Sepsis Management - Pediatric

PRESENTATION

Patient exhibits 2 or more of the following criteria:
- Temperature < 36°C or > 38.1°C
- Unexplained tachycardia[1]
- Respiratory rate[1] greater than normal for age
- WBC count < 3 or ≥ 15 K/microliter
- Additional criteria:
  - Pediatric early warning score (PEWS)[2] ≥ 5
  - Unexplained bradycardia[1]
  - Nurse or parental concern

Note: If on steroids and/or scheduled acetaminophen, patient might not have temperature elevation

EVALUATION

Is patient unresponsive?

Yes → Call **Code Blue Team (x2-7099)** → Admit to PICU

No →
- Administer oxygen via nonrebreather face mask at 10 L/minute to maintain O_2 saturation > 92%
- Primary Pediatric Team to evaluate
- Notify **PICU Team (x5-0570)** if PEWS[2] ≥ 5
- Notify covering provider for ambulatory patients
- Teams to assess for suspicion of infection[3]

Suspicion of infection[3]?

TREATMENT/FOLLOW UP

Yes → See Page 2: Sepsis Management

No →
Inpatients/PACCC:
- For further work up, initiate Sepsis Workup Order Set as indicated
- Follow-up evaluation by Primary Team Ambulatory patients
- Continue evaluation for further treatment or alternative diagnosis

PICU = pediatric intensive care unit
PACCC = pediatric acute cancer care center

[1] See Appendix A: Age Specific Vital Signs
[2] See Appendix B: Modified Pediatric Early Warning Score (PEWS) Tool
[3] See Appendix C: Suspicion of Infection

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Sepsis Management - Pediatric

TREATMENT

Sepsis Management →

Initiate sepsis orders:
- Obtain cultures (blood[1] from 2 sites with one set preferably from peripheral site, and other sources as clinically indicated) **STAT**
- Give broad spectrum antibiotics – first dose **STAT** *Do not delay antibiotic therapy if cultures cannot be obtained within 45 minutes*
- Obtain the following **STAT**: CBC with differential, comprehensive metabolic panel, VBG+, magnesium, phosphorus, calcium, PT, PTT, fibrinogen, cortisol, CRP, procalcitonin, NT-ProBNP, and type and screen
- Initiate cardiac monitoring
- Verify and if needed, obtain adequate IV access
- Give fluid challenge up to 20 mL/kg[2] crystalloids [*e.g.*, plasma-lyte, sodium chloride 0.9% (NS)]; each fluid challenge should be given over 10 - 30 minutes
- Monitor vital signs every 15 minutes for 1 hour, then every hour for 5 hours, then every 2 hours for 24 hours, then every 4 hours
- Titrate oxygen to maintain $SpO_2 \geq 92\%$
- Consider EKG and transthoracic echocardiogram

Hypotensive[3] **or** lactic acid > 2 mmol/L despite adequate fluid resuscitation?

Yes →

Septic Shock
- Transfer to PICU for further management
- Consider placement of arterial line and additional venous access
- Monitor and maintain respiratory/hemodynamic status
- May repeat fluid challenge if indicated[2]
- If lactic acid elevated, repeat level within 4 hours
- Consider norepinephrine for persistent hypotension[4]
- Obtain transthoracic echocardiogram if not already completed

See Page 3 for PACCC/PICU Management

No →

Sepsis
- Continue to monitor and maintain respiratory/hemodynamic status
- Review STAT labs
- Continue broad spectrum antibiotics
- Assess IV fluid provision
- Request appropriate team consults

VBG = venous blood gas

[1] Refer to Central Vascular Access Device (CVAD): Drawing Blood Policy (#CLN0944) for information on blood culture volume collection

[2] Considerations for fluid resuscitation:
- If not hypotensive (See Appendix A) but with history of insensible losses, administer fluid challenge of 10 - 20 mL/kg
- If history of cardiomyopathy, administer fluid challenge of 10 mL/kg
- Monitor for signs of fluid overload (*e.g.*, worsening tachypnea/respiratory distress, desaturations) during administration of bolus

[3] See Appendix A: Age Specific Vital Signs

[4] If inpatient, may start norepinephrine as listed above while awaiting transfer to PICU; may administer peripherally if central access is not available

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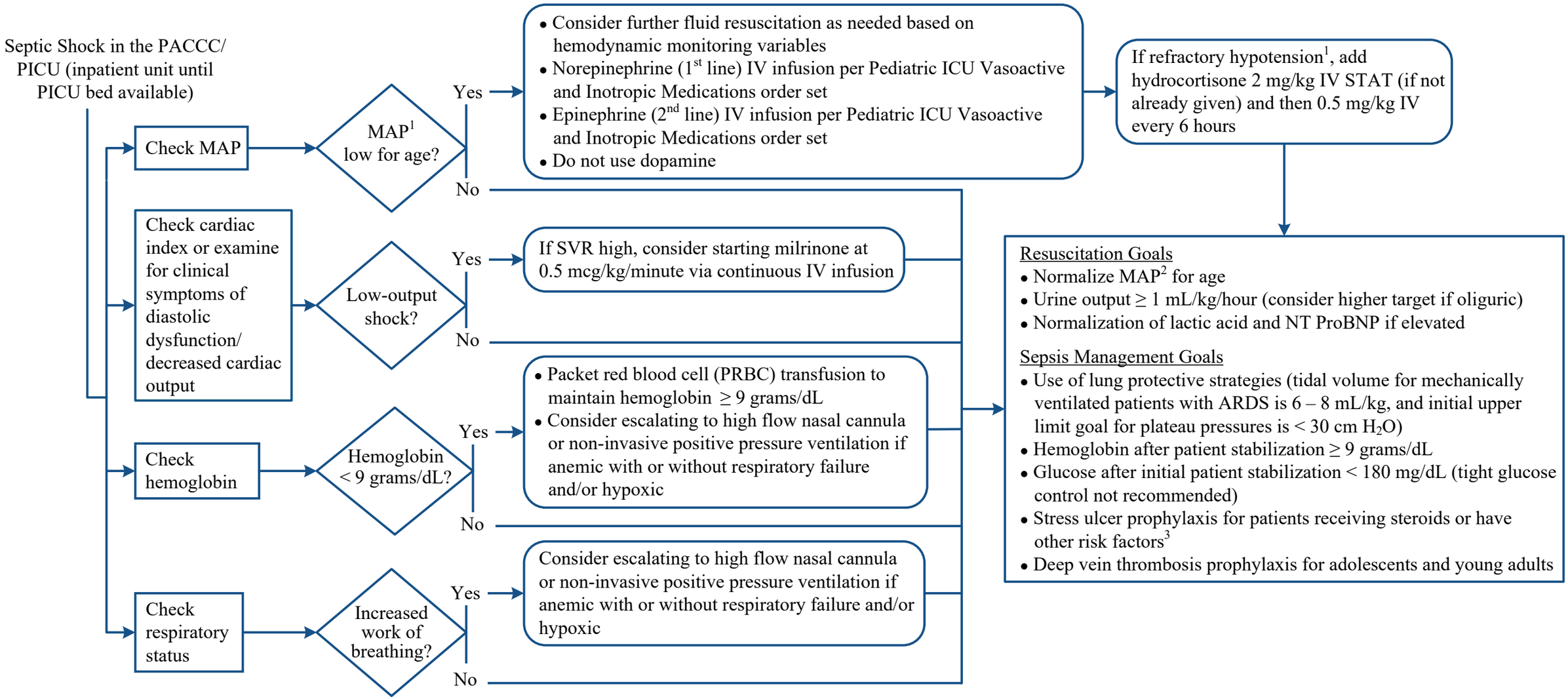
Sepsis Management - Pediatric



MAP = mean arterial pressure
SVR = systemic vascular resistance
ARDS = acute respiratory distress syndrome

[1] Refractory hypotension is hypotension despite adequate fluid resuscitation and vasopressors
[2] See Appendix A: Age Specific Vital Signs
[3] Risk factors for GI bleeding include: mechanical ventilation, coagulopathy, thrombocytopenia, renal failure, liver failure, hypotension, heart failure and arrhythmias

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Sepsis Management - Pediatric

APPENDIX A: Age Specific Vital Signs

Age Group	Tachycardia Heart Rate	Tachypnea Respiratory Rate	Hypotension	
			Systolic Blood Pressure	Mean Arterial Pressure[1]
Infant 1 month to 1 year	> 180 beats/minute	> 34 breaths/minute	< 70 mmHg	< 55 mmHg
Toddler and Preschool 1 to 5 years	> 140 beats/minute	> 24 breaths/minute	< [70 + (2 x age in years)] mmHg	< 60 mmHg
School Age 5 to 12 years	> 130 beats/minute	> 22 breaths/minute	< [70 + (2 x age in years)] mmHg	< 65 mmHg
Adolescent 12 to 18 years	> 110 beats/minute	> 20 breaths/minute	< 90 mmHg	< 65 mmHg

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

Sepsis Management - Pediatric

APPENDIX B: Modified Pediatric Early Warning Score (PEWS) Tool

	Score[1]			
	0	1	**2**	**3**
Behavior	• Playing • Appropriate	Irritable, but consolable	Irritated, but not consolable	• Lethargic • Confused • Reduced response to pain
Cardiovascular System				
Rate	• Within normal parameters for age	• Tachycardia < 20 above normal for age	• Tachycardia 20-29 above normal for age	• Tachycardia ≥ 30 above **or** bradycardia ≥ 10 below normal for age
Color	• Pink	• Pale **or** dusky	• Mottled	• Gray
Perfusion	• Capillary refill 1-2 seconds	• Capillary refill 3 seconds	• Capillary refill 4 seconds	• Capillary refill ≥ 5 seconds
Respiratory System				
Rate	• Within normal parameters for age	• Tachypnea 10-19 above normal parameters for age	• Tachypnea ≥ 20 above normal parameters for age with retractions	• Bradypnea ≥ 5 below normal parameters for age with retractions
Effort	• No retractions	• Mild retractions/accessory muscle use	• Moderate retractions/accessory muscle use (including tracheal tugging)	• Severe retractions/accessory muscle use (including tracheal tugging) **and** grunting
Oxygen	• N/A	• Oxygen required to maintain normal[2] SpO_2 ◦ FiO_2 24-39% ◦ 2 L/minute O_2 • Any assisted ventilation[3] or initiation of O_2	• Oxygen required to maintain normal[2] SpO_2 ◦ FiO_2 40-49% ◦ O_2 ≥ 3 L/minute	• Oxygen required to maintain normal[2] SpO_2 ◦ FiO_2 ≥ 50%

[1] Add 2 extra points if patient requires frequent interventions (*e.g.,* suctioning, positioning, change in O_2 needs, multiple IV attempts required, **or** every 15-minute or continuous nebulized treatments) **or** has persistent post-op vomiting
[2] As defined in patient's orders
[3] Includes home bilevel positive airway pressure (BiPAP)/continuous positive airway pressure (CPAP) or home ventilator at baseline settings

Sepsis Management - Pediatric

APPENDIX C: Suspicion of Infection

- Fever or hypothermia
- 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
- Diabetes mellitus
- Unilateral sinusitis (and/or facial swelling)

SUGGESTED READINGS

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