

# American Heart Association

## Study Guide 2017 BLS for Healthcare Providers

### CPR Emphasis as of February 2016 for Healthcare Providers:

- Focus on providing **high-quality CPR** with special attention to chest compression depth and rate. Permit complete chest wall recoil with minimal interruptions to compressions. Full chest recoil allows more blood to refill the heart to adequately refill between chest compressions. Incomplete chest recoil will reduce the blood flow created by chest compressions. During 2 Rescuer CPR the person at the head can assist in monitoring chest compressions and offer verbal assistance if necessary. This is accomplished by taking the weight off your hands and allowing the chest to return to its normal position but keep your hands in contact with the chest. Appropriate depth of compressions is needed to create blood flow during compressions.  
The lone rescuer should begin CPR with 30 compressions rather than 2 ventilations to reduce delay to first compression.
- Health-care providers performing 2 rescuer CPR for infants and children should use a 15:2 compression-to-ratio – switching roles every 2 minutes or 10 cycles
- Compressions are given at a rate of at least 100- 120 per minute with complete relaxation/recoil of pressure on the chest wall after each compression (allows the heart to adequately refill between compressions) – **minimize** interruption of compressions (increases the chance of survival for the victim) & avoid excess ventilation.
- AED: Remember to utilize the appropriate PADS for your victim! For attempted defibrillation of children 1 to 8 years of age with an AED, the rescuer should use a pediatric dose-attenuator system if one is available. If the rescuer provides CPR to a child in arrest and does not have an AED with a pediatric dose-attenuator system, the rescue should use a standard AED. For infants (<1 year of age), an AED with a pediatric dose-attenuator is desirable but if unavailable an AED without a dose attenuator may be used. Do not allow pads to touch.
- When 2 or more rescuers are available during CPR, rescuers should rotate the compressor role and utilize the TEAM Approach.
- During adult CPR you must compress the chest **at least** 2 inches in depth.
- During child CPR you can use either one or two hands as long as the depth of your compressions remains at least 1/3 the depth of the victim's chest or about 2 inches.
- Refinements have been made to recommend that immediate recognition and activation of the emergency response system based on signs of **unresponsiveness** as well as initiation of CPR if the victim is unresponsive with no breathing or no normal breathing (i.e. victim is only **gasp**ing).
- For unresponsive child victims, the lone rescuer should provide 5 cycles of CPR before leaving the child victim to active the EMS. Then the lone rescuer should return to the victim to use the AED as soon as possible and begin CPR.

### AHA Adult Chain of Survival

**Figure 1**  
AHA ECC Adult Chain of Survival

The links in the new AHA ECC Adult Chain of Survival are as follows:

1. Immediate **recognition** of cardiac arrest and **activation** of the emergency response system
2. Early **CPR** with an emphasis on chest compressions
3. Rapid **defibrillation**
4. Effective **advanced life support**
5. Integrated **post-cardiac arrest care**



The AHA adult *Chain of Survival* symbol depicts the critical action required to treat life-threatening emergencies, including heart attack, cardiac arrest, stroke and FBAO.

- **Early access to the emergency response system** in your healthcare community is to ensure that additional rescuers and those capable of providing advanced life support arrive as quickly as possible.
- **Early CPR** to support circulation to the heart and brain until normal heart activity is restored.
- **Early defibrillation** can help terminate an abnormal rhythm and restore a regular heart rhythm
- **Early advanced care** will be provided by EMS and hospital personnel with additional training and expertise.
- **Integrated post-cardiac care** to improve survival for victims of cardiac arrest who are admitted to a hospital after resuscitation, a comprehensive, structure, integrated multidisciplinary system of post-cardiac arrest care should be implemented in a consistent manner.

The **first** link in the treatment of any emergency is to recognize that an emergency exists and phoning the appropriate emergency response number. ALWAYS ensure the scene is safe prior to approaching the victim.

You must recognize the warning signs of a heart attack, cardiac arrest, stroke, or FBAO. Anyone who is unresponsive should receive emergency care.

Often in an emergency you are not alone with the victim. Other rescuers or bystanders are often nearby. If you find a person who is unresponsive, shout for help to bring other rescuers to help you, and then check the victim for signs of life as soon as they collapse. Then send another rescuer to phone the emergency response number while you begin CPR.

The **second** link is early CPR – a set of actions that the rescuer performs in sequence to evaluate and support airway, breathing and circulation as needed. CPR is the critical link that buys time between the first link (early access) and the third link (early defibrillation). CPR Supports delivery of oxygen to the brain and heart until defibrillation or other advanced care can restore normal heart action.

The **third** link is early defibrillation – this is because most adult victims of a witnessed sudden cardiac arrest are in ventricular fibrillation. VF (Ventricular Fibrillation) is an abnormal, chaotic heart rhythm that prevents the heart from pumping blood. The treatment for VF is defibrillation. Defibrillation is the delivery of a shock to the heart that stops VF and allows a normal heart rhythm to resume. When VF occurs, prompt defibrillation will increase the victim's chance of survival. With each minute that defibrillation is delayed, the victim's chance of survival falls by 7% to 10%. If defibrillation is performed within the first 5 minutes of cardiac arrest caused by VF, the victim's chance of survival is about 50%. After 10 to 12 minutes of cardiac arrest, there is little chance of survival unless good, continual CPR has been provided. CPR prolongs the time that defibrillation can be effective. Do not remove the AED pads once they are placed on patient. The rhythm could change.

An AED is attached to the victim with 2 adhesive electrode pads. The AED analyzes the rhythm of the victim's heart; determines if a shock is needed and then advises the rescuer to press a SHOCK button to deliver the shock.

The **fourth** link is the arrival of highly trained EMS personnel to provide advanced care outside the hospital.

The **fifth** link is the integrated in-hospital care management that a person will receive if the victim is resuscitated.

## **How to Recognize Life-Threatening Emergencies**

### **Heart Attack:**

The most important and most common symptom of a heart attack is chest discomfort, pressure, or pain. The pain develops in the center of the chest, usually behind the breastbone. The pain may travel to the neck, jaw, or down the arm (usually left). It usually lasts for more than 3 to 5 minutes. Remember, not all warning signs will occur in all persons. Some may have vague signs – lightheadedness, faint, shortness of breath or nausea. They may describe heartburn or indigestion. You may notice them sweating as well.

*If you think someone is having a heart attack.....immediately activate the emergency response number.*

**Many people will not admit that they may be having a heart attack.**

Once you make that important phone call to the emergency response number, help the person into a position that is comfortable and that allows the easiest breathing.

### **How to Recognize Cardiac Arrest:**

In cardiac arrest, blood flow stops and the brain, heart and other organs are deprived of oxygen. The victim will be unresponsive and will have no adequate breathing, no signs of circulation, and no pulse. The victim will have no signs of circulation (no adequate breathing, coughing or movement in response to rescue breaths) – this victim needs **high quality** CPR. Healthcare providers should assess the pulse for NO MORE than 10 seconds.

Victims in cardiac arrest often gasp for breath. They may occur early in cardiac arrest, and they are **NOT effective breaths**. Ineffective respirations will not maintain oxygenation or ventilation, so a victim who is gasping is NOT breathing adequately. Your next step will be to begin CPR.

Both healthcare providers and lay rescuers evaluate breathing as a sign of circulation. Healthcare providers should be able to distinguish between adequate and inadequate breathing. If a person of **any age** has an adequate pulse **but is not breathing** we must give breaths without chest compressions.

**Remember** – Immediate CPR provides a flow of oxygen-rich blood to the heart and brain and “buys time” until defibrillation.

### **What is a Stroke & How to Recognize a Stroke:**

A stroke is the rapid onset of neurological problems. A stroke can develop when either a blood vessel in the brain becomes blocked so that an area of the brain receives no blood and no oxygen, or it can develop when a blood vessel in the brain ruptures and bleeds into the brain. Stroke is a leading cause of death and serious disability among Americans (it knows NO age limits).

Risk factors of a stroke include a prior history of stroke, heredity, gender and untreated high blood pressure.

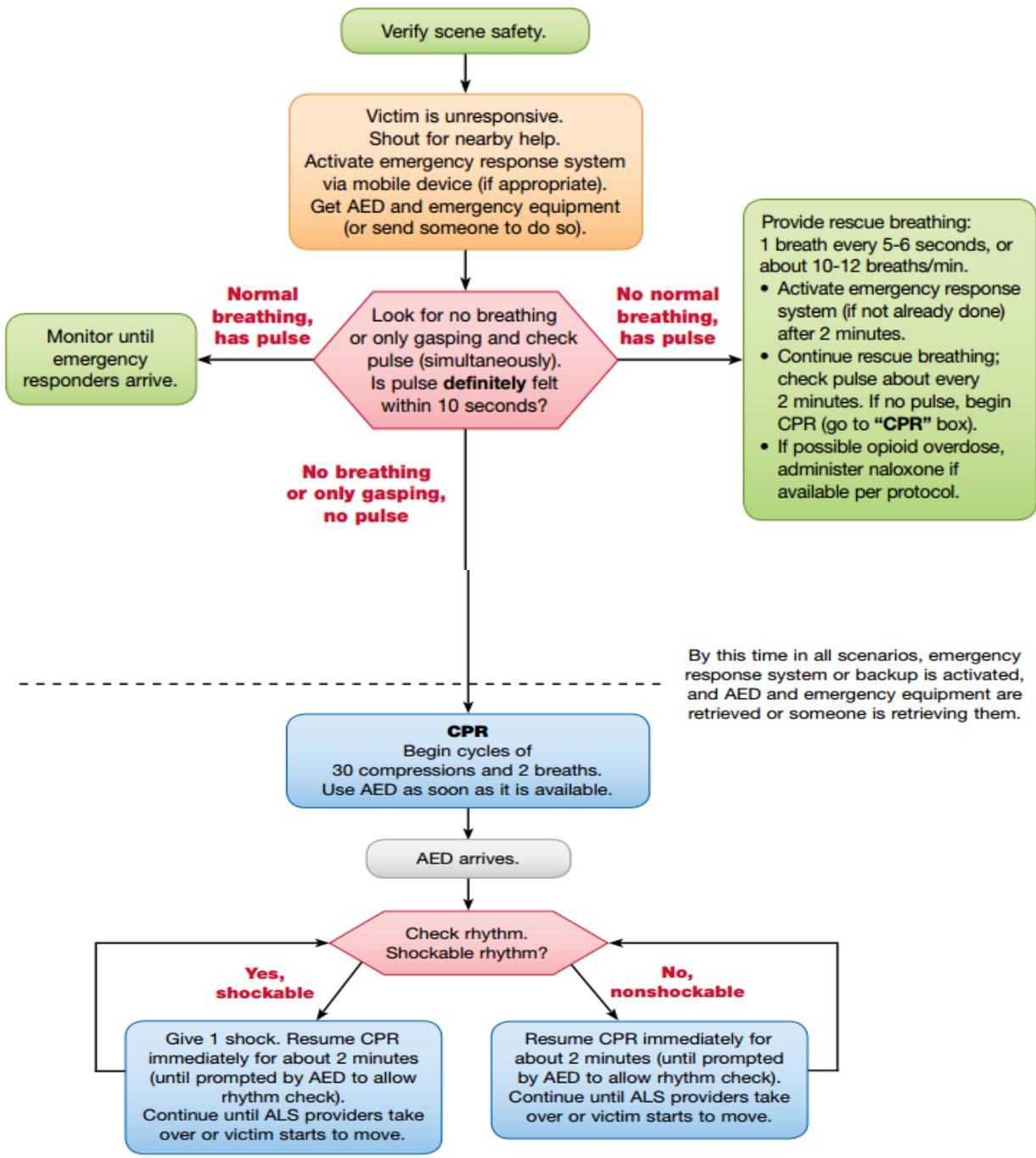
Signs of a stroke – facial droop, arm weakness, speech difficulties as well as others. If you think someone is having a stroke, immediately activate your emergency response number. There are new and effective treatments for stroke but they must be administered within 3 hours.

**How to Recognize FBAO:**

Foreign bodies may *partially* block the airway but still allow adequate air movement. The victim will be responsive and will cough forcefully. Usually they can speak and their breath sounds may be noisy. These victims require no immediate action from you, but be prepared to act if the obstruction becomes severe or complete.

Victims with a *severe* or *complete* FBAO will initially be responsive but will not be able to move enough air to cough forcefully or speak. They may make high-pitched noises when they try to inhale. If severe or complete FBAO is present, give abdominal thrust to relieve the obstruction.

**BLS Healthcare Provider Adult Cardiac Arrest Algorithm**



## Two Rescuers

### This must be accomplished by working as a TEAM working together to give high quality chest compressions and breaths.

In 2-rescuer CPR, 1 rescuer is positioned at the victim's side and performs chest compressions. The other rescuer remains at the victim's head, keeps the airway open, monitors the carotid pulse to assess the effectiveness of chest compressions (if your partner is performing effective compressions you should feel a pulse with each compression), and provides rescue breathing.

The compression rate for 2-rescuer CPR is at least 100-120 compressions per minute. The compression-ventilation ratio for 2-rescuer adult CPR is 30:2. This ratio is the number of compressions (30) and breaths (2) in 1 cycle. The role of the second rescuer at the head during the cycles of compressions to ventilation is to maintain an open airway and give breaths.

Performing chest compressions is exhausting. The rescuers should change positions every 5<sup>th</sup> cycle or approximately 2 minutes. Interrupting chest compressions interrupts circulation. During CPR blood flow is provided by chest compressions. Rescuers must be sure to provide effective chest compressions and minimize any interruption of chest compressions.

To determine if the victim has signs of circulation, stop chest compressions for no more than 10 seconds after the first minute of CPR. When chest compressions are stopped, the rescuer at the victim's head opens the airway and assesses for adequate breathing or coughing. Both rescuers look for movement. The rescuer at the victim's head should also feel for a carotid pulse. If signs of circulation return, chest compressions are no longer required. Rescue breathing may still be needed (about 10-12 breaths per minute for the adult, and about 20 breaths per minute for the pediatric). If no signs of circulation are detected continue chest compressions and check for signs of circulation every few minutes.

Remember when working as a TEAM – to be aware of your limitations – if you become tired ask another TEAM members to relieve you.

The TEAM approach is to function smoothly - this occurs when all TEAM members know their roles and responsibilities.

### Recovery Position

If the victim is unresponsive but **has a pulse and is breathing adequately**, neither cardiac nor respiratory arrest is present. Such a victim does not need chest compressions or rescue breathing. If there are no signs of injury, place the victim in a recovery position. A recovery position keeps the airway open.

To place the victim in a recovery position, kneel beside the victim and straighten the victim's legs. Roll the victim toward you onto his or her side. Position the top leg to balance the victim on his or her side. Tilt the victim's head to a neutral position to keep the airway open. Continue to monitor the victim for adequate breathing.

### Rescue Breathing

**If the victim has Pulse** - evaluate breathing, place your ear near the victim's mouth and nose while maintaining an open airway. While observing the victim's chest, (1) assess for chest rise and fall, (2) assess for airflow moving through the victim's nose and mouth and (3) feel for the flow of air. If the chest does not rise and fall and no air is exhaled, the victim is not breathing. This evaluation procedure should take no more than 10 seconds.

Most victims with cardiac or respiratory arrest have no signs of breathing or exhibit agonal (dying) respirations. **Agonal** gasps are not adequate breathing. For this reason, the rescuer needs to begin CPR in the C-A-B sequence

**If the victim has pulse but is not breathing** -To provide rescue breaths, hold the victim's airway open using the **head tilt/Chin lift method (if no suspected neck injury)**; pinch the nose closed with your thumb and index finger (using the hand on the forehead); take a deep breath and seal your lips around the victim's mouth, creating an airtight seal and give slow breaths – making sure the victim's **chest rises** with each breath (1 breath every 5-6 seconds). (For infant – make a tight seal of your mouth over the infant's mouth and nose) See chart included for the recommended number of breaths per minute for Adults, Children and Infants.

### **Barrier Devices**

AHA recommends that healthcare providers use barrier devices or bag valve mask devices to provide rescue breathing (no human has ever contracted AIDS or hepatitis through mouth to mouth contact during CPR). OSHA recommends that “universal precautions” be followed when there is any exposure to blood or bodily fluids, including saliva. Use of a bag-valve-mask device is **not** recommended for use when there is only a single rescuer.

There are several different types of face shields, facemask and bag valve mask devices. Remember – **whatever device you are using - give a breath till you see 'chest rise' in the victim to ensure you are giving adequate ventilation.**

### **Foreign-Body Airway Obstruction**

Foreign-body airway obstruction (FBAO), or choking, is an alarming and dramatic emergency. To confirm a complete FBAO, ask the victim “Are you choking?”. If the victim cannot speak or can only make weak, high-pitched sounds, perform abdominal thrust until the object is expelled or the victim becomes unresponsive.

1. Stand behind the victim
2. Make a fist with one hand
3. Place your fist on the victim's abdomen, slightly above the navel and well below the breastbone
4. Grasp your fist with your other hand
5. Deliver quick upward thrusts into the victim's abdomen
6. Deliver thrusts until the object is expelled or the victim becomes unresponsive

If a choking adult becomes unresponsive while you are doing abdominal thrust - you should ease the victim to the floor and send someone to activate your emergency response system. *When a choking victim becomes unresponsive, you begin the steps of CPR-starting with compressions. The only difference is that each time you open the airway – look for the obstructing object before giving each breath. Remove the object **if you see it.***

### **AED's**

*Early defibrillation is critical for victims of sudden cardiac arrest. The sooner defibrillation occurs, the greater the victim's chance of survival from cardiac arrest. When ventricular fibrillation is present, CPR can provide a small amount of blood flow to the heart and brain but cannot directly restore an organized rhythm. Use of an AED & immediate CPR can restore an irregular cardiac rhythm. **The probability of successful defibrillation decreases quickly over time.** They are very simple to learn to use and are considered “user friendly”.*

Notes: If a victim has been submerged in water – remove the victim from the water & wipe the chest prior to attaching the AED

If using an AED on a person who has a hairy chest – the pads may not stick and fail to deliver a shock.

### **To use:**

1. TURN THE AED on
2. ATTACH the electrode pads to the victim's bare chest  
**DO NOT TOUCH THE VICTIM AND ASSURE NO ONE IS TOUCHING THE VICTIM & FOLLOW the AED COMMANDS**
3. **Clear** the victim and ANALYZE the Heart Rhythm
4. **Clear** the victim and deliver a SHOCK (if indicated)  
**ALWAYS BE CERTAIN NO ONE IS TOUCHING THE VICTIM** before you press SHOCK. The AED could shock you while it is shocking the victim. (AEDs are sophisticated, computerized devices that are reliable and simple to operate, allowing lay persons and healthcare providers to attempt defibrillation safely. If the AED advises a shock, it will tell you to be sure to clear the victim. This is important to avoid injury to the rescuer or others near the victim.)

**(As soon as the AED give the shock, begin CPR starting with chest compressions.)**

5. If the AED does not detect a rhythm requiring a shock, the AED will prompt you to resume CPR, beginning with chest compressions.  
**Leave the electrode pads attached on the victim's chest.** The AED may prompt you to clear the victim to allow analysis in about 2 minutes. Follow the AED voice prompts. After 2 minutes of CPR, the AED will prompt you to repeat steps 3 and 4.

Remember to utilize the appropriate PADS for your victim. For attempted defibrillation of children 1 to 8 years of age with an AED, the rescuer should use a pediatric dose-attenuator system if one is available. If the rescuer provides CPR to a child in arrest and does not have an AED with a pediatric dose-attenuator system, the rescuer should use a standard AED. For infants (<1 year of age), an AED with a pediatric dose-attenuator is desirable if unavailable and the AED without a dose attenuator may be used.

Only adult pads/system should be used on adult – **never** use child/infant system on an adult.

### **Children and Infants – Prevention of injuries and Arrest**

In the United States the leading cause of death in infants during the first 6 months of life is SIDS. In older infants, children and young adults, injuries are the leading cause of cardiac arrest and death. The most common causes of injury and death are motor vehicle crashes, drowning, burns, smoke inhalation, firearms, poisoning and choking. All of these causes can lead to ***breathing emergencies*** and cardiac arrest in children.

We need to be aware of unsafe conditions involving our children such as:

- Not putting our infants to bed on their stomach – they need to be propped on their back,
- Place our children in the back seat of the car and buckle them in (that includes our infants in car seats),
- Our children must wear a helmet when participating in biking or skating,
- Closely supervise our children when we are near water,
- Teach our children not to play with fire and to have smoke detectors in our homes,
- Never leave a firearm within the reach of a child and if you have a firearm in your home secure it with a 'trigger lock',
- Be aware of all types of poisons that we have in our home (medicines, plants, cleaners, pesticides and petroleum products).

### **The CAB's of CPR: Infant and Child CPR and Relief of Choking (FBAO)**

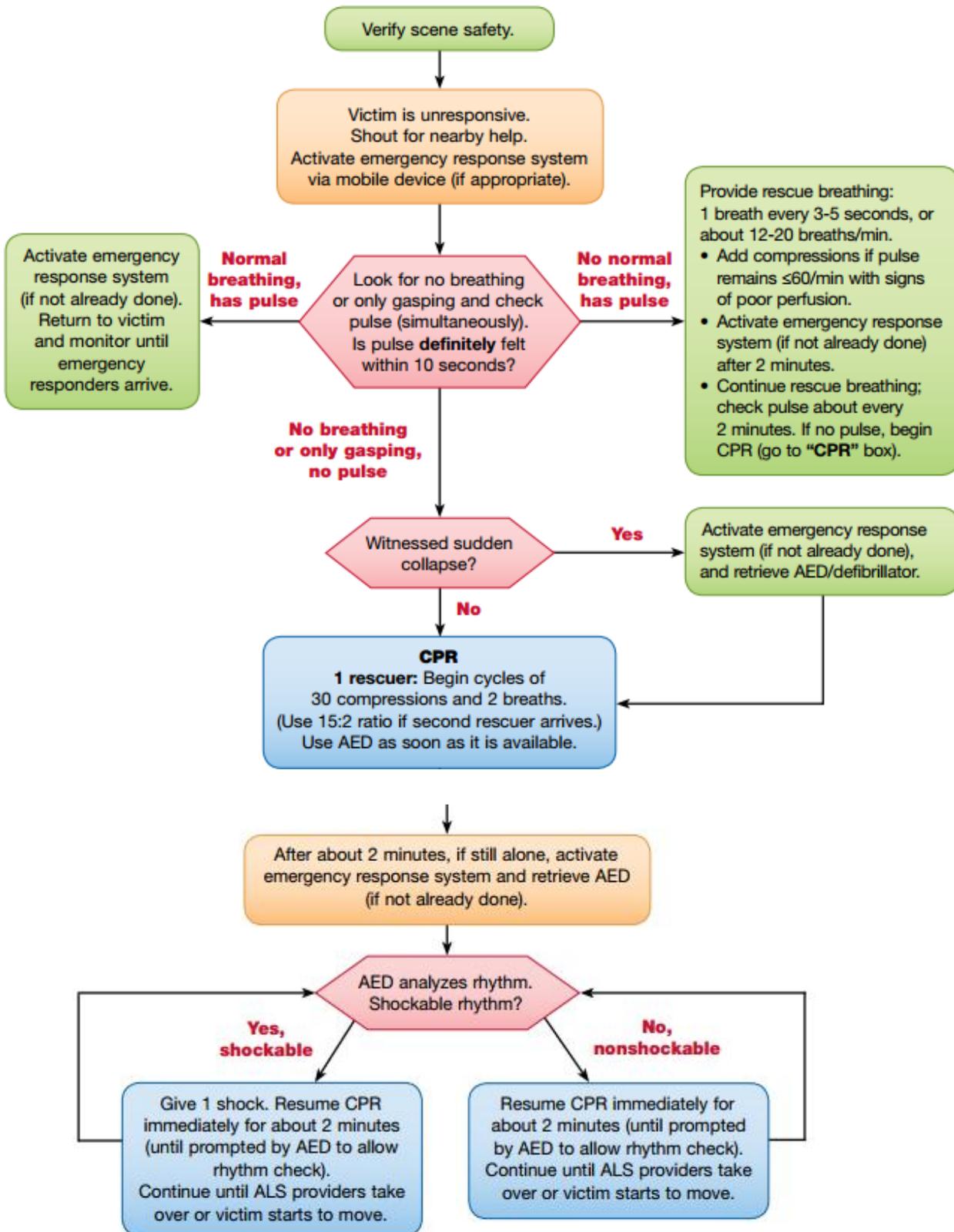
After prevention, early CPR is the second link in the AHA Infant/Child Chain of Survival. CPR steps consist of assessments and the skills needed to support the airway, breathing and circulation.

CPR helps to deliver oxygen to the blood and to move that oxygenated blood to the brain and other vital organs until medical treatment can restore normal heart actions.

If you find an unresponsive child for an unknown reason – 2 min. of assistance prior to calling 911. If you are aware of the reason for unresponsiveness – such as a blocked airway – perform 2 minutes of assistance to the child before leaving to call 911. If someone else is with you send that person to phone the emergency response number. If you are performing CPR on an infant/child with an obstructed airway – remember to look in the mouth for the obstructing object every time you open the airway to give a breath.

Remember: When checking pulse and respiration - make sure that they are enough to sustain life – for example – if you had an infant who was not breathing and checked/found their pulse to be 60 (60 for an infant is not enough to sustain life) & exhibiting signs of poor perfusion you would want to start chest compressions and breaths. In the same venue – if you had a child victim with a pulse of more than 60/min but not breathing you would give breaths without chest compressions.

**BLS Healthcare Provider Pediatric Cardiac Arrest Algorithm for the Single Rescuer**



To perform breaths on pediatric patients:

Infants – cover their mouth and nose with your mouth

Children – pinch their nose and seal your mouth around their mouth

*If using a BVM device the rescuer should give breaths at a rate of 1 breath every 3-5 seconds*

After providing CPR for about 2 minutes (about 5 cycles of 30 compressions to 2 breaths) you will stop and check for signs of circulation.

This is the point that you will either; go and call the Emergency Response Number or if a bystander has done so, you will continue to provide the steps of CPR that are necessary.

## **2 Rescuers CPR in Infants**

With infants, if there are 2 rescuers present, the 2 *thumb-encircling hands technique* is the preferred compression technique. You locate the hand position the same as in 1 rescuer (one finger width below the nipple line); place your thumbs side-by-side in the middle of the breastbone and compress at least 1/3 the depth of the infant's chest. After every 15 compressions, pause briefly for the second rescuer to open the airway with the head tilt-chin lift and give 2 breaths (the chest should rise with the breath). Coordinate compressions and ventilations to avoid simultaneous delivery and to ensure adequate ventilation and chest expansion. Continue compressions and breaths utilizing the ratio of 15:2 switching roles every 2 minutes or 10 cycles.

## **Foreign-Body Airway Obstruction in Infants and Children**

Foreign-body airway obstruction (FBAO) develops when an object becomes lodged in the airway and blocks the movement of air into and out of the lungs. If the blockage is severe or complete, the victim will be unable to breathe and oxygenate blood supplying the brain, heart and other vital organs with adequate oxygen to function normally. If the blockage is not relieved, the victim will become unresponsive and can die.

Signs of severe or complete FBAO in infants and children include: sudden onset of respiratory distress associated with weak or silent cough/cry, inability to speak, stridor or increasing respiratory difficulty.

These signs and symptoms of airway obstruction may also be caused by infections and croup. Typically with FBAO these signs and symptoms will develop suddenly with no other signs of illness or infection.

If you suspect a severe (victim not passing air or ineffective cough/cry) or complete FBAO, follow these steps:

### **For a Responsive Infant**

Pick the infant up from a supine (lying face up) position by lifting the legs with one hand and sliding the other hand all the way to the infant's head. Once this is done, "sandwich" the infant by placing the opposite arm and hand on the infant's stomach and face... grasping the infant's facial cheeks. Supporting the infant – place them face down on your thigh – make sure the head is lower than the body. Deliver 5 back slaps with the heel of your free hand between the shoulder blades. "Sandwich" the infant between your arms once again and turn the infant over so that the infant is lying on their back along your arm which should be placed on your thigh for support. Deliver 5-chest thrusts in the same location used for CPR compressions. Alternate 5 back slaps and 5 chest thrusts until the object is expelled or the infant becomes unresponsive. If unresponsive begin the steps of CPR – in this sequence – every time before you administer a breath – check the airway for foreign objects.

### **For a Responsive Child**

The steps for FBAO in a child are exactly the same, as you would use with an adult FBAO victim. Please review previous documentation.

Component	Adults and Adolescents	Children (Age 1 Year to Puberty)	Infants (Age Less Than 1 Year, Excluding Newborns)
<b>Scene safety</b>	Make sure the environment is safe for rescuers and victim		
<b>Recognition of cardiac arrest</b>	Check for responsiveness No breathing or only gasping (ie, no normal breathing) No definite pulse felt within 10 seconds (Breathing and pulse check can be performed simultaneously in less than 10 seconds)		
<b>Activation of emergency response system</b>	If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR  Otherwise, send someone and begin CPR immediately; use the AED as soon as it is available	<b>Witnessed collapse</b> Follow steps for adults and adolescents on the left  <b>Unwitnessed collapse</b> Give 2 minutes of CPR  Leave the victim to activate the emergency response system and get the AED  Return to the child or infant and resume CPR; use the AED as soon as it is available	
<b>Compression-ventilation ratio with advanced airway</b>	Continuous compressions at a rate of 100-120/min Give 1 breath every 6 seconds (10 breaths/min)		
<b>Compression rate</b>	★ 100-120/min		
<b>Compression depth</b>	At least 2 inches (5 cm)*	At least one third AP diameter of chest  About 2 inches (5 cm)	At least one third AP diameter of chest  About 1½ inches (4 cm)
<b>Hand placement</b>	2 hands on the lower half of the breastbone (sternum)	2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum)	<b>1 rescuer</b> 2 fingers in the center of the chest, just below the nipple line  <b>2 or more rescuers</b> 2 thumb—encircling hands in the center of the chest, just below the nipple line
<b>Chest recoil</b>	Allow full recoil of chest after each compression; do not lean on the chest after each compression		
<b>Minimizing interruptions</b>	Limit interruptions in chest compressions to less than 10 seconds		

\*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CPR, cardiopulmonary resuscitation.

When EMS arrives you may notice them utilize and ‘advanced airway’ (a medical device inserted through the mouth into the victim’s airway) – in this instance the correct compression and ventilation rates for 2 rescuer CPR is to compress at a rate of at least 100-120 per minute, with 1 breath every 6 seconds.