PALS NEW GUIDELINES 2010

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Pediatric Basic Life Support
Change in CPR Sequence
(C-A-B Rather Than A-B-C)

- **2010 (New):**
  
  *Initiate CPR for infants and children with chest compressions rather than rescue breaths.*

CPR should begin with 30 compressions (any lone rescuer) or 15 compressions (for resuscitation of infants and children by 2 healthcare providers) rather than with 2 ventilations.

For resuscitation of the newly born, see the Neonatal Resuscitation section.
Change in CPR Sequence
(C-A-B Rather Than A-B-C)

- 2005 (Old):
  Cardiopulmonary resuscitation was initiated with opening of the airway and the provision of 2 breaths before chest compressions.
Chest Compression Depth

- **2010 (New):**

  To achieve effective chest compressions, rescuers should compress at least one third of the anterior-posterior diameter of the chest.

  - 1½ inches (about 4 cm) in most infants
  - 2 inches (5 cm) in most children.
Chest Compression Depth

- **2005 (Old):**
  
  Push with sufficient force to depress the chest approximately one third to one half the anterior-posterior diameter of the chest.
Elimination of “Look, Listen, and Feel for Breathing”

• **2010 (New):**
  “Look, listen, and feel” was removed from the sequence for assessment of breathing after opening the airway.

• **2005 (Old):**
  “Look, listen, and feel” was used to assess breathing after the airway was opened.
Pulse Check Again De-emphasized

- **2010 (New):**
  
  *If the infant or child is unresponsive and not breathing or only gasping, healthcare providers may take up to 10 seconds to attempt to feel for a pulse (brachial in an infant and carotid or femoral in a child). If, within 10 seconds, you don’t feel a pulse or are not sure if you feel a pulse, begin chest compressions.*

It can be difficult to determine the presence or absence of a pulse, especially in an emergency, and studies show that both healthcare providers and lay rescuers are unable to reliably detect a pulse.
Pulse Check Again De-emphasized

- **2005 (Old):**
  
  *If you are a healthcare provider, try to palpate a pulse. Take no more than 10 seconds.*
Defibrillation and Use of the AED in Infants

• **2010 (New):**
  
  *For infants, a manual defibrillator is preferred to an AED for defibrillation.*

If a manual defibrillator is not available, an AED equipped with a pediatric dose attenuator is preferred.

If neither is available, an AED without a pediatric dose attenuator may be used.
Defibrillation and Use of the AED in Infants

- **2005 (Old):**
  
  *Data have shown that AEDs can be used safely and effectively in children 1 to 8 years of age.*

  However, there are insufficient data to make a recommendation for or against using an AED in infants <1 year of age.
Pediatric BLS Healthcare Providers

1. Unresponsive
   Not breathing or only gasping
   Send someone to activate emergency response system, get AED/defibrillator

2. Lone Rescuer: For SUDDEN COLLAPSE, activate emergency response system, get AED/defibrillator

3. Check pulse: DEFINITE pulse within 10 seconds?
   - Definite Pulse
     - Give 1 breath every 3 seconds
     - Add compressions if pulse remains <60/min with poor perfusion despite adequate oxygenation and ventilation
     - Recheck pulse every 2 minutes

   - No Pulse

4. One Rescuer: Begin cycles of 30 COMPRESSIONS and 2 BREATHS
   Two Rescuers: Begin cycles of 15 COMPRESSIONS and 2 BREATHS

5. After about 2 minutes, activate emergency response system and get AED/defibrillator (if not already done). Use AED as soon as available.

6. Check rhythm:
   - Shockable
     - Give 1 shock
     - Resume CPR immediately for 2 minutes
   - Not Shockable
     - Resume CPR immediately for 2 minutes
     - Check rhythm every 2 minutes; continue until ALS providers take over or victim starts to move

High-Quality CPR
- Rate at least 100/min
- Compression depth to at least ⅓ anterior-posterior diameter of chest, about 1¾ inches (4 cm) in infants and 2 inches (5 cm) in children
- Allow complete chest recoil after each compression
- Minimize interruptions in chest compressions
- Avoid excessive ventilation

Note: The boxes bordered with dashed lines are performed by healthcare providers and not by lay rescuers © 2010 American Heart Association
Many key issues in the review of the PALS literature resulted in refinement of existing recommendations rather than new recommendations;
Recommendations for Monitoring Exhaled CO2

• **2010 (New):**
  
  Exhaled CO2 detection (capnography or colorimetry) is recommended in addition to clinical assessment to confirm tracheal tube position for neonates, infants, and children with a perfusing cardiac rhythm in all settings (eg, prehospital, ED, intensive care unit, ward, operating room) and during intrahospital or interhospital transport.

  Continuous capnography or capnometry monitoring, if available, may be beneficial during CPR to help guide therapy, especially the effectiveness of chest compressions.
Recommendations for Monitoring Exhaled CO2

• **2005 (Old):**
  
  *In infants and children with a perfusing rhythm*, use a colorimetric detector or capnography to detect exhaled CO2 to confirm endotracheal tube position in the prehospital and in-hospital settings and during intrahospital and interhospital transport.
Defibrillation Energy Doses

• **2010 (New):**
  
  *It is acceptable to use an initial dose of 2 to 4 J/kg for defibrillation, but for ease of teaching, an initial dose of 2 J/kg may be used.*

For refractory VF, it is reasonable to increase the dose. Subsequent energy levels should be at least 4 J/kg, and higher energy levels, not to exceed 10 J/kg or the adult maximum dose, may be considered.
Defibrillation Energy Doses

• **2005 (Old):**
  With a manual defibrillator (*monophasic or biphasic*), use a dose of 2 J/kg for the first attempt and 4 J/kg for subsequent attempts.

• Limited evidence is available about effective or maximum energy doses for pediatric defibrillation, but some data suggest that higher doses may be safe and potentially more effective.
Limiting Oxygen to Normal Levels After Resuscitation

• **2010 (New):**
  
  *Once the circulation is restored, monitor arterial oxyhemoglobin saturation.*

  In general it is appropriate to wean the FIO2 when the saturation is 100%, provided the saturation can be maintained $\geq 94\%$. 
Limiting Oxygen to Normal Levels After Resuscitation

• **2005 (Old):**

  *Hyperoxia and the risk for reperfusion injury were addressed in the 2005 AHA Guidelines for CPR and ECC in general, but recommendations for titration of inspired oxygen were not as specific.*

• Recent data from an adult study demonstrated worse outcomes with hyperoxia after resuscitation from cardiac arrest.
Resuscitation of Infants and Children With Congenital Heart Disease

• **2010 (New):**
  Specific resuscitation guidance has been added for management of cardiac arrest in infants and children with single-ventricle anatomy, Fontan or hemi-Fontan/bidirectional Glenn physiology, and pulmonary hypertension.

• **2005 (Old):**
  These topics were not addressed in the 2005 AHA Guidelines for CPR and ECC.
Management of Tachycardia

• **2010 (New):**
  *Wide-complex tachycardia is present if the QRS width is >0.09 second.*

  In a recent scientific statement, QRS duration was considered prolonged if it was >0.09 second for a child under the age of 4 years, and ≥0.1 second was considered prolonged for a child between the ages of 4 and 16 years.

• **2005 (Old):**
  *Wide-complex tachycardia is present if the QRS width is >0.08 second.*
Medications During Cardiac Arrest and Shock

• **2010 (New):**
  The recommendation regarding calcium administration is stronger than in past AHA Guidelines: routine calcium administration is not recommended for pediatric cardiopulmonary arrest in the absence of documented hypocalcemia, calcium channel blocker overdose, hypermagnesemia, or hyperkalemia. Routine calcium administration in cardiac arrest provides no benefit and may be harmful.
Medications During Cardiac Arrest and Shock .... Cont.

• **2010 (New):**
  Etomidate has been shown to facilitate endotracheal intubation in infants and children with minimal hemodynamic effect but is not recommended for routine use in pediatric patients with evidence of septic shock.
Medications During Cardiac Arrest and Shock .... Cont.

• **2005 (Old):**
  The routine administration of calcium does not improve the outcome of cardiac arrest.

  Etomidate was not addressed in the 2005 AHA Guidelines for CPR and ECC.
Post–Cardiac Arrest Care

• **2010 (New):** Although there have been no published results of prospective randomized pediatric trials of therapeutic hypothermia, based on adult evidence, therapeutic hypothermia (to 32°C to 34°C) may be beneficial for adolescents who remain comatose after resuscitation from sudden witnessed out-of-hospital VF cardiac arrest.

Therapeutic hypothermia (to 32°C to 34°C) may also be considered for infants and children who remain comatose after resuscitation from cardiac arrest.
Post–Cardiac Arrest Care

• **2005 (Old):**
  Based on extrapolation from adult and neonatal studies, when pediatric patients remain comatose after resuscitation, consider cooling them to 32°C to 34°C for 12 to 24 hours.
Evaluation of Sudden Cardiac Death Victims

• **2010 (New Topic):**
  *When a sudden, unexplained cardiac death occurs in a child or young adult, obtain a complete past medical and family history (including a history of syncopal episodes, seizures, unexplained accidents/drowning, or sudden unexpected death at <50 years of age) and review previous ECGs.*
Evaluation of Sudden Cardiac Death Victims

• **2010 (New Topic):**
  All infants, children, and young adults with sudden, unexpected death should, where resources allow, have an unrestricted complete autopsy, preferably performed by a pathologist with training and experience in cardiovascular pathology.
  Tissue should be preserved for genetic analysis to determine the presence of channelopathy.
Pediatric Cardiac Arrest

Shout for Help/Activate Emergency Response

1. Start CPR
   - Give oxygen
   - Attach monitor/defibrillator

2. Rhythm shockable?
   - Yes
   - VF/VT
   - Shock

3. CPR 2 min
   - IO/IV access
   - Epinephrine every 3-5 min
   - Consider advanced airway

4. Rhythm shockable?
   - Yes
   - Shock

5. CPR 2 min
   - Epinephrine every 3-5 min
   - Consider advanced airway

6. Rhythm shockable?
   - Yes
   - Amiodarone
   - Treat reversible causes

7. CPR 2 min
   - Amiodarone
   - Treat reversible causes

8. Go to 5 or 7
   - Asystole/PEA → 10 or 11
   - Organized rhythm → check pulse
   - Pulse present (ROSC) → post-cardiac arrest care

9. Asystole/PEA

10. CPR 2 min
    - IO/IV access
    - Epinephrine every 3-5 min
    - Consider advanced airway

11. CPR 2 min
    - Epinephrine every 3-5 min
    - Consider advanced airway

Doses/Details

CPR Quality
- Push hard (1/3 of anterior-posterior diameter of chest) and fast (at least 100/min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 15:2 compression-ventilation ratio. If advanced airway, 8-10 breaths per minute with continuous chest compressions

Shock Energy for Defibrillation
- First shock 3 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 1:10,000 concentration). Repeat every 3-5 minutes.
  - If no IO/IV access, may give endotracheal dose: 0.1 mg/kg (0.1 mL/kg of 1:1000 concentration).
- Amiodarone IO/IV Dose:
  - 5 mg/kg bolus during cardiac arrest. May repeat up to 2 times for refractory VF/pulseless VT.

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 6-8 seconds (8-10 breaths per minute)

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

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Pediatric Bradycardia
With a Pulse and Poor Perfusion

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 continues?
   - No
   - Yes

3. CPR if HR < 60/min with poor perfusion despite oxygenation and ventilation
   - No
   - Yes

4a. Support ABCs
   - Give oxygen
   - Observe
   - Consider expert consultation

4. Bradycardia persists?
   - No
   - 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

Cardiopulmonary Compromise
- Hypotension
- Acutely altered mental status
- Signs of shock

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.

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Pediatric Tachycardia
With a Pulse and Poor Perfusion

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. Narrow (<0.09 sec) Evaluate QRS duration
   3. Evaluate rhythm with 12-lead ECG or monitor
      - 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

4. Search for and treat cause
5. Consider vagal maneuvers (No delays)

6. If IO/IV access present, give adenosine
   OR
   If IO/IV access not available, or if adenosine ineffective, synchronized cardioversion

7. Synchronized cardioversion

8. Consider adenosine if rhythm regular and QRS monomorphic

9. Possible ventricular tachycardia
   - Cardiopulmonary compromise?
     - Hypotension
     - Acutely altered mental status
     - Signs of shock
   - Yes
   - Consider amiodarone or procainamide
   - Expert consultation advised

10. No

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.
- 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.
Thanks