Basic Life Support in Children

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Source

- This presentation is based on the American Heart Association 2015 Guidelines and 2017 Focussed updates
**Introduction**

- For best survival and quality of life, pediatric basic life support (BLS) should be part of a community effort that includes
  1. Prevention,
  2. Early cardiopulmonary resuscitation (CPR),
  3. Prompt access to the emergency response system,
  4. Rapid pediatric advanced life support (PALS),
  5. followed by integrated post–cardiac arrest care.

- These 5 links form the American Heart Association (AHA) pediatric Chain of Survival, the first 3 links of which constitute pediatric BLS.
Pediatric Chain of Survival

Basic Life Support

- Basic life support refers to maintaining an airway and supporting breathing and circulation.

- The purpose is to maintain adequate ventilation and circulation until a means can be obtained to reverse the underlying cause of the arrest.
BLS Courses

- BLS Courses usually provide a wide variety of healthcare professionals the ability to recognize several life-threatening emergencies, provide CPR, use an AED, and relieve choking in a safe, timely and effective manner.

- This presentation will focus on CPR and relief of foreign body airway obstruction in children.
- Infant: under 1 year
- Child: Absence of signs of puberty (breast development in females and axillary hair in males)
Prevention of Cardiopulmonary Arrest

- In children over 1 year of age, injury is the leading cause of death.
- Survival from traumatic cardiac arrest is rare, emphasizing the importance of injury prevention in reducing deaths.
- Motor vehicle crashes are the most common cause of fatal childhood injuries.
- Targeted interventions, such as the use of child passenger safety seats, can reduce the risk of death.
Importance of CPR

- When a child develops respiratory or cardiac arrest, immediate bystander CPR is crucial to survival.

- In respiratory arrest, rescue breathing with oxygen will provide oxygen delivery to the brain and other vital organs.

- CPR may also result in resumption of cardiac activity.

- It should therefore be continued until PALS is available.
Sequence of Paediatric CPR

- Ensure safety of rescuer and victim
- Assess responsiveness
- Activate Emergency Response System if second rescuer available
- C-Circulation
- A-Airway
- B-Breathing
- After 5 cycles of CPR if lone rescuer, activate ERS and obtain an AED Continue CPR
BLS Healthcare Provider
Pediatric Cardiac Arrest Algorithm for the Single Rescuer—2015 Update

- Verify scene safety.
- Victim is unresponsive. Shout for nearby help. Activate emergency response system via mobile device (if appropriate).
- No normal breathing, has pulse:
  - Normal breathing, has pulse:
    - Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?
    - No breathing or only gasping, no pulse:
      - Witnessed sudden collapse?
        - Yes
          - CPR:
            - 1 rescuer: Begin cycles of 30 compressions and 2 breaths. (Use 15:2 ratio if second rescuer arrives.) Use AED as soon as it is available.
            - After about 2 minutes, if still alone, activate emergency response system and retrieve AED (if not already done).
          - AED analyses rhythm. (Shockable rhythm?)
            - Yes, shockable
              - Give 1 shock. Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
            - No, nonshockable
              - Resume CPR immediately for about 2 minutes (until prompted by AED to allow rhythm check). Continue until ALS providers take over or victim starts to move.
        - No
          - Activate emergency response system (if not already done), and retrieve AED/defibrillator.
    - No breathing or only gasping, no pulse:
      - Provide rescue breathing: 1 breath every 3-5 seconds, or about 12-20 breaths/min.
      - Add compressions if pulse remains 60/60 with signs of poor perfusion.
      - Activate emergency response system (if not already done) after 2 minutes.
      - Continue rescue breathing; check pulse about every 2 minutes. If no pulse, begin CPR (go to "CPR" box).
- Yes
  - Activate emergency response system (if not already done), and retrieve AED/defibrillator.

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BLS Algorithm - 2 or more rescuers
Safety of the Rescuer and Victim

- Important when CPR is provided out of hospital
- E.g near burning building, in water or close to electrical wires
- Ensure rescuer and victim are in safe position
- In cases of trauma, the victim should not be moved unless necessary for safety of rescuer and victim
Assess for responsiveness

- Position the victim
  - If unresponsive, move as a unit to supine position to a flat, hard surface such as table, floor or ground
  - If head or neck injury suspected, move child only if necessary as a unit
  - If no trauma suspected carry infant supported by your forearm with the infant’s legs straddling your elbow and your hand supporting the infant’s head
  - May be possible to carry infant to phone for help while beginning CPR
Recognition of cardiac arrest

- Responsiveness
- Breathing: victim is breathing
- Victim does not need CPR.
- If there is no evidence of trauma, turn the child onto the side (recovery position), which helps maintain a patent airway and decreases risk of aspiration.
Recognition of cardiac arrest-2

- Responsiveness: Unresponsive
- Breathing: No breathing or only gasping
- Palpate for Pulse (HCP only): brachial for infants and carotid or femoral for children
- If No pulse palpated within 10 secs or you are not sure
  - Start chest compressions (leads to shorter delay to first compression)
  - Start with 30 compressions
Algorithm

- Recognize that there is cardiac arrest
- C: give 30 chest compressions
- A: open the airway
- B: give 2 rescue breaths
- Continue chest compression: rescue breaths at ratio 30:2 (lone rescuer) and 15:2 for 2 rescuers
- Activate ERS after 5 cycles for lone rescuers or at arrest for 2 rescuers
- Continue CPR
- Attach and use AED as soon as available
Rescuers should therefore rotate the compressor role approximately every 2 minutes to prevent compressor fatigue.

**Inadequate Breathing With Pulse**
If pulse ≥60 per minute but there is inadequate breathing, give rescue breaths at a rate of about 12 to 20 breaths per minute (1 breath every 3 to 5 seconds).
Reassess the pulse about every 2 minutes but spend no more than 10 seconds doing so.

**Bradycardia With Poor Perfusion**
If the pulse is <60 per minute and there are signs of poor perfusion (ie, pallor, mottling, cyanosis) despite support of oxygenation and ventilation, begin chest compressions.
Chest compression technique: child

- Compress the lower half of the sternum with the heel of 1 or 2 hands.
- Position the heel of the hand on the lower half of the sternum with the fingers parallel to the ribs and lifted off the chest wall.
- The rescuer’s arms should be straight, with the elbows locked in extension.
- The rescuer’s shoulders should be directly above the sternum.
- The rescuer’s upper body—not their arms—exerts compression force.
Chest compression: infant

- **Two finger technique**
  - Place two fingers of one hand over the lower third of the sternum one finger breath below the inter-mammary line avoiding the xiphoid process

- **2 Thumbs – encircling hands technique**
  - Both thumbs placed on the lower half of the infants sternum approximately one finger breath below the inter-mammary line
  - Encircle infants chest and support the infants back with fingers of both hands
  - The lone healthcare provider should use the 2-finger chest compression technique for infants. The 2-thumb–encircling hands technique is recommended when CPR is provided by 2 rescuers.
Chest compression

- Press down the sternum at least one third of the anterior posterior dimension of the chest in infants and children
- (approximately 1.5 inches [4 cm] in infants and 2 inches [5 cm] in children), at least 5 cm, but no more than 6 cm (2.4 inches) from puberty
- Allow for complete chest recoil after each compression
- Compression-to-ventilation ratio of 30:2 for single rescuers and 15:2 for two rescuers of children and infants
- Compress at 100 -120 bpm
- The hand not performing compressions should maintain child’s head in neutral position to facilitate rescue breaths
- After 5 cycles of CPR, activate the EMS
- Continue CPR until EMS is available
The most common cause of obstruction in the unresponsive paediatric patient is the tongue.

Use head tilt-chin lift maneuver, open the airway avoiding hyper extension of the neck.

For infants, keep in neutral position so that the tragus of the ear is level with the top (anterior) of the infant’s shoulder.

If head/neck injury suspected, use jaw thrust. Use head tilt-chin lift if jaw thrust does not succeed.

Do not push the soft tissues under the chin because this may block the airway.
Breathing

- Provide rescue breathing
  - Maintain patent airway
  - Remove any obvious airway obstruction
  - Deliver rescue breaths over approximately 1 second, sufficient to see the child’s chest rise
  - Mouth-to-mouth breathing for child (Mouth-to-mouth and nose breathing for infants)
  - Or mouth to nose if rescuer has a small mouth
  - Create a seal between your mouth and victims mouth / mouth and nose and blow
Rescue breathing-contd

- For mouth to nose, close victims mouth
- If necessary, adjust position of child’s head provided there is no head/neck injury
- If head/neck injury suspected, use jaw thrust
- Pass oro-gastric or nasogastric tube to decompress gastric inflation
Ventilation with barrier devices

- Minimize small risk of infection
- 2 broad categories
  - Mouth to face shield
  - Mouth to mask
Bag-mask ventilation

2 types

- Self-inflating resuscitator - recommended
- Flow-inflating resuscitator

Should be available in child and adult sizes

Technique

E-C clamp technique

Thumb and index finger form a C and hold the mask on the child’s face (ensure a seal)

$3^{rd}$, $4^{th}$ and $5^{th}$ finger under the jaw to lift the chin and jaw

Avoid pressure on soft tissues under the jaw because this may block the airway
If an advanced airway is in place

- Cycles of compressions and ventilations are no longer delivered.
- Deliver at least 100 compressions per minute continuously without pauses for ventilation.
- The ventilation rescuer delivers 8 to 10 breaths per minute (a breath every 6 to 8 seconds), being careful to avoid excessive ventilation.
The 5 components of high-quality CPR

- Ensuring chest compressions of adequate rate
- Ensuring chest compressions of adequate depth
- Allowing full chest recoil between compressions
- Minimizing interruptions in chest compressions
- Avoiding excessive ventilation
Neonatal resuscitation

- Aetiology of neonatal arrests is nearly always asphyxia.

- Therefore, the A-B-C sequence has been retained unless there is a known cardiac etiology.

- Compression-ventilation ratio remains 3:1 because ventilation is critical to reversal of newborn asphyxial arrest and higher ratios may decrease minute ventilation.

- If the arrest is known to be of cardiac etiology, a higher ratio (15:2) should be considered.
Compressions only CPR - Updated 2017

- CPR using chest compressions with rescue breaths should be provided for infants and children in cardiac arrest.
- If bystanders are unwilling or unable to deliver rescue breaths, we recommend that rescuers provide chest compressions for infants and children.
Foreign body airway obstruction (FBAO)

- More than 90% of childhood deaths from foreign-body aspiration occur in children <5 years of age.
- 65% of the victims are infants.

- Liquids are the most common cause of choking in infants, whereas balloons, small objects, and foods (e.g., hot dogs, round candies, nuts, and grapes) are the most common causes of foreign-body airway obstruction (FBAO) in children.
FBAO severity varies

- FBAO may cause mild or severe airway obstruction. When the airway obstruction is mild, the child can cough and make some sounds.
- When the airway obstruction is severe, the victim cannot cough or make any sound.
Signs of FBAO

- *Sudden* onset of respiratory distress with coughing, gagging, stridor, or wheezing.

- Sudden onset of respiratory distress in the absence of fever or other respiratory symptoms (eg, antecedent cough, congestion) suggests FBAO rather than an infectious cause of respiratory distress, such as croup.
Signs of severe FBAO in children and infants

- Signs of Severe or Complete Airway Obstruction in the Responsive Child:
  - Universal choking sign (*absent in infants*)
  - Breathing attempts may produce high-pitched sounds
  - Child cannot cry, cough or speak forcefully, voice is weak or silent
  - Lips and fingernails may become blue
Relief of Mild FBAO

- If FBAO is mild, do not interfere but allow the victim to clear the airway by coughing while you observe for signs of severe FBAO.

- If the FBAO is severe (ie, the victim is unable to make a sound) you must act to relieve the obstruction.
Relief of Severe FBAO- child

- Ask: “Are you choking?”
- If yes, ask: “Can you speak? If no, tell the child you are going to help.
- Kneel or stoop to stand behind the child, wrapping your arms around the child.
- Make a fist with one hand; hold it with the other hand against the centre of child’s abdomen, between navel and ribs.
- Provide sub-diaphragmatic abdominal thrusts (Heimlich maneuver) until the object is expelled or the child becomes unresponsive.
Relief of FBAO-Infant

1. Hold the infant face down on your forearm, with the infant’s head in your hand (rest your arm on leg or lap for support).

2. Deliver up to 5 back blows with the heel of your free hand.

3. Turn the infant over and give up to 5 chest thrusts (Just below nipple line).

4. Alternate 5 back blows and 5 chest thrusts until the object is expelled or the infant becomes unresponsive.

5. Abdominal thrusts are not recommended for infants because they may damage the infant's relatively large and unprotected liver.
When the FBAO victim becomes unresponsive

- Start CPR with chest compressions (do not perform a pulse check).
- After 30 chest compressions, open the airway using tongue-jaw lift.
- If you see a foreign body, remove it but do not perform blind finger sweeps because they may push obstructing objects farther into the pharynx and may damage the oropharynx.
- Attempt to give 2 breaths and continue with cycles of chest compressions and ventilations until the object is expelled.
- After 2 minutes, if no one has already done so, activate the emergency response system.
References


THANK YOU