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Rescue Digest

What EMS needs to know about new pediatric sepsis guidelines

EMS providers have a key role in initial emergency care for pediatric patients with sepsis

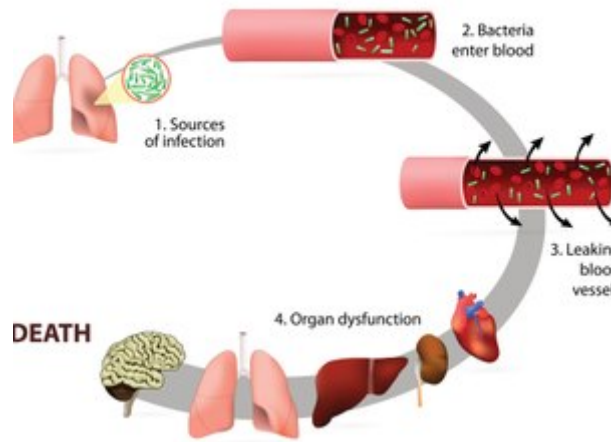
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One of the most important things that EMS caregivers can do is to coordinate care effectively with their in-hospital counterparts. In modern emergency medicine, this means more than simply [calling an alert](#) so that clinicians at the receiving hospital have a heads-up.

Coordinated care means ensuring that at each step, the patient experiences smooth, synchronized and effective assessment and treatment, with continued forward movement towards recovery. For this to occur, caregivers at each step of the way, from first contact, to emergency care, through critical care and rehabilitation, should be working from the same set of clear, evidence-based, regularly updated guidelines.

It is for this reason that EMS providers of all stripes should be up to date on the Surviving Sepsis Campaign's (SSC) release of the [International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children](#) [1].

Sepsis



Worldwide, sepsis is a leading cause of morbidity, mortality and healthcare utilization for children. (Photo/Getty Images)

The challenge with any set of care guidelines is the limit of the science on which they are based. Consequently, most guidelines are less a new set of rules, and more a set of statements addressing key questions in patient care. In other words, even for consensus guidelines, while some of the guidelines may be strong recommendations based on robust scientific studies, other sections may reflect what is, effectively, a best guess by an expert panel evaluating scarce research addressing their question.

In its first update in 15 years, SSC 2020 pediatric guidelines make six strong recommendations, 52 weak recommendations, nine best practice statements where little science exists, along with 49 priorities for future research. Their goal is to, “provide a foundation for consistent care to improve outcomes and inform future research” [1].

Background: Worldwide, [sepsis](#) is a leading cause of morbidity, mortality and healthcare utilization for children. Approximately 8% of patients admitted to pediatric intensive care units and more than 4% of all hospitalized patients younger than 18 years of age have sepsis, even in a high-income countries.

According to the guidelines, “The majority of children who die of sepsis suffer from refractory shock and/or multiple organ dysfunction syndrome, with many deaths occurring within the initial 48 to 72 hours of treatment. Early identification and appropriate resuscitation and management are therefore critical to optimizing outcomes for children with sepsis.” Therefore, EMS understanding of the guidelines is crucial for every other step of care to be effective.

Definitions: The guidelines define septic shock in children as, “severe infection leading to cardiovascular dysfunction,” including hypotension/need for treatment with vasoactive medication. The guidelines define sepsis-associated organ dysfunction as, “severe infection leading to cardiovascular and/or non-cardiovascular organ dysfunction.”

Interestingly, the guidelines note that neonatal sepsis may have a distinctly different pathology and treatment considerations, so newborns less than 37 weeks are not addressed here. The guidelines further note that even where recommendations are listed as “strong,” they do not imply an

unshakeable standard of care. That is, some guidelines may not apply to certain individual patients or patient circumstances.

PEDIATRIC SEPSIS GUIDELINES RECOMMENDATIONS

What follows is an EMS-focused synopsis of recommendations. EMS providers will be most interested in recommendations 1, 3, 4, 17, 20, 24, 28 and 34. The [full guidelines can be obtained here](#).

Screening and Management

1. Children who present as “unwell” should be systematically screened for sepsis at the first point of contact with a caregiver. In many cases, this will mean EMS. Unfortunately, while several screening tools exist, none have as yet proven superior to others so no recommendation is made for a specific pediatric sepsis screening tool or system.
2. Even though the guidelines recognize blood lactate as a valuable indirect marker of tissue perfusion, no recommendation is made to use blood lactate to stratify children with suspected sepsis into high or low risk categories. Instead, blood lactate should be used along with other vital signs to form a complete and individual patient picture to guide treatment.
3. Protocols should be used to help get all care providers on the same page when managing pediatric patients with suspected septic shock or sepsis-associated organ dysfunction.

Antimicrobial Therapy

4-6. Blood cultures should be obtained before initiating antimicrobial therapies such as antibiotics. While antimicrobial therapies should not be delayed if blood cultures cannot be obtained, opportunity exists for EMS providers to facilitate getting blood cultures obtained and antimicrobials administered more quickly. In children with septic shock and sepsis-associated organ dysfunction, antimicrobials should be administered as soon as possible after appropriate evaluation. It is strongly recommended that children with sepsis-associated dysfunction receive these antimicrobials within 3 hours of recognition and children in septic shock receive antimicrobials within 1 hour. This is where EMS recognition and advocacy are key.

7-9. While broad spectrum empiric antimicrobial therapy may be initiated early, once the pathogen is identified, the therapy should be narrowed or discontinued based on the clinical presentation, site of infection and other factors. Empiric therapy is any treatment given based on experience in the absence of complete information. Risks of unnecessary continuation of broad-spectrum antimicrobial therapy include toxicities, infection with *Clostridioides difficile* or fungal pathogens, and overall promotion of antimicrobial resistance among pathogens.

10-14. These recommendations are for very specific antimicrobial therapy strategies for children with or without immune compromise.

Source Control

15-16. It is strongly recommended that the source of infection should be controlled if possible, including the removal of intravascular devices that are confirmed to be sources of sepsis or septic shock. This does not imply that pre-hospital providers should be pulling potentially infected central lines. However, it would be appropriate for EMS clinicians to seek to identify potential sources of infection and for this to be passed on to in-hospital caregivers.

Fluid Therapy

17. The guidelines remind us that, “Effective fluid resuscitation in septic shock can correct hypovolemia caused by capillary leak, vasodilation, and fluid losses. Without maintenance of adequate atrial filling pressures, cardiac output will fall and organ perfusion will be compromised.” Thus, in healthcare systems with available intensive care a fluid bolus of 10-10 mL/kg up to 40-60 mL/kg is recommended over the first hour, titrated to markers of cardiac output and discontinued if signs of fluid overload develop.

18-19. In systems without availability of intensive care, the recommendation for hypotensive patients is still to administer up to 40 mL/kg of fluids, but if hypotension has not yet developed, it is strongly recommended that bolus fluid not be administered.

20-23. Balanced/buffered crystalloids are recommended as the fluid of choice. It is strongly recommended to not use hydroxyethyl starch in acute fluid resuscitation.

Hemodynamic monitoring

24. Specific recommendations for systolic blood pressure (SBP) and [mean arterial pressure \(MAP\)](#) targets were not made, but the guidelines note that regular medical practice targets the 5th or 50th percentile for age. To be clear, EMS providers do not need a table of percentiles in order to provide care. For EMS providers this simply means a target SBP of $2 \times \text{age} + 65$ and a target MAP of $1.5 \times \text{age} + 40$. For example, a 4-year-old child with sepsis would have a target SBP of 73 mm Hg and a target MAP of 46 mm Hg.²

25-26. The guidelines suggest against attempting to categorize pediatric shock as “warm” or “cold” shock based on extremity temperature, capillary refill, diastolic blood pressure or other clinical signs.

27. The guidelines suggest using trends in blood lactate in addition to clinical assessment to guide fluid resuscitation.

Vasoactive medications

28-30. The guidelines recommend [epinephrine](#) or norepinephrine over dopamine in children with septic shock with no specific recommendation of epi or norepi as first-line medication.

31. While the guidelines do not recommend any specific recommendations for initiating vasoactive medications, they recognize that in practice, they are typically begun if abnormal perfusion persists after infusions of 40-60 mL/kg of fluid.

32-33. Vasopressin is recommended as a vasoactive medication to be added to titrate high-dose catecholamine medications in children who require them.

Ventilation

34. The guidelines do not specifically recommend intubation for children in fluid-refractory, catecholamine-resistant shock, but in practice, such children are intubated without respiratory failure.

35. It is suggested to not use etomidate to facilitate intubation in children with septic shock as it can block the normal stress response and cause relative adrenal insufficiency

36. For children who may have sepsis-induced pediatric ARDS (PARDS) without clear need for intubation, a trial of non-invasive mechanical ventilation is recommended.

37-43. Further recommendations for children with PARDS include the use of positive end-expiratory pressure (PEEP) possibly greater than 10 cm H₂O as well as a trial of prone positioning. Additional PARDS therapies with specific indications and guidelines are included in the recommendations, including neuromuscular blockade, inhaled nitric oxide and high-frequency oscillatory ventilation (HFOV).

Corticosteroids

44-45. The guidelines suggest against using IV corticosteroids to treat children with [septic shock](#) if fluid resuscitation and vasopressor therapy are able to restore hemodynamic stability but may be used if fluid and vasopressor therapy are inadequate.

Endocrine and metabolism

46-48. The guidelines recommend against use of insulin therapy to maintain a target blood sugar at or below 140 mg/dL, but do not make specific recommendations as to specific targets for blood glucose ranges or blood calcium levels.

49. The guidelines recommend against routine use of levothyroxine in children with septic shock and other sepsis-associated organ dysfunction in a sick euthyroid state.

50. The guidelines acknowledge the risks and benefits of fever in children, stating, "Fever is a complex physiologic response associated with sepsis, and it remains unclear whether fever is a beneficial or a harmful response to infection. Potential benefits include inhibiting the growth of some pathogens and increased neutrophil production and lymphocyte proliferation. Conversely, fever is associated with an increased metabolic rate and may impair some components of immune function. Fever can also make patients uncomfortable. Thus, the putative benefits of maintaining normothermia by treating fever are unclear."

Nutrition

51-64. The guidelines make a variety of recommendations pertaining to the nutrition of children with sepsis or sepsis-associated organ dysfunction under the management of in-hospital or specialist clinicians.

Blood products

65-74. The guidelines offer specific guidance to clinicians pertaining to the administration of [blood products](#), plasma exchange, renal replacement, and extracorporeal support of children with sepsis or sepsis-associated organ dysfunction.

Immunoglobulins and prophylaxis

75-77. The guidelines suggest against the routine use of IV immune globulin, stress ulcer prophylaxis, or deep vein thrombosis prophylaxis in children with sepsis or sepsis-associated organ dysfunction.

CONCLUSIONS ABOUT PEDIATRIC SEPSIS GUIDELINES

While not all of these guidelines pertain directly to field assessment and care of children with suspected sepsis, it is important for EMS clinicians to understand the full critical care picture that the patient will be experiencing through their course of care.

Even more important, however, is the fact that the guidelines conclude with a large number of knowledge gaps and research opportunities. Thus, the final key take-home point for EMS is that while guidelines such as these can help keep providers on the same evidence-based or at least expert-guided page when caring for critical patients, we must still remain open to further changes down-the-road as science advances, our medical knowledge improves, and EMS becomes an ever more integral part of emergency medicine.

Read next: [Pediatric sepsis: 10 things paramedics need to know](#)

REFERENCES

1. Weiss, S. L. et al. Surviving Sepsis Campaign International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children. *Pediatric Critical Care Medicine* 21, e52 (2020).
2. Baylor College of Medicine. Pediatric Blood Pressure Reference. <https://www.bcm.edu/bodycomplab/Flashapps/BPVAgeChartpage.html> (2017).

About the author

Rom Duckworth is a dedicated emergency responder, author and educator with more than 30 years of experience working in career and volunteer fire departments, hospital healthcare systems, and private EMS. He is a career fire captain and paramedic EMS coordinator for the Ridgefield (Connecticut) Fire Department and the founder of the New England Center for Rescue and Emergency Medicine. Duckworth is recipient of the American Red Cross Hero Award, Sepsis Alliance Sepsis Hero Award, and the EMS 10 Innovators Award in addition to numerous awards and citations for excellence in education and dedication to service. Duckworth is a member of

numerous national education, advisory and editorial boards, as well as a contributing author to more than a dozen EMS, fire and rescue books, including the IFSTA Pumping Apparatus Driver/Operator textbook as well as over 100 published articles in fire and EMS journals, magazines and websites. Duckworth has a bachelor's degree in public safety administration from Charter Oak State College in Connecticut. Connect with Duckworth via RescueDigest.com or RomDuck.com or on [LinkedIn](https://www.linkedin.com/in/romduck).

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Posted by **irwin026** Jul 19, 2020

These aren't "evidence based guidelines", considering the mounting evidence against aggressive fluid resuscitation. Beyond that, 40-60ml/kg fluids seems like a ludicrous amount of fluid just off common sense.



1



Posted by **Wone** Jun 25, 2020

I can't understand in 2020 why sepsis is such a medical mystery still! I'm not a big fan of section 4-6 antimicrobial therapy. There is no proof that administering antibiotics, mainly just a broad spectrum does anything effective for sepsis, especially 10, 15, or even 30 minutes before arrival of ER! There is proof however, mixing antibiotics and giving the wrong antibiotics can cause issue's. I don't think ems should be giving antibiotics in the field, ems is just not ready for it.



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