



# Department of Emergency Medicine Guidelines for Management of Sepsis and Septic Shock

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## Basic Principles of Sepsis

- Treatment in ED should not delay transfer of patients with septic shock to ICU if resources available
- All patients with severe sepsis or septic shock require aggressive fluid resuscitation and early administration of broad spectrum effective antibiotics.
  - Antibiotics should be targeted to the suspected source
  - Infected hardware and/or catheters should be removed as soon as possible
  - Antibiotics should be given as soon as septic shock is noted, mortality increases with antibiotic delay
- Fluid Resuscitation in septic shock should be targeted to an evaluation of cardiac output and preload
  - Evaluation of preload can be done via ultrasound and/or central line catheter. Bedside echocardiography can guide the evaluation of cardiac contractility.
- Whole Blood lactate is an important marker for cryptic sepsis and elevations in lactate greater than 4.0 mmol/L should be treated as septic shock until proven otherwise.
- Give vasopressors to those patients that remain hypotensive after adequate volume resuscitation.

Definitions			
Systemic Inflammatory Response Syndrome	Sepsis	Sepsis Induced Hypoperfusion = Lactate >4 and or Hypotension	
		Severe Sepsis	Septic Shock
<p><b>Any two of the Following:</b></p> <ul style="list-style-type: none"> <li>➤ Temp &lt; 36° C or &gt; 38° C</li> <li>➤ Pulse &gt; 90 / min</li> <li>➤ Respiratory Rate &gt; 20/min or PaCO2 &lt; 32 mmHg</li> <li>➤ WBC &lt; 4000 / mm3 , &gt; 12,000 / mm3, or &gt; 10% Bands</li> </ul>	<p><b>SIRS plus evidence of Infection</b></p>	<p><b>Sepsis plus Signs of End Organ Dysfunction</b>  <b>Examples:</b>  <b>Cardiovascular</b></p> <ul style="list-style-type: none"> <li>➤ Systolic Blood Pressure &lt;65 or 40 mmHg below prior baseline before fluid challenge</li> <li>➤ Elevated Troponin</li> <li>➤ Exam findings of heart failure</li> </ul> <p><b>Respiratory</b></p> <ul style="list-style-type: none"> <li>➤ Bilateral pulmonary infiltrate with room air SaO2 &lt;90% or paO2:FiO2 &lt;300</li> </ul> <p><b>Renal</b></p> <ul style="list-style-type: none"> <li>➤ Urine Output less than 0.5c/kg &gt; 2 hours</li> <li>➤ New Creatinine &gt;2.0</li> </ul> <p><b>Metabolic/Hepatic</b></p> <ul style="list-style-type: none"> <li>➤ INR &gt; 1.5 without anticoagulation</li> <li>➤ Platelets &lt;100k</li> <li>➤ Total Bilirubin &gt;2.0</li> <li>➤ Lactate &gt;2</li> </ul> <p><b>Note: this list is not all inclusive</b></p> <p><b>Historic Mortality ~20%</b></p>	<p><b>Sepsis plus Hypotension: Mean Arterial Pressure &lt;65mmHg after fluid resuscitation with 2L or 20cc/Kg isotonic saline</b></p> <p><b>Historic Mortality ~50%</b></p>

References:

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These guidelines were developed by the Johns Hopkins Department of Emergency Medicine. They are intended to guide the diagnosis and treatment of patients presenting to the Johns Hopkins Hospital with signs or symptoms of sepsis or septic shock. Recommendations are made based on stratification to sepsis severity. These guidelines will need to be adapted to meet the individual needs of a specific patient and should not replace clinical judgment.

# Management Guidelines for Severe Sepsis and Septic Shock

<p><b>Initial Care</b></p> <p><b>Should be completed within 30 minutes of identification</b></p>	<p><b>History and Physical exam guided evaluation for source of infection including indwelling hardware/catheter</b></p>	
	<p><b>Laboratory:</b>            CBC, Whole Blood Lactate            CMP, Blood Cx x 2            Urinalysis and Cx            Consider Sputum Cx and LP            Beta HCG, PT and PTT</p>	<p><b>Radiology:</b>            Chest X-ray            Consider CT Chest if patient has dyspnea/O2 requirement – Increased sensitivity for Pneumonia/ARDS compared to CXR            Consider CT Abdomen or RUQ US for abdominal pain – Cholecystitis common cause of sepsis in elderly</p>
<p><b>Oxygenation and Ventilation</b></p>	<p><b>20 cc/kg isotonic saline bolus over 20 minutes</b>  <b>Empiric broad spectrum antibiotics (see below for choices)</b></p> <p><b>Maintain SaO2 greater than 90% with supplemental O2. If less than 90% on NRB strongly consider intubation:</b></p> <ul style="list-style-type: none"> <li>Expect hypotension with intubation</li> <li>Maintain on low tidal volume ventilation (6-8cc/kg ideal body weight)</li> <li>Provide adequate sedation</li> </ul>	
<p><b>Resuscitation Strategy</b></p>	<p><b>In patients with MAP &gt;65 after initial fluid challenge begin with non invasive strategy</b>  <b>If unable to obtain large bore IV access or IVF bolus unable to be delivered in 30 minutes then choose invasive strategy regardless of blood pressure</b>  <b>If MAP less than 65mmHg after initial fluid bolus choose invasive strategy</b></p> <p><b>Invasive:</b>  <b>1 - Place sterile Central line (US Guided Internal Jugular or Subclavian Preferred).</b>  <b>Administer IVF until:</b></p> <ul style="list-style-type: none"> <li>CVP greater than 10cm/H2O</li> <li>IVC collapse &lt;30% on inspiration</li> </ul> <p><b>2 - If MAP still less than 65mmHg then start vasopressor (first agent - norepinephrine dose 0.5-20 mcg/min, second agent - vasopressin dose 0.04u/min, dopamine a poor choice), place arterial line</b>  <b>3 - Send repeat lactate +/- ScvO2 when above goals met or at 2 hours</b>  <b>4 - If lactate has not cleared by 10% or ScvO2 &lt;70% (if sent)</b></p> <ul style="list-style-type: none"> <li><b>Choose One:</b> <ul style="list-style-type: none"> <li>If Hb less than 7 transfuse (consider 10 in elderly or pts with known CAD) <b>or</b></li> <li>Give additional bolus of 1000cc IVF <b>or</b></li> <li>Increase inotropy with dobutamine start 1mcg/kg/min max 40 mcg/kg/min) – consider bedside ultrasound to guide assessment, replete calcium if low <b>or</b></li> <li>Intubate to reduce metabolic demand</li> </ul> </li> </ul> <p><b>Send lactate q2h and repeat above until lactate cleared by 10% +/- ScvO2 &gt;70</b></p> <p><b>Continue to monitor lactate every 2-4h</b>  <b>Maintain MAP &gt;65, UOP &gt;0.5cc/kg and monitor mental status.</b>            If lactate trends up restart algorithm  <b>Disposition: ICU</b></p>	
<p><b>Antibiotic Recommendations:</b>  <b>General Broad Spectrum Coverage: Cefepime 2g IV q12h and Vancomycin 20mg/Kg IV x 1 then 1g q12 (doses and frequency modified in patients with CrCl &lt;30)</b>            For suspected/confirmed Meningitis <b>change Cefepime to Ceftriaxone 2g, consider Acyclovir and/or Ampicillin, consider Dexamethasone 0.15m/kg q6h administered 10 minutes before antibiotics</b>            For suspected/confirmed Respiratory Source <b>add Azithromycin 500mg IV to cover legionella consider Oseltamivir 75mg in influenza season</b>            For suspected/confirmed intra-abdominal infection <b>Consider Zosyn 3.375 IV as initial agent, or add Metronidazole 500mg IV to cover anaerobic bacteria</b>  <b>Antibiotics should be given as soon as sepsis suspected and as quickly as possible.</b></p>	<p><b>Non Invasive:</b>  <b>1 - Administer IVF guided by non invasive measures of fluid responsiveness, continue administration until:</b></p> <ul style="list-style-type: none"> <li>IVC collapse &lt;30% by bedside US</li> <li>No blood pressure response to additional 500cc-1000cc fluid bolus</li> </ul> <p><b>2 – If MAP drops below 65mmHg convert to invasive strategy</b>  <b>3 – Send repeat lactate at 2 hours</b>  <b>4 - If lactate has not cleared by 10% convert to invasive strategy</b></p> <p><b>Continue to monitor lactate every 2-4h</b>  <b>Maintain UOP &gt;0.5cc/kg and monitor mental status.</b>            If lactate trends up restart algorithm  <b>Disposition: Consider ICU Likely IMC admission</b></p> <p><b>Adjunct Therapy:</b>  <b>Hydrocortisone 100mg x1 then 50mg Iv q6h</b> should be considered when patient is persistently hypotensive and a second vasopressor is considered</p> <p><b>Monitor blood glucose q2h</b> and maintain with IV insulin to a target of 180mg/dL</p> <p><b>Evaluate for ALI/ARDS</b> and follow ARDSnet Protocol</p>	