMS system.

An objective assessment of each medic's performance on the training module was planned. A pre- and post-test assessment for each medic was included in the training. Because of limitations discovered in the LMS, complete information regarding the number of providers who completed the training along with their pre- and post-test scores is not yet available. As a result, the Project Team is unable to determine whether EMS providers gained novel skills or knowledge, experienced a change in self-efficacy (confidence), or provided care as outlined in the protocol through the educational process. With improvement in states' LMS's it is anticipated that further medic-level information could be available.

VI. IMPLEMENTATION TOOLKIT

Implementation toolkits have been described in the literature for use in a number of clinical environments.^{10, 11, 12, 13, 14, 15, 20} However, a published toolkit specifically for the implementation of a prehospital treatment guideline could not be identified. Applying concepts from other published toolkits, the Project Team set out to develop a toolkit specific to this process.

The Project Team sought to create a toolkit that would increase the user's knowledge of the project, outline the target Pain Management EBG, was user-friendly (e.g., including hyperlinks within the document to ease navigation) and would facilitate project implementation. Included in the Toolkit was information regarding barriers to prehospital pain management and issues surrounding analgesia administration among prehospital providers, as described above. The Project Team included information about the EBG development process and the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system to address the "how's" and "why's" of the recommendation. Additionally, in order to establish the science behind the Pain Management EBG, the Project Team included current evidence comparing different pain treatment modalities (medication, dose, route), and pain score assessments in adults and children. Finally, recommendations for successful dissemination, training, and implementation strategies were included, based on information extracted from the NASEMSO Medical Directors Council questionnaire, as described above.

The final version of the Toolkit included the following:

- Background & Significance of the Project
- Evidence-Based Guideline Information
- References
- Talking Points/FAQs
- Implementing a Statewide Guideline – How To
- Educational Resources
- Evaluation Resources

A copy of the Toolkit is included in Appendix A of this report, and can also be found on the NASEMSO website at: <http://bit.ly/2dxMfoq>.

States participating in this project indicated that the Toolkit was “very detailed, with a wealth of information.”

Others noted that the reference section, guideline key elements, and the data point section were most helpful. Furthermore, The Toolkit has been recognized by leadership of the Prehospital EBG Consortium, which is using this project’s Toolkit as a template for future implementation efforts.

VIII. STATE EXPERIENCE SUMMARY

At the end of the project, each of the five states completed a structured self-assessment to identify specific barriers and enablers to dissemination and implementation of the EBG. The following section describes individual state-specific processes and secondarily a collection of similar themes regarding barriers and enablers found among all participating states.

Individual State Experiences

Arizona

Arizona's EMS system has model protocols however, prior to the project, Arizona did not have a state pain management guideline. Although they have the authority to implement statewide protocols, they choose not to exercise that authority. Arizona has both a state EMS medical director and a state Director of EMS. Additionally, the state's EMS and trauma system is administratively divided into four EMS regional councils overseeing training, equipment needs, and guidelines for their respective providers. Arizona has a state EMS database however, the largest agency in the state, Phoenix Fire Department, does not utilize an electronic patient care report. Arizona ultimately developed a pain management guideline after participation in this project and that guideline is provided in Appendix C.

As part of their participation in this project, Arizona developed a steering committee that met monthly. The committee was coordinated by the Strategic Planning and Communications Section Chief and chaired by Toni Gross, MD, Pediatric Emergency Medical Physician and Clinical Associate Professor of Child Health, who was identified as the project lead. Additionally, the committee included a state pharmacy board member, two EMS training program representatives, an Arizona EMS for Children representative, the Bureau Medical Director, Bureau Chief, Bureau Data and Quality Assurance Section Chief, and an MPH intern from a local university. The steering committee provided input on the state-specific implementation plan provided by the Project Team. In addition, the committee facilitated the implementation of an LMS through their Department of Health Services Workforce Development Program. They reviewed regular reports of training module completion data and shared results. In addition to the steering committee, as part of the dissemination and implementation process, the four EMS regional councils wrote letters of support to their local agencies

encouraging guideline implementation, recommended some changes to the guideline for protocol development in accordance with local practice, and placed a link to the pain management training module on their website. In addition to leading the steering committee, Dr. Gross developed baseline training materials, assisted in integrating the EBG into statewide guidelines, performed a needs assessment via a baseline analysis of the statewide Arizona Prehospital Information and EMS Registry System (AZ-PIERS), discussed the training module at local, state, and regional meetings, and provided in-person training at several EMS agencies and regional EMS educational meetings. Acting as a “champion” for the process, Dr. Gross worked closely with state EMS and Department of Health Services personnel to keep the project on track.

Despite active engagement of the four regional EMS councils in dissemination, the councils did not have the authority to mandate implementation at the local level. Because Arizona EMS guidelines are not mandatory or legislative, and reporting of non-mandated EBG is unreliable, the state ultimately found it difficult to determine if the EBG has been officially implemented at the individual agency level. The steering committee ran a baseline pain management data query in May 2014 using AZ-PIERS EMS data for dates January 1, 2012 through December 31, 2013. Their training module, using the LMS, went live July 1, 2015, with the first provider accessing the training module on July 17, 2015. The training data were analyzed May 17, 2016. Initially, Arizona decided to purchase an LMS. However, they found the cost of the LMS to be prohibitive and at the end of the year the state chose not to renew the license.

As part of Arizona’s dissemination and implementation process, the state solicited feedback from agencies and EMS providers. As part of this feedback, EMS providers reported hesitancy to follow the EBG due to long wait times to restock medications at hospitals. The inclusion of a state pharmacy board member on the steering committee had little impact on assisting with the timely stocking of controlled substances at hospitals.

Despite a structured steering committee, local champions at the state level, purchasing the LMS for training, and engagement of the regional EMS councils, it was found that securing feedback from EMS agencies, officially tracking uptake of the EBG, assessing the number of providers trained, and effecting change in treatment practices in accordance with the EBG was very challenging.

Idaho

Idaho does not have a state EMS medical director; it does have the EMS Physician Commission (IEMSPC) and the chair of this commission serves in a similar capacity to that of a state EMS medical director. Model EMS protocol guidelines are a familiar concept in Idaho and have been provided by the state EMS office for a number of years. The model guidelines that the State EMS Office had published previously were intended to be a foundation for local EMS medical directors to develop their EMS agency protocols. The timing of this project was fortuitous as the IEMSPC was developing a more comprehensive set of clinical protocol guidelines that could be adopted by a local EMS medical director as written. It was anticipated that the experience garnered from this project would inform the protocol development process.

While awaiting the publication of the pain management EBG, the IEMSPC completed their work on their statewide protocol, which included a pain management protocol. Idaho's pain management guideline is provided in Appendix C. The IEMSPC considered adapting their pain management protocol once the embargoed EBG was released; however, upon review they chose to continue to use their own guideline as written. Their decision was based on multiple factors including: the published EBG only addressed medication, thus limiting it to only ALS, the EBG did not address any other methods of pain management (e.g., splinting, anxiety control, ice, NSAIDs, etc.) which would be applicable to their BLS agencies, concerns that the EBG had weak quality of evidence, questions on whether the inclusion of a pain scale is even evidence-based, concern that during the delay the evidence had changed. Additionally, the IEMSPC was concerned a reassessment every five minutes during long transport times (common in Idaho) would be unrealistic. Ultimately, the IEMSPC felt that their pain management guideline included the important aspects of the EBG, more in-depth guidance, was better tailored to the providers in their state, and thus did not need to be changed.

As for the training, the IEMSPC felt that since they did not adopt the EBG, the EBG specific training was inappropriate, and instead decided that pain management training should be left to the local medical directors. Idaho does not provide any training for protocols (or regulate this training) other than just-in-time training for issues such as chempack. Additionally, during the project time period, the IEMSPC determined that their LMS had limitations that would have created undue frustrations for the end-users.

Nonetheless, if Idaho had implemented the training, tracking the user participation would have proved difficult.

Overall, Idaho reported that the generic nature of the Toolkit was a notable barrier to participation in the project. This may be due, in part, to the fact that the Toolkit was based on the EBG and not specifically related to the pain management protocol that the State of Idaho had already developed. Ultimately these barriers limited Idaho's ability to track dissemination and implementation of the guideline. While the EBG was not implemented in Idaho, the barriers encountered provide valuable information regarding the process of EBG implementation in their state.

Kansas

The state of Kansas does not have an EMS medical director or an EMS oversight board that reviews and approves EMS protocols, equipment, rules, and waivers at the state level. Protocols are handled at the local level. Prior to participation, pain management protocols were at the discretion of individual EMS agencies and/or in county or regional protocols. The state of Kansas does have a statewide LMS. Kansas was chosen for inclusion in the project when the state was launching a project to creating statewide model protocol guidelines. State EMS leadership determined that this project would be an excellent adjunct to the process they would already be undertaking.

During the time lapse between agreeing to participate in the project, the availability of the Toolkit, and publication and release of the pain EBG, changes in leadership and state priorities occurred in Kansas. As a result, there was no implementation of the guideline at the state or agency level. In its evaluation, Kansas indicated that there was no uptake of the project pain management education into its LMS due to changes in state priorities. State EMS leadership did review the Toolkit and noted that the information provided in the toolkit looked very useful and well thought out. At the time of this report, there are no data available regarding pain management practices in Kansas. The primary barrier to implementation was the redirection of state priorities away from statewide guideline development and implementation. Subsequently, the success of any downstream efforts cannot be assessed because there was not an implementation phase. In its feedback to the Project Team the state could list no individual enablers to success. However, the information obtained from Kansas is still useful as a "control" for the project, and the Project Team has requested their objective data for the study periods (as listed above).

Tennessee

The state of Tennessee has both a state EMS director and state EMS medical director. The state of Tennessee is one of the states with model EMS protocols in place, however there is no authority to mandate the model protocols. Both the state EMS director and the state EMS medical director acted as local champions for the pain EBG dissemination and implementation. A process currently exists for implementation of model guidelines, and EBG followed the same course. In Tennessee, approximately 50% of EMS services adopt the state model protocol guidelines as written; the other 50% made modifications according to their local agency needs. In the case of the project Pain Management EBG, the state Clinical Review Committee reviewed the EBG and the EMS board approved adoption of its recommendations for pain management into its various protocols that deal with traumatic pain. Tennessee's statewide prehospital protocol guidelines are provided in Appendix C. Processes already in existence for statewide implementation were initiated. These included integrating the EBG into their model protocol guidelines on the state EMS website, discussions at regional meetings with EMS medical directors and with regional consultants. The state also provided an in-service to all EMS services for training and dissemination. The pain management training provided by the Project Team was not used for training on the guideline.

Tennessee was able to assess protocol uptake for 22 agencies that provide coverage for approximately 32% of the state's population. Seventeen of these agencies had opiates available as part of their pain management for patients. In addition, all of the agencies reported that pain was routinely assessed and managed on all patients. Most of the agencies reported that the pain scales were required by their protocols however; only 4 agencies indicated that the FLACC pain scale (an observational-behavioral scale for young children) was a part of their pain assessment practices. In contrast, 18 stated that the Wong Baker FACES pain scale (a self-report scale validated for use in older children aged 4-12 years) was a part of their pain assessment.

Overall, the experience reported by Tennessee was straightforward due to existing infrastructure and processes to readily implement the EBG. However, they reported that they are currently unable to obtain a "true picture of pain management" from the ePCRs due to an incomplete data collection system. Lastly, their adoption of the EBG was actually an incorporation of the recommendations into already standing model protocols to reinforce appropriate management of painful conditions.

Wyoming

The state of Wyoming is a predominately rural state with no mandated or model protocols and no state EMS medical director. Ninety-five percent of EMS agencies submit data to its NEMESIS-compliant statewide database, Wyoming Ambulance Trip Reporting System (WATRS). Development and revision of EMS protocols is done at the local agency level. The state has an annual EMS leadership summit where agency EMS medical directors and training officers come to meet and discuss changes at the state level that are relevant to local agencies. The state of Wyoming, at the time of its participation, did not have a statewide pain management guideline. The state did have an LMS but had yet to use it to provide training and determined participation in this project would be a good impetus to explore statewide training using their LMS.

As part of their dissemination and implementation plan, the state identified a project lead to work on the project. This “local champion” was chosen because she was working on a graduate degree and the project would be her capstone project. She worked with the state data manager to obtain baseline data on pain management practices. Also, she helped facilitate the uploading of the training to the LMS. However, similar to other states, Wyoming found challenges with using their established LMS platform (TRAIN) and switched to a different one (Moodle). In addition, given the rural nature of the state, the decision was made to initially pilot the training with several EMS agencies and incorporate “lessons learned” prior to statewide dissemination and implementation. The project lead worked to disseminate the guideline through webinars, email, and at the annual statewide EMS Leadership Summit (held in May 2015). One member of the Project Team (KMA) was able to present on the EBG at the conference and addressed questions regarding the EBG. The baseline assessment of the data in WATRS, revealed insufficient documentation on pain scores and other important data points. This information was used to address and improve documentation among the EMS agencies. Specifically, they found that the documentation of pain scores was done in the narrative and not directly in data fields captured by WATRS. The state addressed this documentation practice and documentation of pain scores in an area that could be captured in the state EMS database improved.

In general, state leadership was often questioned as to whether the implementation was mandatory. There was some confusion about the emphasis (but not mandated) on the Pain Management EBG, as opposed to other guidelines. In the state self-assessment, it

was indicated that implementation would have been easier if the guideline was mandated. The state noted that the use of online training alone is insufficient to the implementation process and that local EMS leadership involvement was key.

Ultimately, nine months prior to the completion of the project timeline, the project lead left her position, and the project was left incomplete. The state EMS director continued to provide the Project Team information on the state self-assessment regarding the status of implementation.

Wyoming made no changes to the provided pain management EBG.

Barriers

There were several barrier ‘themes’ identified during analysis of the individual state assessments of the EBG implementation. These barriers included:

1. Challenges with using an LMS for training including- LMS delivery platform, IT support, cost, and centralized reporting
2. Delays in EBG publication and dissemination
3. Difficulties of guideline adoption without state-mandated protocols
4. Lack of consensus among state, regional, and local EMS leadership

These common themes will be described in more detail below.

Statewide use of an LMS

Pain management training that included EBG instruction was developed by the Project team (see Methodology section for details on the training). The goal was to have each state import the training module into their LMS. Ideally, the plan of implementation, assessment, and pre-implementation would use the LMS to track use of the training and collect pre- and post-test scores of learners. At project onset, only one state had an existing functional LMS. There were a variety of platforms selected by individual states and unanticipated difficulties arose from the various platforms. Granular experience from the states suggested these difficulties may have been in part due to the LMS itself and may also have been from the hardware and software used by services. For instance, states report that a number of EMS agencies have poor online connectivity, were using out of date hardware or software, and that the initial LMS chosen did not allow for pre-testing as well as post-testing and did not allow state officials to track the number of

providers who successfully completed the training. Feedback to the Project Team revealed that more than one state noted that their LMS was challenging to use. They reported that the presence of a robust information technology (IT) system was critical to the success of the education. In some instances, additional software was needed to run the LMS on older platforms. IT assistance included troubleshooting these issues and assisting the states and agencies who inevitably required software updates in order for the program to run effectively.

"[The state LMS] was difficult to use and access." (Wyoming)

Arizona developed their own education module that included local identified needs for a tailored training. Ultimately, the LMS was deemed cost-prohibitive for a single educational goal.

"We couldn't commit the state to providing the amount of resources it would take to build a centralized LMS. Based on uptake of the learning module on the state's website, we may have considered creating a module that didn't need to be online, and then distributing it to individual EMS agencies." (Arizona)

Tennessee did not use the LMS for EBG implementation training due to challenges with the uploading of the training to their LMS. Tennessee integrated the EBG into their state guidelines and conducted in-service training across the state, and then used the LMS to perform follow up assessments of their agencies as part of their evaluation plan. A number of individual agencies preferred to arrange the training and tracking of completion in-house and then provide this data to the state. However, the model of local education followed by reporting to the state offices was difficult to track and therefore success of this model was difficult to ascertain. Overall, tracking of participation and the availability of pre- and post-test scores were not universal and, as a result, there is limited data for this project outcome.

Additionally, states had the following to say about how to best implement online training based on their experiences:

"It needs to be interactive and easy to access." (Wyoming)

"Select a user-friendly system that is easy to access and ensure a staff member is available to assist with troubleshooting (if possible)." (Idaho)

“Online training for one specific topic when you don’t already have an LMS platform is difficult, and a state must consider whether it is worth the effort for one topic, comparing the expense of having an LMS for many topics.” (Arizona)

Delays in EBG publication and dissemination

Several states indicated that the Toolkit was an effective resource that provided relevant references and important key information to the states. However, the twelve-month delay in the release of the EBG, led to a decline of interest and commitment at the time of dissemination of the EBG. Wyoming was impacted specifically due to them initially planning a pilot rollout with several agencies. For Idaho, the delay resulted in the adoption of the local guideline more sufficiently met their needs. Consequently, Idaho was not interested in implementing the project’s EBG at the time of delayed release.

“We engaged the pilot agencies early and then they waited and lost interest while we waited for the training to be developed.” (Wyoming)

“We already had a protocol in place and made no changes based on the guideline.” (Idaho)

Furthermore, the EBG delay impacted the release of the Toolkit and educational materials. Kansas noted that the timing of receiving the Toolkit was a barrier to implementation.

The lack of local adoption without mandated protocols within the state

Several of the states identified that they did not have the ability to mandate the guideline uptake within individual agencies or regions throughout the state. In addition, there were multiple challenges with tracking uptake of the guideline and its actual implementation. One state noted, “if state guidelines were mandated, the process of implementation takes place only once.” Another state reported that successful implementation requires a “multi-pronged approach”, and that implementation would be easier if the state EMS office mandated a significant change. Finally, without a mandate for guideline implementation, the participating states had no process in place to monitor a change in practice. Among states with mandatory protocols, different processes are in place to ensure that novel protocols are locally adopted and monitored. For example, the state of Maine requires that licensed prehospital providers undergo regular education for any protocol updates and that agencies have a Quality Improvement processes in place to monitor prehospital care practices.²⁷

“We need data to assess and actually determine if the protocols adopted are being utilized for pain management. Voices say yes but data is not there to back it up.” (Tennessee)

“Because ... EMS guidelines are not mandatory or legislative, it is more difficult to determine if the EBG has been implemented at the individual agency level. Four EMS regional councils also helped disseminate the guideline, but do not have the authority to mandate its implementation at the local level.” (Arizona)

“As our system is that of guidelines, not mandated protocols, it is hard to advise other states. However, it seems by having guidelines over a period of time they become the culture as acceptable protocols that should be used.” (Tennessee)

“Be clear about whether the implementation of the protocol is mandated.” (Wyoming)

The lack of consensus among state, regional, and local EMS leadership

Overall, every state noted challenges in engaging the overextended state EMS office personnel in the project. In three states, there was neither infrastructure nor an existing statewide process model to facilitate or monitor statewide protocol implementation. In these cases, decisions about protocols are made locally, at the agency or regional level under the direction of the medical director. Although all states and agencies vary, there is often a routine protocol revision process that takes place every few years. Some revisions may rely on new research publications, changes in regulations around scope of practice for providers at the state level, formulary changes, or advances in medical devices. When there are significant protocol changes, agencies are frequently required to re-train personnel which is costly and resource intensive. The monitoring of protocol adherence relies on local needs, abilities, and overall priorities. For example, agencies may choose to prioritize chest pain protocol adherence above traumatic pain management if they perceive that the consequences of non-adherence for one are greater than the other.

In some states, the decision to adopt protocols is done by committee and requires the consensus of several stakeholders. Gaining consensus may be difficult to achieve, as members of the committee often possess local or regional responsibilities that might not align with the policies and procedures of the larger committee. For example, if an agency is tackling drug seeking behavior or opiate overdose within its patient population, encouraging more liberal administration of opiates in their population may

present challenges. This in turn may lead to unwillingness to adopt a national recommendation. As some states noted:

*“Different delivery methods, **more significant involvement of local EMS medical directors**, and implementing changes for significant protocols... [could have made the process smoother].” (Wyoming)*

“Strong support from state EMS office and/or EMS leaders in the state is essential, provided that individual agencies across the state respect the opinions of these leaders.” (Arizona)

“Our in-state guideline development process is much more nimble, so it is unlikely that we will attempt implementation of national guidelines” (Idaho)

Furthermore, personnel turnover was a challenge for protocol implementation and monitoring. In several of the state EMS offices senior leadership transitioned and there was attrition of project champions. In Kansas, the former state EMS director envisioned participation in this project as a means to facilitate the development of statewide protocols or model guidelines. When a new state EMS director transitioned into the role, this intention was de-emphasized due to competing priorities. Kansas did participate in the project but there were not adequate resources to successfully implement the EBG. This project did provide some financial support but not enough to support a full-time staff member. Future efforts may need to take into consideration the typical process for protocol change at the state and local level when planning for EBG implementation and further consider the related resource and costs involved.

Enablers

There were a couple key ‘enablers’ identified during analysis of the self-assessment completed by the states. States reported factors that promoted successful implementation of the EBG protocol including:

- Having a local champion for the guideline and the process,
- Dedicated resources for EBG dissemination, implementation, and monitoring,
- The availability of a state specific and generic implementation Toolkit.

Role of a local champion and engagement of resources:

The most important drivers for project success were a designated local champion and the resources to complete the project. Often, the state EMS office itself functioned as the local champion for the participating states. Engagement of numerous relevant stakeholders such as hospitals and community representatives can help with training and implementation. Such stakeholders can also assist with quality improvement committees. Both of these efforts may offset workload of state personnel as well as ensure state engagement with local communities. Being able to address and tailor protocol adoption at the local level facilitated the engagement of local EMS agencies and secure their participation. Arizona and Tennessee stated that:

“I think the strength is in the message that national experts spent the time necessary to ensure that the most recent and best evidence was used to create the guideline. This message, however, should be tempered with an understanding of barriers, such as when we discovered that hospital restocking times were unacceptable. Tackling some of these barriers is a separate project all together.” (Arizona)

“When I discovered that the medics weren’t completing the on-line training for the guideline, I sent an email, strongly worded, to the training officers, informing them that this training was very important to our office and to their patients. Immediately, there was a huge spike in the number of medics taking the training.” (Tennessee)

Creative resource allocation was also a critical enabler for project success. In Arizona and Wyoming, the state EMS office allocated resources that made this project part of a larger goal. This strategy may be beneficial in future EBG dissemination and implementation projects. In Wyoming, a state EMS office staff person was a graduate student and needed to complete a capstone project. The EBG implementation project was used to meet the academic requirement and consequently there was some personnel for the project. Similarly, in Arizona, the state EMS office worked to disseminate the EBG and provide training on a state LMS. They engaged a graduate student to measure baseline data and conduct analysis on the five key elements of the guideline implementation present in the Arizona EMS registry (AZ-PIERS).²⁸ Lastly, having a method to monitor the progress of training and implementation was an enabler. Training progress should be facilitated by choosing an LMS that allows state officials to track the number of providers who have completed the training. Additionally, state data managers and/or the software vendors of state chosen ePCR’s

should develop reports that allow state leadership to easily track the status of implementation.

The availability of state-specific and generic implementation Toolkit

The toolkit was made available on the NASEMSO website. It was accessed over 7,265 times in three years and downloaded almost 1,500 times. Near project completion, the Project Team asked participating states to provide feedback on the most useful and least helpful elements of the project toolkit. The majority of the states placed high value on the availability of the toolkit and reported that the Toolkit was “very detailed, with a wealth of information”. Overall the states reported that the following elements of the toolkit were helpful:

- 1) EBG FAQ's
- 2) Pain Scale Educational Resources
- 3) EBG Information
- 4) Additional Educational Resources
- 5) Guideline Key Elements
- 6) Guideline Data Elements

Idaho did provide feedback that the availability of a generic toolkit would not be as useful as a state specific toolkit. There was discrepancy in the usefulness of the Toolkit References, with one state noting these were helpful and two states noting these were not helpful. Additionally, the states were mixed in their impression of the How-To Implement section with two states noting this section was helpful and one state noting this section was not helpful. Finally, the states felt as if the Talking Points/FAQ, Evaluation Resources, Example of Protocol, and Hospital Training were not helpful in their experience. No states identified barriers to use of the Toolkit once it was made available. As mentioned previously, the toolkit's release was delayed due to the embargoed EBG; therefore, all states experienced a gap between project start and the release of the toolkit. The large number of times that the toolkit has been accessed and downloaded suggests that it is recognized as a useful resource for others outside of the five participating states.

Project Team Evaluation of the Process

Role of the Local Champion

The number one driver of project success was a local champion. Overall, sustained implementation requires ongoing support within the existing state EMS leadership infrastructure and not simply as part of a supplemental project meeting an academic end. More specifically, when efforts are transient and there is not a dedicated champion to ensure dissemination and implementation of the EMS guideline, sustainability becomes questionable. The Project Team noted that even when there are temporary champions, there is initial success, however, once the individual in question completes their aspect of the project, progress wanes. This was evident in above examples from Idaho and Kansas. Overall, the model to ensure EBG dissemination and implementation is challenging without dedicated resources and personnel.

Piloting and tracking of implementation

The implementation of an EBG should be approached in the same way as any quality improvement or process improvement project which utilizes important resources. For example, all quality improvement efforts involve planning, local baseline data collection, dissemination of the local data, piloting of a process to change, and collection of follow-up data. The state of Arizona provides a good example of this methodology. They developed a steering committee, examined existing data, and promoted the guideline heavily throughout the state. State EMS databases may serve as a useful tool to track guideline implementation. However, this is only possible when data fields exist to capture the data needed to measure guideline implementation. For example, the EBG calls for obtaining a pain score using an age appropriate pain assessment tool. There is not a data field in NEMSIS that clearly allows for the type of pain assessment tool to be documented. Additionally, some electronic PCRs use drop down fields for pain score documentation but in most cases, it is text narrative written by the EMS provider. Information from this narrative does not routinely make it in to the state database and is often only obtained through individual chart review, which is laborious, costly, and time-consuming.

Engaging a state EMS office that promotes and monitors implementation is essential. In Arizona, the state EMS medical director sent a letter to all EMS regions asking them to promote and train on the guideline. Arizona was successful in engaging its EMS providers and in using its LMS to track participation and obtain testing information on

the learners. Arizona found a 94% passing rate among a total of 1,115 EMS providers. They also noted that a total of 1,267 EMS providers participated in the educational module, but this was only approximately 8% of its certified EMS provider population.

In discussions with the states, the Project Team advocated the piloting of the guideline among a few select agencies to identify and troubleshoot any training or data collection issues. This was done by only one state, Wyoming. During the pilot study, they identified a process of implementation that included a data collection system, webinars, emails, and intense engagement with agencies. Wyoming presented their results at their EMS Leadership Summit and found a 49% increase in average test scores from the pre to post-test (~45% to 94%). They also recognized the limitations of the TRAIN system, and created a new LMS to host the training. During this process, they noted:

“The implementation process within Wyoming was difficult. We struggled with communicating to local EMS providers our reasons for participating in the project and how it impacted them. However, the implementation of this (pilot) allowed us to address general documentation issues {by proving guidance on the ‘pain score’ field, and not documenting the pain score in the narrative.”

The four other states did not choose to pilot to guideline despite the Project Team’s recommendation. Tennessee and Idaho followed their model guidelines dissemination and implementation infrastructure, Kansas did not reach the dissemination phase, and Arizona chose to reach out through their regional EMS offices to work locally and did not identify any specific agencies to directly pilot the EBG.

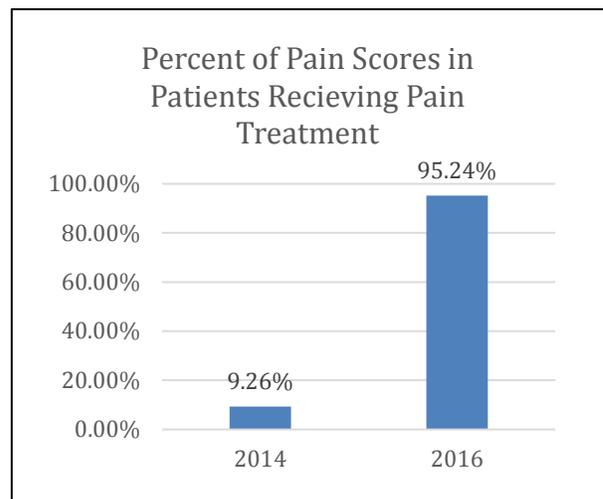
Review of State Data

As mentioned above, all participating states agreed to share data with the Project Team to allow for assessment of any change in pain management practices within the state before and after dissemination and implementation of the evidence-based guideline. As the project developed, however, the Project Team found that while all participating states have state-based electronic run reporting systems, some of the states had difficulty extracting data requested. In some cases, this was due to limitations of locally developed data systems. In other states, local data managers had difficulty extracting data in a standard format requested by the Project Team. Finally, some states did not follow the dissemination or implementation plan suggested by the project. As a result, it is difficult to compare experience amongst the states and a full quantitative evaluation

of dissemination and implementation is not possible. Each state’s individual experience, however, is informative to the overall project goal of studying dissemination and implementation from the state’s perspective.

Over the 2 years prior to implementation of the evidence based guideline, the state of Arizona reported that 65% of patients with primary or secondary impression of either injury or pain underwent measurement of pain through a pain scale, however only 20% of patients with pain scales above 3 received pain control. This baseline pain measurement is higher than Kansas (in which the guideline was not disseminated or implemented) and Idaho (which disseminated and implemented a state model guideline). In the case of Kansas, an average of 16.8% of patients receiving pain medications between 2014 and 2015 had a pain scale reported. In Idaho, the state model guideline was implemented in 2013. That protocol included directives to measure pain “at disposition and pre- and post-medication delivery”.²⁹ In discussion with Idaho state EMS leadership, the Idaho EMS Physician Commission did not utilize the project toolkit, including the project education, and allowed local EMS medical directors and leaders to provide protocol education. From April through June of 2014 and 2016 (approximately 1 and 3 years after implementation of their own guideline), Idaho EMS providers measured pain scores in 15.3% and 15.6% of patients receiving pain medications, respectively.

Wyoming utilized the project toolkit, including the project educational material. Over the months of January to August of 2014 and 2016, Wyoming reported a nearly 10-fold increase in the number of patients undergoing pain measurement (9.26% in 2014 and 95.2% in 2016). While the number of patients receiving pain medications did not change appreciably (7.02% in 2014 vs. 7.03% in 2016), this increase in pain measurement pre- and post-project initiation, suggests some implementation of the guideline, especially when compared to the Idaho and Kansas experience. These results may be confounded by the process



improvement program WY performed mid project, however, it is doubtful that the baseline rate of pain scoring was 95%, based on the results from ID, KS, and AZ. Therefore, it appears as if WY did have some improvement in pain measurement. This increase in pain score documentation is similar to other studies where efforts at introducing a pain protocol did not necessarily increase analgesia administration but did increase pain score documentation.^{30,31}

No states were able to demonstrate significant increase in other metrics measured (including the number of patients receiving pain management). This could be due to limitations in the states' data systems and the described inability to produce all of the data elements requested. Alternatively, this may be related to the project's timeline. For example, most states participating in the project implemented in the guideline between the end of 2015 and the beginning of 2016. As all post-implementation data measured was very proximate to the implementation process, the project team hypothesizes that the data review occurred too soon to capture changes in EMS providers' practice. Finally, this could also be related to a lack of understanding of what happens directly in the field management of patients. This project has focused on the state level of dissemination and implementation. A better understanding of barriers at the agency level could not directly be assessed by project's end.

IX. PROBLEMS ENCOUNTERED

As mentioned above, each state did experience various issues while participating in this project. These problems, and others indicated below, should be addressed during future implementation efforts.

Motivation to adopt EBGs

As discussed in other sections of this document, thirteen states and territories expressed interest in participating in this project, suggesting this effort is considered meritorious with significant benefit for states. Some states considered this project as a means to facilitate internal efforts to develop state-based model guidelines. While other states appreciated the ability to trial internal systems of protocol dissemination and implementation. However, while EBG implementation was considered an important effort, state EMS leadership is constantly involved in multiple important efforts and

dissemination/implementation of this EBG became one of many priorities taxing the resources of the state EMS office.

Strategies for overcoming this institutional inertia must include creation of a nationwide impetus and initiative that promotes adoption of EBG's. The culture surrounding protocols within a state significantly affects the likelihood of EBG adoption. Experience of the Project Team members suggests that states with mandatory protocols or model guidelines and explicit mechanisms to regularly vet and update them are more likely and capable of disseminating and implementing an EMS guideline in a consistent timely fashion. For example, Tennessee reported that the incorporation of the EBG was straightforward as it followed their *routine* for implementing other model guidelines. This potential enabler was additionally recognized by other participating states (Arizona and Wyoming) that commented on their interest in (and "envy" for) state-based mandatory or, at least, model guidelines.

The Project Team's experience suggests that mandatory state protocols may not be the only model that facilitates protocol uptake. It was noted that well-established and well-respected model guidelines also assists in protocol dissemination. For example, although Arizona does not have mandatory guidelines, the work done by the steering committee in advertising and working to disseminate the guideline was well received regionally and locally. Another example can be found in a study from Utah. Pediatric prehospital guidelines were developed by the state EMS for Children program and disseminated throughout the state through webinars, regional meetings, and EMS for Children regional contacts.³² A follow up survey of all 182 agencies was conducted to examine the degree of uptake of the pediatric pain management guideline. The investigators found that 68% of agencies adopted the guideline to their existing protocols. An examination of the state EMS database found that after dissemination of the guideline, overall pain treatment rates increased by 43% and agencies that provided pain management education were 2.5 times more likely to treat pain in their pediatric patients.³² Resources, including the NASEMSO Model EMS Clinical Guidelines, are available to states interested in developing their own state-based model guidelines. These guidelines are updated regularly and include available EBG's. These can be found at the following website www.nasemso.org.³³

While development and promotion of adoption of EBGs nationally is presently motivated by Institute of Medicine^{4,34} suggestions and transmuted evidence from other

domains, as the clinical prehospital EBGs is further defined, there will exist more motivation for EBG implementation. The operational benefits of prehospital EBGs include workflow optimization for EMS protocol developers, assurance that prehospital providers are offering “best practices,” and consistency of EMS practice over large geographic areas. However, consistency in protocols encourages, but does not guarantee, consistency in clinical care. For example, in the case of pediatric seizure management, despite implementation of an EBG in one system, 80% of patients were not treated according to the EBG recommendations.³⁰ In this study, again, they found that those paramedics who were trained on the guideline were more likely to adhere to the EBG recommendations than those who were not trained.

From a legal standpoint, as nationally recognized EBGs become the “standard of care,” there will be potential liability for poor outcomes when these best practices are not utilized. Finally, as the EMS Compass project publishes standardized EMS performance measures, there will be further incentive to incorporate the EBGs associated with those measures. States may utilize compliance with these measures as criteria for licensure and there is the possibility of reimbursement being tied to compliance as well.

Learning Management Systems

At the onset of the project, three states had an LMS in place and only one of these states had moderate familiarity with their LMS. The Project Team, in collaboration with the five participating states, chose to use TRAIN as the LMS because it was a free platform, and three states already had access to the platform. Using one platform provided uniformity of practice, as well as, the cost savings of using a platform that was preexistent in all states. The Project Team did initially pursue creating a training module on a nationally recognized EMS LMS, but the cost was prohibitive, and the Project Team hoped that if a state were to use their own system, they would be able to use the product for future guideline implementation and provider training.

Despite these apparent benefits, neither the Project Team nor the participating states could have foreseen that the LMS would be the number one barrier to guideline dissemination and implementation. The states had innumerable technical difficulties organizing and establishing this TRAIN LMS. Furthermore, none of the participating state EMS offices housed the necessary IT resources to problem-solve these difficulties and therefore were reliant on other state departments, and non-state resources. These

technical problems were so formidable that alternate options were sought, resulting in three states changing to a different LMS altogether.

As described in prior sections, the Project Team's investment in the LMS strategy was founded on information obtained from state EMS directors and medical directors as well as the personal experience of the project's Co-PIs. While the Project Team believes that an LMS remains a potential enabler to dissemination and implementation of an EBG, the experience of this project forces recognition that initial development of an LMS can be difficult and/or expensive, and without necessary IT resources immediately available, the frustrations surrounding an LMS platform can be paralyzing. Problems with the LMS included difficulty hosting a simple training video, providing two-way interaction for testing, not allowing training to be interrupted and resumed, and difficulty with tracking of the completion by each specific provider.

Wyoming found a solution to these issues by changing LMSs. During regularly scheduled conference calls between states, difficulties with the chosen LMS were identified. Project team members recommended an alternate LMS that had been successful in one on the project's co-PI's states. With IT support from the co-PI's state data manager, Wyoming was able to create an LMS using the open-sourced Moodle learning platform at a minimal cost, while at the same time, developing a highly functional LMS. This LMS allows simple provider enrollment, automated support of lost passwords, and tracking of provider continuing education hours (CEH), which auto-populate a provider's existing CEH or license file. Interestingly, the EMS director of the state which adopted Moodle, felt that the implementation project had been a success for his state because it had revealed the shortcoming of the TRAIN system and served as an impetus to investigate different LMS options. This example of one state supporting the efforts of another state could become a model practice.

Additionally, the versatility of the LMS is critical to successful training completion. Many EMS providers will do their training while on shift and the training can be interrupted by calls. Therefore, the learning platform should allow users access from various devices (such as tablets, smart phones) and allow the user to log on and off without losing information. For example, in Wyoming, the longest "completion time" for the training in their system was 5 months and 8 days, demonstrating that the training does not occur in a direct linear manner. In addition, from the state perspective,

it should be low cost and not require significant software updates on computers in local EMS facilities.

Based on the strong working relationships as well as the culture of collaboration that exist within NASEMSO, the Project Team recommends that NASEMSO's Data Managers Council catalogue their individual practices surrounding LMSs and act as a resource when other states consider purchasing or developing an LMS.

The delay between project initiation and EBG release

The delay between the project initiation and release of the EBG had many adverse downstream effects. As discussed in Section IV above, the states agreed to participate prior to actually reviewing the EBG. Each state had its own reason for agreeing to participate. Some states were enthusiastic about an opportunity to improve pain management in their patients. Other states hoped to have this project act as an opportunity to initiate development of state model protocols. However, a full year passed before the Toolkit and the EBG were made available. During that time, multiple circumstances changed for states with ever-shifting priorities. Some EMS leaders recruited interested EMS agencies, yet ultimately some of those agencies decided to move forward to meet their community's needs when the official guideline was not yet available. During the delay period, the Project Team worked to keep states engaged by developing the individual state dissemination and evaluation plans, tailored to their expressed needs. However, it is clear that the delay slowed or halted enthusiasm for the project. Future EBG implementation efforts should only be initiated after formal publication of the EBG.

Lack of resources within state offices to act as change agents

Overall, each state faced challenges with securing adequate resources necessary for project participation. As mentioned in prior sections, there were project funds available to support the EBG implementation process in each state. This was generally used for establishing an LMS, payment for materials, etc. This funding did not directly support state personnel, and one state had bureaucratic difficulties in spending the money. When the states have paid personnel with already existing responsibilities and projects, it is difficult to divert them toward otherwise unfunded projects. In two instances, success was found when the project was part of a separate academic goal being met by the state and outside personnel. Ultimately when utilizing this strategy, the transition of responsibility from an interested individual operation outside of the state offices must

be transferred back to the state. This transition may be straightforward if it occurs with existing, established infrastructure (e.g., standardized tracking of patient care outcomes in the state database and standardized training). However, ongoing monitoring, and responsibility for implementing and adapting changes in current protocols or policies, and establishing new protocols or policies ultimately lies within the purview of the state offices. In addition, only state and local leadership can circumvent local “macro-barriers” and “micro-barriers.” For example, one participating state discovered that restocking opioid medications was a barrier. Once this barrier was identified, it was easily addressed, but prior to state-level awareness, this barrier was insurmountable to local EMS agencies. Outside individuals working on establishing an EBG would not have the authority to deal with such issues.

When working to disseminate and implement EBGs, one strategy for states is to consider these efforts as part of a larger safety and quality plan that espouses to implement “best practices.” For example, EBGs can be tied to the new EMS Compass program, which is working to establish performance measures for EMS care. Improvements in quality and safety are becoming mandates across states and may ultimately be tied to reimbursement. This could also demonstrate to communities that local agencies are working to establish best practices in their care of their patients. The employed Pain Management EBG is an example of a guideline developed to provide tools to assess and treat traumatic pain and remove barriers that has led to disparities in care. Identifying this as a core value at the state level will hopefully positively engage local agencies in their participation of EBG-based protocol development and implementation.

XI. ADAPTING THE IMPLEMENTATION PROCESS

There exist at least four general prehospital settings beyond the setting tested in this project. Those include:

1. A collective of states within a geographic region
2. A single state
3. A region within a state made of up services with some common tether such as geography or a shared resource such as a hospital
4. A single service

For the purposes of this project, the Project Team was a collective of individuals from NASEMSO who partnered with five states to disseminate and implement the EBG in question. Given that the states chosen for the project did not have mandatory EMS guidelines, and that the adoption of state model guidelines by services varied between states, the Project Team was, generally speaking, removed from the decision makers that influence protocol development. In some cases, the vast majority of state services adopted the state's model guideline. In two instances, the participating states did not have model guidelines, in which cases, services created their own protocols using the recommended EBG as a guide, resulting in one additional step between the Project Team and the EMS system protocol developers.

The Project Team hypothesized that as the motivation for EBG adoption moved closer to the EMS leadership responsible for protocol development, both dissemination and implementation would be facilitated. This hypothesis is largely based on prior research results from this project which suggest one of the major enablers to protocol dissemination and implementation is the presence of a strong champion of the protocol with influence to effect change within the EMS system.⁷ This concept was borne out by our project results: states with active system champions who were positioned within the states to effect change were more likely to meet with dissemination and implementation success.

The Project Team postulated that the type of state protocol (mandatory, model, or local) may act as an enabler for EBG dissemination and implementation at the state level, with state adoption of an EBG potentially easier in states with mandatory state protocols. In states without mandatory protocols, pre-existing, well respected, and widely adopted

model guidelines may also assist in dissemination and implementation. These suspicions are based on interactions with partner state leadership and, while these concepts make anecdotal sense, no literature was identified to support these impressions. In states whose model guidelines are not widely adopted or in states with no state guidelines, available evidence suggests regional or local champions may be most successful as change agents or champions for embracing novel practices.^{7,18-22}

Regardless of the state EMS protocol type, the process of dissemination and implementation adopted by the Project Team for this project has merit for each of the proposed settings. The Project Team considers widespread dissemination (reaching a “critical mass”) within the target EMS system as essential to protocol adoption. While the adaptation of the Toolkit methodology, as envisioned in this project, may not be necessary in every setting, the elements and intentions of the Toolkit as utilized by this project may be helpful. For example, the Toolkit includes the Pain Management EBG, as well as source material for the EBG. This combination of elements is intended to pass on the knowledge of the protocol as well as the wisdom supporting the protocol. These are crucial elements of the Toolkit and the Project Team recommends they be incorporated in any dissemination plan within a single agency or across multiple states. Additional strategies employed by the Project Team that may be of benefit when implementing or disseminating in other prehospital settings include the use of a multi-modal platforms for information sharing, incorporating in-person, online, and a system sponsored LMS.

The implementation plan adopted by the Project Team, namely standardized educational material taught either by Project Team members (in the case of states that adopted the project’s online training) or by state specific system leaders (in the state that created its own online educational program or in circumstances in which EMS systems preferred in person training) also has merit in alternate settings. Results from the NASEMSO state EMS director/medical director questionnaire performed prior to project initiation suggested that a number of responding states had found state based online LMS helpful in both dissemination and implementation of protocols. No responding states felt that online education was not helpful. These results, and experience of the Project Team members, suggest that delivering online EMS protocol educational messaging is effective in various prehospital settings. As discussed in prior sections, this method of education may overcome some of the geographic, temporal,

and financial barriers to education and may help eliminate message pollution and message dilution.

Nonetheless, online education does have limitations. The primary technical challenge in this project was the incorporation of a single training program onto different LMS platforms. This required an adept local IT department to ensure that the program was working on each of these systems. Other limitations include eliminating the ability to ask and answer questions seen in more traditional in-person training. In addition, this training was primarily didactic-based and utilized little practical skills based training. Skill scenarios were provided in the Toolkit, but states indicated that they could not track whether any agencies used the scenarios as in-house training. A well-balanced training system should ideally be able to maximize the benefits of an online strategy of education and include hands-on, skill-based training, and a forum for questions, answers, and discussion.

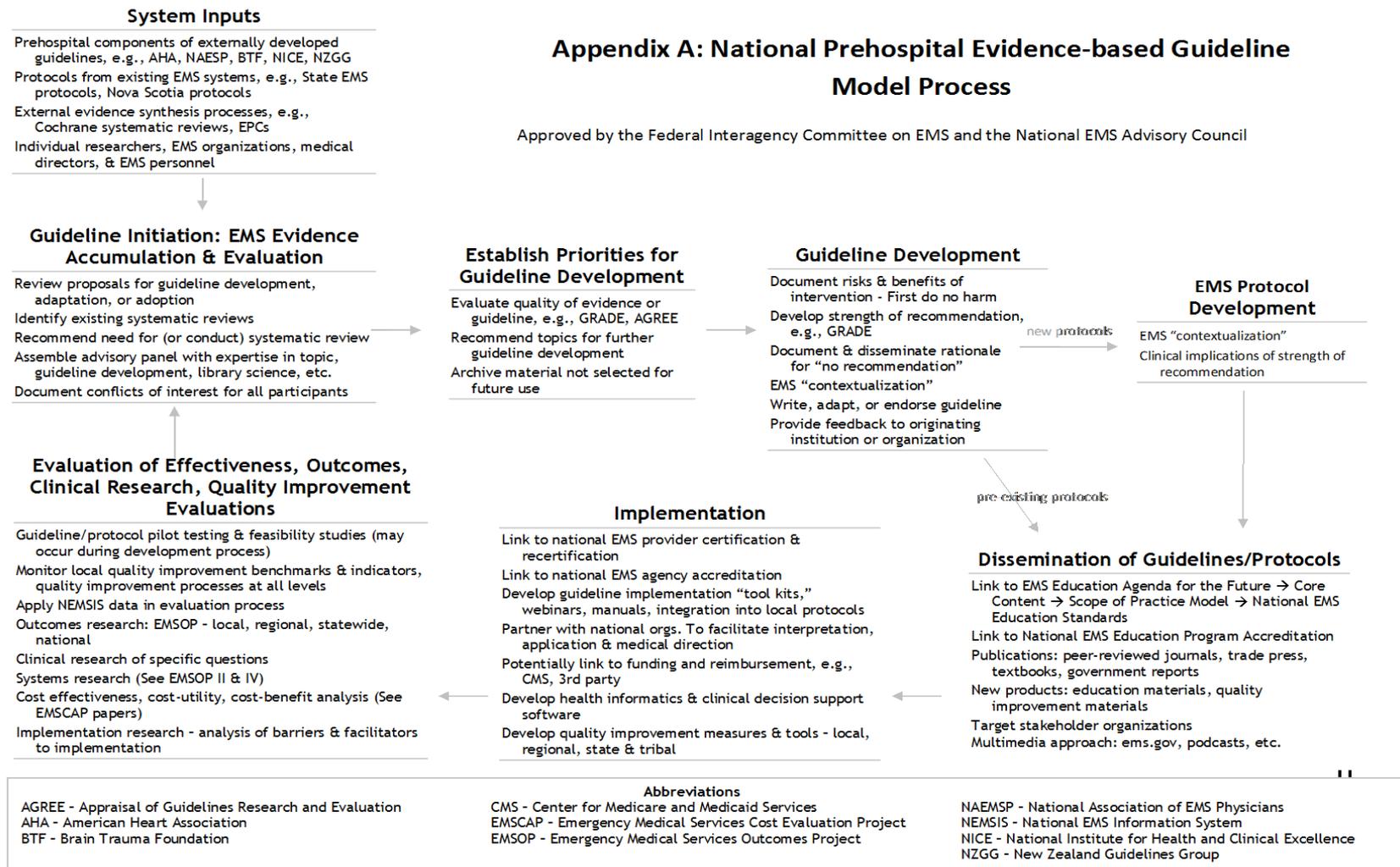
Regardless of the training methodology, post-training evaluation to ensure transfer of knowledge is essential. In addition, prior research highlighted the tremendous potential of hospital providers to influence EMS provider behavior positively or negatively considering “micro-barriers” and “micro-enablers” to prehospital pain management.²⁴ The Project Team suggests that directed hospital provider education should supplement EMS provider education. This will inform hospital providers of the new protocol being implemented, the evidence surrounding the protocol, and the anticipated patient benefit.

XIII. EVALUATION OF IMPLEMENTATION & DISSEMINATION PHASES

Following the recommendations of the 2001 National EMS Research Agenda and the 2006 report by the Institute of Medicine’s Committee on the Future of Emergency Care^{3,35} NHTSA supported the development of the National Prehospital EBG Model Process, which was subsequently approved by FICEMS and NEMSAC and documented by Lang, et al.⁵ The National Prehospital Model Process (see Figure 1) includes the following eight steps:

1. External Inputs
2. Guideline Initiation and Evidence Review
3. Evidence Appraisal
4. Guideline Development
5. Model EMS Protocol Development
6. Guideline/Protocol Dissemination
7. Implementation
8. Evaluation of Effectiveness, Outcomes, Clinical Research, QI Evaluations

FIGURE 1



From: National EMS Advisory Council advisory: *The Next Steps for Prehospital Care Evidence-Based Guidelines*; 2012.

The process is meant to be iterative, whereby the results of the evaluation phase (#8) are then reincorporated into a review process (#2 and #3), which in turn leads to guideline evolution (#4). The process is then intended to repeat itself in an ongoing quality improvement and assurance method or performance improvement cycle.

This project was focused on steps #6 and #7, dissemination and implementation. These two phases of the EBG Model Process each have several sub-processes.

Step #6, the dissemination phase includes the following recommended steps:

- Link to recommendations from the EMS Agenda for the Future and 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

As the Project Team reviewed the work it facilitated as the EBG was disseminated and implemented in the target states, several observations were made relative to the experience with step #6 of the Model Process. Each sub-process will be addressed with reference to our project.

[Link to recommendations from the EMS Agenda for the Future and to the National EMS Education Program Accreditation](#)

It is important to link recommendations from the EMS Agenda for the Future to the National EMS Education Program Accreditation, as these relationships help contribute to the development of funding opportunities for the dissemination of recommendations at the state and federal level. Our project is an example of such linkage. The incorporation of a new guideline into National EMS Education Program Accreditation standards typically lags behind guideline publication and dissemination by other means. The accreditation standards do not change quickly; a new guideline must be well established in the field prior to its incorporation into accreditation criteria. Once this criterion is established, however, such incorporation becomes a very effective dissemination method.

Publish in peer-reviewed journals, trade press, textbooks, and government reports

The publication of the Pain Management EBG by Gausche-Hill et al.,¹ in a peer-reviewed EMS journal, provided the project's EBG national recognition and substantial validity. Furthermore, it provided evidence for the Project Team to share with EMS medical directors and training officers at the state and agency level; that the recommendation was reliable and had expert support. This allowed the medical director to implement the EBG with the confidence that they were following an evidence-base national guideline. Using a published peer-reviewed recommendation/protocol alleviated concerns over possible patient harm or medico legal liability for the agency and their patients. Similarly, publications in trade press (which was not performed in this EBG example), presentation at national conferences (which was performed), and incorporation into standard textbooks of EMS medicine (also performed, but less explicitly) all assisted in the "advertising" of the guideline and offer expert validity to physician medical directors and EMS training officers.

Produce new educational and quality improvement materials

The Project Team produces several educational and quality improvement products to assist in dissemination efforts. These included: the entire Toolkit, the state-specific Toolkits, and the training videos for prehospital providers and emergency department personnel. These materials were provided as a reference and training foundation for states to encourage adoption of the guideline. Our experience was that they were used inconsistently but judged by the states to be "somewhat helpful". One state developed their own educational materials tailored to their agencies and more compatible with the states LMS; which proved to be useful for the EBG dissemination in that state.

Target stakeholder organizations

Stakeholder organizations were targeted in several ways during our project. NASEMSO, as the national body representing state EMS offices, provided a mechanism to circulate and support the dissemination and implementation of the EBG. This support included the incorporation of the Pain Management EBG into its National Model Clinical Guidelines. In addition, it afforded multiple presentation opportunities during its meetings, which helped to promulgate familiarity with the EBG.

The National Association of EMS Physicians (NAEMSP) was a valuable partner in making the EBG more widely known. Several presentations at their national meeting

were related to prehospital pain management in general and the Pain Management EBG in particular. Furthermore, the Project Team was invited to present its implementation project (featuring the Pain Management EBG) at the 2015 NAEMSP Annual Meeting.

Efforts to educate other national organizations, such as the National Association of EMS Educators (NAEMSE), the National Association of EMTs (NAEMT), and the National Registry of EMTs (NREMT) should also be pursued to further disseminate and encourage adoption of the Pain Management EBG (and others as they become available).

Use a multimedia approach

The recommendation that a multimedia approach be used for dissemination was addressed at the state level through training videos and LMSs, as outlined in the previous sections. The use of electronic media facilitated the training of various agencies, by state EMS office, throughout the state. As discussed in Section V, the use of electronic media is still fraught with technical issues, which diminished the dissemination and learning experience. As technical improvements produce better LMS infrastructure, including better leveraging of social media, the ability to disseminate an EBG and related educational tools statewide will be enhanced.

Step #7, “Implementation” of the Model Process also has several recommended sub-processes:

- 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

Link to national EMS provider certification/re-certification

Linking the implementation of the EBG to EMS provider certification/recertification could be accomplished by the state EMS offices, however, the Project Team is not aware

that this was performed in any of the participating states. Guideline would have to become widely accepted (“the standard of care”) prior to such requirements by state EMS offices. This would not be the case until well after initial dissemination and implementation efforts were successful, which were the focus of this project.

Link to national EMS agency accreditation

Likewise, linking the guideline to a national EMS agency accreditation process, while a powerful tool to ensure implementation, could not occur until much later, well after a guideline has been widely accepted in the EMS community.

Develop EBG Implementation toolkits, webinars, manuals

For our project, the Project Team developed a comprehensive Toolkit to support the implementation effort. The resources contained within the Toolkit assist EMS medical authorities at the state and local level to better understand the impetus and background of the guideline. Additionally, the Toolkit provides answers to frequently asked questions, documentation recommendations, and measures to assess guideline compliance and quality improvement. The Toolkit was found to be somewhat helpful to participating state offices as they began dissemination and implementation of the EBG (see Toolkit discussion, Section V, above). The Project Team was not able to discern whether the Toolkit was helpful at the individual agency level. However, the frequency of downloads of the Toolkit from the NASEMSO website would suggest substantial interest by the EMS community. The Prehospital EBG Consortium is in the process of modifying the Toolkit for more general use for dissemination and implementation of future prehospital EBGs.

Partner with national organizations to facilitate interpretation, application, and acceptance by medical direction authorities

As mentioned above in the discussion of Step #6, the Project Team was able to partner with and leverage several national organizations, including NASEMSO and NAEMSP, to provide support for the Pain Management EBG and assist in its dissemination.

Specifically, publication in the journal *Prehospital Emergency Care*, which is the official journal of these organizations, was crucial to both the dissemination and implementation phases. As mentioned, the Co-PIs were invited to discuss the Pain Management EBG and our implementation project at an NAEMSP Annual Meeting. Furthermore, they provided regular updates to NASEMSO in joint meetings as well as

to the Medical Director Council, further validating to the EMS medical director community the substance and importance of the guideline. Further partnering (e.g., with the American Academy of Pediatrics), may have helped to provide a wider acceptance of the guideline outside of the immediate EMS community. In fact, several members of the American Academy of Pediatrics Subcommittee on EMS have been actively engaged in EBG development and dissemination with one of the state project champions acting as the current subcommittee chair.

Potentially link to implementation to funding and reimbursement

Another future option may be linking implementation of an EBG to funding and reimbursement. As with linkage to certification and accreditation, such funding linkage would only be effective after the national EMS community considered the guideline standard best practice.

Develop quality improvement measures and tools

Finally, the development of quality improvement measures and tools can be a very powerful adjunct to successful implementation. Such measures give state authorities and agency EMS medical directors the means to determine if the new protocol is being appropriately adhered to and applied. In addition, measures to evaluate patient outcomes allow EMS authorities to determine if the new protocol is actually effective. As mentioned, the EMS Compass project aims to develop a number of National EMS Information System (NEMSIS)-compliant evidence-based performance measures, and outline a process for future development of such measures. By utilizing NEMSIS data elements, the performance measures are more universally applicable to and accessible by local EMS agencies, and state and national EMS offices. This will facilitate “apples to apples” comparisons at state and national levels. For individual agencies, performance measures utilizing data elements outside of the NEMSIS set, particularly measures of patient outcome, can facilitate analysis of the effectiveness of an EBG at the local level. At present, outcome data is not represented in the NEMSIS dataset.

It is the opinion of the Project Team that future EBGs should be accompanied by recommended performance measures to evaluate proper execution of the guideline and assess patient outcomes. As suggested in step #8 of the Model Process, this evaluation can be used to further refine a guideline to improve its effectiveness (or possibly, to remove an ineffectual guideline altogether). Additionally, when envisioning potential performance measures, future EBGs should ensure the measure in question is easy to

gauge and within the abilities of the state's data management system. The Project Team encountered difficulties in measuring metrics of interest due to difficulties in drawing data from LMS's and electronic data management systems. As with EMS Compass, such performance measures are most useful if they are based on NEMESIS data elements, as this greatly facilitates data access and encourages consistency of measurement across agencies, states, and nationally.

XV. RECOMMENDATIONS FOR IMPROVING THE NATIONAL PREHOSPITAL EBG MODEL PROCESS

The National EBG Model Process is still relatively new and validation of the model is ongoing. Several prehospital EBGs have recently been developed, disseminated, and are in the early phases of implementation. Few, if any, have undergone any significant evaluation of effectiveness or outcomes in the field. Until the entire Model Process has been completed on several EBGs, including evaluation of outcomes, it would be premature to recommend substantial changes to the Model Process.

In executing work with dissemination and implementation (steps #6 and #7) of the Model Process, it is clear that some of the sub-processes are of more value than others. For example, some of the “sticks” mentioned in the implementation step (#7) such as linking implementation of the guideline to national or state recertification or EMS agency accreditation should not be utilized early in the implementation process, but only after a guideline has been widely accepted by the EMS provider community and has undergone field validation of its effectiveness through the use of performance measures.

The Project Team’s assessment of the state’s experience and outcomes leads to the following recommendations

Recommendation #1 – Develop state model, or mandatory, guidelines. Based on the experience of two states, TN and ID, states with well accepted model guidelines that are widely endorsed by local decision makers appear to have been able to disseminate and implement protocols easier than states without such model guidelines. Some states have legislative authority for mandatory guidelines.⁸ No states studied in this project produce mandatory protocols, but experience in other projects suggests an equivalent ease of both dissemination and implementation.³⁶ Based on this experience, states interested in disseminating and implementing evidence based guidelines should consider developing such model guidelines, or, if possible, mandatory guidelines. This process may be facilitated by other, ongoing projects, such as the National EMS Model Clinical Guidelines Project.³³

Recommendation #2 – Establish protocol dissemination and implementation “champions”. The presence of model or even mandatory EMS guidelines does

not in and of itself ensure dissemination and implementation of an evidence based protocol. One state, AZ, with model guidelines struggled to disseminate or implement across all EMS regions within the state. In this state, model guidelines are interpreted and considered by regional or local EMS officials, and in two regions, the evidence based protocol was not adopted. Multiple authors have noted the benefit of champions in the dissemination and implementation of guidelines.^{7,33} Essential elements for such champions include their ability to foster change, based either on their legislated authority or their respect and status within the local EMS system. Champions must be fascicle at developing consensus and coalitions and must be “change agents”, capable of encouraging evolution of practice amongst a wide variety of EMS providers. Additionally, there may be a need to consider a “champion team” such that more than one member of the state EMS office is tasked with dissemination and implementation. This prevents the “loss” of the designated champion in the event that they leave the position to pursue other opportunities as evidenced by the Wyoming experience.

It is important to note the experience in Arizona. This state was able to engage tremendously capable champions at the state level but continued to have difficulty implementing at the regional level. While project champions within the state offices are essential, as evident from the Wyoming, Arizona, and Tennessee experience, the Project Team hypothesizes that champions must be fostered across the entire state EMS system (including the regional and local level) and that champions should be developed proximate to those with authority to develop EMS protocols. Based on feedback from participating states, the following are potential roles of an EBG champion:

- Discuss the expected impact of a planned EBG implementation within the EMS community with key stakeholders, including the rationale for adopting the EBG, the expected benefit in patient outcomes, the potential resources necessary to implement the EBG, and the educational/quality improvement/medical direction/EMS leadership impacts of implementing the EBG
- Develop consensus amongst state, regional and local EMS leadership by methods that may include convening a multi-disciplinary steering committee of invested stakeholders with representation from the state,

regional and local EMS system, as well as subject matter experts and other identified stakeholders

- Develop state, regional and local infrastructure to support dissemination and implementation of guidelines across the state.
- Consider piloting the guideline with representative EMS agencies in an effort to identify micro- and macro-barriers as well as enablers to implementation.

Recommendation #3 – Improve the evidence based guideline development

process. The National Evidence Based Guideline Development process is a very well vetted and well researched process. The evidence based guideline used for this project was one of the first developed using this process and therefore there are lessons from participating states’ experiences that may be helpful to guide future EBG development. This project suffered an unexpected delay between state enrolment and guideline release. In this delay, the state of Idaho, who was planning on using the evidence-based guideline, chose to develop their own guideline. This delay is important to consider for two reasons. First, the delay caused the state to proceed without the benefit of the evidence-based guideline. Second, the time frame between EBG literature review and release was considered too long for the Idaho medical advisory committee and the guideline developed by the state was considered more contemporaneous than the project evidence-based guideline.

Evidence based guideline developers should attempt to limit the time between development and release. It is important to note that this evidence based guideline was one of the first evidence-based guidelines released and one of the first attempts to trial the national evidence based guideline process. Subsequent projects have decreased this time frame between guideline initiation/development and release.³⁷ Future EBG projects should continue this pattern.

Based on the Idaho experience, the Project Team also concludes that evidence based guidelines are less likely to be disseminated and implemented if they are considered to be “out of date”. Maintenance and revision of an evidence based guideline and inclusion of the most recent evidence appears to be as important as prompt release of evidence based guidelines.

Both of these aspects of protocol development, timeliness of release and maintenance and revision, are addressed in the “National Prehospital Evidence-Based Guidelines Strategy: A Summary for EMS Stakeholders”³⁸ and supported by the experience of this project.

Recommendation #4 – Consider state-based learning management systems as one element of the dissemination and implementation strategy. Based on experience from the National Association of State EMS Officials Medical Director’s Council survey ²⁵, state-based learning management systems hold significant potential in the dissemination and implementation of protocols. States without learning management systems should consider developing such systems as one element of their dissemination and implementation strategy. This recommendation is balanced by the experience of this project, which highlighted the difficulties of developing and using these platforms. The lessons learned in this project are important for states to consider prior to developing these systems.

First, a learning management system must be user friendly with an easy user interface that is approachable by individuals with varying experience with computers. Secondly and especially important in rural areas, learning management systems must be functional in area with poor internet connectivity. Third, many EMS agencies utilize older computer hardware and software platforms and the chosen learning management system must be able to operate on these out of date computers and software. Finally, the learning management system must be functional for the state. States participating in the project had significant difficulty implementing the first learning management system chosen by the project. Even in states that were able to utilize this platform, state leadership was unable to track education, including numbers of providers who had completed the training, results of pre- and post-tests, and various demographics of these providers. States interested in developing a learning management system should consider the functionality of the “front end” of the platform, evident to the students, as well as the “back end” of the platform, utilized by state leadership and educators.

Recommendation #5 – Consider using a toolkit for the dissemination and implementation process. States participating in this project indicated that the

Project Team's toolkit was detailed and provided a significant amount of important information. The following elements of the toolkit were felt to be helpful:

- 1) EBG FAQ's
- 2) Pain Scale Educational Resources
- 3) EBG Information
- 4) Additional Educational Resources
- 5) Guideline Key Elements
- 6) Guideline Data Elements

The content of the toolkit was deliberately chosen by the Project Team, based on content in toolkits from other projects, as well as strategies to address known barriers to pain management (for example: training for hospitals). As this is the first known assessment considering which toolkit elements are beneficial and which are not valued to prehospital EBG dissemination and implementation, these results may act as a starting point in determining toolkit contents. Future prehospital evidence based guideline toolkit developers should use caution, however, and recognize these results, which are informative, are based on the experience of only three states. Future research should be directed at studying what toolkit content are most influential to engendering change.

Recommendation #6 – Develop systems, coordinated with the implementation project, that are able to track implementation progress. Key to process improvement is the ability to track program progress.⁷ EBG champions must be able to track implementation successes and failures. Without the ability to review implementation progress, EBG champions are left with anecdote and speculation to guide their impression of implementation progress. One means to track successes is to coordinate with state data managers or vendors of the state's chosen data system to create patient care report queries that are able to provide insight into implementation progress. Such a tracking system would allow state leadership to query individual agencies when barriers to implementation are identified.

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