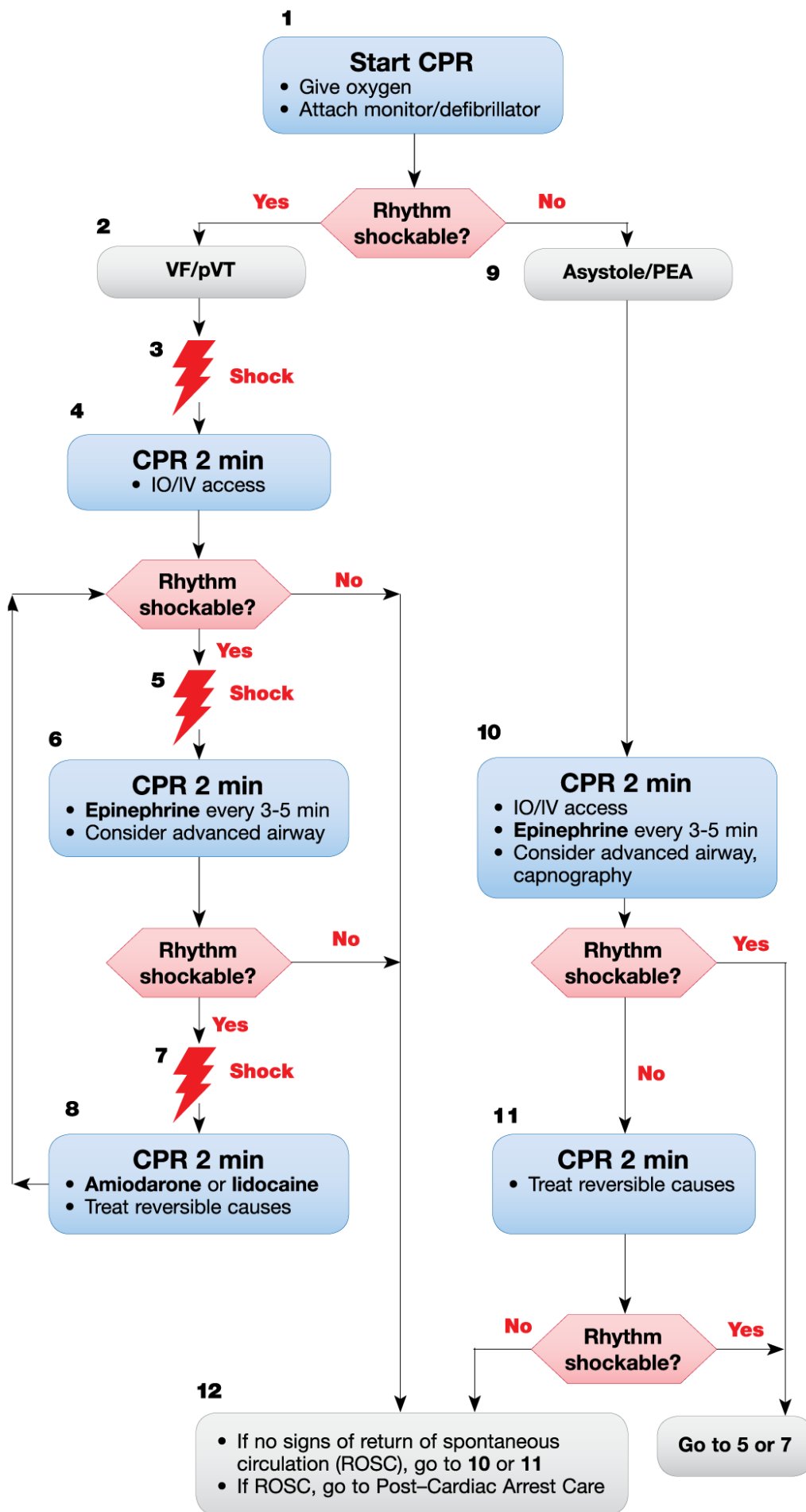


Pediatric Cardiac Arrest Algorithm—2018 Update



CPR Quality

- Push hard ($\geq \frac{1}{3}$ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Change compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 15:2 compression-ventilation ratio.

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥ 4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration).
 - **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
- OR-
- **Lidocaine IO/IV dose:** Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
- Once advanced airway in place, give 1 breath every 6 seconds (10 breaths/min) with continuous chest compressions

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

Pediatric Bradycardia With a Pulse and Poor Perfusion Algorithm

1

Identify and treat underlying cause

- Maintain patent airway; assist breathing as necessary
- Oxygen
- Cardiac monitor to identify rhythm; monitor blood pressure and oximetry
- IO/IV access
- 12-Lead ECG if available; don't delay therapy

2

Cardiopulmonary compromise?

- Hypotension
- Acutely altered mental status
- Signs of shock

No

Yes

3

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

4a

- Support ABCs
- Give oxygen
- Observe
- Consider expert consultation

No

4

Bradycardia persists?

Yes

5

- **Epinephrine**
- **Atropine** for increased vagal tone or primary AV block
- Consider transthoracic pacing/transvenous pacing
- Treat underlying causes

6

If pulseless arrest develops, go to Cardiac Arrest Algorithm

Doses/Details

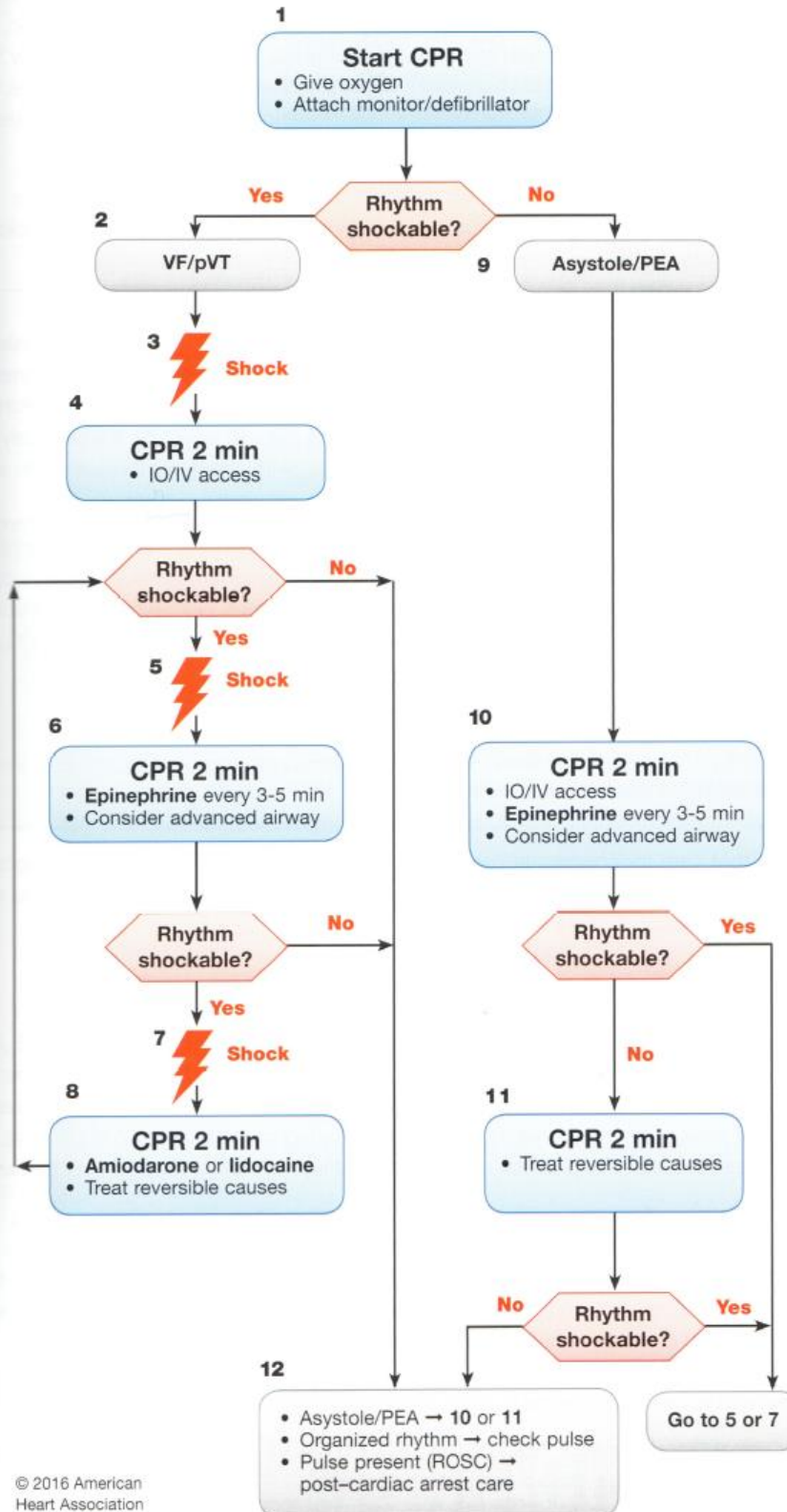
Epinephrine IO/IV dose:

0.01 mg/kg (0.1 mL/kg of 1:10 000 concentration). Repeat every 3-5 minutes. If IO/IV access not available but endotracheal (ET) tube in place, may give ET dose: 0.1 mg/kg (0.1 mL/kg of 1:1000).

Atropine IO/IV dose:

0.02 mg/kg. May repeat once. Minimum dose 0.1 mg and maximum single dose 0.5 mg.

Pediatric Cardiac Arrest Algorithm—2015 Update



CPR Quality

- Push hard ($\geq\frac{1}{3}$ of anteroposterior diameter of chest) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruptions in compressions.
- Avoid excessive ventilation.
- Rotate compressor every 2 minutes, or sooner if fatigued.
- If no advanced airway, 15:2 compression-ventilation ratio.

Shock Energy for Defibrillation

First shock 2 J/kg, second shock 4 J/kg, subsequent shocks ≥ 4 J/kg, maximum 10 J/kg or adult dose

Drug Therapy

- **Epinephrine IO/IV dose:** 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration). Repeat every 3-5 minutes. If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration).
- **Amiodarone IO/IV dose:** 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.
- **Lidocaine IO/IV dose:** Initial: 1 mg/kg loading dose. Maintenance: 20-50 mcg/kg per minute infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus therapy).

Advanced Airway

- Endotracheal intubation or supraglottic advanced airway
- Waveform capnography or capnometry to confirm and monitor ET tube placement
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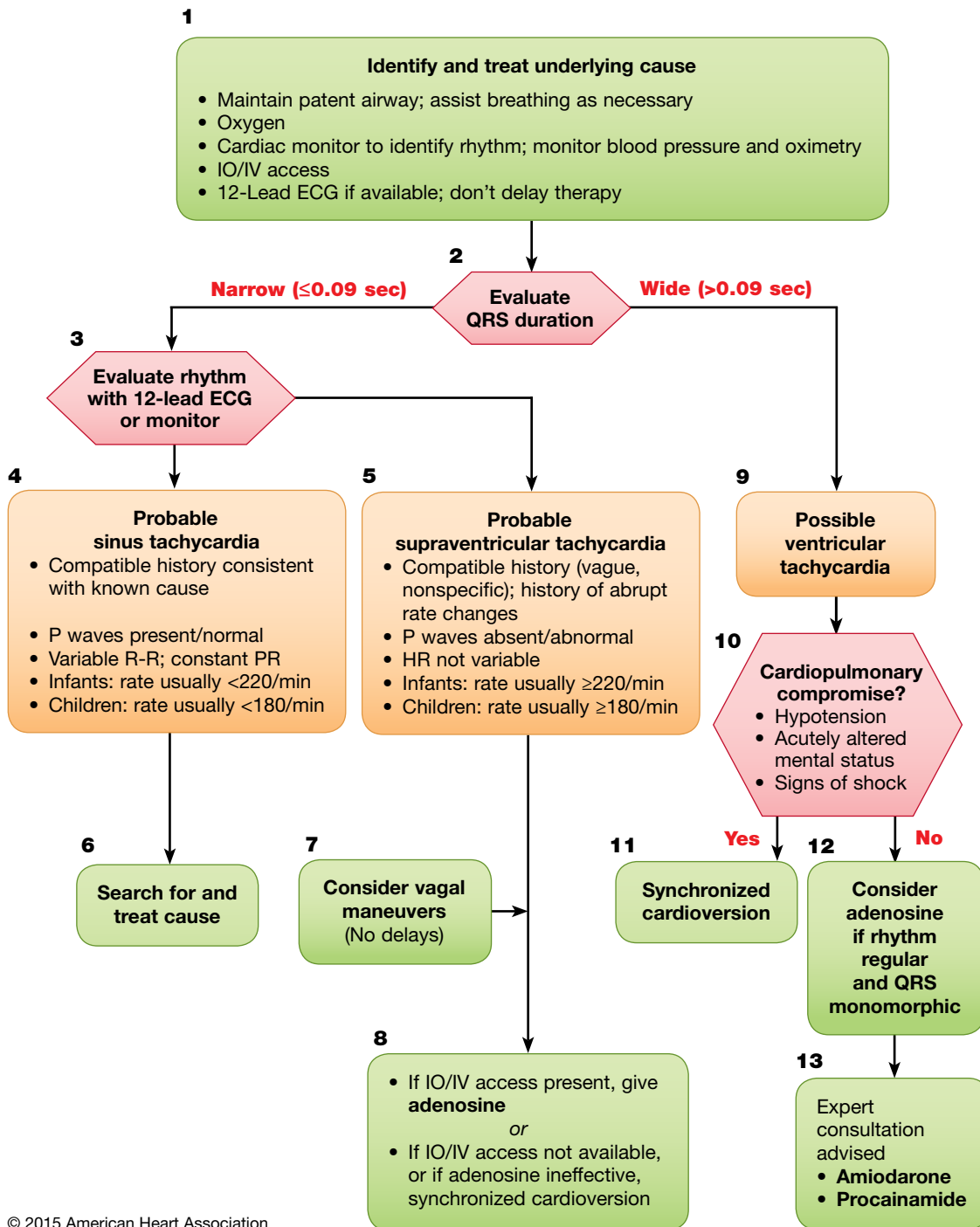
Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Spontaneous arterial pressure waves with intra-arterial monitoring

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypoglycemia
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

Pediatric Tachycardia With a Pulse and Poor Perfusion Algorithm



| Doses/Details |
|--|
| Synchronized Cardioversion |
| Begin with 0.5-1 J/kg; if not effective, increase to 2 J/kg. Sedate if needed, but don't delay cardioversion. |
| Drug Therapy |
| Adenosine IO/IV dose: First dose: 0.1 mg/kg rapid bolus (maximum: 6 mg). Second dose: 0.2 mg/kg rapid bolus (maximum second dose: 12 mg). |
| Amiodarone IO/IV dose: 5 mg/kg over 20-60 minutes or |
| Procainamide IO/IV dose: 15 mg/kg over 30-60 minutes |
| Do not routinely administer amiodarone and procainamide together. |

Pediatric Septic Shock Algorithm

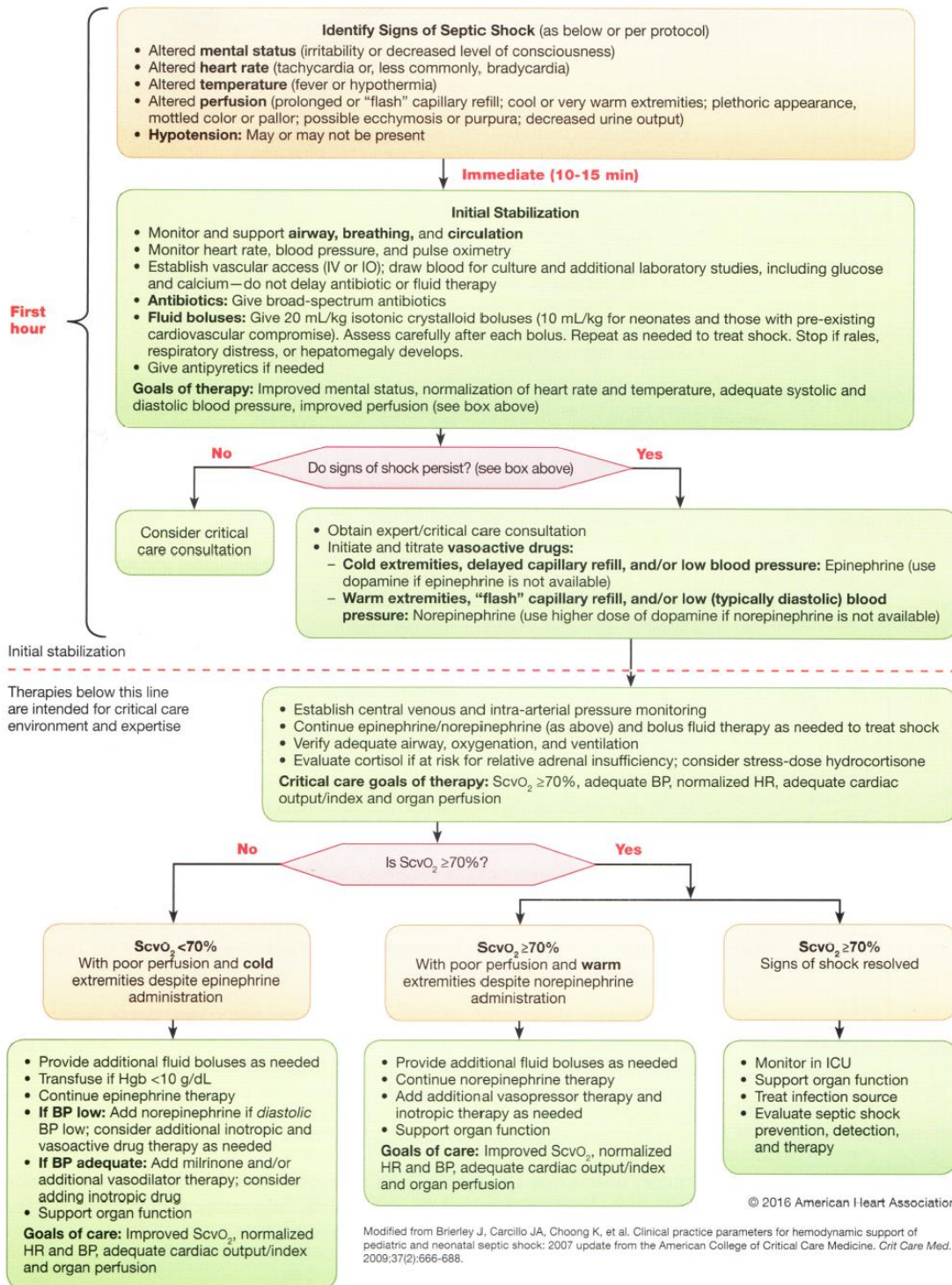


Figure 40. The Pediatric Septic Shock Algorithm.

Management of Shock After ROSC

1

Optimize Ventilation and Oxygenation

- Titrate FiO_2 to maintain oxyhemoglobin saturation 94%-99% (or as appropriate to the patient's condition); if possible, wean FiO_2 if saturation is 100%.
- Consider advanced airway placement and waveform capnography.
- If possible, target a Pco_2 that is appropriate for the patient's condition and limit exposure to severe hypercapnia or hypocapnia.

2

Assess for and Treat Persistent Shock

- Identify and treat contributing factors.*
- Consider 20 mL/kg IV/IO boluses of isotonic crystalloid. Consider smaller boluses (eg, 10 mL/kg) if poor cardiac function suspected.
- Consider the need for inotropic and/or vasopressor support for fluid-refractory shock.

3

***Possible Contributing Factors**

- Hypovolemia**
- Hypoxia**
- Hydrogen ion (acidosis)**
- Hypoglycemia**
- Hypo-/hyperkalemia**
- Hypothermia**
- Tension pneumothorax**
- Tamponade, cardiac**
- Toxins**
- Thrombosis, pulmonary**
- Thrombosis, coronary**
- Trauma**

4

Hypotensive Shock

- Epinephrine
- Dopamine
- Norepinephrine

5

Normotensive Shock

- Dobutamine
- Dopamine
- Epinephrine
- Milrinone

6

- Monitor for and treat agitation and seizures.
- Monitor for and treat hypoglycemia.
- Assess blood gas, serum electrolytes, and calcium.
- If patient remains comatose after resuscitation from cardiac arrest, maintain targeted temperature management, including aggressive treatment of fever.
- Consider consultation and patient transport to tertiary care center.

Pediatric Color-Coded Length-Based Resuscitation Tape

| Equipment | GRAY* 3-5 kg | PINK Small Infant 6-7 kg | RED Infant 8-9 kg | PURPLE Toddler 10-11 kg | YELLOW Small Child 12-14 kg | WHITE Child 15-18 kg | BLUE Child 19-23 kg | ORANGE Large Child 24-29 kg | GREEN Adult 30-36 kg |
|-------------------------------|---|--------------------------------|----------------------------|-------------------------------|-----------------------------------|----------------------------|----------------------------|-----------------------------------|----------------------------|
| Resuscitation bag | | Infant/child | Infant/child | Child | Child | Child | Child | Child | Adult |
| Oxygen mask (NRB) | | Pediatric | Pediatric | Pediatric | Pediatric | Pediatric | Pediatric | Pediatric | Pediatric/adult |
| Oral airway (mm) | 50 | 50 | 50 | 60 | 60 | 60 | 70 | 80 | 80 |
| Laryngoscope blade (size) | 1 Straight | 1 Straight | 1 Straight | 1 Straight | 2 Straight | 2 Straight | 2 Straight or curved | 2 Straight or curved | 3 Straight or curved |
| ET tube (mm) [†] | 3.5 Uncuffed 3.0 Cuffed | 3.5 Uncuffed 3.0 Cuffed | 3.5 Uncuffed 3.0 Cuffed | 4.0 Uncuffed 3.5 Cuffed | 4.5 Uncuffed 4.0 Cuffed | 5.0 Uncuffed 4.5 Cuffed | 5.5 Uncuffed 5.0 Cuffed | 6.0 Cuffed | 6.5 Cuffed |
| ET tube insertion length (cm) | 3 kg 9-9.5 4 kg 9.5-10 5 kg 10-10.5 | 10.5-11 | 10.5-11 | 11-12 | 13.5 | 14-15 | 16.5 | 17-18 | 18.5-19.5 |
| Suction catheter (F) | 8 | 8 | 8 | 10 | 10 | 10 | 10 | 10 | 10-12 |
| BP cuff | Neonatal #5/infant | Infant/child | Infant/child | Child | Child | Child | Child | Child | Small adult |
| IV catheter (ga) | 22-24 | 22-24 | 22-24 | 20-24 | 18-22 | 18-22 | 18-20 | 18-20 | 16-20 |
| IO (ga) | 18/15 | 18/15 | 18/15 | 15 | 15 | 15 | 15 | 15 | 15 |
| NG tube (F) | 5-8 | 5-8 | 5-8 | 8-10 | 10 | 10 | 12-14 | 14-18 | 16-18 |
| Urinary catheter (F) | 5 | 8 | 8 | 8-10 | 10 | 10-12 | 10-12 | 12 | 12 |
| Chest tube (F) | 10-12 | 10-12 | 10-12 | 16-20 | 20-24 | 20-24 | 24-32 | 28-32 | 32-38 |

Abbreviations: BP, blood pressure; ET, endotracheal; F, French; IO, intraosseous; IV, intravenous; NG, nasogastric; NRB, nonbreathing.

*For Gray column, use Pink or Red equipment sizes if no size is listed.

[†]Per 2010 AHA Guidelines, in the hospital cuffed or uncuffed tubes may be used (see Estimating Endotracheal Tube Size on the reverse side of this card).

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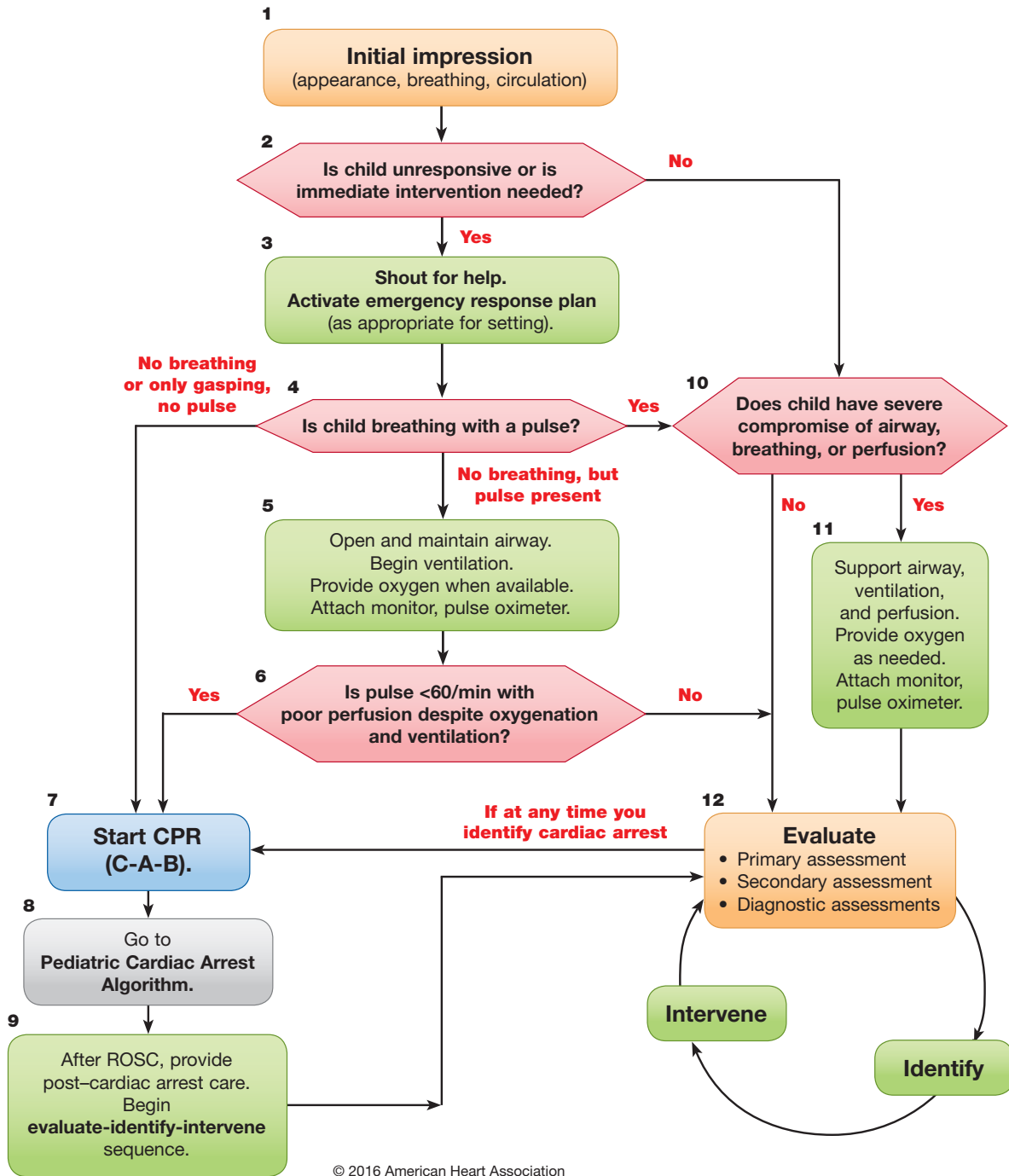
Drugs Used in PALS

| Drug | Indications/Dosages |
|-----------------------------|---|
| Adenosine | SVT <ul style="list-style-type: none"> 0.1 mg/kg IV/IO rapid push (max 6 mg), second dose 0.2 mg/kg IV/IO rapid push (max 12 mg) |
| Albuterol | Asthma, anaphylaxis (bronchospasm), hyperkalemia <ul style="list-style-type: none"> MDI: 4 to 8 puffs via inhalation q 20 minutes PRN with spacer (or ET if intubated) Nebulizer: 2.5 mg/dose (wt <20 kg) or 5 mg/dose (wt >20 kg) via inhalation q 20 minutes PRN Continuous nebulizer: 0.5 mg/kg per hour via inhalation (max 20 mg/h) |
| Amiodarone | SVT, VT (with pulses) <ul style="list-style-type: none"> 5 mg/kg IV/IO load over 20 to 60 minutes (max 300 mg), repeat to daily max 15 mg/kg (2.2 g in adolescents) Pulseless arrest (ie, VF/pulseless VT) <ul style="list-style-type: none"> 5 mg/kg IV/IO bolus (max 300 mg), repeat to daily max 15 mg/kg (2.2 g in adolescents) |
| Atropine sulfate | Bradycardia (symptomatic) <ul style="list-style-type: none"> 0.02 mg/kg IV/IO (max single dose 0.5 mg), may repeat dose once in 3 to 5 minutes, max total dose child 1 mg, max total dose adolescent 3 mg 0.04 to 0.06 mg/kg ET Toxins/overdose (eg, organophosphate, carbamate) <ul style="list-style-type: none"> <12 years: 0.05 mg/kg IV/IO initially, then repeated and doubling the dose every 5 minutes until muscarinic symptoms reverse >12 years: 1 mg IV/IO initially, then repeated and doubling the dose every 5 minutes until muscarinic symptoms reverse |
| Calcium chloride 10% | Hypocalcemia, hyperkalemia, hypermagnesemia, calcium channel blocker overdose <ul style="list-style-type: none"> 20 mg/kg (0.2 mL/kg) IV/IO slow push during arrest, repeat PRN |
| Calcium gluconate | Hypocalcemia, hyperkalemia, hypermagnesemia, calcium channel blocker overdose <ul style="list-style-type: none"> 60 mg/kg (0.6 mL/kg) IV/IO slow push during arrest; repeat PRN |
| Dexamethasone | Croup <ul style="list-style-type: none"> 0.6 mg/kg PO/IM/IV (max 15 mg) |
| Dextrose (glucose) | Hypoglycemia <ul style="list-style-type: none"> 0.5 to 1 g/kg IV/IO (D₅₀W 2 to 4 mL/kg; D₁₀W 5 to 10 mL/kg) |
| Dobutamine | Heart failure, cardiogenic shock <ul style="list-style-type: none"> 2 to 20 mcg/kg per minute IV/IO infusion; titrate to desired effect |
| Dopamine | Cardiogenic shock, distributive shock <ul style="list-style-type: none"> 2 to 20 mcg/kg per minute IV/IO infusion; titrate to desired effect |
| Epinephrine | Pulseless arrest, bradycardia (symptomatic) <ul style="list-style-type: none"> 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration) IV/IO q 3 to 5 minutes (max single dose 1 mg) 0.1 mg/kg (0.1 mL/kg of the 1 mg/mL concentration) ET q 3 to 5 minutes Hypotensive shock <ul style="list-style-type: none"> 0.1 to 1 mcg/kg per minute IV/IO infusion (consider higher doses if needed) Anaphylaxis <ul style="list-style-type: none"> IM autoinjector 0.3 mg (for patient weighing ≥30 kg) or IM junior autoinjector 0.15 mg (for patient weighing 10 to 30 kg) 0.01 mg/kg (0.01 mL/kg of the 1 mg/mL concentration) IM q 15 minutes PRN (max single dose 0.3 mg) 0.01 mg/kg (0.1 mL/kg of the 0.1 mg/mL concentration) IV/IO q 3 to 5 minutes (max single dose 1 mg) if hypotensive 0.1 to 1 mcg/kg per minute IV/IO infusion if hypotension persists despite fluids and IM injection Asthma <ul style="list-style-type: none"> 0.01 mg/kg (0.01 mL/kg of the 1 mg/mL concentration) subcutaneously q 15 minutes (max 0.3 mg or 0.3 mL) Croup <ul style="list-style-type: none"> 0.25 to 0.5 mL racemic solution (2.25%) mixed in 3 mL NS via inhalation 3 mg (3 mL of the 1 mg/mL concentration) epinephrine mixed with 3 mL NS (which yields 0.25 mL racemic epinephrine solution) via inhalation |

Drugs Used in PALS (continued)

| Drug | Indications/Dosages |
|--|--|
| Etomidate | RSI <ul style="list-style-type: none"> 0.2 to 0.4 mg/kg IV/IO infused over 30 to 60 seconds (max 20 mg) will produce rapid sedation that lasts for 10 to 15 minutes |
| Hydrocortisone | Adrenal insufficiency <ul style="list-style-type: none"> 2 mg/kg IV bolus (max 100 mg) |
| Ipratropium bromide | Asthma <ul style="list-style-type: none"> 250 to 500 mcg via inhalation q 20 minutes PRN × 3 doses |
| Lidocaine | VF/pulseless VT, wide-complex tachycardia (with pulses) <ul style="list-style-type: none"> 1 mg/kg IV/IO bolus Maintenance: 20 to 50 mcg/kg per minute IV/IO infusion (repeat bolus dose if infusion initiated >15 minutes after initial bolus) 2 to 3 mg/kg ET |
| Magnesium sulfate | Asthma (refractory status asthmaticus), torsades de pointes, hypomagnesemia (VT with pulses) or slow infusion over 15 to 30 minutes (status asthmaticus) <ul style="list-style-type: none"> 25 to 50 mg/kg IV/IO bolus (max 2 g) (pulseless VT) or over 10 to 20 minutes (VT with pulses) or slow infusion over 15 to 30 minutes (status asthmaticus) Asthma (status asthmaticus), anaphylactic shock <ul style="list-style-type: none"> Load: 2 mg/kg IV/IO/IM (max 60 mg); only use acetate salt IM Maintenance: 0.5 mg/kg IV/IO q 6 hours (max 120 mg/d) |
| Methylprednisolone | Myocardial dysfunction and increased SVR/PVR <ul style="list-style-type: none"> Loading dose: 30 mcg/kg IV/IO over 10 to 60 minutes followed by 0.25 to 0.75 mcg/kg per minute IV/IO infusion |
| Naloxone | Narcotic (opiate) reversal <ul style="list-style-type: none"> Total reversal required for narcotic toxicity secondary to overdose: 0.1 mg/kg IV/IO/IM/subcutaneous bolus q 2 minutes PRN (max 2 mg) Total reversal not required (eg, for respiratory depression associated with therapeutic narcotic use): 1 to 5 mg/kg IV/IO/IM/subcutaneous; titrate to desired effect Maintain reversal: 0.002 to 0.16 mg/kg per hour IV/IO infusion |
| Nitroglycerin | Heart failure, cardiogenic shock <ul style="list-style-type: none"> Initiate at 0.25 to 0.5 mcg/kg per minute IV/IO infusion; titrate by 1 mcg/kg per minute q 15 to 20 minutes as tolerated. Typical dose range 1 to 5 mcg/kg per minute (max 10 mcg/kg per minute) In adolescents, start with 5 to 10 mcg per minute (not per kilogram per minute) and increase to max 200 mcg per minute |
| Nitroprusside | Cardiogenic shock (ie, associated with high SVR), severe hypertension <ul style="list-style-type: none"> 0.3 to 1 mcg/kg per minute initial dose; then titrate up to 8 mcg/kg per minute PRN |
| Norepinephrine | Hypotensive (usually distributive) shock (ie, low SVR and fluid refractory) <ul style="list-style-type: none"> 0.1 to 2 mcg/kg per minute IV/IO infusion; titrate to desired effect |
| Procainamide | SVT, atrial flutter, VT (with pulses) <ul style="list-style-type: none"> 15 mg/kg IV/IO load over 30 to 60 minutes (do not use routinely with amiodarone) |
| Prostaglandin E₁ (PGE₁) | Ductal-dependent congenital heart disease (all forms) <ul style="list-style-type: none"> 0.05 to 0.1 mcg/kg per minute IV/IO infusion initially; then 0.01 to 0.05 mcg/kg per minute IV/IO |
| Sodium bicarbonate | Metabolic acidosis (severe), hyperkalemia <ul style="list-style-type: none"> 1 mEq/kg IV/IO slow bolus Sodium channel blocker overdose (eg, tricyclic antidepressant) <ul style="list-style-type: none"> 1 to 2 mEq/kg IV/IO bolus until serum pH is >7.45 (7.50 to 7.55 for severe poisoning) followed by IV/IO infusion of 150 mEq NaHCO₃/L solution titrated to maintain alkalemia |
| Terbutaline | Asthma (status asthmaticus), hyperkalemia <ul style="list-style-type: none"> 0.1 to 10 mcg/kg per minute IV/IO infusion; consider 10 mcg/kg IV/IO load over 5 minutes 10 mcg/kg subcutaneously q 10 to 15 minutes until IV/IO infusion is initiated (max single dose 0.4 mg) |
| Vasopressin | Catecholamine-resistant hypotension <ul style="list-style-type: none"> 0.0002 to 0.002 unit/kg per minute (0.2 to 2 milliunits/kg per minute) continuous infusion |

PALS Systematic Approach Algorithm



PALS Systematic Approach Summary

Initial Impression

Your first quick (in a few seconds) "from the doorway" observation

| | |
|---|--|
| Appearance | Including level of consciousness (eg, unresponsive, irritable, alert and ability to interact) |
| Breathing | Increased work of breathing, absent or decreased respiratory effort, or abnormal sounds heard without auscultation |
| Circulation (color) | Abnormal skin color, such as cyanosis, pallor, or mottling |
| <i>The purpose is to quickly identify a life-threatening problem.</i> | |

Is the child unresponsive with no breathing or only gasping?

If YES:

- Shout for help.
- Activate emergency response as appropriate for setting.
- Check for a pulse.
- Begin lifesaving interventions as needed.

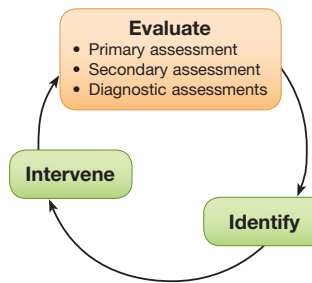
If NO:

- Continue the evaluate-identify-intervene sequence.

Use the **evaluate-identify-intervene** sequence when caring for a seriously ill or injured child.

- Evaluate the child to gather information about the child's condition or status.
- Identify any problem by type and severity.
- Intervene with appropriate actions to treat the problem.

Then repeat the sequence; this process is ongoing.



If at any time you identify a life-threatening problem, immediately begin appropriate interventions. Activate emergency response as indicated in your practice setting.

Evaluate

"Evaluate" consists of the primary assessment (ABCDE), secondary assessment, and diagnostic tests.

Primary Assessment

A rapid, hands-on ABCDE approach to evaluate respiratory, cardiac, and neurologic function; this step includes assessment of vital signs and pulse oximetry

Airway

| | | |
|-------|--------------|------------------|
| Clear | Maintainable | Not maintainable |
|-------|--------------|------------------|

Breathing

| Respiratory Rate and Pattern | Respiratory Effort | Chest Expansion and Air Movement | Abnormal Lung and Airway Sounds | Oxygen Saturation by Pulse Oximetry |
|--|---|--|--|---|
| Normal Irregular Fast Slow Apnea | Normal Increased <ul style="list-style-type: none"> • Nasal flaring • Retractions • Head bobbing • Seesaw respirations Inadequate <ul style="list-style-type: none"> • Apnea • Weak cry or cough | Normal Decreased Unequal Prolonged expiration | Stridor Snoring Barking cough Hoarseness Grunting Gurgling Wheezing Crackles Unequal | Normal oxygen saturation (≥94%) Hypoxemia (<94%) |

Circulation

| Heart Rate and Rhythm | Pulses | | Capillary Refill Time | Skin Color and Temperature | Blood Pressure |
|--|--|---|---|--|-----------------------|
| Normal Fast (tachycardia) Slow (bradycardia) | Central Normal Weak Absent | Peripheral Normal Weak Absent | Normal: ≤2 seconds Delayed: >2 seconds | Pallor Mottling Cyanosis Warm skin Cool skin | Normal Hypotensive |

Disability

| AVPU Pediatric Response Scale | | | | Pupil Size Reaction to Light | | Blood Glucose | |
|-------------------------------|---------------------------|--------------------------|----------------------|------------------------------|----------|---------------|-----|
| A lert | Responds to V oice | Responds to P ain | U nresponsive | Normal | Abnormal | Normal | Low |

Exposure

| Temperature | | | Skin | |
|-------------|------|-----|--------------------|-------------------------------|
| Normal | High | Low | Rash (eg, purpura) | Trauma (eg, injury, bleeding) |

| | |
|-----------------------------|--|
| Secondary Assessment | A focused medical history (SAMPLE) and a focused physical exam |
|-----------------------------|--|

| | |
|-------------------------|--|
| Diagnostic Tests | Laboratory, radiographic, and other advanced tests that help to identify the child's physiologic condition and diagnosis |
|-------------------------|--|

Identify

Identify the child's problem as respiratory, circulatory, or both. Determine the type and severity of the problem(s). The table below lists common clinical signs that typically correlate with a specific type of problem and its severity.

| Type | Severity |
|-----------------------|---|
| Respiratory | <ul style="list-style-type: none"> Respiratory distress Respiratory failure |
| Circulatory | <ul style="list-style-type: none"> Compensated shock Hypotensive shock |
| Cardiac Arrest | |

Respiratory

| Signs | Type of Problem | Severity |
|---|--|---|
| <ul style="list-style-type: none"> Increased respiratory rate and effort (eg, retractions, nasal flaring) Decreased air movement Stridor (typically inspiratory) Barking cough Snoring or gurgling Hoarseness | Upper airway obstruction | Respiratory distress <ul style="list-style-type: none"> Some abnormal signs but no signs of respiratory failure Respiratory failure <i>One or more of the following:</i> <ul style="list-style-type: none"> Very rapid or inadequate respiratory rate Significant or inadequate respiratory effort Low oxygen saturation despite high-flow oxygen Bradycardia (ominous) Cyanosis Decreased level of consciousness |
| <ul style="list-style-type: none"> Increased respiratory rate and effort (eg, retractions, nasal flaring) Decreased air movement Prolonged expiration Wheezing | Lower airway obstruction | |
| <ul style="list-style-type: none"> Increased respiratory rate and effort Decreased air movement Grunting Crackles | Lung tissue disease | |
| <ul style="list-style-type: none"> Irregular respiratory pattern Inadequate or irregular respiratory depth and effort Normal or decreased air movement Signs of upper airway obstruction (see above) | Disordered control of breathing | |

Circulatory

| <ul style="list-style-type: none"> Tachycardia Weak peripheral pulses Delayed capillary refill time Changes in skin color (pallor, mottling, cyanosis) | <ul style="list-style-type: none"> Cool skin Changes in level of consciousness Decreased urine output | Signs of poor perfusion |
|---|--|--|
| Signs | Type of Problem | Severity |
| <ul style="list-style-type: none"> Signs of poor perfusion (see above) | Hypovolemic shock Obstructive shock | Compensated shock <ul style="list-style-type: none"> Signs of poor perfusion and <i>normal</i> blood pressure Hypotensive shock <ul style="list-style-type: none"> Signs of poor perfusion and <i>low</i> blood pressure |
| <ul style="list-style-type: none"> Possible signs of poor perfusion (see above) <i>or</i> Warm, flushed skin with brisk capillary refill (warm shock) Peripheral pulses may be bounding Possible crackles Possible petechial or purpuric rash (septic shock) | Distributive shock | |
| <ul style="list-style-type: none"> Signs of poor perfusion (see above) Signs of heart failure | Cardiogenic shock | |

Intervene

On the basis of your identification of the problem, intervene with appropriate actions. Your actions will be determined by your scope of practice and local protocol.

Recognition of Shock Flowchart

| Clinical Signs | | Hypovolemic Shock | Distributive Shock | Cardiogenic Shock | Obstructive Shock |
|----------------|--------------------------|---|---------------------|--------------------|-------------------|
| A | Patency | Airway open and maintainable/not maintainable | | | |
| B | Respiratory rate | Increased | | | |
| | Respiratory effort | Normal to increased | | Labored | |
| | Breath sounds | Normal | Normal (± crackles) | Crackles, grunting | |
| C | Systolic blood pressure | Compensated Shock → Hypotensive Shock | | | |
| | Pulse pressure | Narrow | Variable | Narrow | |
| | Heart rate | Increased | | | |
| | Peripheral pulse quality | Weak | Bounding or weak | Weak | |
| | Skin | Pale, cool | Warm or cool | Pale, cool | |
| | Capillary refill | Delayed | Variable | Delayed | |
| | Urine output | Decreased | | | |
| D | Level of consciousness | Irritable early Lethargic late | | | |
| E | Temperature | Variable | | | |

Management of Shock Flowchart

Management of Shock Flowchart

- Oxygen
- Pulse oximetry
- ECG monitor
- IV/IO access
- BLS as indicated
- Point-of-care glucose testing

Hypovolemic Shock Specific Management for Selected Conditions

| Nonhemorrhagic | Hemorrhagic |
|--|---|
| <ul style="list-style-type: none"> • 20 mL/kg NS/LR bolus, repeat as needed • Consider colloid | <ul style="list-style-type: none"> • Control external bleeding • 20 mL/kg NS/LR bolus, repeat 2 or 3x as needed • Transfuse PRBCs as indicated |

Distributive Shock Specific Management for Selected Conditions

| Septic | Anaphylactic | Neurogenic |
|---|--|---|
| <p>Management Algorithm:</p> <ul style="list-style-type: none"> • Septic Shock | <ul style="list-style-type: none"> • IM epinephrine (or autoinjector) • Fluid boluses (20 mL/kg NS/LR) • Albuterol • Antihistamines, corticosteroids • Epinephrine infusion | <ul style="list-style-type: none"> • 20 mL/kg NS/LR bolus, repeat PRN • Vasopressor |

Cardiogenic Shock Specific Management for Selected Conditions

| Bradycardia/Tachycardia | Other (eg, CHD, Myocarditis, Cardiomyopathy, Poisoning) |
|--|--|
| <p>Management Algorithms:</p> <ul style="list-style-type: none"> • Bradycardia • Tachycardia With Poor Perfusion | <ul style="list-style-type: none"> • 5 to 10 mL/kg NS/LR bolus, repeat PRN • Vasoactive infusion • Consider expert consultation |










Obstructive Shock Specific Management for Selected Conditions

| Ductal-Dependent (LV Outflow Obstruction) | Tension Pneumothorax | Cardiac Tamponade | Pulmonary Embolism |
|--|---|--|---|
| <ul style="list-style-type: none"> • Prostaglandin E₁ • Expert consultation | <ul style="list-style-type: none"> • Needle decompression • Tube thoracostomy | <ul style="list-style-type: none"> • Pericardiocentesis • 20 mL/kg NS/LR bolus | <ul style="list-style-type: none"> • 20 mL/kg NS/LR bolus, repeat PRN • Consider thrombolytics, anticoagulants • Expert consultation |

Recognition of Respiratory Problems Flowchart

| Pediatric Advanced Life Support Signs of Respiratory Problems | | | | | |
|--|-------------------------|---|---|---|---------------------------------|
| Clinical Signs | | Upper Airway Obstruction | Lower Airway Obstruction | Lung Tissue Disease | Disordered Control of Breathing |
| A | Patency | Airway open and maintainable/not maintainable | | | |
| B | Respiratory Rate/Effort | Increased | | | Variable |
| | Breath Sounds | Stridor (typically inspiratory) Barking cough Hoarseness | Wheezing (typically expiratory) Prolonged expiratory phase | Grunting Crackles Decreased breath sounds | Normal |
| | Air Movement | Decreased | | | Variable |
| C | Heart Rate | Tachycardia (early) | | Bradycardia (late) | |
| | Skin | Pallor, cool skin (early) | | Cyanosis (late) | |
| D | Level of Consciousness | Anxiety, agitation (early) Lethargy, unresponsiveness (late) | | | |
| E | Temperature | Variable | | | |

Pediatric Advanced Life Support Identification of Respiratory Problems by Severity

| Respiratory Distress  Respiratory Failure | |
|--|---|
| A | Open and maintainable  Not maintainable |
| B | Tachypnea  Bradypnea to apnea |
| | Work of breathing (nasal flaring/retractions) Increased effort  Decreased effort  Apnea |
| | Good air movement  Poor to absent air movement |
| C | Tachycardia  Bradycardia |
| | Pallor  Cyanosis |
| D | Anxiety, agitation  Lethargy to unresponsiveness |
| E | Variable temperature |

Management of Respiratory Emergencies Flowchart

The Management of Respiratory Emergencies Flowchart summarizes general management of respiratory emergencies and specific management by etiology. Note that this chart does not include all respiratory emergencies; it provides key management strategies for a limited number of diseases.

Management of Respiratory Emergencies Flowchart

- Airway positioning
- Suction as needed
- Oxygen
- Pulse oximetry
- ECG monitor (as indicated)
- BLS as indicated

Upper Airway Obstruction

Specific Management for Selected Conditions

| Croup | Anaphylaxis | Aspiration Foreign Body |
|--|--|---|
| <ul style="list-style-type: none"> • Nebulized epinephrine • Corticosteroids | <ul style="list-style-type: none"> • IM epinephrine (or autoinjector) • Albuterol • Antihistamines • Corticosteroids | <ul style="list-style-type: none"> • Allow position of comfort • Specialty consultation |

Lower Airway Obstruction

Specific Management for Selected Conditions

| Bronchiolitis | Asthma |
|--|--|
| <ul style="list-style-type: none"> • Nasal suctioning • Bronchodilator trial | <ul style="list-style-type: none"> • Albuterol ± ipratropium • Corticosteroids • Subcutaneous epinephrine • Magnesium sulfate • Terbutaline |

Lung Tissue Disease

Specific Management for Selected Conditions

| Pneumonia/Pneumonitis Infectious Chemical Aspiration | Pulmonary Edema Cardiogenic or Noncardiogenic (ARDS) |
|--|--|
| <ul style="list-style-type: none"> • Albuterol • Antibiotics (as indicated) • Consider CPAP | <ul style="list-style-type: none"> • Consider noninvasive or invasive ventilatory support with PEEP • Consider vasoactive support • Consider diuretic |

Disordered Control of Breathing

Specific Management for Selected Conditions

| Increased ICP | Poisoning/Overdose | Neuromuscular Disease |
|--|---|--|
| <ul style="list-style-type: none"> • Avoid hypoxemia • Avoid hypercarbia • Avoid hyperthermia | <ul style="list-style-type: none"> • Antidote (if available) • Contact poison control | <ul style="list-style-type: none"> • Consider noninvasive or invasive ventilatory support |

Team Dynamics Debriefing Tool



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Instructions

- Use the table below to guide your debriefing.
- Observe and record elements of team dynamics.
- Identify 2 or 3 elements of team dynamics to discuss per debriefing session.

| Action | Gather | Analyze | Summarize |
|--|--|---|--|
| <p>Closed-Loop Communication</p> <ul style="list-style-type: none"> • Orders acknowledged and confirmed when given • Orders announced when executed <p>Clear Messages</p> <ul style="list-style-type: none"> • Team members speak clearly • Orders are questioned when doubt exists <p>Clear Roles</p> <ul style="list-style-type: none"> • All team members have appropriate roles • Roles are reallocated when appropriate <p>Knowing One's Limitations</p> <ul style="list-style-type: none"> • Calls for assistance • Seeks advice when appropriate <p>Knowledge Sharing</p> <ul style="list-style-type: none"> • Sharing information between team members • Asks for ideas and suggestions <p>Constructive Intervention</p> <ul style="list-style-type: none"> • Identifies priorities • Questions colleagues who make mistakes <p>Reevaluation and Summarizing</p> <ul style="list-style-type: none"> • Reevaluates patient • Summarizes patient condition and treatment plan <p>Mutual Respect</p> <ul style="list-style-type: none"> • Speaks in a professional, friendly tone of voice • Provides positive feedback | <p>Student Observations</p> <ul style="list-style-type: none"> • Can you describe the events from your perspective? • How well do you think your treatments worked? • Can you review the events of the scenario? (<i>directed to the Timer/Recorder</i>) • What could you have improved? • What did the team do well? <p>Instructor Observations</p> <ul style="list-style-type: none"> • I noticed that <i>[insert action here]</i>. • I observed that <i>[insert action here]</i>. • I saw that <i>[insert action here]</i>. | <p>Done Well</p> <ul style="list-style-type: none"> • How were you able to <i>[insert action here]</i>? • Why do you think you were able to <i>[insert action here]</i>? • Tell me a little more about how you <i>[insert action here]</i>. <p>Needs Improvement</p> <ul style="list-style-type: none"> • Why do you think <i>[insert action here]</i> occurred? • How do you think <i>[insert action here]</i> could have been improved? • What was your thinking while <i>[insert action here]</i>? • What prevented you from <i>[insert action here]</i>? | <p>Student-Led Summary</p> <ul style="list-style-type: none"> • What are the main things you learned? • Can someone summarize the key points made? • What are the main take-home messages? <p>Instructor-Led Summary</p> <ul style="list-style-type: none"> • Let's summarize what we learned... • Here is what I think we learned... • The main take-home messages are... |

Rhythm Disturbances/ Electrical Therapy Skills Station Competency Checklist



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Student Name _____ Date of Test _____

| Critical Performance Steps | ✓ if done correctly |
|--|----------------------------|
| Applies 3 ECG leads correctly (or local equipment if >3 leads are used) <ul style="list-style-type: none"> Negative (white) lead: to right shoulder Positive (red) lead: to left lower ribs Ground (black, green, brown) lead: to left shoulder | |
| Demonstrates correct operation of monitor <ul style="list-style-type: none"> Turns monitor on Adjusts device to manual mode (not AED mode) to display rhythm in standard limb leads (I, II, III) or paddles/electrode pads | |
| Verbalizes correct electrical therapy for appropriate core rhythms <ul style="list-style-type: none"> Synchronized cardioversion for unstable SVT, VT with pulses Defibrillation for pulseless VT, VF | |
| Selects correct paddle/electrode pad for infant or child; places paddles/electrode pads in correct position | |
| Demonstrates correct and safe synchronized cardioversion <ul style="list-style-type: none"> Places device in synchronized mode Selects appropriate energy (0.5 to 1 J/kg for initial shock) Charges, clears, delivers current | |
| Demonstrates correct and safe manual defibrillation <ul style="list-style-type: none"> Places device in unsynchronized mode Selects energy (2 to 4 J/kg for initial shock) Charges, clears, delivers current | |

STOP TEST

| | |
|--|-----------------------|
| Instructor Notes <ul style="list-style-type: none"> Place a ✓ in the box next to each step the student completes successfully. If the student does not complete all steps successfully (as indicated by at least 1 blank check box), the student must receive remediation. Make a note here of which skills require remediation (refer to Instructor Manual for information about remediation). | |
| Test Results Check PASS or NR to indicate pass or needs remediation: | PASS NR |
| Instructor Initials _____ Instructor Number _____ Date _____ | |

Pediatric Advanced Life Support Child CPR and AED Skills Testing Checklist



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Student Name _____ Date of Test _____

Hospital Scenario: "You are working in a hospital or clinic, and you see a child who has suddenly collapsed in the hallway. You check that the scene is safe and then approach the patient. Demonstrate what you would do next."

Prehospital Scenario: "You arrive on the scene for a child who is not breathing. No bystander CPR has been provided. You approach the scene and ensure that it is safe. Demonstrate what you would do next."

Assessment and Activation

- Checks responsiveness Shouts for help/Activates emergency response system/Sends for AED
 Checks breathing Checks pulse

Once student shouts for help, instructor says, "Here's the barrier device. I am going to get the AED."

Cycle 1 of CPR (30:2) *CPR feedback devices preferred for accuracy

Child Compressions

- Performs high-quality compressions*:
- Hand placement on lower half of sternum
 - 30 compressions in no less than 15 and no more than 18 seconds
 - Compresses at least one third the depth of the chest, about 2 inches (5 cm)
 - Complete recoil after each compression

Child Breaths

- Gives 2 breaths with a barrier device:
- Each breath given over 1 second
 - Visible chest rise with each breath
 - Resumes compressions in less than 10 seconds

Cycle 2 of CPR (repeats steps in Cycle 1) Only check box if step is successfully performed

- Compressions Breaths Resumes compressions in less than 10 seconds

Rescuer 2 says, "Here is the AED. I'll take over compressions, and you use the AED."

AED (follows prompts of AED)

- Powers on AED Correctly attaches pads Clears for analysis Clears to safely deliver a shock
 Safely delivers a shock

Resumes Compressions

- Ensures compressions are resumed immediately after shock delivery
 - Student directs instructor to resume compressions *or*
 - Student resumes compressions

STOP TEST

Instructor Notes

- Place a ✓ in the box next to each step the student completes successfully.
- If the student does not complete all steps successfully (as indicated by at least 1 blank check box), the student must receive remediation. Make a note here of which skills require remediation (refer to Instructor Manual for information about remediation).

Test Results Check **PASS** or **NR** to indicate pass or needs remediation:

PASS

NR

Instructor Initials _____ Instructor Number _____ Date _____

Pediatric Advanced Life Support Infant CPR Skills Testing Checklist (1 of 2)



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Student Name _____

Date of Test _____

Hospital Scenario: “You are working in a hospital or clinic when a woman runs through the door, carrying an infant. She shouts, ‘Help me! My baby’s not breathing.’ You have gloves and a pocket mask. You send your coworker to activate the emergency response system and to get the emergency equipment.”

Prehospital Scenario: “You arrive on the scene for an infant who is not breathing. No bystander CPR has been provided. You approach the scene and ensure that it is safe. Demonstrate what you would do next.”

Assessment and Activation

- Checks responsiveness Shouts for help/Activates emergency response system Checks breathing
 Checks pulse

Once student shouts for help, instructor says, “Here’s the barrier device.”

Cycle 1 of CPR (30:2) *CPR feedback devices preferred for accuracy

Infant Compressions

- Performs high-quality compressions*:
- Placement of 2 fingers in the center of the chest, just below the nipple line
 - 30 compressions in no less than 15 and no more than 18 seconds
 - Compresses at least one third the depth of the chest, about 1½ inches (4 cm)
 - Complete recoil after each compression

Infant Breaths

- Gives 2 breaths with a barrier device:
- Each breath given over 1 second
 - Visible chest rise with each breath
 - Resumes compressions in less than 10 seconds

Cycle 2 of CPR (repeats steps in Cycle 1) Only check box if step is successfully performed

- Compressions Breaths Resumes compressions in less than 10 seconds

Rescuer 2 arrives with bag-mask device and begins ventilation while Rescuer 1 continues compressions with 2 thumb-encircling hands technique.

Cycle 3 of CPR

Rescuer 1: Infant Compressions

- Performs high-quality compressions*:
- 15 compressions with 2 thumb-encircling hands technique
 - 15 compressions in no less than 7 and no more than 9 seconds
 - Compress at least one third the depth of the chest, about 1½ inches (4 cm)
 - Complete recoil after each compression

Rescuer 2: Infant Breaths

This rescuer is not evaluated.

(continued)

Pediatric Advanced Life Support Infant CPR Skills Testing Checklist (2 of 2)



Student Name _____ Date of Test _____

Cycle 4 of CPR

Rescuer 2: Infant Compressions

This rescuer is not evaluated.

Rescuer 1: Infant Breaths

- Gives 2 breaths with a bag-mask device:
 - Each breath given over 1 second
 - Visible chest rise with each breath
 - Resumes compressions in less than 10 seconds

STOP TEST

Instructor Notes

- Place a ✓ in the box next to each step the student completes successfully.
- If the student does not complete all steps successfully (as indicated by at least 1 blank check box), the student must receive remediation. Make a note here of which skills require remediation (refer to Instructor Manual for information about remediation).

Test Results Check **PASS** or **NR** to indicate pass or needs remediation:

PASS **NR**

Instructor Initials _____ Instructor Number _____ Date _____