MyEMCert

## KEY ADVANCES
## PRACTICE ADVANCE

# Emergency Department Evaluation and Management of Sepsis

**New August 2025**

**Why is this topic important?**
Sepsis is a common condition managed in the emergency department (ED) and is associated with significant morbidity and mortality. There has been a considerable amount of literature evaluating sepsis, with controversy concerning several components, including the definition and management.

**How will this change my clinical practice?**
Recent literature, including guidelines, emphasize early diagnosis and management of sepsis, including antibiotics; source control; intravenous (IV) fluid resuscitation; and vasopressors and adjunctive therapies (i.e., corticosteroids) in select patients.

**Synopsis Focus Points:**

1. **There is no single screening tool that can definitively exclude sepsis. Guidelines no longer recommend use of the quick Sepsis Related Organ Failure Assessment (qSOFA) as a single screening tool based on data suggesting higher specificity, but lower sensitivity compared with other scoring systems (e.g., Systemic Inflammatory Response Syndrome [SIRS] criteria). Clinicians must incorporate their history, examination, and testing for diagnosis of sepsis while evaluating the source of infection.**
2. **Lactate elevation is associated with worse prognosis but is not necessarily a marker of poor perfusion.**
3. **Antibiotics should be administered rapidly in those with sepsis, based on the suspected source of infection and patient factors (e.g., recent health care exposure, immunocompromise, etc.). Operative intervention is necessary for those with an amenable source (e.g., incision and drainage for abscess, cholecystectomy for cholecystitis, etc.). C-reactive protein and procalcitonin should not be used to determine need for antibiotics.**
4. **Resuscitation with IV fluids is recommended in those with sepsis-induced hypotension, targeting systemic perfusion and mean arterial pressure (MAP) of 65 mm Hg. The total amount should be based on volume status and patient factors (e.g., renal failure, heart failure, etc.). Either balanced crystalloids or normal saline may be used for resuscitation. Blood transfusion is recommended for those with hemoglobin < 7 g/dL. Those with acute myocardial ischemia may require a higher threshold (8 g/dL).**

5. **IV vasopressors should be administered in those with continued hypotension despite IV fluid resuscitation or those with evidence of fluid overload, starting with norepinephrine. Vasopressors may be administered peripherally with repeat evaluations of the IV site. Patients with continued hypotension should receive vasopressin or epinephrine.**
6. **Corticosteroids (i.e., hydrocortisone) should be considered if the patient takes steroids at baseline; concomitant adrenal suppression is present, or in those with persistent shock despite IV fluids and vasopressors.**
7. **Patients may develop respiratory distress or acute respiratory distress syndrome. In those with acute hypoxemic respiratory failure, high-flow nasal cannula (HFNC) can be considered, but if the patient is significantly altered or has respiratory or ventilatory failure, endotracheal intubation with mechanical ventilation using a low tidal volume ventilation strategy is recommended.**
8. **Monitoring resuscitation measures should include a combination of factors, including change in mental status, capillary refill time, and repeat lactate.**

**Background:**
Sepsis is a life-threatening syndrome associated with organ dysfunction resulting from a dysregulated host response to an infection.(1) Rapid identification of sepsis is essential. Several definitions and classifications of sepsis are available, which have evolved since the Sepsis 1 definition in 1991, followed by Sepsis 2 in 2001 and Sepsis 3 in 2016 (Table 1).(2-5) Guidelines no longer recommend use of qSOFA as a single screening tool based on data suggesting higher specificity but lower sensitivity compared with SIRS, National Early Warning Score, and Modified Early Warning Score scoring systems.(1,6) There is no single screening tool that can definitively exclude sepsis, and clinicians should incorporate history, examination, and testing (laboratory and imaging assessment) for sepsis diagnosis.

**Table 1. Sepsis definitions.**

| Category | CMS Core Measures | 2016 Society of Critical Care Medicine Definition (3) |
|---|---|---|
| **Sepsis** | ≥ 2 of the following with suspected infection:<br>• Temperature > 38 °C or < 36 °C<br>• HR > 90 beats/min<br>• RR > 20 breaths/min or $PaCO_2$ < 32 mm Hg<br>• WBC > 12,000/$mm^3$, < 4000/$mm^3$, or > 10% bands/immature forms | Suspected or documented infection and ≥ 2 on qSOFA:<br>• SBP ≤ 100 mm Hg<br>• Altered mental status<br>• RR ≥ 22 breaths/min |
| **Severe Sepsis** | Sepsis AND:<br>• Sepsis induced hypotension (BP < 90 mm Hg, MAP < 65 mm Hg, decrease in SBP > 40 mm Hg from baseline)<br>• Creatinine (Cr) > 2.0 mg/dL or urine output < 0.5 mL/kg/h for 2 h<br>• Bilirubin > 2.0 mg/dL<br>• Platelet count < 100,000/$mm^3$<br>• INR > 1.5 or PTT > 60 s<br>• Lactate > 2 mmol/L | Not a category |
| **Septic Shock** | Severe sepsis AND:<br>• Persistent hypotension after 30 mL/kg crystalloid fluid resuscitation<br>• Lactate ≥ 4 mmol/L | Sepsis and vasopressors needed to maintain MAP > 65 mm Hg and lactate > 2 mmol/L |

BP, blood pressure; HR, heart rate; INR, international normalized ratio; PTT, partial thromboplastin time; RR, respiratory rate; SBP, systolic blood pressure; WBC, White blood cell count.

**Assessment**:
The ED evaluation begins with the search for a source of infection (most commonly the lungs, gastrointestinal system, and urinary tract). Complete blood count, renal function, electrolytes, lactate, liver function studies, and urinalysis should be obtained. Two or more blood cultures should be obtained from separate sites in those with sepsis and septic shock, preferably prior to antibiotic administration, as long as blood cultures do not delay treatment. Lactate elevation is associated with increased morbidity and mortality, particularly levels ≥ 4 mmol/L, although lactate elevation is not specific to sepsis and is not necessarily a marker of poor systemic perfusion.(7,8) Other inflammatory markers have been evaluated for use in sepsis and septic shock, including procalcitonin, C-reactive protein, and others, but neither should be used as an independent marker to guide therapy.(9,10)

Imaging should be based on clinician assessment.(1) Those with pulmonary symptoms or suspected sepsis without another source should undergo chest radiography. Those with abdominal symptoms should undergo imaging dependent on the source (e.g., right upper quadrant ultrasound for right upper quadrant pain; computed tomography with IV contrast for other quadrants or regions).

**Management**:
*Antibiotics and Source Control*
Antibiotic therapy and source control are the most important interventions to reduce morbidity and mortality.(1) The 2021 Surviving Sepsis Campaign (SSC) guidelines recommend antibiotic administration within 1 hour from presentation in those with septic shock or those with a high likelihood of sepsis. This can be delayed in those with possible sepsis who are stable for up to 3 hours in order to evaluate for a source and to avoid inappropriate antibiotic administration.(1) Broad-spectrum antibiotics are recommended in critically ill patients, although the suspected/confirmed site of infection and patient factors (i.e., hemodynamic status, recent health care exposure, risk for multidrug-resistant bacteria) should be considered.(11-13) Operative intervention is necessary for those with an amenable source (e.g., abscess, necrotizing infection, and septic arthritis).

*IV Fluids*
Sepsis can result in hypovolemia due to reduced vascular tone and increased vascular permeability. In those with sepsis-induced hypotension, IV fluid resuscitation is a key component of management and current guidelines, targeting systemic perfusion and a MAP of 65 mm Hg. Previous guidelines recommended 30 mL/kg ideal body weight fluid bolus within the first 3 hours of management in those with sepsis-induced hypotension, but the 2021 SSC guidelines downgraded this to “suggest” based on low-quality evidence.(1) Patients with comorbidities, including cirrhosis, congestive heart failure (CHF), end-stage renal disease (ESRD), and pulmonary hypertension are at risk of over-resuscitation.(1,15-19) However, several studies have demonstrated no difference in conservative versus liberal fluid strategies in sepsis resuscitation, including those with CHF and ESRD.(15-19) Rather than using one fluid resuscitation volume for all patients with sepsis-induced hypotension, we recommend evaluation and monitoring of volume status during resuscitation, and fluid strategies must be considered in the context of each individual patient, as well as comorbidities.

As of 2024, there is controversy regarding IV fluid choice for resuscitation (i.e., normal saline or balanced crystalloids, such as lactated Ringer’s or Plasmalyte). The 2021 SSC guidelines suggest using balanced crystalloids instead of normal saline, based on studies demonstrating greater risk of acute kidney injury (AKI) with normal saline.(1,20,21) However, since the publication of these guidelines, several large studies have reported no difference between balanced crystalloids and normal saline in mortality and AKI.(21,22) Based on available evidence, clinicians may use either fluid in resuscitation.

Blood transfusion is not recommended unless the patient’s hemoglobin is < 7 g/dL, although clinicians should consider patient factors in the decision to administer blood products. Patients with acute myocardial ischemia may require a transfusion threshold of 8 g/dL.(1)

*Vasopressors*
Patients with hypotension during fluid resuscitation or those with hypotension and evidence of fluid overload should receive vasopressor support, targeting a MAP of 65 mm Hg based on current guidelines. Vasopressors may be administered through a peripheral line (antecubital fossa) for a short period (i.e., 6 hours) with repeat hourly checks for extravasation until central venous access is obtained.(1) The initial vasopressor of choice is norepinephrine, and early administration is associated with improved survival.(23) If norepinephrine doses $\geq$ 0.25 μg/kg/min are required to or unable to maintain a MAP of 65 mm Hg, SSC guidelines recommend the addition of vasopressin infusion, followed by epinephrine if necessary.(1) Bedside ultrasound can assist in assessing cardiac function, which can provide guidance on vasopressor choice. If cardiac function is poor, epinephrine or dobutamine infusion may be beneficial. If cardiac function is normal, vasopressin should be added.

*Adjunctive Therapy*
Several adjunctive therapies have been evaluated. The 2024 SSC focused update recommended stress dose corticosteroids for adult patients with septic shock.(1,24) This may be administrated as hydrocortisone 100 mg IV in the ED. We recommend considering hydrocortisone if the patient takes steroids at baseline, concomitant adrenal suppression is present, or in those with persistent shock despite IV fluids and vasopressors. In this setting, clinicians should also consider other conditions that could mimic sepsis. Fludrocortisone requires further study before routine use. Vitamin C and thiamine are not currently recommended as adjunctive therapies in sepsis.(25,26)

**Shock not responsive to vasopressors.**
- Acidosis
- Adrenal insufficiency/failure
- Anaphylaxis
- Hypocalcemia
- Hypothyroidism
- Occult/ongoing hemorrhage (gastrointestinal, retroperitoneal)
- Other cause of shock (pulmonary embolism, tamponade, hypovolemia)
- Toxicologic/overdose (beta blocker/calcium channel blocker, tricyclic antidepressant)

*Respiratory Support*
Patients with sepsis may develop respiratory failure due to the primary condition causing sepsis (i.e., pneumonia), sequelae of sepsis (i.e., fatigue and acute respiratory distress syndrome [ARDS]), a concurrent condition (i.e., heart failure), or as a complication of therapy (i.e., pulmonary edema due to over-resuscitation). This is most commonly acute hypoxemic respiratory failure (AHRF) from pneumonia or other extrapulmonary infection causing ARDS. The 2021 SSC guidelines recommend use of HFNC for treatment of AHRF over other means of noninvasive ventilation (NIV) (i.e., bilevel positive airway pressure, continuous positive airway pressure), based on a randomized clinical trial demonstrating improved survival with HFNC compared to NIV.(1,27) HFNC may also be beneficial in those with pneumonia who require respiratory support, as it allows for clearance of any secretions. However, if the patient is significantly altered or has respiratory or ventilatory failure, endotracheal intubation with mechanical ventilation using a low tidal volume ventilation strategy (6 mL/kg) and a plateau pressure with an upper limit of 30 cm $H_20$. If the patient's condition permits, adequate resuscitative measures should be instituted prior to induction and intubation to minimize the risk of peri-intubation hypotension or arrest.

**Monitoring:**
There are several means of monitoring volume status and response to therapy during resuscitation. The SSC 2021 guidelines recommend use of dynamic measures over static parameters or examination alone.(1) These dynamic measures include passive leg raise in combination with cardiac output measurement, variation in pulse pressure, fluid challenges against stroke volume, and

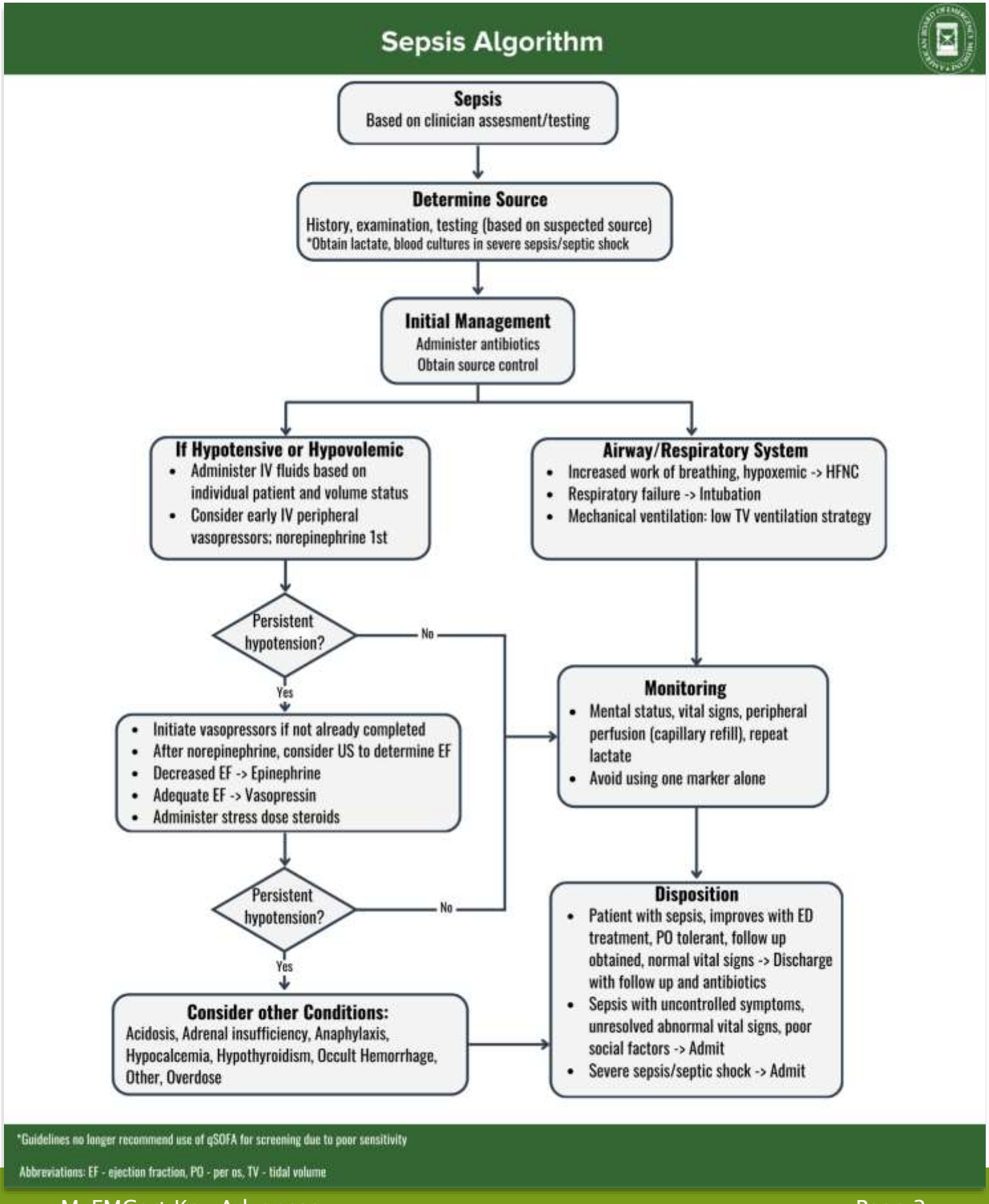
increase in stroke volume with changes in intrathoracic pressure. However, many of these dynamic assessments require dedicated equipment. Other means include inferior vena cava diameter variation on ultrasound, end-tidal $CO_2$, capillary refill, extremity temperature, and skin mottling.(1,27)

Although these measures can assist in determining fluid tolerance, we caution against using any one of these in isolation. Instead, clinicians should consider a combination of factors (i.e., mental status, extremity temperature, and capillary refill time).

Repeat lactate level should be obtained several hours after resuscitation has been initiated. A reduction in lactate levels with treatment may be associated with better prognosis.(1)

**Disposition**:
The vast majority of patients require presenting with sepsis will require admission, and those with septic shock require admission to a critical care setting. There is limited retrospective evidence identifying a select cohort of septic patients that could be considered for discharge. Specifically, the patients were younger, predominantly had urinary tract infections, and had lower measures of illness severity and organ failure.(28). Patients who improve with therapy in the ED, who are adequately resuscitated, have no other severe concurrent comorbidities (e.g., heart failure, uncontrolled diabetes, and ESRD), can tolerate oral intake and have symptoms controlled in the ED, will comply with oral antibiotics and return precautions, and are able to follow-up could potentially be discharge home on the rare occasion that each of these criteria are met.

**Figure 1. Sepsis Algorithm**



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**Resources for Additional Learning**:

EM Docs: Sepsis Updates Relevant to the Emergency Physician
Emergency Medicine Cases: Ep 122 - Sepsis and Septic Shock
EM Ottawa: Surviving Sepsis - The 2021 Review
Taming the SRU: Air Care Series - Sepsis Update
EM Docs: Sepsis Care - What's New?

**Notes:** Practice Advance synopses should be built from a strong body of evidence that likely includes a systematic review. The synopsis will include a recommendation that should be similar in wording to GRADE (Grading of Recommendations Assessment, Development and Evaluation) recommendations. These should not be controversial recommendations and essentially all emergency physicians should adopt them. The impact or "effect size" should be substantial and no significant harm should be associated with this gain.

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