

M02: Pediatrics - Circulatory Emergencies

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Updated: December 07, 2020

Reviewed:

Introduction

The initial signs of shock may be subtle in children and infants as their compensatory mechanisms are very effective. As long as the compensatory mechanisms are able to maintain a systolic BP within an age-appropriate normal range, the shock is considered compensated. When the compensatory mechanisms fail, the child progresses quickly to decompensated shock where the "classic" signs and symptoms of shock are present, such as tachycardia, pallor, cold extremities, and altered levels of consciousness. When this happens, cardiopulmonary arrest may be imminent.

Children are capable of compensation for long periods of time after which they quickly decompensate. Recovery from decompensated shock is less likely. Caution must be always used when assessing children with special needs or chronic health conditions as they are more difficult to assess for what is "normal."

Essentials

- Know and be familiar with normal vital signs for given ages. Use a reference tool (either app or pocket card) before patient contact. Do not rely on memory.
- Assess patients early and from a distance
- Early recognition and intervention are the keys to survival
- Treatments must be targeted to the underlying cause. Vascular access is critical, but not all problems are responsive to fluid.
- Maintain normal oxygen saturation
- Classic systems-based shock categories are septic, hypovolemic, anaphylactic, cardiogenic, obstructive, and spinal

Additional Treatment Information

- In addition to oxygen, vascular access and patient positioning, type-specific priorities are:
 - Septic shock: 10-20 mL/kg crystalloid bolus, early antibiotics, pressors, steroids, and blood products
 - Anaphylactic shock: [EPINEPHrine 0.01 mg/kg](#), 10 mL/kg crystalloid bolus (repeated as necessary), vasopressors, and steroids
 - Hypovolemic: 20 mL/kg crystalloid bolus, packed red blood cells, platelets, and plasma
 - Cardiogenic: 5-10 mL/kg crystalloid bolus (Clinically/TA consult), arterial line monitoring, pressors, inotropes, and chronotropes
 - Obstructive: Identify and treat cause
 - Spinal: 10 mL/kg fluid bolus (may repeat as necessary), pressors, and inotropes

Referral Information

All patients demonstrating signs and symptoms of shock require rapid transport to the most appropriate hospital depending on resources.

General Information

- The recognition of shock relies on careful assessment of the child while at rest. Stimulation – from handling, blood work, vital sign measurements – may agitate the child producing tachycardia, tachypnea, and color changes.
- The initial assessment should follow the pediatric assessment triangle:
 - Appearance: Restlessness or inconsolability, decreased interactivity, decreased motor activity, lethargy and

- listlessness, decreased consciousness, weak cry, and poor eye contact
- Respiratory: Increased work of breathing, primarily tachypnea
- Circulation: Poor skin perfusion, cool periphery, delayed capillary refill, pallor, tachycardia, and weak pulses
- Further assessment will reveal objective findings. These should be broken down into systems:
 - CNS: GCS less than 15, hypotonia or hyporeflexia, seizures (late and ominous)
 - Cardiovascular: tachycardia (early) or bradycardia (late and ominous), weak or absent pulses (may be bounding in cardiogenic or “warm” septic shock), ECG changes, elevated lactate, metabolic acidosis, absent or muffled heart sounds
 - Respiratory: tachypnea, accessory muscle use, hypoxemia, pneumothorax
 - GI/GU: decreased or concentrated urine output, flank pain, incontinence (spinal shock)
 - Integumentary: reduced turgor, rash, mottling, delayed capillary refill

Interventions

First Responder

- Position the patient
 - If symptoms suggest hypotension: lay flat if this does not increase symptoms
 - If no suggestion of hypotension: position of comfort
- Provide warmth
- Support oxygenation and ventilation as needed
 - → [A07: Oxygenation and Medication Administration](#)
 - → [B01: Airway Management](#)

Emergency Medical Responder – All FR interventions, plus:

- Expedite transport
- Assess for treatable cause of shock
- Consider ACP intercept

Primary Care Paramedic – All FR and EMR interventions, plus:

- Consider vascular access while en route; depending on suspected pathology, consider volume replacement
 - → [D03: Vascular Access](#)

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

Depending on pathology:

- 10 mL/kg PRBC bolus over 1hr (Hgb target 70 g/L)
- Platelets 10 mL/kg (max 4 units/1 pool)
- Frozen plasma
- Vitamin K
- Pressors
- Inotropes
- Chronotropes
- Arterial line
- Central line

Evidence Based Practice

[Hypovolemic Shock](#)

[Pediatric Anaphylaxis](#)

[Septic Shock](#)

