PEDIATRIC GENERAL SHOCK

Support Airway, Breathing and Circulation
- Ensure adequate airway, oxygenation and ventilation; monitor pulse oximetry and end-tidal CO_2 (if applicable)
- Establish cardiac monitoring and IV/IO access, if not already done*
- Assess pulses and perfusion; skin color, capillary refill; monitor blood pressure (noninvasive or invasive)
- If sepsis is suspected, follow **Pediatric Septic Shock** code card

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Initiate Intravascular Volume Restoration Based on Type of Shock (See table below)

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Consider Medication Therapy Based on Type of Shock (See table below)

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Consider Additional Measures
- Minimize oxygen demand: Consider mechanical ventilation; treat fever, pain or seizures, when present; consider sedation and neuromuscular blockade, as clinically indicated
- Obtain laboratory samples (e.g., CBC, CMP, lactate, ABG)
- Identify and manage metabolic abnormalities; treat hypoglycemia; manage acidosis
- If adrenal insufficiency and/or acute or chronic steroid exposure that are refractory to fluid and vasoactive therapy in shock, consider stress dose hydrocortisone
- Obtain critical care consultation

Goals of Care
- The goals of care include maintaining or restoring circulation, defined as:
  - Normal perfusion for age
  - Normal blood pressure for age
  - Normal heart rate for age
  - Capillary refill ≤2 seconds
  - Normal mental status

IDENTIFY AND TREAT SPECIFIC TYPES OF SHOCK

Hypovolemic Shock

Nonhemorrhagic
- Administer 20 mL/kg isotonic **crystalloid fluid bolus** rapidly†; repeat as needed to restore normovolemia to max of 60 mL/kg‡

Hemorrhagic
- Control hemorrhage
- Administer 20 mL/kg isotonic **crystalloid fluid bolus** rapidly†; repeat as indicated (if blood products are not immediately available)‡
- Administer **PRBCs** (10 mL/kg)**/whole blood** (10-20 mL/kg) as indicated
- Administer **TXA** as indicated

Distributive Shock

Septic
- Follow **Pediatric Septic Shock** code card

Anaphylactic
- Administer **epinephrine** (IM, SQ, auto-injector, infusion)
- Administer 20 mL/kg isotonic **crystalloid fluid bolus**†; repeat as needed‡
- Administer **albuterol** as indicated
- Administer **corticosteroids, antihistamines** as indicated
- Be prepared to intubate the patient due to airway compromise

Neurogenic
- Administer 20 mL/kg isotonic **crystalloid fluid bolus**†; repeat as needed‡
- Administer vasoactive agents as indicated

Cardiogenic Shock

- Obtain 12-lead ECG, manage arrhythmias (refer to appropriate code cards)
- Administer 5 to 10 mL/kg isotonic **crystalloid fluid bolus** over 10 to 20 min if clinically indicated; repeat as needed‡
- Consider administering **milrinone** as first-line therapy; consider administering **epinephrine**, **dopamine**, or **dobutamine** additively or independently, as clinically indicated.
- Correct metabolic derangements
- Consider **ventilatory support** to reduce cardiac work
- Seek early expert consultation

Obstructive Shock

Cardiac Tamponade
- Perform, or arrange for, urgent **pericardiocentesis**
- Administer 20 mL/kg isotonic **crystalloid fluid bolus** rapidly†; repeat as needed to support perfusion‡

Tension Pneumothorax
- Perform emergent **needle decompression**; perform, or arrange for, insertion of **thoracostomy tube**
- Administer 20 mL/kg isotonic **crystalloid fluid bolus**†; repeat as needed‡

Pulmonary Embolism
- Administer 20 mL/kg isotonic **crystalloid fluid bolus**† as needed to support perfusion; repeat as needed‡
- Consider medical therapy with **fractionated** or **unfractionated heparin**
- Consider **thrombolytic therapy** (IV or endovascular localized) or **thrombectomy**

Obstructive Cardiac or Aortic Lesion
- Initiate **prostaglandin E1** for infants with suspected/documentated ductal-dependent lesion
- Support ventricular function with **inodilators**, **inotropes** and/or **vasocative substances** as indicated
- Consider **ventilatory support** to reduce cardiac workload
- Manage acidosis
- Consult pediatric cardiologist for definitive diagnosis and management; note that immediate surgical or catheter based intervention may be warranted

*If unable to obtain intravenous access and if clinically warranted, establish intraosseous access. If possible, two large-bore IV (or IO) access points are best for hypovolemic shock.

†Administer smaller (10 mL/kg) fluid bolus volumes in neonates. Also consider smaller (5 to 10 mL/kg) fluid bolus volumes in children with poor cardiac function/heart failure. (Fluid therapy may be contraindicated in children with hypervolemic conditions.)

‡Reassess after each bolus. Monitor for signs of hypervolemia, including worsening heart failure and worsening perfusion.

American Red Cross
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PEDIATRIC GENERAL SHOCK

IDENTIFICATION OF TYPE OF SHOCK

Type of Shock	Primary Assessment Findings	
Compensated to Decompensated	▪ Airway patent to possible airway compromise due to altered level of consciousness ▪ Tachypnea to possible bradypnea (late) ▪ Normal systolic blood pressure for age to hypotension ▪ Tachycardia to possible bradycardia (late)	▪ Diminished peripheral pulses and delayed capillary refill to absent peripheral pulses, weak central pulses and absent capillary refill ▪ Pale, cool skin to cold, pale, mottled skin ▪ Decreased urine output for age to negligible urine output ▪ Anxiety to altered mental status or decreased level of consciousness ▪ Pale, cool extremities to cold, pale, mottled extremities
Hypovolemic	▪ Most commonly arising from gastrointestinal fluid loss ▪ Early signs: tachycardia and peripheral vasoconstriction ▪ Pulse pressure may be narrowed ▪ Urine output typically decreased	▪ Decreased tear production ▪ Dry mucous membranes ▪ Sunken eyes ▪ Sunken fontanelle (infants) ▪ Pain if related to trauma
Distributive	▪ Anaphylactic shock: • Hypotension post exposure to known or suspected allergen • Signs of angioedema (lips, tongue, uvula) • Dyspnea, increased work of breathing, wheezing • Hives, flushing, itching, pallor • Tachycardia ▪ Neurogenic shock (symptoms dependent on level of spinal cord injury): • Airway patent unless level of consciousness impaired • Hypotension in the absence of tachycardia (relative bradycardia) • Wide pulse pressure • Warm, flushed skin (due to vasodilation due to interrupted sympathetics), occurring below the level of the spinal injury • Hypothermia • Signs not specifically attributed to shock (e.g., signs of respiratory compromise depending on level of spinal injury, neurologic deficits, altered level of consciousness if concurrent head injury)	▪ Septic shock: • Tachypnea and/or hyperpnea, increased work of breathing, hypoxemia • Tachycardia or bradycardia • Diminished pulses, but can be bounding in some early • Delayed capillary refill, but can be normal or brisk in some early • Normal or reduced blood pressure • Narrow pulse pressure and pale, cool, mottled skin, but in subset may be wide pulse pressure and warm, flushed skin • Mental status may be altered • Increased or decreased body temperature • Cool, mottled extremities, but in subset may be warm, flushed extremities • Petechiae and/or purpura
Cardiogenic	▪ Tachypnea, grunting, retractions or nasal flaring ▪ Wheezing or crackle on lung auscultation (latter rare in infants) ▪ Pulmonary edema ▪ Cyanosis ▪ Tachycardia or bradycardia ▪ Hypotension, narrowed pulse pressure	▪ Weak pulses; pale, cool, mottled skin ▪ Decreased urine output for age ▪ Altered level of consciousness; anxiety and restlessness ▪ Neck vein distention ▪ Peripheral edema ▪ Diaphoresis
Obstructive	▪ General: • Tachypnea and/or dyspnea • Tachycardia • Altered level of consciousness • Cold extremities ▪ Cardiac tamponade: • Beck's triad (hypotension, muffled heart sounds, neck vein distention) • Diminished pulses • Narrowed pulse pressure • Pulsus paradoxus • Pericardial rub ▪ Tension pneumothorax: • Tracheal deviation to unaffected side • Chest pain upon inspiration • Decreased breath sounds and hyperresonance to percussion on affected side • Hypotension • Neck vein distention • Pulsus paradoxus	▪ Pulmonary embolism: • Chest pain • Coughing up blood (hemoptysis) • Signs of acute right heart failure (e.g., distended neck veins, peripheral edema, ascites, hepatomegaly) • Hypotension • Arrhythmias (most often sinus tachycardia) • Signs of deep vein thrombosis (e.g., swelling, pain, erythema), most often in lower extremities and unilateral ▪ Obstructive cardiac and aortic lesions: • Respiratory distress, tachypnea, irregular breathing • Cyanosis (may or may not be present depending on the lesion) • Signs of cold shock • Hypotension • Diminished or absent femoral pulses (if aortic lesion) • Differential blood pressure, O2 saturation, or pulse between upper and lower extremities or between the right upper extremity and all other extremities (i.e., left upper extremity and lower extremities) • Diaphoresis, poor weight gain