

# Child/Infant Cardiopulmonary Resuscitation and AED

## Course

*Health Science*

## Unit VI

*CPR/AED &  
First Aid*

## Essential Question

*What would you  
do if a child  
stopped  
breathing?*

## TEKS

*130.204 (c) 8  
(H)*

## Prior Student Learning

*Students should  
have completed  
the unit of  
Anatomy &  
Physiology:  
Cardiovascular  
and Respiratory  
system, and  
Adult CPR*

## Estimated time

*2 hours  
depending on  
class size*

## Rationale

Healthcare professionals have a responsibility to respond appropriately to all situations, including emergencies.

## Objectives

Upon completion of this lesson, the student will be able to:

- Administer rescue breathing to a child and an infant
- Recall the differences between adult and child CPR
- Show the basic steps of CPR for a child and an infant
- Demonstrate the steps for using an AED on a child

## Engage

Tell the students that with the knowledge and skills learned in this lesson they could save the life of a child.

## Key Points

\*Note to teacher: This lesson is not designed to take the place of American Heart Association *Healthcare Provider* course. It is designed to introduce life-saving CPR techniques and basic facts about CPR. You must complete the AHA BLS Instructor course in order to give your students a *Healthcare Provider* course completion card.

- I. Sudden cardiac arrest is the number one sudden killer in children
  - A. In adults, sudden cardiac arrest results primarily from cardiac disease.
  - B. In children, sudden cardiac arrest is predominantly caused by things other than heart disease.
    1. Trauma
    2. Poisoning
    3. Various respiratory disorders
      - a) *Airway obstruction*
      - b) *Smoke inhalation*
      - c) *Drowning*
      - d) *Respiratory infection*
      - e) *Sudden Infant Death Syndrome*
- II. There are four elements in the pediatric cardiac chain of survival:
  - A. Prevention of arrest
  - B. Early and effective CPR
  - C. Rapid activation of the EMS system
  - D. Early and effective advanced life support

- III. Child CPR should be used on an unresponsive victim between the ages of one and puberty.
  - A. If you don't know the victim's age, look for signs of puberty.
  - B. Signs of puberty include
    - 1. Breast development in females
    - 2. Underarm, chest, and facial hair on males
  - C. Adult CPR should be done on children that have reached puberty.
  - D. Infant CPR is used when the unresponsive victim's age is birth to one year old.
- IV. The unconscious victim
  - A. Never attempt CPR on a person that is responsive.
  - B. Establish unresponsiveness
    - 1. Shake and Shout
      - a) *Tap the victim on the shoulder for response.*
      - b) *Shout, "Hey are you okay?"*
    - 2. If no responses from the victim, begin the steps of child CPR, and have someone call 911 and get the AED for you.
      - (1) If you are alone, perform 5 cycles of CPR. If someone has not done so already, then activate the emergency response system and get an AED if available.  
\*\*\* This is different than adult CPR.
      - b) *Answer all the 911 dispatcher's questions.*
      - c) *Wait until the dispatcher disconnects the phone connection before you hang up.*
    - 3. Anytime you have an unresponsive victim, you should call 911, even if you don't know why the victim is unconscious.
    - 4. Be prepared to begin CPR.
- V. Steps of Child CPR
  - A. Make sure the scene is safe.
    - 1. Is the victim in a dangerous place?
    - 2. Are there any obvious threats or dangers to you or the victim?
  - B. Make sure the victim is lying on his back on a firm, flat surface.
    - 1. If the victim is lying face-down, carefully roll him onto his back.
    - 2. If the victim is face-up on a bed or another soft surface, place a board, or other firm object, under his back.
    - 3. A soft surface diminishes the effect of chest compressions.
    - 4. Effective chest compressions can only be performed on a firm surface.
  - C. Kneel at the victim's side and open the airway using the head tilt-chin lift method.

1. Tilt the head by pushing back on the forehead.
  2. Lift the chin by putting your fingers on the bony part of the chin.
  3. Do not press the soft tissues on the neck or under the chin.
  4. Lift the chin to move the jaw forward.
- D. Check for normal breathing (at least one breath every 3-5 seconds).
1. Look, Listen and Feel.
    - a) *Put your ear next to the victim's mouth and nose.*
    - b) *Look to see if the chest rises.*
    - c) *Listen for breaths.*
    - d) *Feel for breaths on your cheek.*
  2. If the victim is breathing normally
    - a) *Roll the victim onto his or her side.*
    - b) *Wait for trained help to take over.*
    - c) *If the victim stops breathing, start the steps of CPR from the beginning.*
- E. If there is no normal breathing, give 2 breaths.
1. Hold the airway open with a head tilt-chin lift.
  2. Pinch the nose closed.
  3. Take a normal breath and cover the victim's mouth with your mouth, creating an airtight seal.
  4. Give 2 breaths, about 1 second each.
    - a) *Children's lungs are smaller than adult lungs.*
    - b) *You will not need to blow as forcefully as you do when giving adult CPR.*
  5. Watch for chest to rise as you give each breath.
  6. If the first breath does not go in, re-open the airway with a head tilt-chin lift and try again.
  7. Room air is 21% oxygen (O<sub>2</sub>).
    - a) *We only use part of the 21% O<sub>2</sub> we breathe in.*
    - b) *We breathe out waste products and "leftover O<sub>2</sub>."*
    - c) *It is enough O<sub>2</sub> to be of help to the non-breathing victim.*
  8. \*Note to instructor: Foreign body airway obstruction will be taught in a separate lesson.
- F. Check for pulse
1. Healthcare providers are trained to check for a pulse while lay persons are not.
  2. Check the carotid pulse.
    - a) *If heart activity is producing any pulse activity at all, there is a better chance of palpating the pulse if you check a central pulse.*
      - (1) The carotid pulse is close to the heart
      - (2) Peripheral pulses such as the brachial and radial pulses are further away from the heart

- b) *Locate the trachea using 2 or 3 fingers.*
  - (1) Slide these 2 or 3 fingers into the groove between the trachea and the muscles at the side of the neck
  - (2) Feel for the throb of the carotid pulse for at least 5, but no more than 10, seconds
  - (3) If you can feel a pulse, and the pulse is at least 60 beats per minute, continue with rescue breathing
    - (a) *1 breath every 5 seconds for adults*
    - (b) *1 breath every 3 seconds for a child or baby*
  - (4) If you do not feel a pulse OR the pulse is less than 60 beats per minute, AND there are signs of poor perfusion, begin chest compressions
    - (a) *Poor perfusion is poor circulation*
    - (b) *Pale or cyanotic skin are signs of poor perfusion*

G. Remove clothes from the front of the chest.

- 1. Clothing is removed so that you can see the landmark for placing your hands in the correct position.
- 2. Clothing gets in the way when using the automated external defibrillator (AED).

H. Give 30 chest compressions.

- 1. Put the heel of one hand on the center of the victim's chest.
  - a) *The center of the chest is between the nipples.*
  - b) *This puts your hand on the lower part of the sternum, but away from the xiphoid process.*
  - c) *A child's body is smaller than an adult's, so one hand will be strong enough to give effective chest compressions.*
- 2. Push hard and fast.
  - a) *Push straight down on the chest,  $\frac{1}{3}$  to  $\frac{1}{2}$  depth of the chest with each chest compression.*  
*\*\*\* This is different than adult CPR.*
  - b) *Push at a rate of 100 compressions per minute.*
- 3. After each compression, release pressure on the chest to let it come back to its normal position (recoil).
- 4. A chest compression is an artificial heart beat.
  - a) *Compressions pump blood to the brain and heart.*
  - b) *When the heart stops beating, the sooner you start compressions, the better.*
    - (1) Blood is still oxygen-rich at the time the heart stops.

- (2) Each compression will be delivering oxygen-rich blood to the body organs.

I. Keep giving CPR.

1. 30 chest compression for every 2 breaths
2. Until the AED arrives;
3. The victim starts to move; or
4. Trained help takes over (i.e. EMT, nurse, doctor).

VI. What is an AED?

A. Automated External Defibrillator

B. A machine with a computer inside

1. Recognizes cardiac arrest that requires a shock
2. Tells the rescuer when a shock is needed
3. Gives the shock if needed
4. Can stop some abnormal heart rhythm and allow a normal rhythm to return
5. A machine that is accurate and easy-to-use
  - a) *Uses visual and audible prompts*
  - b) *Simple, easy-to-follow steps*

C. When to use an AED

1. The person performing CPR continues until the AED arrives.
2. As soon as the AED arrives and is set up, CPR stops, and the AED is put into use.
  - a) *If the person arriving with the AED is trained in CPR/AED use, that person will set up the AED.*
  - b) *The person administering CPR continues CPR until the AED is ready to be used.*
3. AED use is indicated only when three criteria are present:
  - a) No response from victim
  - b) No breathing seen in the victim
    - (1) Agonal breaths are occasional gasps of air in a cardiac arrest victim
    - (2) Agonal gasps are not effective breaths
  - c) No pulse can be palpated in the victim

VII. Steps in using an AED

A. Turn the AED on.

1. Push the "ON" button, or open the lid
2. Follow the visual and audible prompts

B. Attach pads.

1. Choose the correct pads.
  - a) *Some AEDs can deliver a smaller shock dose for children, if you use child pads, or a child "key" or switch.*
  - b) *Use the child pads or child "key" if available.*

- c) *If the AED does not have child pads, adult pads may be used on a child.*
    - \*\*\* *May use adult pads on a child.*
    - \*\*\* *May NOT use child pads on an adult.*
  - 2. Open the AED pad package and peel away the plastic backing.
  - 3. Attach the sticky side of the pads directly to the victim's bare chest.
  - 4. The picture on the pad will show you where to put the pads.
- C. Clear the victim
  - 1. Make sure no one is touching the victim – not even you.
  - 2. The victim's body must be motionless for the AED to analyze the heart rhythm or give a shock.
- D. Allow the AED to check the heart rhythm.
  - 1. Many AEDs audibly say, "Analyzing Now."
  - 2. The AED will say, "Shock Advised" or "No shock needed."
  - 3. If "Shock Advised" is said, then you will hear the AED charging.
- E. Push the SHOCK button if the AED tells you to do so.
- F. The AED may tell you to resume CPR.
  - 1. Do not recheck for a pulse.
  - 2. Immediately start chest compressions.

## VIII. Special Situations when using the AED

### A. Water

- 1. DO NOT deliver shock if victim is
  - a) *Lying in water*
  - b) *Covered with water*
    - (1) Victim is covered with sweat
    - (2) Victim has just been pulled from a pool of water
    - (3) If the victim is lying in a small puddle of water or snow, but the chest is not covered with water, you can give shocks
- 2. Move the victim away from standing water.
- 3. Quickly wipe the victim's chest before you attach the pads.
- 4. Water may cause the shock to flow over the skin from one pad to the other: energy won't get to the heart.

### B. Medicine patch

- 1. Do not put an AED pad over a medicine patch.
  - a) *The patch may block some of the shock dose.*
  - b) *The patch may burn the victim if the pad is placed over a medicine patch.*
  - c) *Wear gloves when you remove a medicine patch.*
- 2. Wipe the chest where the patch was, before you put on the

pad

C. Pacemaker or Internal Defibrillator

1. Look for a lump under the skin of the chest that looks smaller than a deck of cards.
2. If you see this lump where the pads should go, put the pads at least 1 inch away from the lump.
3. You may use the AED on victims with pacemakers or internal defibrillators as long as you keep the AED patch 1 inch away from the devices.

D. Hairy chest

1. If the pads stick to the hair instead of the skin, press down firmly on each pad.
2. If the AED still tells you to check the pads, quickly pull off the pads to remove the hair.
3. If a lot of hair still remains where you will put the pads, shave the area with the razor located in the AED carrying case.
4. Put on a new set of pads then follow the AED's visual and audible prompts.

IX. 2-rescuer Child CPR

A. Performing CPR can be a shared process.

B. One rescuer performs chest compressions.

1. Give 15 chest compressions.
2. Pause after the 15<sup>th</sup> compression to give time for the second rescuer to give 2 breaths.
3. Note that with 2-rescuer child CPR, the ratio between compressions and breaths changes to 15:2.

C. One rescuer gives rescue breaths.

1. Give two 1-second breaths.
  - a) *Mouth-to-mouth*
  - b) *Mouth-to-mask*
  - c) *Bag mask*

X. Recovery Position

A. Side-lying position

B. Not recommended for infants and small children

C. The side-lying position may block the airway if the head is not adequately supported.

\*Note to teacher: demonstrate each step of child CPR and use of an AED.

You may choose to demonstrate each step of CPR/AED as you explain the various parts, and then show the complete sequence at the last part of the lesson.

XI. Infant CPR

- A. Age from birth to one year
- B. Breaths are smaller than for a child or an adult.
- C. Chest compressions are done with less force than those used with a child or an adult.
- D. Just as with CPR for a child, if you are alone when you find the child unresponsive, do 5 cycles of CPR before stopping to call 911.

## XII. The Steps of Infant CPR

- A. Check for responsiveness.
  - 1. Don't shake the baby.
  - 2. Tap on the infant's foot.
  - 3. In a loud voice say, "Are you okay?"
- B. Have someone activate the emergency response system while you continue to work on the infant.
  - 1. Yell for someone to call 911.
  - 2. If you are alone, continue with the steps of CPR, delivering 5 cycles of 30:2 before you stop to activate the EMS system.
- C. Open the airway.
  - 1. Use the head tilt-chin lift.
  - 2. Be careful not to hyperextend the baby's neck.
  - 3. Tilt the head back to only the neutral (sniffing) position.
- D. Check for breathing.
  - 1. Look for the chest to rise and fall.
  - 2. Listen for air escaping during exhalation.
  - 3. Feel for the flow of air against your cheek.
- E. Give 2 breaths.
  - 1. A baby's nose is very close to his or her mouth.
  - 2. Put your mouth over the baby's nose AND mouth.
  - 3. Blow in enough air the make the chest rise.
    - a) *A baby's chest is very small.*
    - b) *It will only take a puff of air.*
  - 4. If the first breath does not go in and make the chest rise, reposition the airway and attempt a second breath.
  - 5. You may need to make multiple attempts to get the air in.
    - a) *Reposition the head and try again.*
    - b) *Check that you have a good seal if using a pocket mask or bag mask.*
- F. Check the Brachial pulse
  - 1. A baby's neck is short and fat.
  - 2. It is difficult to get your fingers on the neck to check the carotid pulse.
  - 3. Use 2 fingers to locate the brachial pulse.
  - 4. Feel for the pulse for at least 5, but no more than 10, seconds.



5. If no pulse is felt, begin infant-CPR.
- G. Locate the CPR hand (finger) position.
  1. Place your ring and middle fingers just below the intermammary line.
  2. Slightly below the nipple line, in the center of the chest
- H. Deliver 30 compressions.
  1. Push straight down on the chest,  $\frac{1}{3}$  to  $\frac{1}{2}$  the depth of chest, with each chest compression.
  2. Push at a rate of 100 compressions a minute.
  3. After each compression, release pressure on the chest to let it come back to its normal position (recoil).
  4. The infant needs to be on a firm, flat surface for chest compressions to be effective.
- I. Give 2 breaths.
  1. Just enough air to make the chest rise
  2. Continue CPR till trained help arrives.

### XIII. 2-rescuer Infant CPR

- A. The first rescuer delivers 15 compressions.
  1. When 2-rescuer infant CPR is done
    - a) *There is not enough room for both rescuers to be side-by-side while working with the infant*
    - b) *The rescuer positions the baby so that the baby's feet are pointed towards the rescuer*
  2. The rescuer uses the 2 thumb-encircling hands technique, instead of the-2 finger method of compressions.
    - a) *Place both thumbs side by side in the center of the infant's chest on the breastbone, just below the nipple line.*
    - b) *Do not press on the xiphoid.*
    - c) *The thumbs may overlap in very small infants.*
    - d) *Encircle the infant's chest and support the baby's back with the fingers of both hands.*
    - e) *Use your thumbs to depress the breastbone, approximately  $\frac{1}{3}$  to  $\frac{1}{2}$  the depth of baby's chest.*
    - f) *Give 15 compressions, smoothly, at a rate of 100 beats per minute.*
    - g) *Pause briefly for the second rescuer to give 2 breaths.*
- B. The second rescuer gives 2 breaths.
  1. Positions him or herself at the head of the baby
  2. Be ready to give 2 breaths during the pause after the 15<sup>th</sup> compression.
- C. Continue CPR, with a ratio of 15 compressions to 2 breaths, until trained help arrives

XIV. The use of an AED is not recommended for infants.

### **Activity**

- I. Students will practice the steps of Child CPR/AED and Infant CPR on a practice manikin.

### **Assessment**

Students will perform the steps of Child and Infant CPR and use of AED on the child manikin.

Rubric

### **Materials**

One child and infant CPR manikin for every 3 students

Manikin cleaning supplies

Manikin mouth shields

CPR Face Mask

Bag mask (ambu bag)

AED trainer

\* If you don't have CPR manikins, you should check with the athletic department at your school. Sometimes they have CPR manikins.

### **Accommodations for Learning Differences**

For reinforcement the student will receive one-on-one coaching during CPR practice.

For enrichment, the student may research statistics on child and infant mortality rates related to sudden cardiac arrest. The students will share their findings with the class.

### **National and State Education Standards**

National Healthcare Foundation Standards and Accountability Criteria:

Foundation Standard 2

2.11 interpret verbal and nonverbal communication

2.14 Recognize the elements of communication using a sender-receiver model.

2.15 Apply speaking and active listening skills.

2.22 Use medical abbreviations to communicate information.

Foundation Standard 10: Technical Skills

Healthcare professionals will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

Accountability Criteria

10.1 Technical Skills

10.12 Apply skills to obtain training or certification in cardiopulmonary

resuscitation (CPR), automated external defibrillator (AED), foreign body airway obstruction (FBAO) and first aid. Additional technical skills may be included in a program of study based on career specialties.

TEKS

130.204 (c)(8)(H) demonstrate first aid, vital signs, cardiopulmonary resuscitation, and automated external defibrillator skills in a laboratory setting.

Texas College and Career Readiness Standards

*Science Standard,*

I. Nature of Science C. Collaborative and safe working practices  
Demonstrate skill in the safe use of a wide variety of apparatuses, equipment, techniques, and procedures.

*Cross-Disciplinary Standards,*

I. Key Cognitive Skills D. Academic Behavior: 1. Self monitor learning needs and seek assistance when needed, 3. Strive for accuracy and precision, 4. Persevere to complete and master task. E. Work habits: 1. Work independently, 2. Work collaboratively  
II. Foundation Skills A. 2. Use a variety of strategies to understand the meaning of new words. 4. Identify the key information and supporting details.

Health Science  
**Health Professional One and Two-rescuer  
 Child CPR/AED Checklist**

Steps	Action	Successfully completed
Step 1	Check for response: Tap the victim and ask loudly “Hey are you okay?”	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 2	Tell someone to call 911 and get the AED	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 3	Open the airway with the head tilt-chin lift	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 4	Look, listen and feel for breaths	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 5	Give 2 1-second breaths (keeping the airway open).	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 6	Bare the victim’s chest and place one hand in the proper position to begin CPR	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 7	Give 30 compressions at the rate of 100 beats per minute and about $\frac{1}{3}$ to $\frac{1}{2}$ the depth of the victim chest. *** Using only one hand	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 8	Give 2 1-second breaths	<input type="checkbox"/> completed <input type="checkbox"/> skipped
<i>Rescuer two arrives with the AED</i>		
Step 9	Rescuer one (R1) continues CPR as rescuer two (R2) sets up the AED for use	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 10	R2 turns on the AED	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 11	R2 selects and applies the proper child pads correctly (R1 continues with CPR steps)	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 12	R2: Clear the victim to analyze. R1: Stops CPR	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 13	If shock is advised, R2 clears the victim for shock and presses the shock button.	<input type="checkbox"/> completed <input type="checkbox"/> skipped

Step 14	R2: Resumes CPR, starting with chest compressions, if the AED instructs you to continue CPR. 100 beats per minute, 15:2 ratio, pauses after the 15 <sup>th</sup> compression to allow R1 to give 2 breaths <b>(NO pausing to recheck for pulse)</b>	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 15	R1: Gives 2 1-second breaths (keeping the airway open).	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 16	R2: Gives <b>15</b> compressions at the rate of 100 beats per minute. Continue CPR until the AED is ready to reanalyze the victim, the victim is revived or emergency medical personnel arrive to take over.	<input type="checkbox"/> completed <input type="checkbox"/> skipped

16 steps completed = 100

15 steps completed = 92

14 steps completed = 87

13 steps completed = 70 and needs remediation

Comments:

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# Health Science

## Health Professional One and Two-rescuer Infant CPR Checklist

Steps	Action	Successfully completed
Step 1	Check for response: Tap the infant on the feet and say loudly “Baby, baby you okay?”	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 2	Tell someone to call 911	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 3	Open the airway with the head tilt-chin lift	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 4	Look, listen and feel for breaths (at least 5 seconds)	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 5	Give 2 1-second breaths (keeping the airway open).	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 6	Bare the victim’s chest and place the ring and middle fingers in the proper position to begin CPR	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 7	Give 30 compressions at the rate of 100 beats per minute and about $\frac{1}{3}$ to $\frac{1}{2}$ the depth of the victim chest. *** Using only the two weakest fingers, i.e. middle and ring fingers	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 8	Give 2 breaths, just enough to make the chest rise	<input type="checkbox"/> completed <input type="checkbox"/> skipped
<i>Rescuer two arrives, after calling 911 and is ready to help. **AED not recommended for use on an infant.</i>		
Step 9	R2: Takes over chest compressions, using the two thumb circling hand-technique, 100 beats per minute and a 15:2 ratio. Pauses after the 15 <sup>th</sup> compression to allow R1 time to give 2 breaths	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 10	R1: Gives 2 breaths (keeping the airway open).	<input type="checkbox"/> completed <input type="checkbox"/> skipped
Step 11	R2: Gives 15 compressions at the rate of 100 beats per minute. Continue CPR until the victim is revived or emergency medical personnel arrive to take over.	<input type="checkbox"/> completed <input type="checkbox"/> skipped

11 steps completed = 100

10 steps completed = 92

9 steps completed = 87

8 steps completed = 70 and needs remediation