2024 EMS RESEARCH READING LIST

Literature Summaries

Prehospital Guidelines Consortium

EXECUTIVE SUMMARY

Overview
Influenced by publications such as the National EMS Research Agenda and the Institute of Medicine (now the National Academy of Medicine) "EMS at the Crossroads," there has been a decades-long effort to incorporate more scientific evidence into EMS personnel education and EMS clinical protocols. Efforts of the Prehospital Guidelines Consortium (PGC), the National Registry of EMTs (NREMT), and other member organizations of the PGC have aimed to improve the dissemination of new scientific knowledge among EMS clinicians, including through improved education about EMS research and evidence-based guidelines.

Prehospital Guidelines
Since 2020, the PGC, in collaboration with NREMT, has completed and published biennial systematic reviews of prehospital guidelines to identify the highest quality evidence-based guidelines available to EMS clinicians and medical directors. These reviews aim to identify all guidelines providing recommendations for prehospital clinical care or operations and evaluate the quality of individual guidelines using standardized criteria.

The 2024 Systematic Review of Evidence-Based Guidelines for Prehospital Care involved a systematic search of the literature in Ovid Medline and EMBASE from January 1, 2021, to June 6, 2023, excluding guidelines identified in the prior systematic reviews (guidelines from 2020 not identified in the prior systematic review were also included). Publications were retained if they were:

1. relevant to prehospital care,
2. based on an organized review of the literature, and
3. focused on providing recommendations for clinical care or operations.

Included guidelines were appraised to identify if guidelines met the National Academy of Medicine (NAM) criteria for high-quality guidelines and scored across the six domains of the Appraisal of Guidelines for Research and Evaluation (AGREE) II tool, which is a widely used tool for assessing the quality of guidelines. Among 33 guidelines addressing a variety of clinical and operational aspects of EMS medicine, 7 met all NAM criteria for "high quality guidelines." These seven guidelines are summarized herein and include 4 guidelines from the American Heart Association addressing cardiovascular resuscitation of adults, children, and neonates, along with resuscitation education science. Also represented are guidelines on pain management, field triage of injured patients, and pediatric traumatic hemorrhagic shock.

Other Key Peer-Reviewed Publications
Additionally, in 2022, through a collaborative agreement with the NREMT, the PGC initiated a biennial effort to identify and report key recently published scientific peer-reviewed articles that could be incorporated into certification and continued competency activities for EMS clinicians. To identify these articles, the PGC established an open call for scientific literature of relevance to EMS clinicians published between 2021 and 2023. The open call was disseminated by EMS stakeholder organizations comprising the PGC. Submitted publications were reviewed and scored using a 1-5 Likert scale.

Submissions were also categorized using the Consensus Standard for Evidence Integration into EMS Education and High-Stakes Testing. Through additional review by a task force comprised of members of the Research Committee of the PGC, a list of ten key articles was selected and recommended by the PGC Board of Directors.

Submissions included published original research, systematic reviews, position statements and non-peer reviewed sources, such as a textbook chapter. The members of the PGC's Research Committee who reviewed the submitted publications comprised a technical expert panel including EMS physicians, paramedics, an EMT, and a non-EMS physician. A final list of ten articles, all receiving average ratings ≥3.5 were selected and supported by the PGC Board of Directors as recommended articles for EMS professionals. These articles include systematic reviews of the literature, position statements, a randomized control trial, and large cohort studies.

Summary

This document provides succinct summaries of essential peer-reviewed scientific publications, which can be used for educational purposes relevant to initial certification and continued competency activities for EMS personnel.

Table. Recommended Reading List of Peer-Reviewed EMS Publication, 2024 *(organized by author)*.

TITLE

Part 5: Neonatal Resuscitation: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time/Life-Critical Conditions**
  - *1.1.2 Airway/Respiratory*
- **1.4 Special Clinical Considerations**
  - *1.4.5 Pediatrics*

REFERENCE

Aziz K, Lee HC, Escobedo MB, et al. Part 5: Neonatal Resuscitation: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S524-S550. PMID: 33081528.

PUBLISHED ABSTRACT

N/A

SUMMARY OF GUIDELINE

This guideline from the American Heart Association aims to identify the most impactful steps to perform in the resuscitation of a neonate and provides specific recommendations for the training of resuscitation personnel, as well as for the development of systems of care. The guideline is based on evidence reviews completed by the International Liaison Committee on Resuscitation.

The guideline outlines the following “Top 10 Take-Home Messages for Neonatal Life Support”:

1. *Newborn resuscitation requires anticipation and preparation by providers who train individually and as teams.*
2. *Most newly born infants do not require immediate cord clamping or resuscitation and can be evaluated and monitored during skin-to-skin contact with their mothers after birth.*
3. *Inflation and ventilation of the lungs are the priority in newly born infants who need support after birth.*
4. *A rise in heart rate is the most important indicator of effective ventilation and response to resuscitative interventions.*
5. *Pulse oximetry is used to guide oxygen therapy and meet oxygen saturation goals.*
6. *Chest compressions are provided if there is a poor heart rate response to ventilation after appropriate ventilation corrective steps, which preferably include endotracheal intubation.*
7. *The heart rate response to chest compressions and medications should be monitored electrocardiographically.*

8. *If the response to chest compressions is poor, it may be reasonable to provide epinephrine, preferably via the intravenous route.*
9. *Failure to respond to epinephrine in a newborn with history or examination consistent with blood loss may require volume expansion.*
10. *If all these steps of resuscitation are effectively completed and there is no heart rate response by 20 minutes, redirection of care should be discussed with the team and family.*

TITLE

Prehospital Hemorrhage Control and Treatment by Clinicians: A Joint Position Statement

CATEGORY

Position Statement

EMS MEDICINE CORE CONTENT AREA(S)

- **1.2 Injury**
  - *1.2.1 Trauma*
- **1.4 Special Clinical Considerations**
  - *1.4.2 Procedures*

REFERENCE

Berry C, Gallagher JM, Goodloe JM, Dorlac WC, Dodd J, Fischer PE. Prehospital Hemorrhage Control and Treatment by Clinicians: A Joint Position Statement. Prehosp Emerg Care. 2023;27(5):544-551. PMID: 36961935.

PUBLISHED ABSTRACT / POSITION STATEMENT

Exsanguination remains the leading cause of preventable death among victims of trauma. For adult and pediatric trauma patients in the prehospital phase of care, methods to control hemorrhage and hemostatic resuscitation are described in this joint consensus opinion by the American College of Surgeons Committee on Trauma, the American College of Emergency Physicians, and the National Association of EMS Physicians.

SUMMARY OF PUBLICATION

This joint position statement from the American College of Surgeons Committee on Trauma, the American College of Emergency Physicians, and the National Association of EMS Physicians is intended to be used by EMS clinicians, EMS medical directors, trauma surgeons, and nurses in the treatment of acute trauma patients with severe, life-threatening external bleeding. Recommendations are based on the consensus of the authors and supported by these organizations.

Key points of consensus include:

- Direct pressure remains the first choice of treatment and effectively controls bleeding in most patients.
- A Bleeding Control Algorithm for Life-Threatening External Hemorrhage is provided, focusing on:
  - Identifying the source of bleeding.
  - Appropriate use of direct pressure, gauze or hemostatic-impregnated dressings for wound packing, and tourniquets based on location and compressibility of wounds.
- When indicated, hemostatic-impregnated dressings should be applied followed by at least 3 minutes of direct pressure.
- There is a greater chance of survival for the extremity trauma patient with life-threatening bleeding the earlier a tourniquet is applied.

- The technique for tourniquet application is reviewed.
- Tourniquets placed by non-clinicians need to be further evaluated by trained medical professionals.
- Improvised tourniquets are not recommended in the prehospital setting due to ineffectiveness and should be converted to a commercial grade tourniquet as soon as possible.
- There is inadequate clinical experience and data in civilian trauma to routinely recommend the use of junctional tourniquets.
- Patients with signs of hemorrhagic shock should receive prehospital blood products whenever available; whole blood is preferred over packed red blood cells.
- There is insufficient data to support recommendation of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) to be used in the prehospital setting.
- Suspected pelvic fractures should be treated with circumferential pelvic compression.
- Except children less than 2 years old, the same tourniquet used for adults can be used for children. The principles of tourniquet conversion are identical for children and adults.
- In all situations where the number of patients outweigh the available resources, hemorrhage control and treatment should be done as quickly as possible and focused on the most-acute patients using triage principles.

TITLE

Prehospital Airway Management: A Systematic Review

CATEGORY

Systematic Review

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time/Life-Critical Conditions**
  - *1.1.2 Airway Compromise/ Respiratory Failure*
- **1.4 Special Clinical Considerations**
  - *1.4.1 Airway Management in Adverse Conditions*
  - *1.4.2 Procedures*

REFERENCE

Carney N, Totten AM, Cheney T, et al. Prehospital Airway Management: A Systematic Review. Prehosp Emerg Care. 2022;26(5):716-727. PMID: 34115570.

PUBLISHED ABSTRACT

Objective: To assess comparative benefits and harms across three airway management approaches (bag valve mask [BVM], supraglottic airway [SGA], and endotracheal intubation [ETI]) used by prehospital emergency medical services (EMS) to treat patients with trauma, cardiac arrest, or medical emergencies, and how they differ based on techniques and devices, EMS personnel and patient characteristics.
Data sources: We searched electronic citation databases (Ovid® MEDLINE®, CINAHL®, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, and Scopus®) from 1990 to September 2020.
Review methods: We followed Agency for Healthcare Research and Quality Effective Health Care Program Methods guidance. Outcomes included mortality, neurological function, return of spontaneous circulation (ROSC), and successful advanced airway insertion. Meta-analyses using profile-likelihood random effects models were conducted, with analyses stratified by study design, emergency type, and age.
Results: We included 99 studies involving 630,397 patients. We found few differences in primary outcomes across airway management approaches. For survival, there was no difference for BVM versus ETI or SGA in adult and pediatric patients with cardiac arrest or trauma. For neurological function, there was no difference for BVM versus ETI and SGA versus ETI in pediatric patients with cardiac arrest. There was no difference in BVM versus ETI in adults with cardiac arrest, but improved neurological function with BVM or ETI versus SGA. There was no difference in ROSC for patients with cardiac arrest for BVM versus ETI or SGA in adults and pediatrics, or SGA versus ETI in pediatrics. There was higher frequency of ROSC in adults with SGA versus ETI. For successful advanced airway insertion, there was higher first-pass success with SGA versus ETI for all patients except adult medical patients (no difference), and no difference in overall success using SGA versus ETI in adults.
Conclusions: The currently available evidence does not indicate benefits of more invasive airway approaches based on survival, neurological function, ROSC, or successful airway insertion. Strength of

evidence was low or moderate; most included studies were observational. This supports the need for high-quality randomized controlled trials to advance clinical practice and EMS education and policy, and improve patient-centered outcomes.

SUMMARY OF PUBLICATION

This manuscript is a systematic review of publications comparing the benefits and harms of airway management approaches used by EMS agencies, including bag valve mask (BVM), supraglottic airway (SGA), and endotracheal intubation (ETI).

A total of 99 studies were included, of which 22 were randomized controlled trials, 20 were prospective and 50 retrospective observational studies, and 7 used before/after study designs.
Most studies were from the U.S. and Canada, followed by Europe and Asia. These studies represented a total of 630,397 patients.

Key findings of this systematic review include:

- **Survival** measured in-hospital or at 1-month post incident:
  - No difference in outcomes across all three comparisons in adult/mixed-age and pediatric patients with cardiac arrest.
  - No difference when BVM was compared with ETI in adult patients with trauma.
- **Neurological function** in-hospital or at 1-month post incident:
  - ***Outcomes favored BVM compared with SGA in adult patients with cardiac arrest.***
  - ***Outcomes measured by the CPC favored ETI compared to SGA in adult patients with cardiac arrest***; there was no difference in outcomes measured by the mRS in this group.
  - No difference in outcomes when BVM was compared with ETI in adult patients with cardiac arrest.
  - No difference in outcomes when ETI was compared with BVM or SGA in pediatric patients with cardiac arrest.
- **Return of spontaneous circulation (ROSC)** (prehospital, sustained, or overall):
  - No difference in outcomes when BVM was compared with SGA or ETI in adult patients with cardiac arrest.
  - ***Outcomes favored SGA when compared to ETI in adult patients with cardiac arrest***.
  - No difference in outcomes when ETI was compared with BVM or SGA in pediatric patients with cardiac arrest.
- **Successful advanced airway insertion** when SGA is compared with ETI:
  - ***First-pass success favored SGA in adult patients with cardiac arrest and with mixed emergency types, and in pediatric patients with cardiac arrest***; no difference was noted in adult patients with medical emergencies.
  - No difference in overall airway insertion success in adult patients with cardiac arrest, medical emergencies, or mixed emergency types.

TITLE

Part 6: Resuscitation Education Science: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **2.3 EMS Personnel**
  - *2.3.2 Education*
- **2.4 System Management**
  - *2.4.3 Public Health*

REFERENCE

Cheng A, Magid DJ, Auerbach M, et al. Part 6: Resuscitation Education Science: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S551-S579. PMID: 33081527.

PUBLISHED ABSTRACT

N/A

SUMMARY OF GUIDELINE

This guideline from the American Heart Association aims to provide "recommendations for the design and delivery of resuscitation training for lay rescuers and healthcare providers." The guideline is based on evidence reviews completed by the International Liaison Committee on Resuscitation.

The guideline outlines the following "Top 10 Take-Home Messages" for resuscitation education science:

1. *Effective education is an essential contributor to improved survival outcomes from cardiac arrest.*
2. *Use of a deliberate practice and mastery learning model during resuscitation training improves skill acquisition and retention for many critical tasks.*
3. *The addition of booster training to resuscitation courses is associated with improved cardiopulmonary resuscitation (CPR) skill retention over time and improved neonatal outcomes.*
4. *Implementation of a spaced learning approach for resuscitation training improves clinical performance and technical skills compared with massed learning.*
5. *The use of CPR feedback devices during resuscitation training promotes CPR skill acquisition and retention.*
6. *Teamwork and leadership training, high-fidelity manikins, in situ training, gamified learning, and virtual reality represent opportunities to enhance resuscitation training that may improve learning outcomes.*
7. *Self-directed CPR training represents a reasonable alternative to instructor led CPR training for lay rescuers.*

8. *Middle school– and high school–age children should be taught how to perform high-quality CPR because this helps build the future cadre of trained community-based lay rescuers.*
9. *To increase bystander CPR rates, CPR training should be tailored to low–socioeconomic status neighborhoods and specific racial and ethnic communities, where there is currently a paucity of training opportunities.*
10. *Future resuscitation education research should include outcomes of clinical relevance, establish links between performance outcomes in training and patient outcomes, describe cost-effectiveness of interventions, and explore how instructional design can be tailored to specific skills.*

TITLE

Defibrillation Strategies for Refractory Ventricular Fibrillation

CATEGORY

Original Research

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time/Life-Critical Conditions**
  - *1.1.1 Cardiac Arrest*

REFERENCE

Cheskes S, Verbeek PR, Drennan IR, et al. Defibrillation Strategies for Refractory Ventricular Fibrillation. N Engl J Med. 2022;387(21):1947-1956. PMID: 36342151.

PUBLISHED ABSTRACT

Background: Despite advances in defibrillation technology, shock-refractory ventricular fibrillation remains common during out-of-hospital cardiac arrest. Double sequential external defibrillation (DSED; rapid sequential shocks from two defibrillators) and vector-change (VC) defibrillation (switching defibrillation pads to an anterior-posterior position) have been proposed as defibrillation strategies to improve outcomes in patients with refractory ventricular fibrillation.

Methods: We conducted a cluster-randomized trial with crossover among six Canadian paramedic services to evaluate DSED and VC defibrillation as compared with standard defibrillation in adult patients with refractory ventricular fibrillation during out-of-hospital cardiac arrest. Patients were treated with one of these three techniques according to the strategy that was randomly assigned to the paramedic service. The primary outcome was survival to hospital discharge. Secondary outcomes included termination of ventricular fibrillation, return of spontaneous circulation, and a good neurologic outcome, defined as a modified Rankin scale score of 2 or lower (indicating no symptoms to slight disability) at hospital discharge.

Results: A total of 405 patients were enrolled before the data and safety monitoring board stopped the trial because of the coronavirus disease 2019 pandemic. A total of 136 patients (33.6%) were assigned to receive standard defibrillation, 144 (35.6%) to receive VC defibrillation, and 125 (30.9%) to receive DSED. Survival to hospital discharge was more common in the DSED group than in the standard group (30.4% vs. 13.3%; relative risk, 2.21; 95% confidence interval [CI], 1.33 to 3.67) and more common in the VC group than in the standard group (21.7% vs. 13.3%; relative risk, 1.71; 95% CI, 1.01 to 2.88). DSED but not VC defibrillation was associated with a higher percentage of patients having a good neurologic outcome than standard defibrillation (relative risk, 2.21 [95% CI, 1.26 to 3.88] and 1.48 [95% CI, 0.81 to 2.71], respectively).

Conclusions: Among patients with refractory ventricular fibrillation, survival to hospital discharge occurred more frequently among those who received DSED or VC defibrillation than among those who received standard defibrillation. (Funded by the Heart and Stroke Foundation of Canada; DOSE VF ClinicalTrials.gov number, NCT04080986.).

SUMMARY OF PUBLICATION

This was a cluster-randomized trial conducted among six Canadian paramedic services that enrolled 405 patients to evaluate double sequential external defibrillation (DSED; rapid sequential shocks from two defibrillators) and vector-change (VC) defibrillation (switching defibrillation pads to an anterior-posterior position) in patients with refractory ventricular fibrillation. The study was stopped early due to the COVID-19 pandemic after enrollment of 136 (30.9%) patients received standard defibrillation, 144 (35.6%) received VC defibrillation, and 125 (30.9%) received DSED.

More patients survived to hospital discharge with DSED than standard defibrillation (30.4% vs. 13.3%; relative risk, 2.21; 95% confidence interval [CI], 1.33 to 3.67) and with VC compared to standard defibrillation (21.7% vs. 13.3%; relative risk, 1.71; 95% CI, 1.01 to 2.88). Use of DSED but not VC defibrillation was associated with a higher percentage of patients having a good neurologic outcome compared to standard defibrillation (relative risk, 2.21 [95% CI, 1.26 to 3.88] and 1.48 [95% CI, 0.81 to 2.71], respectively).

Overall, more patients with refractory ventricular fibrillation survived to hospital discharge after receiving DSED or VC defibrillation compared to standard defibrillation.

TITLE

Racial, Ethnic, and Socioeconomic Disparities in Out-of-Hospital Pain Management for Patients With Long Bone Fractures

CATEGORY

Original Research

EMS MEDICINE CORE CONTENT AREA(S)

- **1.4 Special Clinical Considerations**
  - *1.4.3 Pain Assessment and Management in the Field*
- **1.5 Special Considerations for Evaluation, Treatment, Transport, and Destinations**
  - *1.5.2 Special Patient Populations*
- **2.4 System Management**
  - *2.4.7 Ethics in EMS*

REFERENCE

Crowe RP, Kennel J, Fernandez AR, et al. Racial, Ethnic, and Socioeconomic Disparities in Out-of-Hospital Pain Management for Patients With Long Bone Fractures. Ann Emerg Med. 2023;82(5):535-545. PMID: 37178100.

ACCESIBILITY

Free Access

PUBLISHED ABSTRACT

Study objective: To evaluate racial and ethnic disparities in out-of-hospital analgesic administration, accounting for the influence of clinical characteristics and community socioeconomic vulnerability, among a national cohort of patients with long bone fractures.

Methods: Using the 2019-2020 ESO Data Collaborative, we retrospectively analyzed emergency medical services (EMS) records for 9-1-1 advanced life support transport of adult patients diagnosed with long bone fractures at the emergency department. We calculated adjusted odds ratios (aOR) and 95% confidence intervals (CI) for out-of-hospital analgesic administration by race and ethnicity, accounting for age, sex, insurance, fracture location, transport time, pain severity, and scene Social Vulnerability Index. We reviewed a random sample of EMS narratives without analgesic administration to identify whether other clinical factors or patient preferences could explain differences in analgesic administration by race and ethnicity.

Results: Among 35,711 patients transported by 400 EMS agencies, 81% were White, non-Hispanic, 10% were Black, non-Hispanic, and 7% were Hispanic. In crude analyses, Black, non-Hispanic patients with severe pain were less likely to receive analgesics compared with White, non-Hispanic patients (59% versus 72%; Risk Difference: -12.5%, 95% CI: -15.8% to -9.9%). After adjustment, Black, non-Hispanic patients remained less likely to receive analgesics compared with White, non-Hispanic patients (aOR:0.65, 95% CI:0.53 to 0.79). Narrative review identified similar rates of patients declining analgesics offered by EMS and analgesic contraindications across racial and ethnic groups.

Conclusions: Among EMS patients with long bone fractures, Black, non-Hispanic patients were substantially less likely to receive out-of-hospital analgesics compared with White, non-Hispanic patients. These disparities were not explained by differences in clinical presentations, patient preferences, or community socioeconomic conditions.

SUMMARY OF PUBLICATION

Crowe et al. used data from the 2019 and 2020 ESO Data Collaborative research dataset to identify almost 38,000 patients with long bone fractures. The research team reviewed those cases to determine whether clinical factors and community socioeconomic resources influenced racial and ethnic disparities in prehospital analgesic administration.

After excluding cases where race and ethnicity were not documented, and after controlling for potentially confounding variables, the adjusted odds of receiving an out-of-hospital analgesic was 35% lower for Black non-Hispanic patients compared to White non-Hispanic patients (aOR: 0.65, 95% CI: 0.53 to 0.79). This disparity was not explained by differences in clinical factors (pain severity, clinical appropriateness or patient preferences) or community socioeconomic resources. The adjusted odds of receiving an out-of-hospital analgesic was not different between Hispanic patients or those of other races and ethnicities compared to White non-Hispanic patients.

This study highlights the racial and ethnic inequities that persist in out-of-hospital analgesic administration.

TITLE

Consensus Standard for Evidence Integration into EMS Education and High-Stakes Testing

CATEGORY

Original Research

EMS MEDICINE CORE CONTENT AREA(S)

- ***2.3 EMS Personnel***
  - *2.3.2 Education*
- **3.1 Quality Improvement Principles and Programs**
  - *3.1.3 Evidence-based Practice*
- **3.2 Research**
  - *3.2.3 EMS Research Design*

REFERENCE

Gage CB, Terry M, McKenna KD, et al. Consensus Standard for Evidence Integration into EMS Education and High-Stakes Testing. Prehosp Disaster Med. 2023;38(3):338-344. PMID: 37139715.

PUBLISHED ABSTRACT

Background: Incorporating emerging knowledge into Emergency Medical Service (EMS) competency assessments is critical to reflect current evidence-based out-of-hospital care. However, a standardized approach is needed to incorporate new evidence into EMS competency assessments because of the rapid pace of knowledge generation.
Objective: The objective was to develop a framework to evaluate and integrate new source material into EMS competency assessments.
Methods: The National Registry of Emergency Medical Technicians (National Registry) and the Prehospital Guidelines Consortium (PGC) convened a panel of experts. A Delphi method, consisting of virtual meetings and electronic surveys, was used to develop a Table of Evidence matrix that defines sources of EMS evidence. In Round One, participants listed all potential sources of evidence available to inform EMS education. In Round Two, participants categorized these sources into: (a) levels of evidence quality; and (b) type of source material. In Round Three, the panel revised a proposed Table of Evidence. Finally, in Round Four, participants provided recommendations on how each source should be incorporated into competency assessments depending on type and quality. Descriptive statistics were calculated with qualitative analyses conducted by two independent reviewers and a third arbitrator.
Results: In Round One, 24 sources of evidence were identified. In Round Two, these were classified into high- (n = 4), medium- (n = 15), and low-quality (n = 5) of evidence, followed by categorization by purpose into providing recommendations (n = 10), primary research (n = 7), and educational content (n = 7). In Round Three, the Table of Evidence was revised based on participant feedback. In Round Four, the panel developed a tiered system of evidence integration from immediate incorporation of high-quality sources to more stringent requirements for lower-quality sources.

Conclusion: The Table of Evidence provides a framework for the rapid and standardized incorporation of new source material into EMS competency assessments. Future goals are to evaluate the application of the Table of Evidence framework in initial and continued competency assessments.

SUMMARY OF PUBLICATION

Gage et al. developed by consensus a process for rapidly updating EMS curricula and high stakes testing content with new science. Using a four-round Delphi model, a task force of eleven subject matter experts began by identifying potential sources of informational material available to EMS clinicians, educators, and medical directors. The task force then categorized those sources as either high, medium, or low levels of evidence quality. The task force also evaluated whether the specific evidence category provided recommendations for diagnosis or care in the out-of-hospital setting, primary research without making recommendations for care, or whether the evidence category was simply informational or educational. Next the task force used this information to generate and refine a table of evidence. Finally, the task force defined best practices and timelines for integrating new science into the National Registry certification examination.

The final combined table of evidence developed by the task force panel is available in the publication as Figure 2. Recommendations concerning the impact of evidence on certification examinations based on the quality of evidence is available as Figure 3.

TITLE

Real-World Midazolam Use and Outcomes With Out-of-Hospital Treatment of Status Epilepticus in the United States

CATEGORY

Original Research

EMS MEDICINE CORE CONTENT AREA(S)

- ***1.3 Medical Emergencies***
  - *1.3.3 Neurological*

REFERENCE

Guterman EL, Sporer KA, Newman TB, et al. Real-World Midazolam Use and Outcomes With Out-of-Hospital Treatment of Status Epilepticus in the United States. Ann Emerg Med. 2022;80(4):319-328. PMID: 35931608.

PUBLISHED ABSTRACT

Study objective: Guidelines recommend 10-mg intramuscular midazolam as the first-line treatment option for status epilepticus. However, in real-world practice, it is frequently administered intranasally or intravenously and is dosed lower. Therefore, we used conventional and instrumental variable approaches to examine the effectiveness of midazolam in a national out-of-hospital cohort.
Methods: This retrospective cohort study of adults with status epilepticus used the ESO Data Collaborative research dataset (January 1, 2019, to December 31, 2019). The exposures were the route and dose of midazolam. We performed hierarchical logistic regression and 2-stage least squares regression using agency treatment patterns as an instrument to examine our outcomes, rescue therapy, and ventilatory support.
Results: There were 7,634 out-of-hospital encounters from 657 EMS agencies. Midazolam was administered intranasally in 20%, intravenously in 46%, and intramuscularly in 35% of the encounters. Compared with intramuscular administration, intranasal midazolam increased (risk difference [RD], 6.5%; 95% confidence interval [CI], 2.4% to 10.5%) and intravenous midazolam decreased (RD, -11.1%; 95% CI, -14.7% to -7.5%) the risk of rescue therapy. The differences in ventilatory support were not statistically significant (intranasal RD, -1.5%; 95% CI, -3.2% to 0.3%; intravenous RD, -0.3%; 95% CI, -1.9% to 1.2%). Higher doses were associated with a lower risk of rescue therapy (RD, -2.6%; 95% CI, -3.3% to -1.9%) and increased ventilatory support (RD, 0.4%; 95% CI, 0.1% to 0.7%). The instrumental variable analysis yielded similar results, except that dose was not associated with ventilatory support.
Conclusion: The route and dose of midazolam affect clinical outcomes. Compared with intramuscular administration, intranasal administration may be less effective and intravenous administration more effective in terminating status epilepticus, although the differences between these and previous results may reflect the nature of real-world data as opposed to randomized data.

SUMMARY OF PUBLICATION

Guterman et al. examined the effect of the out-of-hospital route of administration and initial dose of midazolam in terminating seizures for patients with convulsive status epilepticus. This retrospective cohort study reviewed over 7,600 adult patient care records submitted to the ESO Data Collaborative public use research data set during the 2019 calendar year. The primary outcome variable was the need for rescue therapy, which the authors defined as the administration of any additional benzodiazepine doses before arriving at the hospital. Secondarily, the authors were interested in whether the patients receiving the initial dose of midazolam required subsequent ventilatory support.

Administration of intranasal midazolam resulted in a 6.5% increase in the need for additional benzodiazepine doses (95% CI, 2.4% to 10.5%) when compared to intramuscular administration. In contrast, midazolam administered via the intravenous route reduced the need for additional benzodiazepine dose by 11.1% (95% CI, -14.7% to -7.5%). The need for ventilatory support before arriving in the emergency department was unaffected by the route of administration. Increasing the initial dose of midazolam to 5 milligrams or more was associated with an 11.1% decreased risk of rescue therapy (95% CI, −14.9% to −7.3%). As with the route of administration, the need for ventilatory support before arriving in the emergency department was unaffected by the magnitude of the initial dose.

This observational study suggests that the intravenous route of midazolam administration is more effective at terminating convulsive status epilepticus in adult patients compared with the intranasal and intramuscular routes. Similarly, initial doses of 5 milligrams or more is more effective that lower initial doses without ventilatory support. The authors suggest that additional randomized data may be needed to identify the real-world treatment effects of specific route and dose administrations.

TITLE

Clinical Care and Restraint of Agitated or Combative Patients by Emergency Medical Services Practitioners

CATEGORY

Position Statement

EMS MEDICINE CORE CONTENT AREA(S)

- ***1.3 Medical Emergencies***
  - *1.3.10 Behavioral Emergencies*

REFERENCE

Kupas DF, Wydro GC, Tan DK, Kamin R, Harrell AJt, Wang A. Clinical Care and Restraint of Agitated or Combative Patients by Emergency Medical Services Practitioners. Prehosp Emerg Care. 2021;25(5):721-723. PMID: 33877949.

PUBLISHED ABSTRACT / POSITION STATEMENT

No abstract available. Position statement summarized below.

SUMMARY OF PUBLICATION

This joint position statement from the National Association of EMS Physicians (NAEMSP), National Association of State EMS Officials (NASEMSO), National EMS Management Association (NEMSMA), National Association of Emergency Medical Technicians (NAEMT), and the American Paramedic Association (APA) replaces prior position statements on patient restraint from 2002 and 2017. This is an area of EMS medicine that has very limited scientific evidence and this position statement provides consensus-based recommendations.

This statement addresses the need to care for patients who may be agitated, combative, or violent, and whose care may be complicated by alcohol use, substance use, or mental health illness. These situations put patients, the public, and emergency responders at risk of injury. In severely impaired patients, rapid pharmacologic management/sedation may prevent adverse events and maximize patient safety.

A summary of key recommendations includes (refer to the publication for additional details):

- The primary goal should be to protect agitated, combative, or violent patients from injuring themselves, while simultaneously protecting the public and emergency responders from injury.
- Every EMS agency should have specific protocols for dealing with an agitated, violent, or combative individual.
- EMS practitioners must perform an appropriate patient assessment to identify and manage clinical conditions that may be contributing to a patient's agitated, combative, or violent behavior and should consider using an agitation score, like the Richmond Agitation Sedation Scale (RASS). Assessment should aim to identify clinical conditions including hypoxia, hypoglycemia, alcohol or substance intoxication, stroke, seizure, traumatic brain injury, and delirium.

- Persons who lack decision-making capacity should be assessed and treated with implied consent while maintaining the patient's dignity to the extent possible. The use of appropriate de-escalation techniques should take precedence over physical restraint or pharmacologic management whenever possible.
- The use of restraint techniques and thresholds for the implementation of restraint techniques in the out-of-hospital environment may differ from those used within a hospital.
- EMS practitioners must receive education and training on how to identify and treat the clinical spectrum of conditions that are associated with agitated, combative, or violent behavior.
- Physical restraint and pharmacologic management/sedation are only indicated to protect a patient, the public, and emergency responders from further injury, facilitate assessment, or allow for treatment of life-threatening injury or illness.
- Restraint protocols must address the strategies, devices, and techniques that will be used, when each will be used, who can apply them, and if direct medical oversight must be involved.
- Restraint protocols should address the type of physical restraints and techniques that are permissible for use by EMS practitioners.
- Restraint protocols should identify restraint techniques that are expressly prohibited for use by EMS practitioners.
- Pharmacologic management is an effective method of protecting the violent or combative patient from self-injury. A medication with rapid onset is preferred to reduce the risk as quickly as possible and every individual who receives pharmacologic management must be continuously monitored and treated by EMS providers, including for potential respiratory depression.
- After patient physical restraint and/or pharmacologic management, physiologic monitoring and clinical assessment/reassessment must be done as soon as possible and at recurring intervals.
- EMS documentation should include details of patient behavior, patient assessment (including agitation scores), clinical indication for restraint, type of restraint intervention(s) attempted or applied, details of reassessment, and additional care provided during transport.
- If required, EMS medical directors should determine the point at which EMS practitioners are expected to contact a physician in these situations.
- Every case of physical restraint or pharmacologic management by EMS practitioners should undergo quality assurance review.
- Law enforcement officers, whenever available, should be involved in all cases in which a patient poses a threat to themselves, the public, or emergency responders.
- If law enforcement officers apply restraint techniques or technologies to individuals which are not sanctioned by EMS protocols. a law enforcement officer must remain immediately available while the EMS practitioner assesses and manages the patient based upon the EMS agency's clinical protocols.
- If a law enforcement-based restraint intervention that is not sanctioned for use by EMS practitioners must be continued during transport by EMS, a law enforcement officer should either accompany the patient during transport by ambulance or the law enforcement-based restraint intervention should, when appropriate, be discontinued in favor of a sanctioned EMS-based restraint intervention.

TITLE

Evidence-Based Guidelines for Prehospital Pain Management: Recommendations

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.4 Special Clinical Considerations**
  - *1.4.3 Pain Assessment/Mgmt*

REFERENCE

Lindbeck G, Shah MI, Braithwaite S, et al. Evidence-Based Guidelines for Prehospital Pain Management: Recommendations. Prehosp Emerg Care. 2023;27(2):144-153. PMID: 34928760.

PUBLISHED ABSTRACT

This project sought to develop evidence-based guidelines for the administration of analgesics for moderate to severe pain by Emergency Medical Services (EMS) clinicians based on a separate, previously published, systematic review of the comparative effectiveness of analgesics in the prehospital setting prepared by the University of Connecticut Evidence-Based Practice Center for the Agency for Healthcare Research and Quality (AHRQ). A technical expert panel (TEP) was assembled consisting of subject matter experts in prehospital and emergency care, and the development of evidence-based guidelines and patient care guidelines. A series of nine “patient/population-intervention-comparison-outcome” (PICO) questions were developed based on the Key Questions identified in the AHRQ systematic review, and an additional PICO question was developed to specifically address analgesia in pediatric patients. The panel made a strong recommendation for the use of intranasal fentanyl over intravenous (IV) opioids for pediatric patients without intravenous access given the supporting evidence, its effectiveness, ease of administration, and acceptance by patients and providers. The panel made a conditional recommendation for the use of IV non-steroidal anti-inflammatory drugs (NSAIDs) over IV acetaminophen (APAP). The panel made conditional recommendations for the use of either IV ketamine or IV opioids; for either IV NSAIDs or IV opioids; for either IV fentanyl or IV morphine; and for either IV ketamine or IV NSAIDs. A conditional recommendation was made for IV APAP over IV opioids. The panel made a conditional recommendation against the use of weight-based IV ketamine in combination with weight-based IV opioids versus weight–based IV opioids alone. The panel considered the use of oral analgesics and a conditional recommendation was made for either oral APAP or oral NSAIDs when the oral route of administration was preferred. Given the lack of a supporting evidence base, the panel was unable to make recommendations for the use of nitrous oxide versus IV opioids, or for IV ketamine in combination with IV opioids versus IV ketamine alone. Taken together, the recommendations emphasize that EMS medical directors and EMS clinicians have a variety of effective options for the management of moderate to severe pain in addition to opioids when designing patient care guidelines and caring for patients suffering from acute pain.

SUMMARY OF GUIDELINE

This guideline from the National Association of State EMS Officials provides specific recommendations related to the administration of analgesics for moderate to severe pain by EMS clinicians. Recommendations were primarily based on a systematic review of the evidence related to the prehospital use of analgesics prepared by the University of Connecticut Evidence-Based Practice Center for the Agency for Healthcare Research and Quality (AHRQ).

Key recommendations as stated in the guideline include:

- *We recommend in favor of intranasal (IN) fentanyl over intramuscular (IM) or intravenous (IV) opioids in the treatment of moderate to severe pain in pediatric patients prior to IV access or without (or without indication for) IV access (strong recommendation, low certainty of evidence). The panel makes a conditional recommendation for either IN fentanyl or IV opioids once IV access is established (conditional recommendation, low certainty of evidence).*
- *We suggest in favor of IV acetaminophen (APAP) over IV opioids alone for the initial management of moderate to severe pain in the prehospital setting if IV APAP is available, affordable, and easy to administer. (conditional recommendation, low certainty of evidence).*
- *We suggest either IV NSAIDS or IV opioids for the initial management of moderate to severe pain in the prehospital setting. (conditional recommendation, moderate certainty of evidence)*
- *We suggest in favor of IV NSAIDs over IV APAP for the initial management of moderate to severe pain in the prehospital setting. Additionally, we recommend in favor of either PO NSAIDs or PO APAP for the initial management of pain in the prehospital setting if an oral analgesic is considered. (conditional recommendation, low certainty of evidence).*
- *We suggest either IV ketamine or IV NSAIDs for the initial management of moderate to severe pain in the prehospital setting (conditional recommendation, moderate certainty of evidence).*
- *We suggest either IV ketamine or IV opioids for the initial management of moderate to severe pain in the prehospital setting (conditional recommendation, very low certainty of evidence).*
- *If opioids are selected for pain management, we suggest either IV morphine or IV fentanyl for the treatment of moderate to severe pain in the prehospital setting (conditional recommendation, low certainty of evidence).*
- *We suggest against the combination of weight-based IV opioid plus weight-based IV ketamine versus weight-based IV opioid alone for the initial management of moderate to severe pain in the prehospital setting. (conditional recommendation, very low certainty of evidence).*

TITLE

Appropriate Air Medical Services Utilization and Recommendations for Integration of Air Medical Services Resources into the EMS System of Care: A Joint Position Statement and Resource Document of NAEMSP, ACEP, and AMPA

CATEGORY

Position Statement

EMS MEDICINE CORE CONTENT AREA(S)

- **1.5 Special Considerations for Evaluation, Treatment, Transport, and Destinations**
  - *1.5.1 Time-Life Critical Conditions*
- ***2.2 EMS Systems***
  - *2.2.1 Public Safety Answering Points*
  - *2.2.2 Design of System Components*
  - *2.2.3 Delivery Systems with Special Considerations*

REFERENCE

Lyng JW, Braithwaite S, Abraham H, et al. Appropriate Air Medical Services Utilization and Recommendations for Integration of Air Medical Services Resources into the EMS System of Care: A Joint Position Statement and Resource Document of NAEMSP, ACEP, and AMPA. Prehosp Emerg Care. 2021;25(6):854-873. PMID: 34388053.

PUBLISHED ABSTRACT / POSITION STATEMENT

This update to the 2013 joint position statement, Appropriate and Safe Utilization of Helicopter Emergency Medical Services, provides guidance for air medical services utilization based on currently available evidence. Air medical services utilization considerations fall into three major categories: clinical considerations, safety considerations, and system integration and quality assurance.

Clinically, air medical services should accomplish one or more of three primary patient-centered goals: initiation or continuation of locally unavailable advanced or specialty care; expedited delivery to definitive care for time-sensitive interventions; and/or extraction from physically remote or otherwise inaccessible locations that limit timely access to necessary care. Ground-EMS (GEMS) transport is preferred when it is able to provide the necessary level of care and timely transport to definitive care.

Risk identification and safety of both the patient and crew must be uniformly balanced against the anticipated degree of patient medical benefit. While auto-ready and auto-launch practices may increase access to air medical services, they also risk over-use, and so must be rigorously reviewed. Safety is enhanced during multi-agency emergency responses by coordinated interagency communication, ideally through centralized communication centers. Helicopter shopping and reverse helicopter shopping both create significant safety risks and their use is discouraged.

Regional EMS systems must integrate air medical services to facilitate appropriate utilization in alignment with the primary patient goals while being cognizant of local indications, resources, and needs. To maximize consistent, informed air medical services utilization decisions, specific indications for and limitations to air medical services utilization that align with local and regional system and patient needs should be identified, and requests routed through centralized coordinating centers supported by EMS physicians.

To limit risk and promote appropriate utilization of air medical services, GEMS clinicians should be encouraged to cancel an air medical services response if it is not aligned with at least one of the three primary patient-centered goals. Similarly, air medical services clinicians should be empowered to redirect patient transport to GEMS. Air medical services should not routinely be used solely to allow GEMS to remain in their primary service area.

SUMMARY OF PUBLICATION

This joint position statement from the National Association of EMS Physicians (NAEMSP), American College of Emergency Physicians (ACEP), and the Air Medical Physicians Association (AMPA) replaces a prior 2013 position statement on the appropriate and safe utilization of helicopter EMS. The position statements provides specific guidance within three major categories: clinical considerations, safety considerations, and system integration and quality assurance. Specific recommendations are succinctly summarized in the abstract.

TITLE

2022 Systematic Review of Evidence-Based Guidelines for Prehospital Care

CATEGORY

Systematic Review

EMS MEDICINE CORE CONTENT AREA(S)

- **3.1 Quality Improvement Principles and Programs**
  - *3.1.3 Evidence-based Practice*
- **3.2 Research**
  - *3.2.3 EMS Research Design*

REFERENCE

Martin-Gill C, Brown KM, Cash RE, Haupt RM, Potts BT, Richards CT, Patterson PD; Prehospital Guidelines Consortium. 2022 Systematic Review of Evidence-Based Guidelines for Prehospital Care. Prehosp Emerg Care. 2023;27(2):131-143. PMID: 36369826.

PUBLISHED ABSTRACT

Introduction: Multiple national organizations and federal agencies have promoted the development, implementation, and evaluation of evidence-based guidelines (EBGs) for prehospital care. Previous efforts have identified opportunities to improve the quality of prehospital guidelines and highlighted the value of high-quality EBGs to inform initial certification and continued competency activities for EMS personnel.

Objectives: We aimed to perform a systematic review of prehospital guidelines published from January 2018 to April 2021, evaluate guideline quality, and identify top-scoring guidelines to facilitate dissemination and educational activities for EMS personnel.

Methods: We searched the literature in Ovid Medline and EMBASE from January 2018 to April 2021, excluding guidelines identified in a prior systematic review. Publications were retained if they were relevant to prehospital care, based on organized reviews of the literature, and focused on providing recommendations for clinical care or operations. Included guidelines were appraised to identify if they met the National Academy of Medicine (NAM) criteria for high-quality guidelines and scored across the six domains of the Appraisal of Guidelines for Research and Evaluation (AGREE) II tool.

Results: We identified 75 guidelines addressing a variety of clinical and operational aspects of EMS medicine. About half (n = 39, 52%) addressed time/life-critical conditions and 33 (44%) contained recommendations relevant to non-clinical/operational topics. Fewer than half (n = 35, 47%) were based on systematic reviews of the literature. Nearly one-third (n = 24, 32%) met all NAM criteria for clinical practice guidelines. Only 27 (38%) guidelines scored an average of >75% across AGREE II domains, with content relevant to guideline implementation most commonly missing.

Conclusions: This interval systematic review of prehospital EBGs identified many new guidelines relevant to prehospital care; more than all guidelines reported in a prior systematic review. Our review reveals important gaps in the quality of guideline development and the content in their publications, evidenced by the low proportion of guidelines meeting NAM criteria and the scores across AGREE II domains. Efforts to increase guideline dissemination, implementation, and related education may be best focused around the highest quality guidelines identified in this review.

SUMMARY OF PUBLICATION

The 2022 systematic review of prehospital evidence-based guidelines (EBGs) identified and assessed the quality of new EBGs published between 2018 and April 2021. Evidence-based guidelines are essential for translating scientific research into EMS practice and ensuring that EMS personnel provide care based on the latest and most reliable evidence.

This systematic review identified 75 new guidelines since the PGC's prior systematic review of prehospital EBGs by Turner et. al. covering a variety of clinical and operational topics. The quality of evidence evaluation, development of recommendations, and reporting as assessed using criteria adapted from the National Academy of Medicine (NAM) and the guideline evaluation tool AGREE II. There were 24 guidelines that met the full NAM criteria for high-quality guidelines. Other guidelines were often limited by not including or reporting all elements of a systematic review of the literature, which is critical for developing high-quality recommendations.

EMS personnel should be familiar with the identified guidelines, especially those meeting high-quality criteria. Understanding these guidelines and how they are developed can help reduce variability in care and improve patient outcomes. For individuals involved in guideline development, it is important to note limitations of existing prehospital guidelines to ensure future guidelines are of high quality. For example, based on AGREE II scoring, prehospital guidelines scored lowest on "Applicability," which measures how well guidelines provide tools and information for real-world implementation. This gap may translate into challenges in implementing guidelines in EMS systems.

By integrating high-quality guidelines into ongoing education and training, EMS personnel can be better equipment to translate the best available evidence and recommendations into improving patient care in the prehospital setting.

TITLE

National guideline for the field triage of injured patients: Recommendations of the National Expert Panel on Field Triage, 2021

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.2 Injury**
  - *1.2.1 Trauma*
- **1.5 Special Considerations for Evaluation, Treatment, Transport, and Destinations**
  - *1.5.1 Time-Life Critical Conditions*
  - *1.5.2 Special Patient Populations*
- **4.1 Mass casualty**
  - *4.1.2 Triage*

REFERENCE

Newgard CD, Fischer PE, Gestring M, et al. National guideline for the field triage of injured patients: Recommendations of the National Expert Panel on Field Triage, 2021. J Trauma Acute Care Surg. 2022;93(2):e49-e60. PMID: 35475939.

PUBLISHED ABSTRACT

This work details the process of developing the updated field triage guideline, the supporting evidence, and the final version of the 2021 National Guideline for the Field Triage of Injured Patients.

SUMMARY OF GUIDELINE

This guideline was developed by an interdisciplinary national expert panel (comprised of EMS clinicians, EMS physicians, emergency physicians, trauma surgeons, pediatric surgeons, nurses, EMS medical directors, experts in EMS training and education, EMS and trauma system administrators, researchers, and representatives from stakeholder organizations) in collaboration with the EMS subcommittee of the American College of Surgeons Committee on Trauma.

The guideline updates and replaces the previous 2011 guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, which was previously led by the Centers for Disease Control & Prevention (CDC).

Recommendations were based on systematic reviews of the literature and consensus of the interdisciplinary national expert panel. Additionally, a 40-question electronic end-user feedback tool was distributed to 29 national organizations to gather information directly from EMS clinicians about the use of the field triage guideline; responses from 3,958 EMS clinicians were shared with the expert panel and incorporated into the guideline revision process.

This National Guideline for the Field Triage of Injured Patients is represented in the publication with a schematic differentiating Red Criteria (high risk for serious injury) and Yellow Criteria (moderate risk for serious injury).

New and modified criteria compared to the 2011 guideline as stated in the publication include:

- ***Injury Patterns (Previously Step 2 Anatomic Criteria)***
  - *New criterion: Active bleeding requiring a tourniquet or wound packing with continuous pressure.*
  - *Criterion clarified: Penetrating injuries to the head, neck, torso, and proximal extremities.*
  - *Criterion clarified: Skull deformity, suspected skull fracture.*
  - *Criterion clarified: Suspected spinal injury with new motor or sensory loss.*
  - *Criterion clarified: Chest wall instability, deformity, or suspected flail chest.*
  - *Criterion clarified: Suspected pelvic fracture.*
  - *Criterion clarified: Suspected fracture of two or more proximal long bones.*
- ***Mental Status and Vital Signs (Previously Step 1 Physiologic Criteria)***
  - *New criterion: "Unable to follow commands (motor GCS <6)" replaces total "GCS ≤13."*
  - *New criterion: heart rate (HR) > systolic blood pressure (SBP) (adults and older adults).*
  - *New criterion: SBP < 70 mm Hg + (2 × age in years) (children 0–9 years).*
  - *New criterion: "Respiratory distress or need for respiratory support" replaces "need for ventilatory support" and "respiratory rate <20 in infant aged <1 year."*
  - *New criterion: Room-air pulse oximetry <90%*
- ***Mechanism of Injury Criteria***
  - *New criterion: Child (age 0–9 years) unrestrained or in unsecured child safety seat.*
  - *Modified criterion: Significant intrusion (including roof) >12 in occupant site or >18 in any site or need for extrication of the entrapped patient.*
  - *Modified criterion: Rider separated from transport vehicle with significant impact (e.g., motorcycle, ATV, horse, etc.).*
  - *Modified criterion: fall from height >10 ft (all ages).*
  - *Modified criterion: Pedestrian/bicycle rider thrown, run over, or with significant impact.*
- ***Emergency Medical Services Judgment (Previously Step 4 Special Considerations)***
  - *New criterion: Suspicion of child abuse.*
  - *Modified criterion: Low level falls in young children (age ≤5 years) or older adults (age ≥65 years) with significant head impact.*
  - *Modified criterion: Low level falls in young children (age ≤5 years) or older adults (age ≥65 years) with significant head impact.*
  - *Modified criterion: Anticoagulation use.*

TITLE

Essential Principles to Create an Equitable, Inclusive, and Diverse EMS Workforce and Work Environment: A Position Statement and Resource Document

CATEGORY

Position Statement

EMS MEDICINE CORE CONTENT AREA(S)

- **1.5 Special Considerations for Evaluation, Treatment, Transport, and Destinations**
  - *1.5.2 Special Patient Populations*
- **2.4 System Management**
  - *2.4.3 Public Health*
  - *2.4.7 Ethics in EMS*

REFERENCE

Owusu-Ansah S, Tripp R, S NW, et al. Essential Principles to Create an Equitable, Inclusive, and Diverse EMS Workforce and Work Environment: A Position Statement and Resource Document. Prehosp Emerg Care. 2023;27(5):552-556. PMID: 36867425.

PUBLISHED ABSTRACT / POSITION STATEMENT

Emergency medical services (EMS), similar to all aspects of health care systems, can play a vital role in examining and reducing health disparities through educational, operational, and quality improvement interventions. Public health statistics and existing research highlight that patients of certain socioeconomic status, gender identity, sexual orientation, and race/ethnicity are disproportionately affected with respect to morbidity and mortality for acute medical conditions and multiple disease processes, leading to health disparities and inequities. With regard to care delivery by EMS, research demonstrates that the current attributes of EMS systems may further contribute to these inequities, such as documented health disparities existing in EMS patient care management, and access along with EMS workforce composition not being representative of the communities served influencing implicit bias. EMS clinicians need to understand the definitions, historical context, and circumstances surrounding health disparities, health care inequities, and social determinants of health in order to reduce health care disparities and promote care equity. This position statement focuses on systemic racism and health disparities in EMS patient care and systems by providing multifaceted next steps and priorities to address these disparities and workforce development. NAEMSP believes that EMS systems should:

- Adopt a multifactorial approach to workforce diversity implemented at all levels within EMS agencies.
- Hire more diverse workforce by intentionally recruiting from marginalized communities.
- Increase EMS career pathway and mentorship programs within underrepresented minorities (URM) communities and URM-predominant schools starting at a young age to promote EMS as an achievable profession.
- Examine policies that promote systemic racism and revise policies, procedures, and rules to promote a diverse, inclusive, and equitable environment.

- Involve EMS clinicians in community engagement and outreach activities to promote health literacy, trustworthiness, and education.
- Require EMS advisory boards whose composition reflects the communities they serve and regularly audit membership to ensure inclusion.
- Increase knowledge and self-awareness of implicit/unconscious bias and acts of microaggression through established educational and training programs (i.e., anti- racism, upstander, and allyship) such that individuals recognize and mitigate their own biases and can act as allies.
- Redesign structure, content, and classroom materials within EMS clinician training programs to enhance cultural sensitivity, humility, and competency and to meet career development, career planning, and mentoring needs, particularly of URM EMS clinicians and trainees.
- Discuss cultural views that affect health care and medical treatment and the effects of social determinants of health on care access and outcomes during all aspects of training.
- Design research and quality improvement initiatives related to health disparities in EMS that are focused on racial/ethnic and gender inequities and include URM community leaders as essential stakeholders involved in all stages of research development and implementation.

SUMMARY OF PUBLICATION

This position statement from the National Association of EMS Physicians highlights that patients of certain socioeconomic status, gender identity, sexual orientation, and race/ethnicity are disproportionately affected by medical conditions and the presence of multiple disease processes, leading to health disparities and inequities. EMS systems may further contribute to these inequities via disparities in EMS patient care management, access to EMS care, or the EMS workforce composition not being representative of the communities served. The position statement emphases a need for EMS clinicians to understand and work to reduce health disparities, health care inequities, and social determinants of health, thus promoting care equity. This position statement provides concrete next steps and priorities to address these disparities and workforce development.

TITLE

Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time / Life Critical Conditions**
  - *1.1.1 Cardiac Arrest*
  - *1.1.2 Airway/Respiratory*
- **1.4 Special Clinical Considerations**
  - *1.4.2 Procedures*
- **1.5 Special Considerations for Evaluation, Treatment, Transport, and Destinations**
  - *1.5.1 Time-Life Critical Conditions*
  - *1.5.2 Special Patient Populations*

REFERENCE

Panchal AR, Bartos JA, Cabanas JG, et al. Part 3: Adult Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S366-S468. PMID: 33081529.

PUBLISHED ABSTRACT

N/A

SUMMARY OF GUIDELINE

This guideline from the American Heart Association provides recommendations for basic life support (BLS) and advanced life support (ALS) for adult patients. The guideline is based on evidence reviews completed by the International Liaison Committee on Resuscitation.

The guideline outlines the following “Top 10 Take-Home Messages for Adult Cardiovascular Life Support”:

1. *On recognition of a cardiac arrest event, a layperson should simultaneously and promptly activate the emergency response system and initiate cardiopulmonary resuscitation (CPR).*
2. *Performance of high-quality CPR includes adequate compression depth and rate while minimizing pauses in compressions,*
3. *Early defibrillation with concurrent high-quality CPR is critical to survival when sudden cardiac arrest is caused by ventricular fibrillation or pulseless ventricular tachycardia.*
4. *Administration of epinephrine with concurrent high-quality CPR improves survival, particularly in patients with nonshockable rhythms.*

5. *Recognition that all cardiac arrest events are not identical is critical for optimal patient outcome, and specialized management is necessary for many conditions (eg, electrolyte abnormalities, pregnancy, after cardiac surgery).*
6. *The opioid epidemic has resulted in an increase in opioid-associated out-of-hospital cardiac arrest, with the mainstay of care remaining the activation of the emergency response systems and performance of high-quality CPR.*
7. *Post–cardiac arrest care is a critical component of the Chain of Survival and demands a comprehensive, structured, multidisciplinary system that requires consistent implementation for optimal patient outcomes.*
8. *Prompt initiation of targeted temperature management is necessary for all patients who do not follow commands after return of spontaneous circulation to ensure optimal functional and neurological outcome.*
9. *Accurate neurological prognostication in brain-injured cardiac arrest survivors is critically important to ensure that patients with significant potential for recovery are not destined for certain poor outcomes due to care withdrawal.*
10. *Recovery expectations and survivorship plans that address treatment, surveillance, and rehabilitation need to be provided to cardiac arrest survivors and their caregivers at hospital discharge to optimize transitions of care to home and to the outpatient setting.*

TITLE

Pediatric traumatic hemorrhagic shock consensus conference recommendations

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time / Life Critical Conditions**
  - *1.1.3 Hypotension/Shock*
- **1.2 Injury**
  - *1.2.1 Trauma*
- **1.4 Special Clinical Considerations**
  - *1.4.2 Procedures*
  - *1.4.5 Pediatrics*

REFERENCE

Russell RT, Esparaz JR, Beckwith MA, et al. Pediatric traumatic hemorrhagic shock consensus conference recommendations. J Trauma Acute Care Surg. 2023;94(1S Suppl 1):S2-S10. PMID: 36245074.

PUBLISHED ABSTRACT

Hemorrhagic shock in pediatric trauma patients remains a challenging yet preventable cause of death. There is little high-quality evidence available to guide specific aspects of hemorrhage control and specific resuscitation practices in this population. We sought to generate clinical recommendations, expert consensus, and good practice statements to aid providers in care for these difficult patients.

The Pediatric Traumatic Hemorrhagic Shock Consensus Conference process included systematic reviews related to six subtopics and one consensus meeting. A panel of 16 consensus multidisciplinary committee members evaluated the literature related to 6 specific topics: (1) blood products and fluid resuscitation for hemostatic resuscitation, (2) utilization of prehospital blood products, (3) use of hemostatic adjuncts, (4) tourniquet use, (5) prehospital airway and blood pressure management, and (6) conventional coagulation tests or thromboelastography-guided resuscitation. A total of 21 recommendations are detailed in this article: 2 clinical recommendations, 14 expert consensus statements, and 5 good practice statements. The statement, the panel's voting outcome, and the rationale for each statement intend to give pediatric trauma providers the latest evidence and guidance to care for pediatric trauma patients experiencing hemorrhagic shock. With a broad multidisciplinary representation, the Pediatric Traumatic Hemorrhagic Shock Consensus Conference systematically evaluated the literature and developed clinical recommendations, expert consensus, and good practice statements concerning topics in traumatically injured pediatric patients with hemorrhagic shock.

SUMMARY OF GUIDELINE

This guideline was developed by a multidisciplinary team of experts and key stakeholders to “(1) develop consensus statements on best practice in resuscitation strategies for pediatric trauma patients

experiencing hemorrhagic shock based on the current literature; (2) create a strategy, in collaboration with implementation experts, for adaptive dissemination and implementation into clinical and research environments; and (3) develop future research priorities for studying resuscitation practices for pediatric traumatic hemorrhagic shock and foster collaboration in pursuit of improved clinical care for these patients." Recommendations are based on systematic reviews of the literature and a consensus meeting involving a panel of 16 multidisciplinary committee members.

The guideline provides 2 clinical recommendations and 14 expert consensus statements. The following are specifically relevant to prehospital care:

- ***Blood Products and Fluid Resuscitation in Pediatric Traumatic Hemorrhagic Shock***
  - *In traumatically injured children in hemorrhagic shock, we suggest prioritizing the use of blood products over the use of crystalloids for resuscitation (consensus panel expertise).*
  - *In traumatically injured children in hemorrhagic shock, the use of low titer (≤200 immunoglobulin G) group O WB might be considered if available over individual blood components (RBC, plasma, and platelets) for resuscitation (clinical recommendation; conditional recommendation).*
- ***Prehospital Blood Products Use in Pediatric Traumatic Hemorrhagic Shock***
  - *In traumatically injured children in hemorrhagic shock, it is reasonable to consider prehospital transfusion by out-of-hospital emergency medical service (EMS) for injured children based on product availability and clinical judgment (consensus panel expertise).*
- ***Use of Tranexamic Acid and Other Hemostatic Adjuncts in Pediatric Traumatic Hemorrhagic Shock***
  - *In traumatically injured children with hemorrhagic shock, the empiric use of tranexamic acid within 3 hours of injury might be considered (clinical recommendation; conditional recommendation; very low certainty of evidence).*
- ***Use of Tourniquets in Pediatric Traumatic Hemorrhagic Shock***
  - *In traumatically injured children with exsanguinating extremity hemorrhage, we recommend the use of commercially available tourniquets by individuals with training (consensus panel expertise).*
- ***Prehospital Intubation and Blood Pressure Management in Pediatric Traumatic Hemorrhagic Shock***
  - *In traumatically injured children with hemorrhagic shock, we suggest against a permissive hypotension strategy and suggest resuscitation goals that optimize end organ perfusion and adequate oxygen delivery (consensus panel expertise).*

TITLE

Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

CATEGORY

Evidence-Based Guideline

EMS MEDICINE CORE CONTENT AREA(S)

- **1.1 Time / Life Critical Conditions**
  - *1.1 Cardiac Arrest*
  - *1.1.2 Airway/Respiratory*
  - *1.1.3 Hypotension/ Shock*
- **1.3 Medical Emergencies**
  - *1.3.2 Cardiovascular*
- **1.4 Special Clinical Considerations**
  - *1.4.2 Procedures*
  - *1.4.5 Pediatrics*

REFERENCE

Topjian AA, Raymond TT, Atkins D, et al. Part 4: Pediatric Basic and Advanced Life Support: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2):S469-S523. PMID: 33081526.

PUBLISHED ABSTRACT

N/A

SUMMARY OF GUIDELINE

This guideline from the American Heart Association provides recommendations for pediatric basic and advanced life support, excluding the newborn period. The guideline is based on evidence reviews completed by the International Liaison Committee on Resuscitation.

The guideline outlines the following “Top 10 Take-Home Messages”:

1. *High-quality cardiopulmonary resuscitation (CPR) is the foundation of resuscitation. New data reaffirm the key components of high-quality CPR: providing adequate chest compression rate and depth, minimizing interruptions in CPR, allowing full chest recoil between compressions, and avoiding excessive ventilation.*
2. *A respiratory rate of 20 to 30 breaths per minute is new for infants and children who are (a) receiving CPR with an advanced airway in place or (b) receiving rescue breathing and have a pulse.*
3. *For patients with nonshockable rhythms, the earlier epinephrine is administered after CPR initiation, the more likely the patient is to survive.*
4. *Using a cuffed endotracheal tube decreases the need for endotracheal tube changes.*

5. *The routine use of cricoid pressure does not reduce the risk of regurgitation during bag-mask ventilation and may impede intubation success.*
6. *For out-of-hospital cardiac arrest, bag-mask ventilation results in the same resuscitation outcomes as advanced airway interventions such as endotracheal intubation.*
7. *Resuscitation does not end with return of spontaneous circulation (ROSC). Excellent post–cardiac arrest care is critically important to achieving the best patient outcomes. For children who do not regain consciousness after ROSC, this care includes targeted temperature management and continuous electroencephalography monitoring. The prevention and/or treatment of hypotension, hyperoxia or hypoxia, and hypercapnia or hypocapnia is important.*
8. *After discharge from the hospital, cardiac arrest survivors can have physical, cognitive, and emotional challenges and may need ongoing therapies and interventions.*
9. *Naloxone can reverse respiratory arrest due to opioid overdose, but there is no evidence that it benefits patients in cardiac arrest.*
10. *Fluid resuscitation in sepsis is based on patient response and requires frequent reassessment. Balanced crystalloid, unbalanced crystalloid, and colloid fluids are all acceptable for sepsis resuscitation. Epinephrine or norepinephrine infusions are used for fluid-refractory septic shock.*