Critical Sepsis - Emergency Department

**Inclusion Criteria:**
Any patient > 30 days old with clinical concern for critical sepsis/septic shock OR Sepsis RED AND ED Attending/Fellow assessment with concern for critical sepsis/septic shock

**Exclusion Criteria:**
Burn patient

- **Primary team huddle to evaluate for sepsis**
  - (RN/Team Leader, LIP, Surgeon when appropriate)
  - Notify Attending
  - Deviation from pathway requires detailed documentation

**activate critical sepsis pathway/order set**

- Provide supplemental oxygen as needed (oral/nasal ETCO2 for perfusion deficits)
- Reassess vital signs every 5 minutes
- Order appropriate antibiotics

**Initial fluid resuscitation**
- Administer 1st bolus of 20mL/kg normal saline RAPIDLY via push-pull or pressure bag within 5-15 minutes
  - Consider 5-10mL/kg boluses if concern for fluid intolerance (cardiac/renal dysfunction)
  - Consider hydrocortisone stress dosing in pt. with adrenal insufficiency or petechia/purpura

**Ongoing resuscitation**
- Administer 2nd and 3rd bolus of 20mL/kg normal saline RAPIDLY via push-pull or pressure bag, until perfusion improves or rales or hepatomegaly develop
- Order vasoactive/inotropic drips
- Consider blood products

**Respiratory Support**
- Consider ET intubation for hypoxic respiratory failure or persistent shock despite adequate resuscitation and inotropic support (obtain CXR for ETT verification) using shock safe medications NO ETOMIDATE
- Consider BIPAP as an alternative

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**Signs & Symptoms of Critical Sepsis**
- Hypotension (MAP ≤ 5th percentile for age)
- Tachycardia
- Poor perfusion
- Reduced urine output
- Tachypnea/new oxygen requirement
- Mental status changes

**Time Zero = Patient flags sepsis red**

**Access**
- Place 2 large bore PIVs if no central line
- Consider PIV in patients with central line
- If 2 unsuccessful IV attempts: consider IO

**Labs**
- Blood/urine cultures
- ISAT VBG
- POCT Glucose
- CBC + diff
- UA
- BMP
- Procalcitonin
- Consider Type & Screen
- Lactate-order STAT
- Magnesium
- Phosphorus
- Consider PT/PTT/d-dimer
- Consider lumbar puncture <1 year old

**Administer antimicrobials**
- Appropriate antibiotics for specific populations:
  - HemOnc Suspected Infection
  - Central Line Infections
  - Previously healthy patients with/without intra-abdominal source
  - Medically complex patients with/without intra-abdominal source
  - Consider history of resistant organisms
  - Surgical consult for suspected infection requiring source control (e.g. skin/soft tissue, intra-abdominal)

**Resuscitation**
- Consider ET intubation for hypoxic respiratory failure or persistent shock despite adequate resuscitation and inotropic support (obtain CXR for ETT verification) using shock safe medications NO ETOMIDATE
- Consider BIPAP as an alternative

**Bedside Huddle with ED, ICU, +/- Inpatient Admitting LIP**
- Document outcome of huddle
- RN-Septis reassessment

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**Emergency Department**

**Patient flags sepsis red**
- Requirement
- Reduced urine output
- Poor perfusion
- Tachycardia
- Percentile for age
- Hypotension

**Shock time**
- Time Zero = Patient flags sepsis red
- 5 min
- 15 min
- 30 min
- 60 min

**Critical sepsis pathway/order set**

- Provide supplemental oxygen as needed (oral/nasal ETCO2 for perfusion deficits)
- Reassess vital signs every 5 minutes
- Order appropriate antibiotics

**Initial fluid resuscitation**
- Administer 1st bolus of 20mL/kg normal saline RAPIDLY via push-pull or pressure bag within 5-15 minutes
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**Respiratory Support**
- Consider ET intubation for hypoxic respiratory failure or persistent shock despite adequate resuscitation and inotropic support (obtain CXR for ETT verification) using shock safe medications NO ETOMIDATE
- Consider BIPAP as an alternative

**Inpatient Admit Criteria**
- (ACNW = use clinical judgement for transfer to ACL)
  - Normotensive after ≤ 40mL/kg NS boluses
  - Well appearing with reassuring labs
  - First dose of antibiotics administered
  - Improving tachycardia

**ICU Admit/Transfer to AC**
- Little Rock Criteria: Any of the following and/or other concerning clinical findings:
  - Ventilatory support
  - Vasoactive/inotropic support
  - Hypotension despite fluid resuscitation volume
  - Lactate ≥ 4mmol/L
  - pH ≤ 7.3
  - Base excess greater than -6mmol
  - ILT appearing
  - Cold shock
  - Tachycardia not resolved after intervention
  - CR ≥ 3 sec after ≥ 60mL/kg NS boluses
  - ↓MAP according to the following: < 1.5(age in years) + 40; 14 years old and greater MAP < 60mmHg
  - Need for critical care management

**IMU Admit Criteria**
- (ACNW = use clinical judgement for transfer to ACL)
  - Need for monitored bed
  - Normotensive after 40-60mL/kg NS boluses
  - Increased assessment needs
  - Increased vital sign needs
  - Increasing HFNC support

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E. Rader 4-1659
Approved by P&T committee 9/15/20
Approved by PCDC 10/6/20
**New Onset Critical Sepsis – General Care Inpatient Phase**

- **Primary team huddle to evaluate for sepsis (RN/Team Leader, LIP, Surgeon when appropriate)**
- **Notify Attending**
- **Call MET**
- **Consider transfer to IMU/ICU**

**Activate Critical Sepsis Pathway**

- **Provide supplemental oxygen as needed (oral/nasal ET CO2 for perfusion deficits)**
- **Reassess vital signs every 5 minutes**
- **Order appropriate antibiotics**

**Indication of shock**

- **Time Zero**
  - Patient flags sepsis red

**Shock Time Goals**

- **5 minutes**
- **15 minutes**
- **30 minutes**
- **60 minutes**

**Rapid Response/MET**

- **Does patient meet CRITICAL SEPSIS criteria?**

**Off Pathway**

- **Resume routine care**

**Assess/Initial Fluid Resuscitation**

- **Consider IV in patients with central line if additional access is needed**
- **Admire 3L bolus of 20mL/kg normal saline rapidly over 20 minutes OR LESS**
- **Consider 5-10mL/kg boluses if concern for fluid intolerance (cardiac/renal dysfunction)**

**Microbiological Workup**

- **POCT: Electrolytes, VBG, lactate, iCa, Glucose**
- **Procalcitonin**
- **Blood/urine/CSF cultures**
- **CBC + diff**
- **CRP**
- **Magnesium**
- **Phosphorus**
- **Consider Type & Screen**
- **Consider lumbar puncture**

**Administer Antimicrobials**

- **Appropriate antibiotics for specific populations:**
  - HemOne Suspected Infection
  - Central Line Infections
  - Previously healthy patients with/without intra-abdominal source
  - Medically complex patients with/without intra-abdominal source
  - Consider history of resistant organisms
  - Consider broadening antibiotic coverage
  - Consider PICU consult or calling a code

**Re-Evaluation**

- **Well-appearing patients who do not meet IMU/ICU transfer criteria may stay on Inpatient unit and are placed on WATCHER list for reassessment**

**ICU Transfer Criteria**

- **Recurrent Hypotension despite >40mL/kg fluid resuscitation in the last 2 hours**
  - Fluid resuscitation includes either crystalloid or colloid
  - Hypotension (≤5th percentile for age)
  - How to calculate MAP: <1.5 (age in years) + 40 or if age > 13 years MAP < 60
- **Need for continuous cardiorespiratory monitoring**
- **Need for 3L normal saline fluid bolus**
- **IMU Admission, Transfer, and Discharge Criteria**

**Intermediate Care (IMU) Transfer Criteria**

- **ACNW – use clinical judgement for transfer to ACLR**
  - Resolved hypotension requiring intervention (≤ 5th percentile for age)
  - How to calculate MAP: <1.5 (age in years) + 40 or if age > 13 years MAP < 60
  - Need for continuous cardiorespiratory monitoring
  - Need for 3L normal saline fluid bolus
  - **IMU Admission, Transfer, and Discharge Criteria**

**Ongoing Resuscitation**

- **Consider administration of 2L and 3L boluses of 20mL/kg normal saline rapidly over 20 minutes OR LESS as clinically indicated**
- **Order vasoactive/inotropic drips as indicated**
- **Consider blood products as indicated**
- **Consider broadening antibiotic coverage**
- **Consider PICU consult or calling a code**

**Transfer to ICU**

- **ACNW – use clinical judgement for transfer to ACLR**
  - Initiate vasoactive/inotropic drips for fluid refractory shock
  - Epinephrine for cold shock
  - Norepinephrine for warm shock
  - Titrate drips to resuscitation goals

**Call code blue for imminent cardiac or pulmonary failure or neurologic emergency**
## MAPs by Age

<table>
<thead>
<tr>
<th>Age (year)</th>
<th>MAP 5th %tile</th>
<th>MAP 50th %tile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40</td>
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<td>18</td>
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<td>82</td>
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</table>
### Medication Dosing for Critical Sepsis

Dosing is for normal renal function

<table>
<thead>
<tr>
<th>Antipyretics – Choose one</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Acetaminophen 15 mg/kg, PO, q6 PRN fever</td>
<td></td>
</tr>
<tr>
<td>□ Acetaminophen 20 mg/kg, Rectal, q6 PRN fever</td>
<td></td>
</tr>
<tr>
<td>□ Acetaminophen 15 mg/kg, IV, q6 PRN fever</td>
<td></td>
</tr>
<tr>
<td>□ Ibuprofen 10 mg/kg, PO, q6 PRN fever</td>
<td></td>
</tr>
</tbody>
</table>

**Antibiotics:**

**Previously healthy patients**

<table>
<thead>
<tr>
<th>antibiotic</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Ceftriaxone (bacteremia)</td>
<td>50 mg/kg, IV, q24h</td>
</tr>
<tr>
<td>□ Ceftriaxone (meningitis)</td>
<td>50 mg/kg, IV q12h</td>
</tr>
<tr>
<td>□ Ceftriaxone (pneumonia)</td>
<td>75 mg/kg, IV, q24h</td>
</tr>
</tbody>
</table>

+/-

| □ Vancomycin – only if suspect MRSA (what dose has patient been on that gave therapeutic levels?) | 15 mg/kg, IV, q6h |

+/-

| □ Metronidazole – only if suspect intra-abdominal infection | 10 mg/kg, IV, q8h |

**Antibiotics:**

**Medically Complex Patients**

<table>
<thead>
<tr>
<th>antibiotic</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Cefepime</td>
<td>50 mg/kg, IV, q6h</td>
</tr>
</tbody>
</table>

+/-

| □ Vancomycin – only if suspect MRSA (what dose has patient been on that gave therapeutic levels?) | 15 mg/kg, IV, q6h |

+/-

| □ Metronidazole – only if suspect intra-abdominal infection | 10 mg/kg, IV, q8h |

OR

| □ Meropenem – alternative if cefepime allergy or previous cefepime resistant infection (ID/ASP approval required) Must re-evaluate treatment plan at 72 hrs | 40 mg/kg, IV, q8h |

**Hypocalcemia**

<table>
<thead>
<tr>
<th>medication</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Calcium gluconate in dextrose 5%-IV</td>
<td>50 mg/kg, IV, once</td>
</tr>
</tbody>
</table>

**Adrenal Insufficiency**

<table>
<thead>
<tr>
<th>medication</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Hydrocortisone</td>
<td>2 mg/kg, IV, once</td>
</tr>
</tbody>
</table>

**Hypoglycemia**

<table>
<thead>
<tr>
<th>medication</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ D10 Bolus</td>
<td>5 ml/kg, IV, once</td>
</tr>
<tr>
<td>□ D25 Bolus</td>
<td>2 ml/kg, IV, once</td>
</tr>
<tr>
<td>□ D50 Bolus</td>
<td>1 ml/kg, IV, once</td>
</tr>
</tbody>
</table>

**Intubation**

<table>
<thead>
<tr>
<th>medication</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Atropine</td>
<td>0.02 mg/kg (max 0.5 mg)</td>
</tr>
<tr>
<td>□ Ketamine</td>
<td>2 mg/kg (max 100 mg)</td>
</tr>
<tr>
<td>□ Rocuronium</td>
<td>1.2 mg/kg (max 100 mg)</td>
</tr>
<tr>
<td>□ Sugammadex (for NMB reversal)</td>
<td>16 mg/kg</td>
</tr>
</tbody>
</table>

**Vasoactive**

<table>
<thead>
<tr>
<th>medication</th>
<th>dose and route</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Epinephrine - titrate in small increments based on perfusion (drug of choice for inotropy in pediatric shock)</td>
<td>0.05-2 mcg/kg/min</td>
</tr>
<tr>
<td>□ Norepinephrine - titrate in small increments to achieve normal MAP</td>
<td>0.05-2 mcg/kg/min</td>
</tr>
<tr>
<td>□ Milrinone - no bolus; no titration</td>
<td>0.3-0.5 mcg/kg/min</td>
</tr>
</tbody>
</table>
Metrics

1. Time to first normal saline bolus from positive sepsis red screen
2. Time to first antibiotics from positive sepsis red screen
3. Blood culture collection time and result
4. Huddle completed for patients that screen sepsis red
5. Critical sepsis order set usage in ED and Inpatient areas
6. Number of critical sepsis/septic shock diagnoses added to problem list
Contributing Members

Lawrence Quang, MD – Emergency Medicine
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Steve Shirm, MD – Emergency Medicine
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Christopher Edwards, MD – Hospital Medicine
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Heather Kreulen, RN – Inpatient Nursing Director
Eimear Melton, RN – Emergency Department
Jill Jacobs, RN – Emergency Department Patient Care Manager
Jessica Crump, RN – Intermediate Care Unit
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Valerie Hamric, RN – Intermediate Care Unit Patient Care Manager
Holly Maples, PharmD - Antimicrobial Stewardship Director
Emily Rader, RN – Clinical Pathways Specialist
References


2. B. Ku, MD; F. Balamuth, MD; M.K. Funari, RN; J. Lavelle, MD; C. Jacobstein, MD; D. Davis, MD; J. Fitzgerald, MD J. Gerber, MD; T. Metjian, Pharm D; S. Fesnak, MD; L. Hutchins, CRNP; D. Potts, RN 2018 July. ED Pathway for Evaluation/Treatment of Infants > 28 Days of Age and Children with Suspected Severe Sepsis. Available from: from https://www.chop.edu/clinical-pathway/sepsis-emergent-care-clinical-pathway