

National Association of EMS Educators (NAEMSE) Position Paper on Sepsis

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NAEMSE recommends the inclusion of prehospital emergency care as an important healthcare partner in the development of evidence-based recommendations for awareness, assessment and treatment of sepsis. Photo courtesy Jason Walchok/Greenville County (S.C.) EMS

Introduction

The National Association of EMS Educators (NAEMSE) has adopted the following positions on education on the topic of pre-hospital sepsis care and the roles of EMS educators, with regards to sepsis as a part of initial and ongoing EMS education programs.

Executive Summary

NAEMSE recognizes sepsis as a global health concern, with an incidence of more than 30 million per year and a mortality rate of six million per year, most of which are preventable.¹ NAEMSE recognizes sepsis as an emergent medical condition in the United States that affects 1.7 million people each year, killing more than 270,000.²⁻⁶

Although there are variations from healthcare system to healthcare system, mortality from sepsis ranges from approximately 15% to 30%, and mortality from septic shock ranges from 40% to 70%.^{7,8} Furthermore, sepsis is the leading cause of mortality in hospitals and is the leading cause of hospital readmissions, with a gross economic impact on healthcare costs exceeding \$27 billion and rising by approximately 6.25% annually.^{6,9,10}

NAEMSE recognizes that septic shock is an emergent medical condition upon which EMS patient care has a direct impact, given that more than half of patients with severe sepsis arrive at hospital EDs via ambulance.¹¹⁻¹³ It's noteworthy that five patients with sepsis are transported by EMS for every two patients with myocardial infarction.¹⁴

NAEMSE recognizes that, although a need for further research remains, a solid body of knowledge has been established that indicates that high-quality and timely EMS care for sepsis, when recognized and treated properly, currently has a positive impact on outcomes by reducing the time to effective lifesaving treatment, potentially improving rates of morbidity and mortality.¹¹⁻²²

NAEMSE further recognizes that a substantial education gap exists for members of the EMS workforce, and that the gap likely affects the ability of EMS providers to identify, assess and provide appropriate essential care for patients suffering from sepsis and septic shock.^{14-16,18,20,22-25} This gap is a result of the challenges pertaining to defining sepsis and developing evidence-based consensus recommendations for recognition, assessment and treatment among all branches of the medical community.²⁶⁻²⁸

The education gap has further widened due to national EMS education standards having lagged behind the sepsis knowledge base of critical care medicine.²⁹⁻³⁷ The educational standards and recommendations lag has left many EMS providers with an out-of-date understanding of the nature and acuity of sepsis and septic shock in the prehospital environment, which has led to missed recognition, assessments and effective treatments of this critical medical condition.^{14-16,22,24}

Definitions

Sepsis: A potentially life-threatening emergency that occurs when an over-reaction of the immune system is triggered by infection resulting in organ system dysfunction. Chemicals are released into the bloodstream to fight infection, triggering pro- and anti-inflammatory responses throughout the body which result in a cascade of leaking blood vessels, vasoconstriction, inflammation, cell damage, clotting and disruption of cellular processes.^{38,39}

Sepsis occurs when a pathogen (virus, bacteria, fungus or parasite) infecting the body triggers a dysfunction of the immune response. When this dysfunction occurs, it results in a combination of physiological, immune, inflammatory/anti-inflammatory, and circulatory changes. This includes vasodilation (causing distributive shock), capillary leakage (causing hypovolemic shock), and increased clotting, resulting in many smaller blood vessels being blocked by clots (causing obstructive shock), all at the same time.^{39,40}

Septic Shock: A subset of sepsis initially unresponsive to fluid resuscitation in which severe circulatory, cellular, and metabolic problems result in organ dysfunction, often resulting in severe injuries, disabilities, and death.^{39,40}

History of Sepsis Management & Education in EMS

Sepsis was not mentioned in national EMS education standards from the National Highway Traffic Safety Administration (NHTSA) prior to the 1984 *EMT-Ambulance National Standard Curriculum*.³⁰ The 1985 *Paramedic National Standard Curriculum* mentioned sepsis, but not as an emergent issue for EMS, reflecting an incomplete understanding of sepsis at the time.²⁹

In 1991, the Chicago Consensus Conference of the American College of Chest Physicians/Society of Critical Care Medicine (ACCP/SCCM) produced new definitions of sepsis along with recommendations for identification and treatment of septic shock as an emergent condition.²⁶ As late as 1994, the *EMT National Standard Curriculum* still did not mention sepsis.³¹ Sepsis was mentioned in the 1998 *Paramedic National Standard Curriculum*, but again the connection to prehospital emergency care was greatly understated.³²

These educational standards framed sepsis as a condition to be found in a patient's medical history rather than a medical emergency to be identified, assessed and treated in the field. The failure to describe sepsis and septic shock as medical emergencies requiring prehospital intervention may have had a significantly negative impact on the knowledge and attitude of EMS providers in general towards sepsis.

In 2001, emergency medical treatment recommendations for sepsis care were further refined at the International Sepsis Definitions Conference, reflecting an improved understanding of both the pathophysiology of sepsis and its impact on public health.²⁷

By 2005, the *National EMS Core Content* listed sepsis as a possibly emergent or critical condition, but placed it under the subtopic of bacterial systemic infectious disorders. By grouping it along with much less frequently encountered conditions such as botulism and tetanus, the implication is made that while sepsis may be emergent, it is infrequently encountered and is unlikely to be identifiable or treatable by EMS.³³

The 2009 *National EMS Education Standards* mentioned sepsis only once in the EMT Instructional Guidelines in the pathophysiology section as a subcategory of "shock due to container failure," even though this is only one of the numerous paths through which sepsis causes physiological damage.³⁴ In

the Paramedic Instructional Guidelines, sepsis was mentioned as its own type of shock after cardiogenic, hypovolemic, neurogenic, and anaphylactic.³⁵ However, current understanding of sepsis would place it in the higher-level subtopic currently listed as Multiple Organ Dysfunction Syndrome (MODS), which would more properly describe the acuity and pathophysiology of sepsis and septic shock, but currently lists only a brief connection with sepsis.³⁵

Within the National Registry's 2016 revision of the National Continued Competency Program (NCCP), sepsis and septic shock are discussed only briefly under the Infectious Diseases module, though they do use modern terminology for sepsis and discuss it as an emergent condition.^{36,37} Although this is encouraging, it is, by itself, not enough to close the large gap of knowledge and attitudes that currently exists among providers.

Precedent for NHTSA Scope of Practice Changes

On Nov. 1, 2017, the Director of the Office of Emergency Medical Services under NHTSA issued changes to the National EMS Scope of Practice Model: the ability for EMS providers to administer narcotic antagonists to patients suspected of narcotic overdose and the addition of the use of tourniquets and wound packing for hemorrhage control. These changes established a precedent for adopting substantial changes to education models and programs for prehospital providers in situations where a significant healthcare threat arises.⁴¹

Best Practices

Currently available best practice models of sepsis education include the following:

- Pathophysiology of sepsis including initial infection, systemic inflammatory and immune responses, and tissue and organ dysfunction;
- Progression of septic shock with refractory hypotension or hypoperfusion despite fluid resuscitation;
- Identification of potential sepsis, if a prehospital healthcare provider identifies or strongly suspects infection, beginning with the patient chief complaint;
- Effective patient history-taking, to further define the potential for infection, as well as patients' ability to compensate for shock;
- Effective patient assessment, focusing on identifying potential infection, as well as signs and symptoms of hypoperfusion and/or organ dysfunction, using validated sepsis criteria and assessment tools;
- Identification of criteria to alert a receiving hospital of the pending arrival of a patient with sepsis or septic shock;
- Effective prehospital treatment for sepsis and septic shock, including tools and techniques such as rapid but controlled administration of fluids, pressor medications, airway and breathing support, and management of hypoglycemia as necessary; and
- Ongoing monitoring of patient progression and response to treatment.

Recommendations

NAEMSE recommends:

1. The inclusion of prehospital emergency care as an important healthcare partner in the development of evidence-based recommendations for awareness, assessment, and treatment of sepsis.
2. Further research to create and validate sepsis identification and assessment tools and treatment protocols for use in the prehospital environment.
3. A universal adoption of sepsis-specific EMS education and training programs that describe septic shock as an emergent condition encountered frequently by EMS providers upon which they have significant influence on patient outcomes.
4. EMS Educators must stress the importance of patient education as a vital component of the work of pre-hospital providers, including topics shown to help reduce incidence of sepsis such as infection prevention and control, effective vaccination practices, appropriate use of antibiotics and antimicrobials, and public awareness of the signs and symptoms of sepsis.

5. Future updates of National Education Standards EMT Instructional Guidelines should have sepsis moved to an upper-level topic of shock, identifying it as involving multiple simultaneous shock pathways including hypovolemic, distributive, and obstructive.
6. In future updates of National Education Standards Paramedic Instructional Guidelines, sepsis be moved to an upper-level topic of hypoperfusion, replacing Multiple Organ Dysfunction syndrome which may be moved to a sub-topic under sepsis.
7. Future updates to the National Continued Competency Programs, sepsis and septic shock must be moved from a low-level subtopic, located under infectious disease issues, to a top-level subtopic under immunological emergencies, alongside allergic reaction and anaphylaxis with which sepsis has much more in common.
8. NAEMSE must work collaboratively and in partnership with other global and national organizations to reduce the morbidity and mortality rates that are due to sepsis.

Summary Statement

It is the position of NAEMSE that a framework for sepsis education, integrating current terminology, models of understanding, and evidence-based assessment and treatment recommendations, be integrated into future EMS Instructional Guidelines for new providers, as well as continuing prehospital medical education and competency assessment for current providers.

References

1. [Reinhart K, Daniels R, Kissoon N, et al. \(2017\). Recognizing sepsis as a global health priority—A WHO resolution. *N Engl J Med.* 2017;377\(5\):414–417.](#)
2. [Epstein L, Dantes R, Magill S, et al. Varying estimates of sepsis mortality using death Certificates and administrative codes — United States, 1999–2014. *MMWR Morb Mortal Wkly Rep.* 2016;65\(13\):342–345.](#)
3. [Novosad SA. Vital signs: Epidemiology of sepsis: Prevalence of health care factors and opportunities for prevention. *MMWR Morb Mortal Wkly Rep.* 2016;65\(33\):864–869.](#)
4. [Rhee C, Dantes R, Epstein L, et al. Incidence and trends of sepsis in US hospitals using clinical vs claims data, 2009–2014. *JAMA.* 2017;318\(13\):1241–1249.](#)
5. Centers for Disease Control and Prevention. (Aug. 3, 2017.) FastStats. Retrieved December 14, 2017, from www.cdc.gov/nchs/fastats/leading-causes-of-death.htm.
6. [Arefian H, Heublein S, Scherag A, et al. Hospital-related cost of sepsis: A systematic review. *J Infect.* 2017;74\(2\):107–117.](#)
7. [Gaieski DF, Edwards JM, Kallan MJ, et al. Benchmarking the incidence and mortality of severe sepsis in the United States. *Crit Care Med.* 2013;41\(5\):1167–1174.](#)
8. [Kaukonen KM, Bailey M, Suzuki S, et al. Mortality related to severe sepsis and septic shock among critically ill patients in Australia and New Zealand, 2000–2012. *JAMA.* 2014;311\(13\):1308–1316.](#)
9. [Liu V, Escobar GJ, Greene JD, et al. Hospital deaths in patients with sepsis from 2 independent cohorts. *JAMA.* 2014;312\(1\):90–92.](#)
10. Fingar K, Washington R. (November 2015.) Statistical brief #196: Trends in hospital readmissions for four high-volume conditions, 2009–2013. Retrieved July 27, 2018, from www.hcup-us.ahrq.gov/reports/statbriefs/sb196-Readmissions-Trends-High-Volume-Conditions.jsp.
11. [Wang HE, Weaver MD, Shapiro NI, et al. Opportunities for emergency medical services care of sepsis. *Resuscitation.* 2010;81\(2\):193–197.](#)
12. [Herlitz J, Bång A, Wireklint-Sundström B, et al. Suspicion and treatment of severe sepsis. An overview of the prehospital chain of care. *Scand J Trauma Resusc Emerg Med.* 2012;20:42.](#)
13. [Studnek JR, Artho MR, Garner CL Jr, et al. The impact of emergency medical services on the ED care of severe sepsis. *Am J Emerg Med.* 2012;30\(1\):51–56.](#)
14. [Seymour CW, Rea TD, Kahn JM, et al. Severe sepsis in pre-hospital emergency care: Analysis of incidence, care, and outcome. *Am J Respir Crit Care Med.* 2012;186\(12\):1264–1271.](#)
15. Baker S. (2016). Reducing mortality from severe sepsis and septic shock: A macro system approach. *University of San Francisco Doctor of Nursing Practice (DNP) Projects*. Retrieved July 27, 2018, from <https://repository.usfca.edu/dnp/78>.

16. [Baker SD. Improving sepsis recognition and utilization of early goal-directed therapy in the prehospital environment: A review of the literature. *J Emerg Nurs.* 2016;42\(5\):387–394.](#)
17. [Band RA, Gaieski DF, Hylton JH, et al. Arriving by emergency medical services improves time to treatment endpoints for patients with severe sepsis or septic shock. *Acad Emerg Med.* 2011;18\(9\):934–940.](#)
18. [Ginde AA, Moss M. Has the time for advanced pre-hospital care of severe sepsis finally arrived? *Am J Respir Crit Care Med.* 2012;186\(12\):1204–1205.](#)
19. [Guerra WF, Mayfield TR, Meyers MS, et al. Early detection and treatment of patients with severe sepsis by prehospital personnel. *J Emerg Med.* 2013;44\(6\):1116–1125.](#)
20. [Jones J, Lawner BJ. Prehospital sepsis care. *Emerg Med Clin North Am.* 2017;35\(1\):175–183.](#)
21. [Smyth MA, Brace-McDonnell SJ, Perkins GD. Impact of prehospital care on outcomes in sepsis: A systematic review. *West J Emerg Med.* 2016;17\(4\):427–437.](#)
22. [Yealy DM, Huang DT, Delaney A, et al. Recognizing and managing sepsis: What needs to be done? *BMC Med.* 2015;13:98.](#)
23. [Alam N, Oskam E, Stassen PM, et al. Prehospital antibiotics in the ambulance for sepsis: A multicentre, open label, randomised trial. *Lancet Respir Med.* 2018;6\(1\):40–50.](#)
24. [Báez AA, Hanudel P, Perez MT, et al. Prehospital Sepsis Project \(PSP\): Knowledge and attitudes of United States advanced out-of-hospital care providers. *Prehosp Disaster Med.* 2013;28\(2\):104–106.](#)
25. [van der Wekken LC, Alam N, Holleman F, et al. Epidemiology of sepsis and its recognition by emergency medical services personnel in the Netherlands. *Prehosp Emerg Care.* 2016;20\(1\):90–96.](#)
26. Bone RC, Balk RA, Cerra FB, et al. Definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. The ACCP/SCCM Consensus Conference Committee. American College of Chest Physicians/Society of Critical Care Medicine. *Chest.* 1992;101(6):1644–1655.
27. [Levy MM, Fink MP, Marshall JC, et al. 2001 SCCM/ESICM/ACCP/ATS/SIS International Sepsis Definitions Conference. *Intensive Care Med.* 2003;29\(4\):530–538.](#)
28. [Seymour CW, Liu VX, Iwashyna TJ, et al. Assessment of clinical criteria for sepsis: For the third international consensus definitions for sepsis and septic shock \(Sepsis-3\). *JAMA.* 2016;315\(8\):762–774.](#)
29. Emergency Medical Technician—Paramedic: National Standard Curriculum. (1985.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from www.ems.gov/pdf/education/Emergency-Medical-Technician-Paramedic/Paramedic_Inst_Lessons_1985.pdf.
30. Emergency Medical Technician—Ambulance: National Standard Curriculum. (1984.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from www.ems.gov/pdf/education/Emergency-Medical-Technician/EMT_Ambulance_1984.pdf.
31. Emergency Medical Technician—Basic: National Standard Curriculum. (1994.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from http://www.ems.gov/pdf/education/Emergency-Medical-Technician/EMT_Basic_1996.pdf.
32. EMT—Paramedic: National Standard Curriculum. (1998.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from www.ems.gov/pdf/education/Emergency-Medical-Technician-Paramedic/Paramedic_1998.pdf.
33. National EMS Core Content. (July 2005.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from www.ems.gov/pdf/education/EMS-Education-for-the-Future-A-Systems-Approach/National_EMS_Core_Content.pdf.
34. National Emergency Medical Services Education Standards: Emergency Medical Technician Instructional Guidelines. (January 2009.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018 from www.ems.gov/pdf/EMT_Instructional_Guidelines.pdf.
35. National Emergency Medical Services Educational Standards: Paramedic Instructional Guidelines. (January 2009.) *National Highway Traffic Safety Administration*. Retrieved July 27, 2018, from www.ems.gov/pdf/education/National-EMS-Education-Standards-and-Instructional-Guidelines/Paramedic_Instructional_Guidelines.pdf.

36. National Continued Competency Program: EMT Education Update. (Oct. 1, 2016.) *National Registry Of Emergency Medical Technicians*. Retrieved July 27, 2018, from https://content.nremt.org/static/documents/2016_EMT_NCCP_final.pdf.
37. National Continued Competency Program: Paramedic Education Update. (Oct. 1, 2016.) *National Registry of Emergency Medical Technicians*. Retrieved July 27, 2018, from https://content.nremt.org/static/documents/2016_NRP_NCCP_final.pdf.
38. [Angus DC, van der Poll T. Severe sepsis and septic shock. *N Engl J Med*. 2013;369\(9\):840–851.](#)
39. [Rhodes A, Evans LE, Alhazzani W, et al. Surviving sepsis campaign: International guidelines for management of sepsis and septic shock: 2016. *Crit Care Med*. 2017;45\(3\):486–552.](#)
40. [Gotts JE, Matthay MA. Sepsis: Pathophysiology and clinical management. *BMJ*. 2016;353:i1585.](#)
41. Krohmer JR. (Nov. 1, 2017). 2007 National EMS Scope of Practice Mode Cover Letter and Change Notices. *National Highway Traffic Safety Office of EMS*. Retrieved July 27, 2018, from www.ems.gov/pdf/2007-National-EMS-Scope-of-Practice-Mode-Cover-Letter-and-Change-Notices.pdf.

