Scenario Lead-in

Prehospital: You are dispatched to the home of a 6-month-old infant with trouble breathing.
ED: You are notified that a 6-month-old infant with trouble breathing is en route by BLS ambulance.
Ward: You are called to evaluate an infant on the wards with increased respiratory distress.
ICU: You are called to the bedside to evaluate a 6-month-old infant who was admitted to the ICU earlier today.

General Assessment: Pediatric Assessment Triangle

Appearance
- Restless, not interactive

Breathing
- Increased effort, noise on inspiration

Circulation
- Pale, mottled skin

Categorize
Respiratory distress vs failure

Act
- Activate emergency response system if appropriate
- Open airway manually and administer 100% oxygen

Decide

Primary Assessment

- Airway: Inspiratory stridor (partial obstruction)
- Breathing: Respiratory rate about 40/min, deep sternal retractions, nasal flaring, poor aeration on auscultation, \( \text{SpO}_2 \) 90%
- Circulation: HR 160/min, peripheral pulses normal, delayed capillary refill (about 3 seconds), BP 90/60
- Disability: Restless, not interactive
- Exposure: Temperature 38.9°C (102°F), no rashes

Categorize
Respiratory distress vs failure
Upper airway obstruction

Act
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

Decide

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Fever, respiratory distress
- Allergies: None known
- Medications: None
- Past medical history: Premature birth at 7 months
- Last meal: Formula 4 oz 4 hours ago
- Events (onset): URI symptoms x 2 days, new onset of fever and respiratory distress

Physical Examination:
- Repeat vital signs after airway maneuver and oxygen administration: HR 140, RR 30/min, \( \text{SpO}_2 \) 95%, BP 80/50
- Head, eyes, ears, nose, and throat/neck: Nasal congestion
- Heart and lungs: No murmur, breath sounds coarse
- Abdomen and pelvis: Normal
- Extremities: No edema; no rash; mottled skin
- Back: Normal
- Neurologic: Restless, not interactive, withdraws to pain

Recategorize
Respiratory distress
Upper airway obstruction

Act
- Consider specific treatments for upper airway obstruction (eg, racemic epinephrine, CPAP)
- Consider vascular access (IV/IO)
- Prepare for endotracheal intubation

Decide

Tertiary Assessment

- Lab data (as tolerated): ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), CBC with differential

Reassess
## General Management for All Patients
- Airway positioning
- Oxygen
- Pulse oximetry
- ECG monitor (as indicated)
- BLS as indicated

## Upper Airway Obstruction
### Specific Management for Selected Conditions

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<tr>
<th>Croup</th>
<th>Anaphylaxis</th>
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<td>Allow position of comfort</td>
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## Lower Airway Obstruction
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## Lung Tissue (Parenchymal) Disease
### Specific Management for Selected Conditions

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<td>Antibiotics (as indicated)</td>
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## Disordered Control of Breathing
### Specific Management for Selected Conditions

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<td>Contact poison control</td>
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<tr>
<td>Avoid hyperthermia</td>
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<td></td>
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Instructor points for discussion:
- Manual airway maneuvers and CPAP can significantly improve upper airway obstruction due to soft tissue.
- If the child with UAO is responsive, minimize stimulation (ie delay IV/IO access).
- If the patient requires endotracheal intubation, consider using a tube that is smaller than that predicted by the patient’s age or size.

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Respiratory Core Case 2
Lower Airway Obstruction

Scenario Lead-in
Prehospital: You are dispatched to the home of an 8-month-old infant with trouble breathing.
ED: You are notified that an 8-month-old infant with trouble breathing is en route by BLS ambulance.
Ward: You are called to evaluate an infant on the wards with increased respiratory distress.
ICU: You are called to the bedside to evaluate an 8-month-old infant who was admitted to the ICU earlier today.

General Assessment: Pediatric Assessment Triangle

- Appearance
  - Lethargic
- Breathing
  - Increased effort, nasal cannula in place
- Circulation
  - Pale skin

Categorize
Respiratory distress vs failure

Decide

Act
- Activate emergency response system if appropriate
- Administer 100% oxygen by mask

Primary Assessment

Airway: Copious nasal secretions
Breathing: Respiratory rate about 50/min, subcostal retractions, nasal flaring, use of accessory/abdominal muscles, expiratory wheezes on auscultation, SpO₂ 93%
Circulation: HR 140/min, peripheral pulses normal, normal capillary refill time, BP 80/40
Disability: Lethargic, not interactive
Exposure: Afebrile, no rashes

Categorize
Respiratory distress vs failure
Lower airway obstruction

Decide

Act
- Suction the nose
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Cough, respiratory distress
- Allergies: None known
- Medications: None
- Past medical history: None
- Last meal: Juice 2 hours ago
- Events (onset): URI symptoms × 2 days, recent onset of cough and labored breathing

Physical Examination:
- Repeat vital signs after oxygen administration: HR 130, RR 30/min, SpO₂ 95%, BP 80/40
- Head, eyes, ears, nose, and throat/neck: Nasal congestion
- Heart and lungs: No murmur, coarse expiratory wheezes, prolonged expiratory phase
- Abdomen and pelvis: Normal
- Extremities: No edema; no rash; mottled skin
- Back: Normal
- Neurologic: Lethargic, withdraws to pain

Recategorize
Respiratory distress
Lower airway obstruction

Decide

Act
- Obtain vascular access (IV/IO)
- Consider specific treatments for lower airway obstruction (eg, inhaled albuterol)
- Prepare for assisted ventilations
- Prepare for endotracheal intubation

Tertiary Assessment

- Lab data: ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab)
- Radiology: Chest x-ray

Reassess
### General Management for All Patients
- Airway positioning
- Oxygen
- Pulse oximetry
- ECG monitor (as indicated)
- BLS as indicated

### Upper Airway Obstruction
#### Specific Management for Selected Conditions

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• Corticosteroids | • IM epinephrine (or auto-injector)  
• Albuterol  
• Antihistamines  
• Corticosteroids | • Allow position of comfort  
• Specialty consultation |

### Lower Airway Obstruction
#### Specific Management for Selected Conditions

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• Corticosteroids  
• SQ epinephrine  
• Magnesium sulfate  
• Terbutaline |

### Lung Tissue (Parenchymal) Disease
#### Specific Management for Selected Conditions

<table>
<thead>
<tr>
<th>Pneumonia/Pneumonitis</th>
<th>Pulmonary Edema</th>
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</table>
| **Infectious**  
• Albuterol  
• Antibiotics (as indicated) | **Cardiogenic or Noncardiogenic (ARDS)**  
• Consider noninvasive or invasive ventilatory support with PEEP  
• Consider vasocative support  
• Consider diuretic |
| **Chemical** | **Noninvasive**  
| **Aspiration** | **Invasive** |

### Disordered Control of Breathing
#### Specific Management for Selected Conditions

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| • Avoid hypoxemia  
• Avoid hypercarbia  
• Avoid hyperthermia | • Antidote (if available)  
• Contact poison control | • Consider noninvasive or invasive ventilatory support |

**Instructor points for discussion:**
- Decision for assisted ventilations is based primarily on mental status.
- If the patient requires endotracheal intubation, provide ventilations at a slower than usual rate to permit increased time for exhalation.

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Respiratory Core Case 3
Lung Tissue (Parenchymal) Disease

Scenario Lead-in
Prehospital: You are dispatched to the home of a 6-year-old child with trouble breathing.
ED: You are notified that a 6-year-old child with trouble breathing is en route by BLS ambulance.
Ward: You are called to evaluate a child on the wards with increased respiratory distress.
ICU: You are called to the bedside to evaluate a 6-year-old child who was admitted to the ICU earlier today.

General Assessment: Pediatric Assessment Triangle

- **Appearance**
  - Lethargic, eyes not focused
- **Breathing**
  - Increased effort
- **Circulation**
  - Pale skin

Categorize
Respiratory distress vs failure

Act
- Activate emergency response system if appropriate
- Provide high flow oxygen

Primary Assessment

- **Airway:** Excess secretions
- **Breathing:** Respiratory rate 32/min, sternal retractions, "seesaw" breathing respiratory pattern, coarse breath sounds, \(\text{SpO}_2\) 88%
- **Circulation:** HR 130/min, peripheral pulses normal, normal capillary refill time, BP 102/50
- **Disability:** Obtunded, not interactive
- **Exposure:** Temperature 39.7°C (103.5°F), no rashes

Categorize
Respiratory failure

Act
- Assist ventilations with 100% oxygen, suction airway
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

Secondary Assessment

SAMPLE History:
- **Signs and Symptoms:** Fever, labored breathing
- **Allergies:** None known
- **Medications:** Dilantin, ranitidine
- **Past medical history:** Developmental delay, seizure disorder, reflux
- **Last meal:** Gastrostomy tube feeding 3 hours ago
- **Events (onset):** Vomited after feeding, with acute onset of respiratory distress

Physical Examination:
- Repeat vital signs after assisted ventilations: HR 120, RR 30/min (assisted), \(\text{SpO}_2\) 92%, BP 90/50
- **Head, eyes, ears, nose, and throat/neck:** Increased secretions
- **Heart and lungs:** No murmur, coarse breath sounds, good chest rise with assisted ventilations
- **Abdomen and pelvis:** Gastrostomy tube in place
- **Extremities:** No edema; no rash; mottled skin
- **Back:** Normal
- **Neurologic:** Obtunded, minimal response to pain

Recategorize
Respiratory failure
Lung tissue (parenchymal) disease

Act
- Obtain vascular access (IV/IO)
- Consider specific treatments for lung tissue (parenchymal) disease (eg, antibiotics for suspected pneumonia)
- Consider use of noninvasive ventilatory support (eg, CPAP or BiPAP)
- Prepare for endotracheal intubation

Tertiary Assessment

- **Lab data:** ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab) CBC with differential, blood culture
- **Radiology:** Chest x-ray

Reassess
General Management for All Patients
- Airway positioning
- Oxygen
- Pulse oximetry
- ECG monitor (as indicated)
- BLS as indicated

Upper Airway Obstruction
Specific Management for Selected Conditions

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Lung Tissue (Parenchymal) Disease
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Disordered Control of Breathing
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Instructor points for discussion:
- Decision for assisted ventilations is based primarily on mental status and oxygenation.
- Application of continuous positive airway pressure (CPAP) or positive end-expiratory pressure (PEEP) may improve oxygenation in lung tissue disease.
- In a child with gastrostomy tube, opening the tube during positive-pressure ventilations may relieve gastric distention.

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Disordered Control of Breathing

Scenario Lead-in

**Prehospital:** You are dispatched to the home of a 1-year-old child having a seizure; parents have administered rectal diazepam. The seizure activity stops just before you arrive.

**ED:** You are notified that a 1-year-old child with seizures is en route by parents’ car; parents administered rectal diazepam at home.

**Ward:** You are called to the wards for a child having a seizure; nursing staff have administered rectal diazepam. The seizure activity stops just before you arrive.

**ICU:** You are called to the bedside to evaluate a 1-year-old child who is having prolonged seizure; nursing staff have administered lorazepam IM because the IV has infiltrated. The seizure activity stops just before you arrive.

---

**General Assessment:**

**Pediatric Assessment Triangle**

- **Appearance**
  - Obtunded, eyes not focused

- **Breathing**
  - Decreased rate and effort

- **Circulation**
  - Pale skin

**Categorize**

- Respiratory failure

**Decide**

- Activate emergency response system if appropriate
- Suction the oropharynx
- Assist ventilations with 100% oxygen

**Act**

- Obtain vascular access (IV/IO)
- Consider specific treatments for disordered control of breathing (eg, reversal agents)
- Prepare for endotracheal intubation

**Recategorize**

- Respiratory failure
- Disordered control of breathing

**Tertiary Assessment**

- **Lab data:** ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), CBC with differential, blood culture
- **Radiology:** Chest x-ray

---
### General Management for All Patients
- Airway positioning
- Oxygen
- Pulse oximetry
- ECG monitor (as indicated)
- BLS as indicated

### Upper Airway Obstruction
#### Specific Management for Selected Conditions

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### Disordered Control of Breathing
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Instructor points for discussion:
- Decision for assisted ventilations is based primarily on mental status and oxygenation.
- With supplemental oxygen, patients may maintain oxygenation while becoming significantly hypercarbic.
- The use of reversal agents for benzodiazepines in the setting of acute seizures is not recommended.
- Patients with respiratory depression following a prolonged seizure and use of benzodiazepines may be managed with a longer trial of BMV prior to endotracheal intubation because their respiratory depression may quickly resolve.

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Scenario Lead-in

Prehospital: You are dispatched to a school nurse's office for a 9-year-old child with abdominal pain.
ED: You are notified that a 9-year-old child with abdominal pain is en route by BLS ambulance.
Ward: You are called to evaluate a 9-year-old child on the wards with abdominal pain.
ICU: You are called to the bedside to evaluate a 9-year-old child who has just been admitted via the transport team.

General Assessment: Pediatric Assessment Triangle

**Appearance**
- Lethargic, eyes not focused

**Breathing**
- Increased rate and effort

**Circulation**
- Pale, mottled skin

Primary Assessment
- **Airway:** Clear
- **Breathing:** Respiratory rate about 30/min, intercostal retractions, nasal flaring, use of accessory muscles, hyperpnea, SpO₂ 100%
- **Circulation:** HR 157/min, peripheral pulses weak, central pulses present, delayed capillary refill (about 4 sec), BP 90/68
- **Disability:** Lethargic, not interactive
- **Exposure:** Normothermic, no rashes

Secondary Assessment
SAMPLE History:
- **Signs and Symptoms:** Vomiting, abdominal pain, increased thirst
- **Allergies:** None known
- **Medications:** None
- **Past medical history:** Healthy
- **Last meal:** Ate small amount at dinner last night
- **Events (onset):** Symptoms began 1 week ago

Physical Examination:
- Repeat vital signs after oxygen administration: HR 140, RR 30/min, SpO₂ 100%, BP 90/60
- **Head, eyes, ears, nose, and throat/neck:** Mucous membranes dry and cracked, eyes sunken, fruity odor on breath
- **Heart and lungs:** No murmur, breath sounds clear
- **Abdomen and pelvis:** Abdomen diffusely tender, no guarding
- **Extremities:** No edema; no rash; mottled skin
- **Back:** Normal
- **Neurologic:** Lethargic, not interactive, withdraws to pain

Tertiary Assessment
- **Lab data:** ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), calcium, magnesium, phosphorous, CBC with differential, urinalysis
- **Radiology:** Chest x-ray

Reassess—identify therapeutic end points in shock management
Management of Shock Emergencies

- Oxygen
- Pulse oximetry
- ECG monitor
- IV/IO access
- BLS as indicated
- Bedside glucose

Hypovolemic Shock

Specific Management for Selected Conditions

<table>
<thead>
<tr>
<th>Nonhemorrhagic</th>
<th>Hemorrhagic</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mL/kg NS/LR bolus, repeat as needed</td>
<td>Control external bleeding</td>
</tr>
<tr>
<td>Consider colloid after 3rd NS/LR bolus</td>
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<td>Transfuse PRBCs as indicated</td>
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Distributive Shock

Specific Management for Selected Conditions

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<td></td>
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<tr>
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Cardiogenic Shock

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<td>Vasoactive infusion</td>
</tr>
<tr>
<td>Tachycardia with poor perfusion</td>
<td>Consider expert consultation</td>
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Obstructive Shock

Specific Management for Selected Conditions

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<th>Ductal-Dependent (LV Outflow Obstruction)</th>
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<td>Expert consultation</td>
<td>Tube thoracostomy</td>
<td>20 mL/kg NS/LR bolus</td>
<td>Consider thrombolytics, anticoagulants</td>
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Instructor points for discussion:
- Patients with shock and metabolic acidosis will breathe rapidly and deeply in order to compensate; this may give the appearance of respiratory distress even though the lungs are normal.

Lesson | Room set-up | Equipment/activity
---|-------------|-------------------|
17 | Students view and discuss | DVD player, video clips, Shock Management Flowchart |
18 | Manikin with O₂, IV/IO, monitor | Mega supplies to simulate treating pediatric shock patient, Learning Station Competency Checklist |
Obstructive Shock

Scenario Lead-in

Prehospital: You are asked to transport a 4-year-old child who was struck by a car from a local ED to a trauma center; the patient was intubated before you arrived.

ED: You are notified that a 4-year-old child who was struck by a car is en route by ALS ambulance; paramedics have intubated the patient in the field.

Ward: N/A

ICU: You are called to the bedside to evaluate a 4-year-old child who was admitted earlier today after being struck by a car. The patient is intubated and mechanically ventilated.

General Assessment: Pediatric Assessment Triangle

Appearance
- Unresponsive, cervical collar in place

Breathing
- Intubated, poor chest rise

Circulation
- Cyanotic

Categorize
- Respiratory failure

Decide
- Activate emergency response system if appropriate
- Continue ventilations via ETT with 100% oxygen at about 20/min

Act
- Prepare for emergency pleural decompression on the right (second intercostal space, midclavicular line)
- Obtain vascular access (IV/IO)
- Administer a fluid bolus 20 mL/kg of isotonic crystalloid rapidly IV/IO

Primary Assessment

- Airway: ETT (size 5.0) secured at 15 cm at the lip
- Breathing: Ventilated via ETT at 20/min, asymmetric chest rise, breath sounds decreased on the right, increasing pressures required to move chest, SpO2 67%
- Circulation: HR 150/min, peripheral pulses weak, central pulses present, delayed capillary refill (about 4 sec), BP 76/56
- Disability: Unresponsive
- Exposure: Normothermic, abrasions to extremities

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Unconscious with slow, irregular respirations before sedation and intubation
- Allergies: None known
- Medications: None
- Past medical history: Healthy
- Last meal: Ate lunch just before event
- Events (onset): Struck by car traveling about 30 mph, thrown about 10 feet, unconscious at scene

Physical Examination:
- Repeat vital signs after continuing BMV ventilations: HR 160, RR 20/min (assisted), SpO2 70%, BP 70/58
- Head, eyes, ears, nose, and throat/neck: No blood or fluid from nose or ears, cervical collar in place; if assessed -/+ jugular venous distention, no tracheal deviation
- Heart and lungs: Markedly diminished breath sounds on right; asymmetric chest rise (left > right)
- Abdomen and pelvis: Abdomen distended
- Extremities: Obvious right femur fracture
- Back: Normal
- Neurologic: Unresponsive, pupils 4 mm, reactive bilaterally

Decide
- Respiratory failure
- Decompensated shock (Cardiopulmonary failure)

Act
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm
- Consider causes of acute deterioration in the intubated patient (DOPE mnemonic)

Recategorize
- Respiratory failure
- Hypotensive shock (Cardiopulmonary failure)
- Obstructive shock

Decide
- Prepare for emergency pleural decompression on the right (second intercostal space, midclavicular line)
- Obtain vascular access (IV/IO)
- Administer a fluid bolus 20 mL/kg of isotonic crystalloid rapidly IV/IO

Tertiary Assessment

- Lab data: ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), CBC, type and cross
- Radiology: Chest x-ray, femur x-ray, CT head, CT abdomen/pelvis
- Consider adding lateral C spine XR

Reassess—identify therapeutic end points in shock management
**Management of Shock Emergencies**

- Oxygen
- Pulse oximetry
- ECG monitor
- IV/IO access
- BLS as indicated
- Bedside glucose

**Hypovolemic Shock**

*Specific Management for Selected Conditions*

<table>
<thead>
<tr>
<th>Nonhemorrhagic</th>
<th>Hemorrhagic</th>
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| • 20 mL/kg NS/LR bolus, repeat as needed  
• Consider colloid after 3rd NS/LR bolus | • Control external bleeding  
• 20 mL/kg NS/LR bolus repeat 2 or 3× as needed  
• Transfuse PRBCs as indicated |

**Distributive Shock**

*Specific Management for Selected Conditions*

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| Management Algorithm:  
• Septic Shock | • IM epinephrine (or auto-injector)  
• Antihistamines  
• Corticosteroids  
• Epinephrine infusion  
• Albuterol | • 20 mL/kg NS/LR bolus, repeat PRN  
• Vasopressor |

**Cardiogenic Shock**

*Specific Management for Selected Conditions*

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| Management Algorithms:  
• Bradycardia  
• Tachycardia with poor perfusion | • 5 to 10 mL/kg NS/LR bolus, repeat PRN  
• Vasoactive infusion  
• Consider expert consultation |

**Obstructive Shock**

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| • Prostaglandin E₁  
• Expert consultation | • Needle decompression  
• Tube thoracostomy | • Pericardiocentesis  
• 20 mL/kg NS/LR bolus | • 20 mL/kg NS/LR bolus, repeat PRN  
• Consider thrombolytics, anticoagulants  
• Expert consultation |

**Instructor points for discussion:**

- The DOPE mnemonic can be used to identify causes of deterioration in the intubated patient.

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| 18     | Manikin with O₂, IV/IO, monitor | Mega supplies to simulate treating pediatric shock patient  
Learning Station Competency Checklist |
Scenario Lead-in

Prehospital: You are dispatched to the home of a 2-year-old child with a high fever.

ED: You are notified that a 2-year-old child with a high fever is en route by BLS ambulance.

Ward: You are called to evaluate a 2-year-old child admitted earlier in the day with a high fever.

ICU: You are called to the bedside where the transport team has just arrived with a 2-year-old child who presented with a high fever.

General Assessment: Pediatric Assessment Triangle

Appearance
- Lethargic, not interactive

Breathing
- Increased rate but no distress

Circulation
- Dark lesions on skin

Act
- Activate emergency response system if appropriate
- Infection control precautions (mask and gloves)
- Administer high flow oxygen

Primary Assessment

Airway: Clear
Breathing: Breathing rate elevated (about 30/min), no distress, breath clear, SpO₂ 95%
Circulation: HR 170/min, peripheral pulses absent, central pulses weak, delayed capillary refill (about 4 sec), BP 70/30
Disability: Lethargic, not interactive
Exposure: Temperature 39.5°C (103°F), purpuric, nonblanching rash on body

Act
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Fever, lethargy, vomiting, spreading rash
- Allergies: None known
- Medications: None
- Past medical history: Healthy
- Last meal: Juice several hours ago
- Events (onset): Fever, lethargy, vomiting started last night; spreading rash noted several hours ago

Physical Examination:
- Repeat vital signs after oxygen administration: HR 170, RR 30/min, SpO₂ 98%, BP 68/30
- Head, eyes, ears, nose, and throat/neck: Mucous membranes dry, neck supple, no jugular venous distention
- Heart and lungs: No murmur or gallop, lungs clear
- Abdomen and pelvis: Normal
- Extremities: Purpuric lesions present on upper and lower extremities
- Back: Normal
- Neurologic: Lethargic, moans in response to pain. Pupils 4 mm, equal, reactive

Recategorize

Hypotensive shock

Distributive (septic) shock

Act
- Obtain vascular access (IV/IO)
- Administer a fluid bolus 20 mL/kg of isotonic crystalloid rapidly IV/IO
- If scope of practice: administer antibiotics if not already done
- Identify vasoactive agent for use if shock is fluid-refractory

Tertiary Assessment

Lab data: ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), calcium, CBC with differential, blood culture

Reassess—identify therapeutic end points in shock management
Shock Core Case 3
Distributive (Septic) Shock

Recognize altered mental status and perfusion
Give oxygen and support ventilation, establish vascular access and begin resuscitation according to PALS guidelines
Consider VBG or ABG, lactate, glucose, ionized calcium, cultures, CBC

First hour: Push repeated 20 mL/kg boluses of isotonic fluid up to 3, 4, or more boluses based on patient response
Additional therapies:
- Correct hypoglycemia & hypocalcemia
- Administer first-dose antibiotics STAT
- Consider ordering STAT vasopressor drip and stress-dose hydrocortisone*

Fluid responsive (ie, normalization of blood pressure and/or perfusion)?
Yes
- Consider ICU Monitoring
No

Scv$_2$ > 70%, low BP
“warm shock”
- Additional fluid boluses
- Norepinephrine +/- vasopressin

Scv$_2$ < 70%, normal BP/poor perfusion
- Transfuse to Hgb > 10 g/dL
- Optimize arterial oxygen saturation
- Additional fluid boluses
- Consider milrinone or nitroprusside
- Consider dobutamine

Scv$_2$ < 70%, low BP/poor perfusion
“cold shock”
- Transfuse to Hgb > 10 g/dL
- Optimize arterial oxygen saturation
- Additional fluid boluses
- Consider epinephrine or dobutamine + norepinephrine

Evaluate Scv$_2$; goal Scv$_2$ sat > 70%?

*Note: Fluid refractory and dopamine- or norepinephrine-dependent shock defines patient at risk for adrenal insufficiency.

Instructor points for discussion:
- Appropriate infection control measures should be taken if there is a potentially transmissible disease. Gloves and mask are typically adequate.
- Aggressive fluid resuscitation is indicated for septic shock.
- In general, vasoactive infusions should not be initiated until after several fluid boluses have been administered (up to 60 mL/kg).

Lesson | Room set-up: | Equipment/activity
--- | --- | ---
19 | Students view and discuss | DVD player, video clips, Septic Shock Algorithm
20 | Manikin with O$_2$, IV/IO, monitor | Mega supplies to simulate treating pediatric shock patient Learning Station Competency Checklist

Scenario Lead-in

Prehospital: You are dispatched to the home of a 5-year-old child with trouble breathing.
ED: You are notified that a 5-year-old child with trouble breathing is en route by BLS ambulance.
Ward: You are called to evaluate a 5-year-old child admitted earlier in the day with suspected reactive airway disease.
ICU: You are called to the bedside where the transport team has just arrived with a 5-year-old child who presented with fatigue and trouble breathing.

General Assessment: Pediatric Assessment Triangle

Appearance
- Lethargic, not interactive
Breathing
- Increased rate but no distress
Circulation
- Pale, mottled skin

Categorize
Respiratory distress, Shock

Decide

Act
- Activate emergency response system if appropriate
- Administer high flow oxygen

Primary Assessment

- Airway: Clear
- Breathing: Breathing rate elevated (about 36/min), mild intercostal retractions, nasal flaring, SpO2 93%
- Circulation: HR 140/min, peripheral pulses weak, central pulses present, delayed capillary refill (about 4 sec), BP 74/54
- Disability: Lethargic, not interactive
- Exposure: Normothermic, no rashes

Categorize
Respiratory distress, Hypotensive shock

Decide

Act
- Apply pulse oximeter
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Lethargy, rapid breathing
- Allergies: None known
- Medications: Albuterol inhaler
- Past medical history: Mild reactive airway disease (asthma)
- Last meal: Milk several hours ago
- Events (onset): URI resolved 1 week ago. Progressive fatigue, lethargy, unable to lie flat because of trouble breathing.

Physical Examination:
- Repeat vital signs after oxygen administration: HR 150, RR 30/min, SpO2 98%, BP 68/40
- Head, eyes, ears, nose, and throat/neck: Mucous membranes dry, + jugular venous distention
- Heart and lungs: Rapid rate, gallop, no murmur; crackles at lung bases
- Abdomen and pelvis: Liver edge palpable 4 cm below right costal margin
- Extremities: Cool peripherally, otherwise normal
- Back: Normal
- Neurologic: Lethargic, withdraws to pain. Pupils 4 mm, equal, reactive

Recategorize
Hypotensive shock
Cardiogenic shock

Decide

Act
- Obtain vascular access (IV/IO)
- Administer a fluid bolus 5-10 mL/kg of isotonic crystalloid slowly IV/IO
- Identify vasoactive agent for use if shock is persistent

Reassess—identify therapeutic end points in shock management

Tertiary Assessment

- Lab data: ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), calcium, magnesium, phosphorous, CBC with differential, blood culture
- Radiology: CXR, ECG, ECHO
### Management of Shock Emergencies
- Oxygen
- Pulse oximetry
- ECG monitor
- IV/IO access
- BLS as indicated
- Bedside glucose

### Hypovolemic Shock
#### Specific Management for Selected Conditions

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### Distributive Shock
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### Cardiogenic Shock
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Instructor points for discussion:
- In general, vasoactive infusions should not be initiated until after several fluid boluses have been administered (up to 60 mL/kg).
- Give smaller fluid boluses (5 to 10 mL/kg) over a longer period of time (10 to 20 minutes) in suspected cardiogenic shock.
- Vasoactive drugs that cause peripheral vasodilation (dobutamine, milrinone) are frequently used in cardiogenic shock due to compensatory mechanisms that impair cardiac output.

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**Scenario Lead-in**

**Prehospital:** You are dispatched to a school where a 6-year-old child has collapsed.

**ED:** You are notified that a 6-year-old child is being transported by BLS ambulance with CPR in progress.

**Ward:** You are called to a Code Blue on the pediatric inpatient unit.

**ICU:** You are called to the bedside to evaluate a 6-year-old child who was admitted earlier in the day.

---

**General Assessment:**

**Pediatric Assessment Triangle**

- **Appearance**
  - Unresponsive, limp
- **Breathing**
  - No effort
- **Circulation**
  - Cyanotic

**Categorize**

**Life-threatening condition**

**Act**

- Activate emergency response system if appropriate
- Begin or ensure continuation of CPR (see below). Monitor quality of compressions and ventilations provided.

---

**Primary Assessment**

- **Airway:** Not maintained
- **Breathing:** Apnea
- **Circulation:** No central pulses
- **Disability:** Unresponsive, limp
- **Exposure:** Deferred

**Categorize**

**Cardiac arrest**

**Act**

- Place leads or pads and assess cardiac rhythm on the monitor
- Throughout CPR assess effectiveness of compressions and ventilations provided
- Use 100% oxygen when available

**Recategorize**

**Cardiac arrest**

**VF or pulseless VT**

**Act**

- Provide high-quality CPR
- Attempt defibrillation at 2 J/kg
- Continue CPR for about 2 minutes
- Establish IV/IO access
- Prepare epinephrine 0.01 mg/kg (0.1 mL/kg of 1:10 000)
- Perform rhythm check (persistent VF/pulseless VT)/rotate compressors
- Attempt defibrillation at 4 J/kg
- Continue CPR for about 2 minutes
- Administer epinephrine IV/IO during compressions (anytime after second rhythm check)
- Prepare an antiarrhythmic (amiodarone or lidocaine)
VF/Pulseless VT

1. **PULSELESS ARREST**
   - BLS Algorithm: Continue CPR
   - Give oxygen when available
   - Attach monitor/defibrillator when available

2. **Check rhythm**
   - Shockable rhythm?

3. **VF/VT**
   - **Shockable**
   - Give 1 shock
     - Manual: 2 J/kg
     - AED: >1 year of age
     - Use pediatric system if available for 1 to 8 years of age
     - Resume CPR immediately
   - Give 5 cycles of CPR*
   - Check rhythm
   - Shockable rhythm?
     - **Shockable**

4. **Check rhythm**
   - **Not Shockable**
     - Asystole/PEA
     - Resume CPR immediately
     - Give epinephrine
       - IV/IO: 0.01 mg/kg (1:10,000: 0.1 mL/kg)
       - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
     - Repeat every 3 to 5 min

5. **Give 5 cycles of CPR***
   - **Not Shockable**
     - Continue CPR while defibrillator is charging
     - Give 1 shock
       - Manual: 4 J/kg
       - AED: >1 year of age
     - Resume CPR immediately
     - Give epinephrine
       - IV/IO: 0.01 mg/kg (1:10,000: 0.1 mL/kg)
       - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
     - Repeat every 3 to 5 min

6. **Check rhythm**
   - Shockable rhythm?
     - **Shockable**

7. **Give 5 cycles of CPR***
   - **Not Shockable**
     - Continue CPR while defibrillator is charging
     - Give 1 shock
       - Manual: 4 J/kg
       - AED: >1 year of age
     - Resume CPR immediately
     - Consider antiarrhythmics
       - (eg, amiodarone 5 mg/kg IV/IO or lidocaine 1 mg/kg IV/IO)
       - Consider magnesium 25 to 50 mg/kg IV/IO, max 2 g for torsades de pointes
       - After 5 cycles of CPR* go to Box 5 above

8. **Check rhythm**
   - **Not Shockable**
     - Go to Box 4

9. **Asystole/PEA**
   - Resume CPR immediately
   - Give epinephrine
     - IV/IO: 0.01 mg/kg (1:10,000: 0.1 mL/kg)
     - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
   - Repeat every 3 to 5 min

10. **Check rhythm**
    - Shockable rhythm?
      - **Not Shockable**
        - If asystole, go to Box 10
        - If electrical activity, check pulse. If no pulse, go to Box 10
        - If pulse present, begin postresuscitation care
      - **Shockable**

11. **Give 5 cycles of CPR***
    - **Not Shockable**
      - Check rhythm
      - **Shockable**
        - If asystole, go to Box 10
        - If electrical activity, check pulse. If no pulse, go to Box 10
        - If pulse present, begin postresuscitation care
    - **Shockable**
      - Resume CPR immediately
      - Give 1 shock
        - Manual: 2 J/kg
        - AED: >1 year of age
      - Use pediatric system if available for 1 to 8 years of age
      - Resume CPR immediately

12. **During CPR**
    - Push hard and fast (100/min)
    - Ensure full chest recoil
    - Minimize interruptions in chest compressions
      - One cycle of CPR: 15 compressions then 2 breaths; 5 cycles = 1 to 2 min
      - Avoid hyperventilation
      - Secure airway and confirm placement.
      - After an advanced airway is placed, rescuers no longer deliver “cycles” of CPR. Give continuous chest compressions without pauses for breaths. Give 8 to 10 breaths/minute. Check rhythm every 2 minutes.

13. **Consider**
    - Antiarrhythmics (eg, amiodarone 5 mg/kg IV/IO or lidocaine 1 mg/kg IV/IO)
    - Magnesium 25 to 50 mg/kg IV/IO, max 2 g for torsades de pointes
    - After 5 cycles of CPR* go to Box 5 above

**Instructor points for discussion:**
- Minimize interruptions in chest compressions; **ideally** pause only for ventilations, rhythm checks, and shock delivery. Once advanced airway is in place (LMA or ETT), compressors can provide continuous compressions (rate of 100/min), and rescuer providing ventilations can deliver 8 to 10 breaths/min (1 breath every 6 to 8 seconds).
- Consider potentially reversible causes.

---

**Lesson | Room set-up: | Equipment/activity**
---
7 | Students observe team video | Manikin and mega supplies/instructor leads a team using algorithm
8 | Manikin with mega supplies | Team role labels, mega supplies, simulate team managing an arrest; learning station competency checklist
**Scenario Lead-in**

**Prehospital:** You are dispatched to the home of a 1-year-old child who is not breathing.

**ED:** You are notified that a 1-year-old child is being transported by BLS ambulance with CPR in progress.

**Ward:** You are called to a Code Blue on the pediatric inpatient unit.

**ICU:** You are called to the bedside to evaluate a 1-year-old child who was admitted earlier in the day.

---

**General Assessment: Pediatric Assessment Triangle**

- **Appearance**
  - Unresponsive, limp

- **Breathing**
  - No effort

- **Circulation**
  - Cyanotic

**Categorize**

**Life-threatening condition**

**Act**

- Activate emergency response system if appropriate
- Begin CPR (or verify effectiveness of ventilation and compressions provided)
- Administer 100% oxygen as soon as it is available

---

**Primary Assessment**

- **Airway:** Not maintained
- **Breathing:** Apnea
- **Circulation:** No central pulses
- **Disability:** Unresponsive, limp
- **Exposure:** Deferred

**Categorize**

**Cardiac arrest**

**Act**

- Place leads or pads and assess cardiac rhythm on the monitor
- Throughout CPR assess effectiveness of compressions and ventilations provided
- Use 100% oxygen when available

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**Recategorize**

**Cardiac arrest Asystole or PEA**

**Act**

- Provide high-quality CPR
- Establish vascular access (IV/IO)
- Prepare and administer epinephrine 0.01 mg/kg (0.1 mL/kg of 1:10 000) IV/IO every 3 to 5 minutes
- Perform rhythm check after about 2 minutes of CPR; rotate compressors
- Consider underlying causes of asystole/PEA
Cardiac Core Case 2
Asystole/PEA

**PULSELESS ARREST**
- BLS Algorithm: Continue CPR
- Give oxygen when available
- Attach monitor/defibrillator when available

1. **Shockable**
   - Check rhythm
   - Shockable rhythm?

2. **Not Shockable**
   - Check rhythm
   - Shockable rhythm?

3. **VF/VT**
   - Give 5 cycles of CPR*

4. **Give 1 shock**
   - Manual: 2 J/kg
   - AED: >1 year of age
   - Use CPR immediately

5. **Give 5 cycles of CPR***
   - Check rhythm
   - Shockable rhythm?

6. **Shockable**
   - Continue CPR while defibrillator is charging
   - Give 1 shock
   - Manual: 4 J/kg
   - AED: >1 year of age
   - Resume CPR immediately
   - Give epinephrine
   - IV/IO: 0.01 mg/kg (1:10,000: 0.1 mL/kg)
   - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
   - Repeat every 3 to 5 min

7. **Give 5 cycles of CPR***
   - Check rhythm
   - Shockable rhythm?

8. **Shockable**
   - Continue CPR while defibrillator is charging
   - Give 1 shock
   - Manual: 4 J/kg
   - AED: >1 year of age
   - Resume CPR immediately
   - Consider antiarrhythmics
     - (eg, amiodarone 5 mg/kg IV/IO or lidocaine 1 mg/kg IV/IO)
   - Consider magnesium 25 to 50 mg/kg IV/IO,
     max 2 g for torsades de points
   - After 5 cycles of CPR* go to Box 5 above

9. **Asystole/PEA**
   - Resume CPR immediately
   - Give epinephrine
   - IV/IO: 0.01 mg/kg (1:10,000: 0.1 mL/kg)
   - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
   - Repeat every 3 to 5 minutes

10. **Check rhythm**
    - Shockable rhythm?

11. **Give 5 cycles of CPR***
    - Check rhythm
    - Shockable rhythm?

12. **Not Shockable**
    - If electrical activity, check pulse. If no pulse, go to Box 10
    - If pulse present, begin postresuscitation care

13. **Go to Box 4**

**During CPR**
- Push hard and fast (100/min)
- Ensure full chest recoil
- Minimize interruptions in chest compressions
- One cycle of CPR: 15 compressions then 2 breaths; 5 cycles =1 to 2 min
- Avoid hyperventilation
- Secure airway and confirm placement.
- After an advanced airway is placed, rescuers no longer deliver “cycles” of CPR. Give continuous chest compressions without pauses for breaths. Give 8 to 10 breaths/minute. Check rhythm every 2 minutes.
- Rotate compressors every 2 minutes with rhythm checks
- Search for and treat possible contributing factors:
  - Hypovolemia
  - Hypoxia
  - Hydrogen ion (acidosis)
  - Hypo-/hyperkalemia
  - Hypoglycemia
  - Hypothermia
  - Toxins
  - Tamponade, cardiac
  - Tension pneumothorax
  - Thrombosis (coronary or pulmonary)
  - Trauma

**Instructor points for discussion:**
- Review potentially reversible causes of asystole/PEA.
- Monitor effectiveness of compressions and ventilations provided.

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<td>Students observe team demonstration</td>
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<td>Manikin with mega supplies</td>
<td>Team role tags, mega set up, simulate team managing an arrest; steps, learning station competency checklist</td>
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Supraventricular Tachycardia

Cardiac Core Case 3

Scenario Lead-in

Prehospital: You are dispatched to the home of a 4-month-old infant with trouble breathing.
ED: You are notified that a 4-month-old infant is en route via BLS ambulance with trouble breathing.
Ward: You are called to assess a 4-month-old infant on the pediatric ward who is having increased respiratory distress.
ICU: You are called to the bedside to evaluate a 4-month-old infant admitted to the ICU who is having increased respiratory distress.

General Assessment: Pediatric Assessment Triangle

Appearance
- Anxious

Breathing
- Increased rate and work

Circulation
- Pale, mottled skin

Categorize
Respiratory distress

Decide

Act
- Activate emergency response system if appropriate
- Provide high flow oxygen

Primary Assessment

- Airway: Clear
- Breathing: Rapid respiratory rate (about 60/min), intercostal retractions, flaring, crackles in lung bases bilaterally, SpO2 95%
- Circulation: HR rapid at about 255/min, central pulses present, weak peripheral pulses, delayed capillary refill (about 4 sec), skin cool and mottled, BP 76/50
- Disability: Awake, anxious look on face
- Exposure: Afebrile, no rashes

Secondary Assessment

SAMPLE History:
- Signs and Symptoms: Irritability, diaphoresis, rapid breathing
- Allergies: None known
- Medications: None
- Past medical history: Previously healthy, term infant
- Last meal: 2 oz formula 4 hours ago
- Events (onset): Began having difficulty eating 2 days ago

Physical Examination:
- Repeat vital signs after adenosine: BP 74/52, HR 250, RR 60, SpO2 100% on blow-by oxygen
- Head, eyes, ears, nose, and throat/neck: Nasal flaring
- Heart and lungs: Tachycardic; no murmur, gallop, or rub; lungs with crackles at bases, intercostal retractions
- Abdomen and pelvis: Liver edge palpable 3 cm below right costal margin
- Extremities: No edema; no rash; cool skin; peripheral pulses weak, delayed capillary refill
- Back: Normal
- Neurologic: Awake and anxious, weak cry in response to pain

Recategorize
Respiratory distress
Compensated shock
Cardiac arrhythmia (SVT)

Act
- Perform vagal maneuvers (eg, ice to face)
- Obtain vascular access (IV/IO)
- Prepare adenosine 0.1 mg/kg and saline flush
- Administer adenosine IV/IO by rapid bolus followed by saline flush
- Be prepared for synchronized cardioversion at 0.5 to 1 J/kg

Tertiary Assessment

- Lab data: ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), calcium, magnesium, phosphorous. Consider lactate.
- Radiology: Chest x-ray
- ECG
Supraventricular Tachycardia

- If IV access readily available:
  Give **adenosine** 0.1 mg/kg (maximum first dose 6 mg) by rapid bolus
  May double first dose and give once (maximum second dose 12 mg)
  or
  **Synchronized cardioversion**: 0.5 to 1 J/kg; if not effective, increase to 2 J/kg
  Sedate if possible but don’t delay cardioversion

- Search for and treat cause
  **Consider vagal maneuvers** (No delays)

Probable Sinus Tachycardia
- Compatible history consistent with known cause
- P waves present/normal
- Variable R-R; constant PR
- Infants: rate usually <220/min
- Children: rate usually <180/min

Probable Supraventricular Tachycardia
- Compatible history (vague, nonspecific); history of abrupt rate changes
- P waves absent/abnormal
- HR not variable
- Infants: rate usually ≥220/min
- Children: rate usually ≥180/min

Evaluate rhythm with 12-lead ECG or monitor
Evaluate QRS duration
Narrow QRS (≤0.08 sec) → Symptoms Persist → Evaluate RNS duration → Wide QRS (>0.08 sec) → Possible Ventricular Tachycardia

Evaluate QRS duration
Narrow QRS (≤0.08 sec) → Symptoms Persist → Evaluate RNS duration → Wide QRS (>0.08 sec) → Possible Ventricular Tachycardia

During Evaluation
- Secure, verify airway and vascular access when possible
- Consider expert consultation
- Prepare for cardioversion

**TACHYCARDIA** With Pulses and Poor Perfusion
- Assess and support ABCs as needed
- Give oxygen
- Attach monitor/defibrillator

Search for and treat cause

- **Expert consultation advised**
  - **Amiodarone** 5 mg/kg IV over 20 to 60 minutes
  - **Procainamide** 15 mg/kg IV over 30 to 60 minutes
  Do not routinely administer amiodarone and procainamide together

**TACHYCARDIA** With Pulses and Poor Perfusion
- Assess and support ABCs as needed
- Give oxygen
- Attach monitor/defibrillator

During Evaluation
- Secure, verify airway and vascular access when possible
- Consider expert consultation
- Prepare for cardioversion

**Treat possible contributing factors:**
- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypoglycemia
- Hypothermia
- Toxins
- Tamponade, cardiac
- Tension pneumothorax
- Thrombosis (coronary or pulmonary)
- Trauma (hypovolemia)

Instructor points for discussion:
- Discuss how to distinguish between sinus tachycardia (ST) and supraventricular tachycardia (SVT).
- Point out to the students that although the patient has respiratory distress, there may be secondary respiratory effects of systemic illness, including shock and metabolic acidosis.
- Discuss indications for synchronized cardioversion.

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<td>Team role tags, mega set up, simulate team leader managing a child with a fast rhythm</td>
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**Scenario Lead-in**

**Prehospital:** You are dispatched to the home of a 5-year-old child who is unconscious.

**ED:** You are notified that an unconscious 5-year-old child is en route via his parents’ car.

**Ward:** You are called to a Code Blue on the pediatric ward.

**ICU:** You are called to the bedside to evaluate a 5-year-old child who was admitted to the ICU earlier today.

---

**General Assessment: Pediatric Assessment Triangle**

**Appearance**
- Unresponsive

**Breathing**
- Decreased effort, poor chest rise

**Circulation**
- Pale, cyanotic skin

**Categorize**
Acute, life-threatening problem

**Decide**

**Act**
- Activate emergency response system if appropriate
- Assist ventilations with 100% oxygen

---

**Primary Assessment**

- **Airway:** Snoring noises (soft tissue obstruction)
- **Breathing:** Slow respiratory rate (about 6/min), poor chest rise, SpO2 70%
- **Circulation:** HR slow at about 40/min, central pulses present, weak peripheral pulses, delayed capillary refill (about 4 sec), BP 60/40
- **Disability:** Unresponsive
- **Exposure:** Normothermic, no rashes

**Categorize**
Respiratory failure
Hypotensive shock
(Cardiopulmonary failure)

**Decide**

**Act**
- Consider initiation of chest compressions
- Attach pads/leads, turn on monitor
- Identify cardiac rhythm

---

**Secondary Assessment**

SAMPLE History:
- **Signs and Symptoms:** Lethargy, confusion, difficulty walking
- **Allergies:** None known
- **Medications:** None
- **Past medical history:** Previously healthy
- **Last meal:** Dinner last night
- **Events (onset):** Found unresponsive in bedroom this morning

Physical Examination:
- Repeat vital signs after BMV: HR 90, RR 16 (assisted), SpO2 90%
- **Head, eyes, ears, nose, and throat/neck:** Normal
- **Heart and lungs:** No murmur, gallop, or rub; lungs clear
- **Abdomen and pelvis:** Normal
- **Extremities:** No edema; no rash; cool skin; peripheral pulses weak, delayed capillary refill
- **Back:** Normal
- **Neurologic:** Unresponsive, does not react to pain

**Recategorize**
Respiratory failure
Hypotensive shock
(Cardiopulmonary failure)
Cardiac arrhythmia
( Bradycardia)

**Decide**

**Act**
- Obtain vascular access (IV/IO)
- Prepare epinephrine 0.01 mg/kg (0.1 mL/kg of 1:10 000)
- Administer epinephrine IV/IO followed by a saline flush
- Consider potentially reversible causes of bradycardia

---

**Tertiary Assessment**

- **Lab data:** ABG/VBG, electrolytes, BUN/creatinine, glucose (bedside and lab), calcium, magnesium, phosphorous, toxicology screen.
- **Radiology:** Chest x-ray, CT of head
- **ECG**

**Reassess**
Cardiac Core Case 4
Bradycardia

**BRADYCARDIA With a Pulse**
Causing cardiorespiratory compromise

- Support ABCs as needed
- Give oxygen
- Attach monitor/defibrillator

Bradycardia still causing cardiorespiratory compromise?

- Perform CPR if despite oxygenation and ventilation HR <60/min with poor perfusion

Persistent symptomatic bradycardia?

- Give epinephrine
  - IV/IO: 0.01 mg/kg (1:10000: 0.1 mL/kg)
  - Endotracheal tube: 0.1 mg/kg (1:1000: 0.1 mL/kg)
  Repeat every 3 to 5 minutes
- If increased vagal tone or primary AV block:
  Give atropine, first dose: 0.02 mg/kg, may repeat. (Minimum dose: 0.1 mg; maximum total dose for child: 1 mg.)
  - Consider cardiac pacing

**Reminders**
- During CPR, push hard and fast (100/min)
- Ensure full chest recoil
- Minimize interruptions in chest compressions
- Support ABCs
- Secure airway if needed; confirm placement
- Search for and treat possible contributing factors:
  - Hypovolemia
  - Hypoxia or ventilation problems
  - Hydrogen ion (acidosis)
  - Hypo-/hyperkalemia
  - Hypoglycemia
  - Hyperthermia
  - Toxins
  - Tamponade, cardiac
  - Tension pneumothorax
  - Thrombosis (coronary or pulmonary)
  - Trauma (hypovolemia, increased ICP)

Instructor points for discussion:
- Chest compressions should be initiated if there is not rapid improvement in HR to >60 after beginning assisted ventilations with 100% oxygen.
  It is also acceptable to initiate chest compressions when the slow pulse is identified and to discontinue after reassessment of the heart rate.
- Potentially reversible causes include hypothermia, heart block, increased intracranial pressure, toxins, hypoxia, and heart transplant.
- Epinephrine is preferred over atropine for bradycardia secondary to hypoxia.

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