Sepsis Management - Adult

This practice algorithm has been specifically developed for MD Anderson using a multidisciplinary approach and taking into consideration circumstances particular to MD Anderson, including the following: MD Anderson’s specific patient population; MD Anderson’s services and structure; and MD Anderson’s clinical information. Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers. This algorithm should not be used to treat pregnant women.

Patient exhibits two or more of the following qSOFA criteria:
- Altered mental status
- Respiratory rate greater than or equal to 22 bpm
- Systolic blood pressure less than or equal to 100 mmHg

Initiate and manage per the Sepsis order set:
- Assess for presence of infection
- Assess for organ dysfunction (See Appendix B)
- Cultures (blood x2, sputum, urine, and other sources)
- Broad spectrum antibiotics – First dose STAT
  Do not delay antibiotic therapy if cultures cannot be obtained within 30 minutes
- CBC, lactic acid, point of care lactic acid (if available), ABG, sodium, potassium, chloride, CO2, BUN, creatinine, magnesium, phosphorus, calcium, PT, PTT, D-dimer, fibrinogen, total bilirubin, direct bilirubin, AST, ALT, alkaline phosphatase, LDH, albumin, and lipase
- Verify adequate IV access
- 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

MAP less than 65 mmHg and lactate greater than or equal to 2 mmol/L despite adequate fluid resuscitation?

Yes
- 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)

No
- Reassess patient
- Monitor and maintain respiratory/ hemodynamic status
- Call MERIT
- Continue broad spectrum antibiotics
- IV fluids
- Review stat labs
- Request appropriate team consults

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

See Page 2 for ICU/EC Management
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 colloid if pulmonary edema or liver failure

- Norepinephrine\(^2\) (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

Resuscitation
- MAP greater than or equal to 65 mmHg\(^1\) (DBP greater than 55 mmHg)
- Urine Output greater than or equal to 0.5 mL/kg/hour (consider higher target if oliguric)
- Normalization of lactic acid if elevated

Sepsis Management Goals
- Goal tidal volume for mechanically ventilated patients with ALI/ARDS is 6 mL/kg, and the initial upper limit goal for plateau pressures is less than or equal to 30 cm H\(_2\)O
- Goal hemoglobin after patient stabilization is greater than or equal to 9 grams/dL
- Goal glucose after initial patient stabilization is less than 180 mg/dL (tight glucose control not recommended)
- Stress ulcer prophylaxis
- Deep vein thrombosis prophylaxis

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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.

\(^{\text{ALI = acute lung injury}}\)
\(^{\text{ARDS = acute respiratory distress syndrome}}\)
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

APPENDIX B: SOFA Score to Assess for Organ Dysfunction

<table>
<thead>
<tr>
<th>Variables</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>PaO₂/FiO₂ (mmHg)</td>
<td>Greater than 400</td>
<td>301 to 400</td>
<td>201 to 300</td>
<td>101 to 200</td>
</tr>
<tr>
<td>Coagulation</td>
<td>Platelets (K/microliter)</td>
<td>Greater than 150</td>
<td>101 to 150</td>
<td>51 to 100</td>
<td>21 to 50</td>
</tr>
<tr>
<td>Liver</td>
<td>Bilirubin (mg/dL)</td>
<td>Less than 1.2</td>
<td>1.2 to 1.9</td>
<td>2.0 to 5.9</td>
<td>6.0 to 11.9</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Hypotension</td>
<td>No hypotension</td>
<td>MAP less than 70 mmHg</td>
<td>Dopamine less than or equal to 5 mcg/kg/minute or dobutamine (any dose)</td>
<td>Dopamine greater than 15 mcg/kg/minute, or epinephrine or norepinephrine less than or equal to 0.1 mcg/kg/minute</td>
</tr>
<tr>
<td>Renal</td>
<td>Creatinine (mg/dL) or Urine Output (mL/day)</td>
<td>Less than 1.2</td>
<td>1.2 to 1.9</td>
<td>2 to 3.4</td>
<td>3.5 to 4.9 or less than 500 mL/day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Greater than 5.0 or less than 200 mL/day</td>
</tr>
</tbody>
</table>

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

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

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SUGGESTED READINGS


This practice consensus algorithm is based on majority expert opinion of the Sepsis Work Group at the University of Texas MD Anderson Cancer Center. It was developed using a multidisciplinary approach that included input from the following:

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