Sepsis Management - Pediatric

INITIAL EVALUATION

Patient exhibits 2 or more of the following criteria: **One of which must be abnormal temperature or Leukocyte count:**
- Core temperature (measured orally) of greater than 38.1°C or less than 36°C
- Tachycardia in the absence of external stimulus, chronic drugs or painful stimuli or otherwise unexplained persistent elevation over a 0.5 - 4 hour time period
- Tachypnea greater than normal for age
- PEWS 6 or greater

Note: If on steroids, patient might not have temperature elevation

Is patient unresponsive with altered mental status?

- **Yes**
  - Assess circulation, airway and breathing
    - Initiate CPR if needed
    - Start oxygen via nonrebreather face mask
  - Call:
    - CODE Blue Team (x2-7099) and PICS Team and
    - Inpatient G9 Team or Clinic Primary Team

- **No**
  - Assess circulation, airway and breathing
    - Initiate CPR if needed
    - Start oxygen via nonrebreather face mask
  - Call:
    - Inpatient G9 Team or
    - Clinic Primary Team

Admit to PICS

See Page 2 for continuation

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1See Appendix A for Age Specific Vitals (Page 4)
2See Detecting Pediatric Patient Deterioration using PEWS algorithm
3See Appendix B for Primary Teams (Page 4)
Sepsis Management - Pediatric

Intervention

- Give fluid challenge of 20 mL/kg (maximum 1 liter) crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) or albumin 5% IV over 5-10 minutes by push-pull technique. Give 10 mL/kg of fluids if patient has history of cardiomyopathy.
- Cultures: blood 1 and other sources as clinically indicated
- Broad spectrum antibiotics – first dose STAT
  Do not delay antibiotic therapy if cultures cannot be obtained within 30 minutes
- Obtain CBC, sodium, potassium, chloride, bicarbonate, BUN, creatinine, glucose, magnesium, phosphorus, ionized calcium, VBG (via point of care machine), PT/INR, PTT, D-dimer, fibrinogen, cortisol, CRP, procalcitonin, BNP, lactic acid, and type and screen
- For patients with chronic steroid use or on weaning doses, consider administering hydrocortisone 2 mg/kg IV STAT

- Inform Primary team
- Cultures: blood 1 and other sources as clinically indicated
- Broad spectrum antibiotics – first dose STAT
  Do not delay antibiotic therapy if cultures cannot be obtained within 30 minutes
- Obtain CBC, sodium, potassium, chloride, bicarbonate, BUN, creatinine, glucose, magnesium, phosphorus, ionized calcium, VBG, PT/INR, PTT, D-dimer, fibrinogen, cortisol, CRP, procalcitonin, BNP, lactic acid, and type and screen
- Consider fluid challenge of 10-20 mL/kg (maximum 1 liter) crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) IV over 1 hour for patients with history of insensible fluid losses

Continue from Page 1

Is patient hypotensive 1?

Yes

Reassess vitals every 5 minutes for a total of 30 minutes and then every 15 minutes for a total of 30 minutes

- Patient remains hypotensive 1 or hemodynamically unstable?
  Yes
  - Give second fluid challenge of 20 mL/kg (maximum 1 liter) crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) or albumin 5% IV over 5-10 minutes by push-pull technique
  - If patient remains hypotensive and has no evidence of pulmonary edema or CHF, repeat fluid challenge
  - Start vasopressor 3
    - Norepinephrine (1st line) 0.05 mcg/kg/minute IV; titrate by 0.01 mcg/kg/minute every 5 minutes to normalize MAP 1
    - Epinephrine is 2nd line
    - Do not use dopamine
    - Call PICS team
    - Order cardiac ECHO STAT
  - Admit to PICS
  - See Page 3 for PICS management

- Monitor vitals per Unit protocol

No

- Monitor vitals per unit protocol

Reassess vitals every 5 minutes for a total of 30 minutes and then every 15 minutes for a total of 30 minutes

- Is patient hypotensive 1 or hemodynamically unstable?
  Yes
  - Give fluid challenge of 20 mL/kg (maximum 1 liter) crystalloids (e.g., plasmalyte, Lactated Ringer’s, 0.9% sodium chloride) or albumin 5% IV over 5-10 minutes by push-pull technique
  - Notify MERIT and prepare for immediate transfer to PICS

- Monitor vitals per Unit protocol

No

- Monitor vitals per unit protocol

1 See Appendix A for Age Specific Vitals (Page 4)
2 Blood cultures - draw from central venous line and all ports of a central venous line
3 If inpatient, may start norepinephrine as listed above while awaiting transfer to PICS (notify MERIT and prepare for immediate transfer to PICS); may administer peripherally if central line access is not available

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Department of Clinical Effectiveness V2
Approved by the Executive Committee of the Medical Staff on 09/26/2017

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

Check MAP

- MAP lower for age?
  - Yes: For refractory hypotension, add hydrocortisone 2 mg/kg IV STAT (if not already given) and then 0.5 mg/kg every 6 hours
  - No: Consider starting milrinone at 0.25 mcg/kg/minute (0.5 mcg/kg/minute if patient is normotensive) via continuous IV infusion to decrease lactic acid

Check cardiac index

- Low-output shock?
  - Yes: PRBC transfusion to maintain Hgb greater than or equal to 9 grams/dL. Consider escalating to high flow nasal cannula or non-invasive positive pressure ventilation for patients with acute lung injury
  - No: Resuscitation Goals
    - Normalize MAP for age
    - Urine output greater than or equal to 0.5 mL/kg/hour (consider higher target if oliguric)
    - Normalization of lactic acid and BNP if elevated

Check Hgb

- Hgb less than 9 grams/dL?
  - Yes: ALI = acute lung injury
  - No: ARDS = acute respiratory distress syndrome

\(^1\)See Appendix A for Age Specific Vitals (Page 4)
\(^2\)Refractory hypotension is hypotension despite adequate fluid resuscitation and vasopressors
\(^3\)Order cardiac ECHO STAT if not already performed

ALI = acute lung injury
ARDS = acute respiratory distress syndrome
APPENDIX A: Age Specific Vital Signs

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Tachycardia Heart Rate</th>
<th>Tachypnea Respiratory Rate</th>
<th>Hypotension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant 1 month to 1 year</td>
<td>Greater than 180 beats/min</td>
<td>Greater than 34 breaths/min</td>
<td>Less than 70 mmHg</td>
</tr>
<tr>
<td>Toddler and Preschool 1 to 5 years</td>
<td>Greater than 140 beats/min</td>
<td>Greater than 24 breaths/min</td>
<td>Less than [70 + (2 x age in years)] mmHg</td>
</tr>
<tr>
<td>School Age 5 to 12 years</td>
<td>Greater than 130 beats/min</td>
<td>Greater than 22 breaths/min</td>
<td>Less than [70 + (2 x age in years)] mmHg</td>
</tr>
<tr>
<td>Adolescent 12 to 18 years</td>
<td>Greater than 110 beats/min</td>
<td>Greater than 20 breaths/min</td>
<td>Less than 90 mmHg</td>
</tr>
</tbody>
</table>

Less than 55 mmHg

Less than 60 mmHg

Less than 65 mmHg

Less than 65 mmHg

1Minimum goal for Mean Arterial Pressure (MAP) is [55 + (1.5 x age in years)] mmHg

APPENDIX B: Primary Teams

Inpatient G9 Team: For pediatric inpatients on G9 or other floors
AM Team (7am-5pm) – G9 Resident + Fellow + APP + Attending
PM Team (5pm-7am) – G9 Resident + Nocturnalist + Fellow + APP + Attending

Primary Team for Pediatric Clinic: For pediatric patient in Child & Adolescent Center
Fellow + APP + Attending
SUGGESTED READINGS


Sepsis Management - Pediatric

This practice consensus algorithm is based on majority expert opinion of the Pediatric 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:

Micah Bhatti, MD
Jose A. Cortes, MD
Patricia Craven, BSN, RN
Natalie J. M. Dailey Garnes, MD
Winston Huh, MD
Rodrigo Mejia, MD
Demetrios Petropoulos, MD
Shehla Razvi, MD
Anita M. Williams, BS
Sonal Yang, PharmD

*Development Leads
*Clinical Effectiveness Development Team

Moreover, this algorithm is not intended to replace the independent medical or professional judgment of physicians or other health care providers.

DEVELOPMENT CREDITS

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.