Sepsis Management - Adult

Disclaimer: This algorithm has been developed for MD Anderson using a multidisciplinary approach considering circumstances particular to MD Anderson’s specific patient population, services and structure, and clinical information. This is not intended to replace the independent medical or professional judgment of physicians or other health care providers in the context of individual clinical circumstances to determine a patient’s care. This algorithm should not be used to treat pregnant women.

**PRESENTATION**

Patient with suspected infection (see Appendix A)

**EVALUATION**

Patient exhibits two or more of the following qSOFA criteria:
- Altered mental status
- Respiratory rate ≥ 22 bpm
- Systolic blood pressure ≤ 100 mmHg

Initiate and manage per the appropriate sepsis order set:
- Assess for presence of infection
- Assess for organ dysfunction (see Appendix B)
- Cultures (blood x 2, sputum, urine, and other sources)
- CBC with differential, lactic acid, point of care lactic acid (if available), ABG, sodium, potassium, chloride, CO₂, BUN, creatinine, glucose, magnesium, phosphorus, calcium, PT, PTT, D-dimer, fibrinogen, total bilirubin, direct bilirubin, AST, ALT, alkaline phosphatase, LDH, albumin, and lipase

**TREATMENT**

- Verify adequate IV access
- Broad spectrum antibiotics – first dose STAT
  - Do not delay antibiotic therapy if cultures cannot be obtained within 30 minutes
- Give fluid challenge of 30 mL/kg (maximum 2 liters) crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) over 30-60 minutes; reduce volume of fluid challenge if patient has history of LVEF less than 40%
- Do not use hetastarch fluids
- Check MAP; may repeat fluid bolus if indicated
- Maintain SpO₂ greater than 94% during fluid challenge
- Normalize lactic acid if elevated (decrease of 20% every 2 hours)
- Obtain transthoracic ECHO

**Sepsis**
- Reassess patient
- Monitor and maintain respiratory/hemodynamic status
- Notify MERIT
- Continue broad spectrum antibiotics
- IV fluids
- Review stat labs
- Request appropriate team consults

**Septic Shock**
- Transfer to ICU for further management (consider MERIT if bed is not available)
- Consider placement of arterial line and central venous access
- Monitor and maintain respiratory/hemodynamic status
- May repeat fluid bolus if indicated
- Consider norepinephrine for persistent hypotension (if used on inpatient floor, notify MERIT and prepare transfer to ICU)

**MAP**

MAP < 65 mmHg and lactate > 2 mmol/L despite adequate fluid resuscitation?

Yes

No

**See Page 2 for ICU/EC Management**

qSOFA = quick Sequential Organ Failure Assessment
LVEF = left ventricular ejection fraction
MAP = mean arterial pressure = 1/3 (SBP - DBP) + DBP

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Septic Shock in the EC/ICU (inpatient unit until ICU bed available)

- Fluid bolus 30 mL/kg crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) over 30 minutes
- Consider albumin 5% if pulmonary edema or liver failure
- Norepinephrine (1st line) 5 mcg/minute IV; titrate by 2.5 mcg/minute every 5 minutes
- Epinephrine (2nd line)
- Vasopressin as salvage agent or to reduce norepinephrine dose
- Phenylephrine only if norepinephrine-induced tachyarrhythmia and high cardiac output shock
- Do not use dopamine unless patient is bradycardic (heart rate < 60 bpm)

If refractory hypotension, add hydrocortisone 50 mg IV every 6 hours

Resuscitation
- MAP ≥ 65 mmHg
- Urine output ≥ 0.5 mL/kg/hour (consider higher target if oliguric)
- Normalization of lactic acid if elevated

Sepsis Management Goals
- Tidal volume for mechanically ventilated patients with ARDS is 6 mL/kg, and the initial upper limit goal for plateau pressures is ≤ 30 cm H2O
- Hemoglobin after patient stabilization ≥ 9 grams/dL
- Glucose after initial patient stabilization < 180 mg/dL (tight glucose control not recommended)
- Stress ulcer prophylaxis
- Deep vein thrombosis prophylaxis

ARDS = acute respiratory distress syndrome

1 Consider higher target if patient has history of hypertension, diabetes mellitus, vasculopathy, increased abdominal pressure, ensuing renal failure, or pulmonary hypertension

2 If inpatient, may start norepinephrine as listed above while awaiting transfer to ICU (notify MERIT and prepare for immediate transfer to ICU)

3 Refractory hypotension is hypotension despite adequate fluid resuscitation and vasopressors

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APPENDIX A: Suspicion of Infection

- Fever
- Recent surgical procedure
- Immunocompromised
  - Chemotherapy
  - Steroids/immunosuppressed
  - Loss of skin integrity
  - HIV/suspected HIV
- Skin wound
- Invasive device
  - Central line
  - Foley catheter
- Infiltrate on chest x-ray
- Cough with sputum production
- Diarrhea with or without abdominal pain
- History of diabetes mellitus
- Cirrhosis
- Unilateral sinusitis (and/or facial swelling)

APPENDIX B: SOFA Score to Assess for Organ Dysfunction

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<tr>
<th>Variables</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>Respiratory</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>PaO₂/FiO₂ (mmHg)</td>
<td>≥ 400</td>
<td>300 - 399</td>
<td>200 - 299</td>
<td>100 - 199</td>
<td>&lt; 100</td>
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<tr>
<td>Coagulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platelets (K/microliter)</td>
<td>≥ 150</td>
<td>100 - 149</td>
<td>50 - 99</td>
<td>20 - 49</td>
<td>&lt; 20</td>
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<tr>
<td>Liver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilirubin (mg/dL)</td>
<td>&lt; 1.2</td>
<td>1.2 - 1.9</td>
<td>2 - 5.9</td>
<td>6 - 11.9</td>
<td>&gt; 12</td>
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<td>Cardiovascular</td>
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<tr>
<td>Hypotension</td>
<td>MAP ≥ 70 mmHg</td>
<td>MAP &lt; 70 mmHg</td>
<td>Dopamine &lt; 5 mcg/kg/minute or dobutamine (any dose)</td>
<td>Dopamine 5.1 - 15 mcg/kg/minute, or epinephrine ≤ 0.1 mcg/kg/minute, or norepinephrine ≤ 0.1 mcg/kg/minute</td>
<td>Dopamine &gt; 15 mcg/kg/minute, or epinephrine &gt; 0.1 mcg/kg/minute, or norepinephrine &gt; 0.1 mcg/kg/minute</td>
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<tr>
<td>Central nervous system</td>
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<td></td>
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<tr>
<td>Glasgow Coma Scale</td>
<td>15</td>
<td>13 to 14</td>
<td>10 to 12</td>
<td>6 to 9</td>
<td>Less than 6</td>
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<tr>
<td>Renal</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine (mg/dL) or Urine Output (mL/day)</td>
<td>&lt; 1.2</td>
<td>1.2 - 1.9</td>
<td>2 - 3.4</td>
<td>3.5 - 4.9 or &lt; 500 mL/day</td>
<td>≥ 5.0 or &lt; 200 mL/day</td>
</tr>
</tbody>
</table>

PaO₂ = partial pressure of oxygen
FiO₂ = fraction of inspired oxygen

1 Increase in SOFA score by 2 or more points from baseline is indicative of organ dysfunction
SUGGESTED READINGS


DEVELOPMENT CREDITS

This practice consensus algorithm is based on majority expert opinion of the Sepsis work group at the University of Texas MD Anderson Cancer Center for the patient population. These experts included:

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