

Basic Life Support

Provider handbook

National Health Care Provider Solutions



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Basic Life Support

Provider Handbook



Basic Life Support: Provider Handbook

1st edition

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1 General concepts of basic life support

The American Heart Association (AHA) has updated the Basic Life Support (BLS) course over the years as new research in cardiac care has become available. Cardiac arrest continues to be a leading cause of death in the United States. Life Support guidelines have changed dramatically, and the elements of BLS continue to be some of the most important steps in initial treatment. Basic Life Support includes:

- Quickly starting the Chain of Survival
- Delivering high quality chest compressions for adults, children and infants
- Knowing where to locate and understanding how to use an Automatic External Defibrillator (AED)
- Providing rescue breathing when appropriate
- Understanding how to perform as a team
- Knowing how to treat choking

1.1 Initiating the chain of survival

Early initiation of BLS has been shown to increase the probability of survival for a victim of cardiac arrest. To increase the odds of surviving a cardiac event, the rescuer should follow the steps in the Adult Chain of Survival.

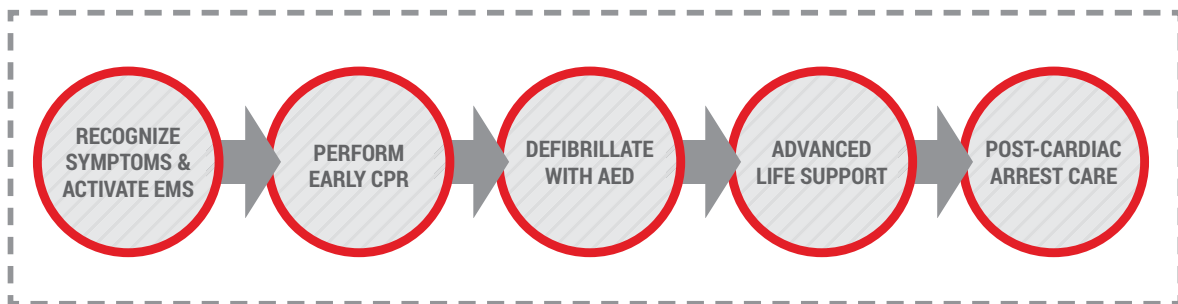


Figure 1: Adult chain of survival

Infants and children do not usually have primary cardiac events. Pediatric patients will most often suffer from respiratory events or dehydration that lead to cardiac arrest. The most important part of the Pediatric Chain of Survival is the first link – Prevention.

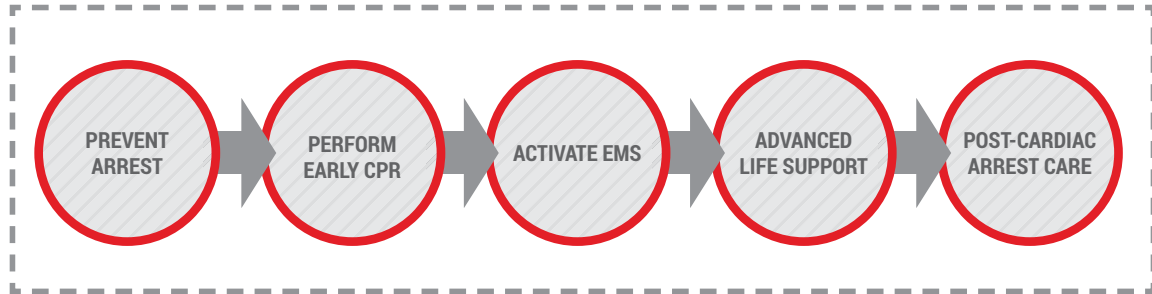


Figure 2: Pediatric chain of survival

1.2 2010 BLS guidelines changes

In 2010, the American Heart Association (AHA) released a revision of the BLS Guidelines. Approximately every five years the AHA updates the guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC). The content contained herein is based on the most recent AHA publications on BLS and will periodically compare old versus new recommendations for a comprehensive review.¹

These changes include:

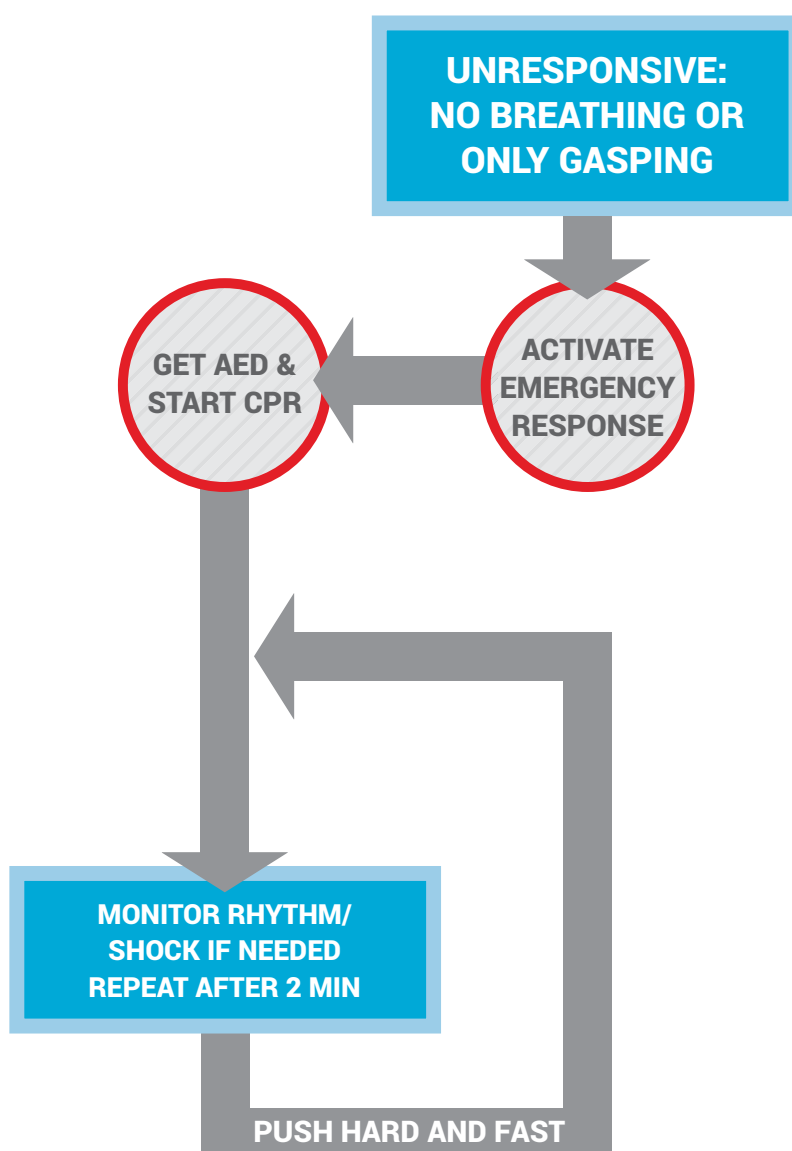
- Previously, the initial steps were A-B-C (Airway, Breathing, Compressions). The literature indicates that starting compressions early in the process will increase survival rates. Therefore, the steps have been changed to C-A-B (Compressions, Airway, Breathing). This is intended to encourage early CPR and avoid bystanders interpreting agonal breathing as signs of life and withholding CPR.
- “Look, listen and feel” for breathing is no longer recommended. Instead of assessing the victim’s breathing, begin CPR if the victim is not breathing (or is only gasping for breath), has no pulse (or if you are unsure), or if the victim is unresponsive. Do not perform an initial assessment of respirations. The goal is early delivery of chest compressions to cardiac arrest victims.

- High-quality CPR is key and is defined as:
 - Compression rate of AT LEAST 100 per minute for all victims
 - Compression depth of AT LEAST 2 inches for adults/children and about 1.5 inches for infants
 - Allow complete chest recoil after each compression
 - Minimize interruptions in CPR except to use an AED or change rescuer positions
 - Do NOT over-ventilate
 - Provide CPR as a team when possible
- Cricoid pressure is NO longer routinely performed.
- Pulse checks are shorter – feel for a pulse for 10 seconds then begin compressions if a pulse is absent or if you are not sure you feel a pulse. Even trained clinicians cannot always reliably tell if they can feel a pulse.
- For infants, use a manual defibrillator if one is available. If one is NOT available, an AED with pediatric dose attenuator should be used for an infant. If an AED with dose attenuator is not available, you may use an adult AED – even for an infant.

2 BLS for adults

The Basic Life Support (BLS) course for adults focuses on doing several tasks simultaneously. In previous versions of BLS, the focus was primarily on one-rescuer CPR. With the 2010 guideline update, it is recognized that more than one person is typically available to do CPR. However, all rescuers should know how to do both one and two-person resuscitation. This includes chest compressions, establishing an airway, breathing for the victim, and defibrillation when an AED machine is available. It is critical to know the steps in Adult BLS.

Simple adult BLS algorithm



2.1 One-rescuer adult BLS/CPR

BE SAFE	<ul style="list-style-type: none">• Move the victim out of traffic.• Move the victim out of water.• Be sure you do not become a victim.
ASSESS THE VICTIM	<ul style="list-style-type: none">• Shake the victim and shout at the victim.• Check to see if the victim is breathing.
CALL EMS	<ul style="list-style-type: none">• Send someone for help and an AED.• If alone, first call for help.
CPR	<ul style="list-style-type: none">• Check pulse.• Begin compressions and breathing.
DEFIBRILLATE	<ul style="list-style-type: none">• Attach the AED when available.• Listen and perform the steps as directed.

2.1.1 Steps for CPR

1. Check for the carotid pulse on the side of the neck. Remember not to waste time trying to feel for a pulse; feel for **NO MORE THAN 10 seconds**. If you are not sure you feel a pulse, begin CPR with a cycle of 30 chest compressions and two breaths. (*Fig. 1*)

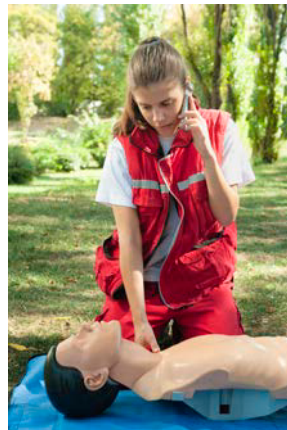


Fig. 1

2. Use the heel of one hand on the lower half of the sternum in the middle of the chest. (*Fig. 2*)



Fig. 2

- Put your other hand on top of the first hand. (Fig. 3)



Fig. 3

- Straighten your arms and press straight down. Compressions should be AT LEAST two inches into the victim's chest and at a rate of AT LEAST 100 per minute. (Fig. 4)



Fig. 4


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5. Stop pressing and let the chest expand after each compression – this will allow blood to return back into the heart.
6. After 30 compressions, stop compressions and open the airway by tilting the head and lifting the chin. (*Fig. 5A & B*)
 - a) Put your hand on the victim's forehead and tilt the head back.



Fig. 5A

- b) Lift the victim's jaw by placing your index and middle fingers on the lower jaw; lift up.



Fig. 5B

- c) Do not perform head tilt/chin lift if you suspect the victim may have a neck injury.
 7. Give a breath while watching the chest rise. Repeat while giving a second breath. Breaths should be delivered over 1 second.
 8. Resume chest compressions.

2.2 Two-rescuer adult BLS/CPR

Many times there will be a second person available that can act as a second team member. Send this person to call EMS and find an AED while you begin CPR. When the second rescuer returns, the CPR tasks can be shared:

1. Have the second rescuer prepare the AED for use.
2. Begin chest compressions and count the compressions aloud.
3. The second rescuer applies the AED pads.

4. The second rescuer opens the victim's airway and gives rescue breaths.
5. Switch positions after every five cycles of compressions and breaths.
One cycle consists of 30 compressions and 2 breaths.
6. When the AED is connected, minimize interruptions of CPR by switching rescuers while the AED analyzes the heart rhythm.

2.3 Adult mouth-to-mask ventilation

In one-rescuer CPR, breaths should be supplied using a pocket mask, if available.

1. Give 30 high-quality chest compressions.
2. Seal the mask against the victim's face by placing four fingers of one hand across the top of the mask and the thumb of the other hand along the bottom edge of the mask.

(*Fig. 1a & Fig 1b*)



Fig. 1a



Fig. 1b

3. Using the fingers of your hand on the bottom of the mask, open the airway using a head tilt/chin lift (do not do this if you suspect the victim may have a neck injury).
4. Press firmly around the edges of the mask and ventilate by delivering a breath over 1 second as you watch the victim's chest rise.

2.4 Adult bag-mask ventilation in two-rescuer CPR

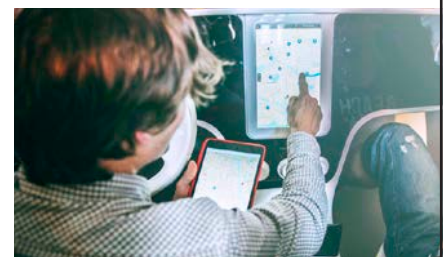
If two people are present and a bag-mask device is available, the second rescuer is positioned at the victim's head while the other rescuer performs high-quality chest compressions.

1. Deliver 30 high-quality chest compressions while counting aloud.
2. The second team member holds the mask with one hand using the thumb and index finger in the shape of a "C" on one side of the mask to form a seal between the mask and the face, while the other fingers open the airway by lifting the victim's lower jaw.
3. The second team member gives two breaths over one second each.

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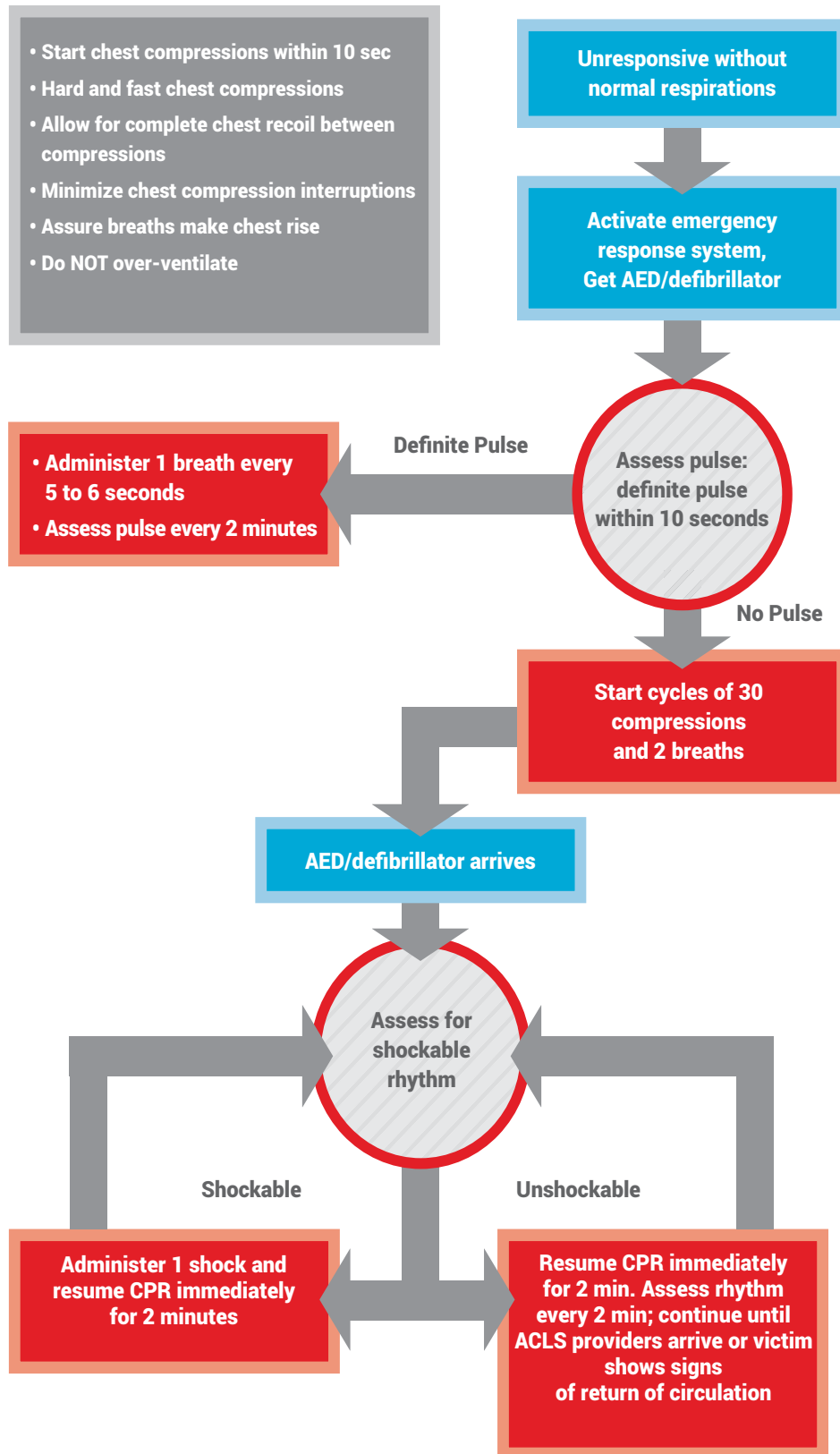


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2.5 Adult BLS algorithm



2.6 Self assessment

1. A 65-year-old male is on a short ladder changing a light and suddenly collapses. He is unresponsive. What is the next step?
 - a) Call 9-1-1
 - a) Begin CPR
 - a) Begin mouth-to-mouth ventilation
 - b) Check pulse

2. What method should be used to open his airway in the case above?
 - a) Chin lift
 - a) Jaw thrust
 - a) Head tilt/Chin lift
 - b) Head tilt

3. CPR is initiated and the victim's pulse returns but he is not breathing. What ventilation rate should be used for this patient?
 - a) 8 per minute
 - a) 12 per minute
 - a) 20 per minute
 - b) Depends on his color

Answers

1. A
Initiation of the Chain of Survival is the first step in the treatment of this gentleman.
 - b) CPR is likely indicated, but other causes of collapse are possible such as stroke or seizure and CPR is not indicated in those scenarios.
 - c) Compression takes precedence over ventilation.
 - d) A check for a pulse should be performed prior to initiating chest compressions.

2. B
The jaw thrust is the maneuver of choice to open this patient's airway given the concern of a fall and potential for traumatic injuries.
 - a) The patient fell off a ladder and may have a neck (cervical spine) injury and unnecessary movement of the neck must be avoided.
 - c) This technique causes excessive motion of the neck and should be avoided in any patient with the potential of traumatic injury (a fall in this case).
 - d) Again after a fall and possible neck injury, it is important to minimize neck movement whenever possible.

3. B

Most experts recommend a ventilation rate of 12 per minute for adult patients.

- a) Too slow.
- c) Too fast and may result in rescuer fatigue, stomach distention or inadequate exhalation time in the victim.
- d) Do not base rescue breaths on the patient's color.



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3 Use of the automated external defibrillator (AED)

Ventricular fibrillation is a common cause of cardiac arrest. The treatment for ventricular fibrillation is defibrillation, or the delivery of an electric shock to the heart through the victim's chest wall. The automated external defibrillator (AED) is a device that recognizes ventricular dysrhythmias and delivers an electric shock at the right time. The AED has become a common sight in public buildings. The AED is nearly fool proof and will not allow you to make a mistake. It is safe for anyone to use.

Using the team concept, one person should coordinate the available rescuers so that one person performs chest compressions while the second person prepares the AED for use. Although there are many different brands of AEDs, all are utilized in essentially the same way. Remember to move the victim and yourself to a safe place before using the AED. Electricity and water can be lethal when combined. Ensure the victim is not wet (quickly wipe dry) or in close proximity to water before using the AED. The AED can be used if the victim has a pacemaker, transdermal medication patches, a hairy chest, and even if the patient is lying in snow.

AED Steps

1. Retrieve the AED (*Fig. 1*)
 - Open the case
 - Turn on the AED



Fig. 1

2. Expose the victim's chest (*Fig. 2*)
 - If wet, dry chest
 - Remove medication patches



Fig. 2

3. Open the AED pads (*Fig. 3*)
 - Peel off backing
 - Check for pacemaker or defibrillator

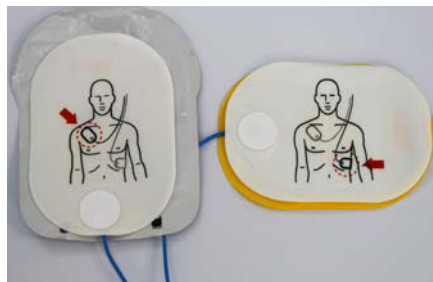


Fig. 3

4. Apply the pads (*Fig. 4*)
 - Upper right chest above breast
 - Lower left chest below armpit



Fig. 4

AED steps cont

5. Ensure wires are attached to AED box (*Fig. 1*)



Fig. 1

An advertisement for the AXA Global Graduate Program 2015. It features a close-up portrait of a young woman with red hair, smiling slightly. The background is split diagonally from the top-left to the bottom-right, with a dark blue/black area on the left and a white area on the right. A red diagonal line is visible in the top-left corner. Text on the right side includes: '> Apply now' in blue, 'REDEFINE YOUR FUTURE' in blue, 'AXA GLOBAL GRADUATE PROGRAM 2015' in bold blue, and 'redefining / standards AXA' at the bottom right, where 'redefining' is in blue, 'standards' is in grey, and 'AXA' is in white on a blue square background. A small vertical text 'agence.cdg © Photonostop' is on the left edge of the image.

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6. Move away from the victim (*Fig. 2*)
 - Stop CPR
 - Clear the patient. Tell others not to touch victim



Fig. 2

7. AED analyzes the rhythm
8. Message “Check Electrodes”
 - Ensure electrodes make good contact
 - Hairy chest? Pull off pad and replace
9. Message “Shock”
 - Ensure electrodes make good contact
 - Hairy chest? Pull of pad and replace
10. Resume CPR for 2 minutes (*Fig. 3 & Fig. 4*)



Fig. 3



Fig. 4

11. Repeat cycle

3.1 Self assessment

1. What does AED stand for?
 - a) Automatic Energy Delivery
 - b) Automated External Device
 - c) Automated External Defibrillator
 - d) Autonomous Energy Defibrillator

A 49-year-old female suffers a witnessed cardiac arrest. She has a known cardiac history per her family.

2. You notice a bulge in the upper left chest under the skin. There is a healed incision overlying that bulge. Which is true of AED use?
 - a) Cannot be used in this patient
 - b) Put a magnet over the bulge before using the AED
 - c) Place pads over bulge
 - d) Avoid placing pads over bulge
3. The AED indicates shock advised. What is the next step?
 - a) Clear the patient and deliver the shock
 - b) Deliver 2 additional minutes of CPR before delivering shock
 - c) Ventilate while shock is delivered
 - d) Assume error and do not deliver shock
4. After delivering a shock, what is the next step in caring for this patient?
 - a) Reassess for a pulse
 - b) Chest compressions only
 - c) Resume CPR
 - d) Ventilation only

Answers

1. C
AED = Automated External Defibrillator. The other choices are incorrect. Note that AICD refers to automated implantable cardioverter-defibrillator and is similar to a pacemaker, but can also deliver a shock (defibrillate).
2. D
This patient has either a pacemaker or implantable pacemaker-defibrillator (AICD). Avoid placing AED pads directly over these devices.
 - a) Incorrect. Place the pads and use the AED as you normally would. In this scenario, the patient's AICD has malfunctioned and you must proceed with placing the AED.
 - b) A magnet can be used to manipulate a pacemaker, but is not indicated in this case or for BLS providers.
 - c) Avoid placing pads directly over pacemakers and AICD devices.

3. A

Clear the patient and deliver the shock.

- b) Do not delay delivery of a shock to perform additional CPR.
- c) All responders should be clear of the patient when a shock is delivered.
- d) Do not assume error or delay administration of a shock.

4. C

After delivery of a shock, 2 minutes of high quality CPR is performed. Do not perform a rhythm or pulse check at this point.

- a) Resume CPR by starting with chest compressions followed by 2 breaths. Do not stop to check a pulse at this point.
- b) Chest compressions take precedence, but ventilations should be delivered as part of CPR.
- d) Compressions take precedence over ventilation. After a shock, CPR is resumed with compressions as the first step.

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4 BLS for children (age 1 to 8 years old)

Many similarities exist between the BLS guidelines for Adults and Children. The main differences between the two are:

- For children, if two rescuers are available to do CPR, the compression to breaths ratio is 15:2; if only one rescuer is available, the ratio is 30:2 for all age groups.
- For very small children, you can use one-handed chest compressions.
- The depth of compression may be different. For a child, compress the chest at least one-third the depth of the chest. This may be less than two inches for small children, but will be approximately two inches for larger children.
- If you are the only person at the scene and find an unresponsive child, perform CPR for two minutes BEFORE you call EMS or go look for an AED.
- In children, primary cardiac events are not common. Cardiac arrest is most commonly preceded by respiratory problems. Survival rates improve with early intervention for respiratory problems. Remember that prevention is the first link in the Pediatric Chain of Survival!
- If you witness a cardiac arrest in a child, call EMS and get an AED just as you would in the Adult BLS sequence.

4.1 One-rescuer BLS for children

If you are alone with a pediatric victim, do the following:

1. Shake and shout at the victim to determine if they are responsive.
2. Assess if they are breathing.
3. If the child does not respond and they are not breathing (or if they are only gasping), yell for help. If someone responds, send the second person to activate the Emergency Response System and to get an AED.
4. Feel for the child's carotid pulse (on the side of the neck) or femoral pulse (on the inner thigh in the crease between their leg and groin) for no more than 10 seconds.
5. If you cannot feel a pulse (or if you are unsure), begin CPR by doing 30 compressions followed by 2 breaths. If you CAN feel a pulse but the pulse rate is less than 60 beats-per-minute, you should begin CPR. This rate is too slow for a child.
6. After doing CPR for about 2 minutes (usually about 5 cycles of 30 compressions and 2 breaths) and if other help has not arrived, leave the child to call EMS and get an AED (if you know where one is).
7. Use and follow AED prompts when available while continuing CPR until EMS arrives or patient condition normalizes.

4.2 Two-rescuer BLS for children

If you are not alone with the child at the scene:

1. Shake and shout at the victim to determine if they are responsive.
2. Assess if they are breathing.
3. If the child does not respond and they not breathing (or if they are only gasping), send the second person to activate the Emergency Response System and to get an AED.
4. Feel for the child's carotid pulse (on the side of the neck) or femoral pulse (on the inner thigh in the crease between their leg and groin) for no more than 10 seconds.
5. If you cannot feel a pulse (or if you are unsure), begin CPR by doing 30 compressions followed by 2 breaths. If you CAN feel a pulse but the rate is less than 60 beats-per-minute, begin CPR. This rate is too slow for a child.
6. When the second rescuer returns, begin doing CPR by performing 15 compressions by one rescuer and 2 breaths by the second rescuer.
7. Use and follow AED prompts when available while continuing CPR until EMS arrives or patient condition normalizes.

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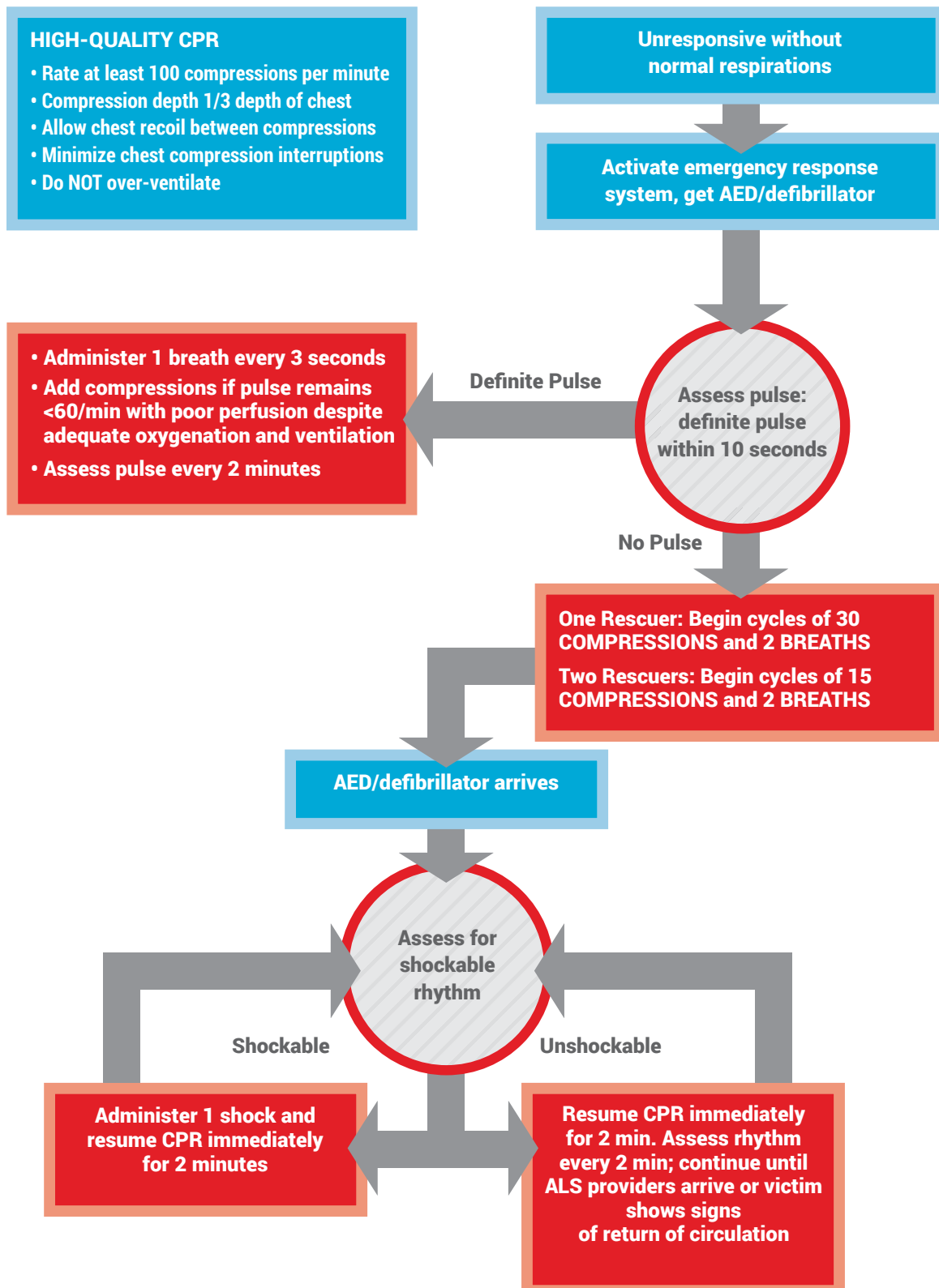
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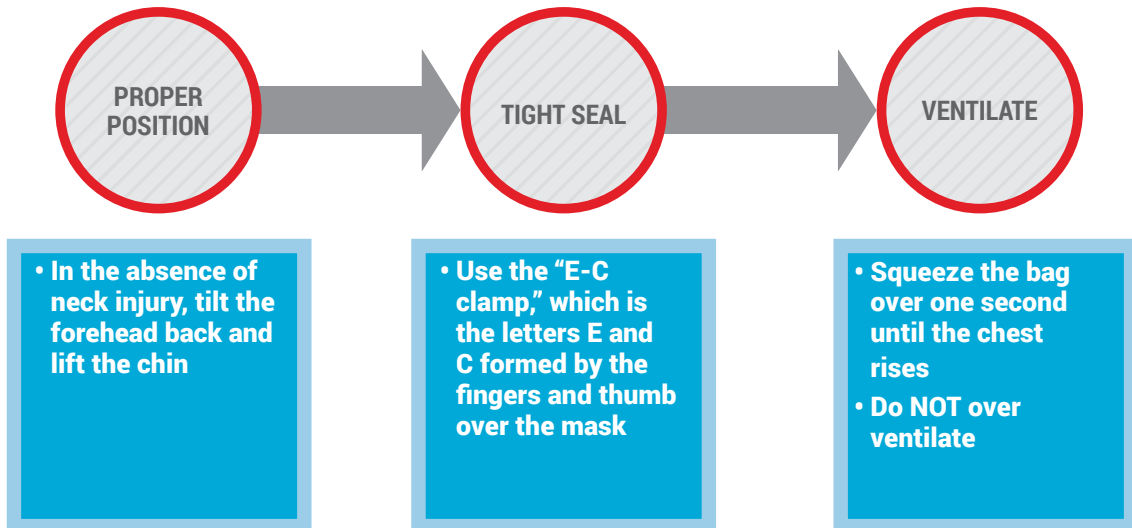


Pediatric BLS algorithm



4.2.1 Child ventilation

If masks are available, they should be used as in adults; however, you must ensure the mask is the correct size for the child. The mask should cover the child’s mouth and nose without covering the eyes or chin. You will not be able to get a good seal with a mask that is too big. As with an adult, use the head tilt/chin lift maneuver to open the child’s airway. Each breath should last one second and should cause the child’s chest to rise. As with an adult victim, avoid giving breaths too quickly, as this may result in distention of the stomach, vomiting, and possible aspiration of stomach contents.



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5 BLS for infants (0 to 12 months old)

BLS for both children and infants is almost identical. For example, if two rescuers are available to perform CPR, the breath to compression ratio is 15:2 for both infants and children (the ratio is 30:2 for all age groups if only one rescuer is present). The main differences between BLS for children and BLS for infants are:



Fig. 1

- Check the pulse in the infant using the brachial artery on the inside of the upper arm between the infant's elbow and shoulder.
- During CPR, compressions can be performed on an infant using two fingers (if only one rescuer) or with two thumb-encircling hands (*Fig. 1*) (if there are two rescuers and rescuer's hands are big enough to go around the infant's chest).
- Compression depth should be $\frac{1}{3}$ of the chest depth; for most infants, this is about 1½ inches.
- If you are the only person at the scene and find an unresponsive infant, perform CPR for two minutes BEFORE calling EMS or using an AED.
- In infants, primary cardiac events are not common. Usually, cardiac arrest will be preceded by respiratory problems. Survival rates improve when you intervene with respiratory problems as early as possible. Remember that prevention is the first link in the Pediatric Chain of Survival!
- If you witness a cardiac arrest in an infant, call EMS and get an AED just as you would in the BLS sequence for adults or children.

5.1 One-rescuer BLS for infants

If you are the lone rescuer of an infant, do the following:

1. Shake and shout at the victim to determine if they are responsive.
- 2) Assess if they are breathing.
- 3) If the child does not respond and they are not breathing (or if they are only gasping), yell for help. If someone responds, send the second person to call EMS and get an AED.
- 4) Feel for the infant's brachial pulse for no more than 10 seconds. (*Fig. 2*)



Fig. 2

5. If you cannot feel a pulse (or if you are unsure), begin CPR by doing 30 compressions followed by 2 breaths. If you CAN feel a pulse but the rate is less than 60 beats-per-minute, begin CPR. This rate is too slow for an infant. To perform CPR on an infant:
 - a) Be sure the infant is face up on a hard surface.
 - a) Using two fingers, perform compressions in the center of the infant's chest; do not press on the end of the sternum as this can cause injury to the infant. (*Fig. 3*)



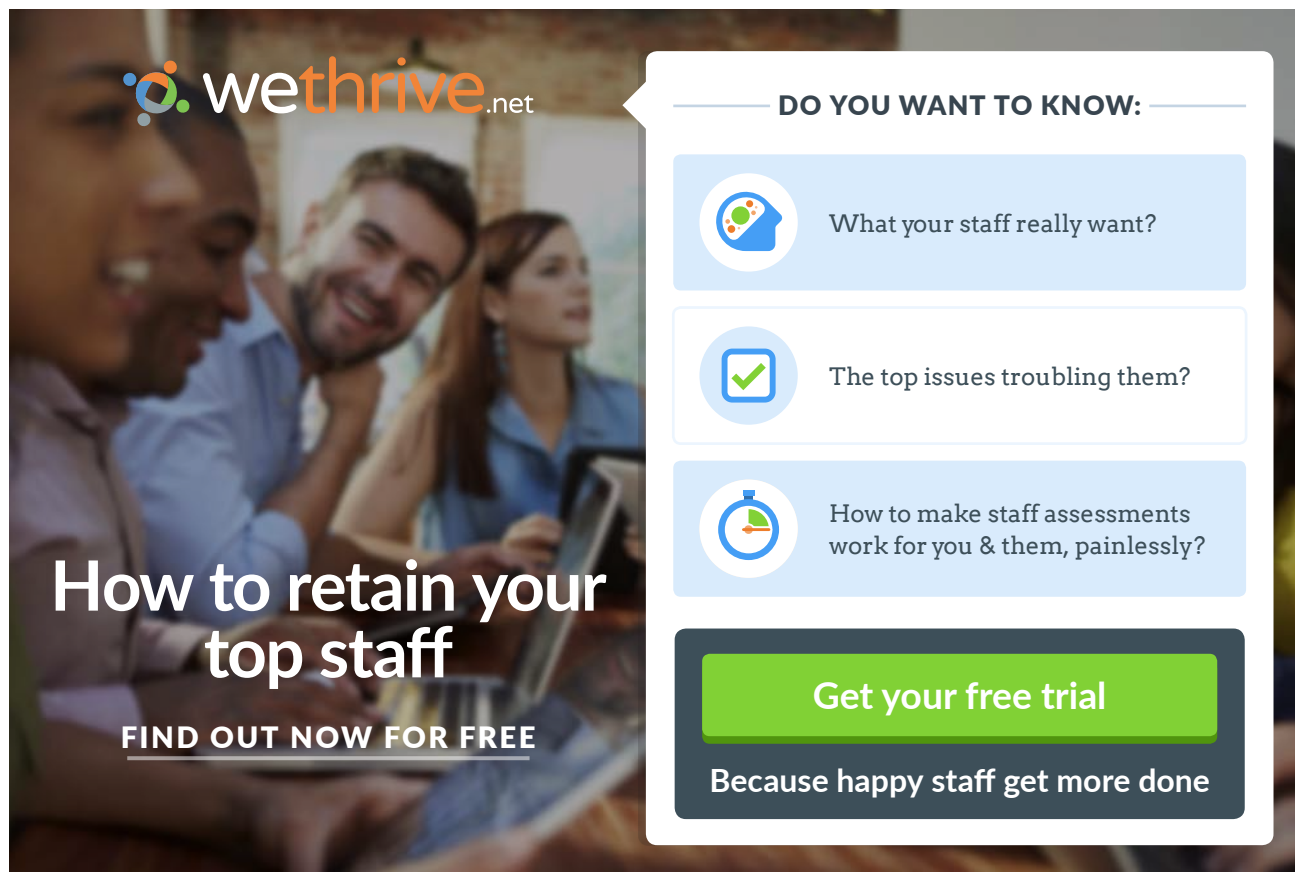
Fig. 3

- b) Compression depth should be about 1.5 inches and AT LEAST 100 per minute.
6. Perform CPR for about 2 minutes (usually about 5 cycles of 30 compressions and 2 breaths). If help has not arrived, leave the infant to call EMS and get an AED.
 7. Use and follow AED prompts when available while continuing CPR until EMS arrives or patient condition normalizes.

5.2 Two-rescuer BLS for infants

If you are not alone with the infant at the scene:

1. Shake and shout at the infant to determine if they are responsive.
2. Assess if they are breathing.
3. If the child does not respond and they are not breathing (or if they are only gasping), send the second person to call EMS and to get an AED.
4. Feel for the infant's brachial pulse for no more than 10 seconds.
5. If you cannot feel a pulse (or if you are unsure), begin CPR by doing 30 compressions followed by 2 breaths. If you CAN feel a pulse but the rate is less than 60 beats-per-minute, begin CPR. This rate is too slow for an infant.
6. When the second rescuer returns, begin CPR by performing 15 compressions by one rescuer and 2 breaths by the second rescuer. If the second person can fit their hands around the infant's chest, perform CPR using the two thumb-encircling hands method. Do not press on the bottom end of the sternum as this can cause injury to the infant.
7. Compressions should be approximately 1.5 inches deep and at a rate of AT LEAST 100 per minute.
8. Use and follow AED prompts when available while continuing CPR until EMS arrives or patient condition normalizes.



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6 Automated external defibrillator infants & children

An AED can be used on infants and children and should be used as early as possible for the best chance of improving survival.

Check the AED when it arrives on the scene. Pediatric pads should be used if the victim is less than eight years old. Standard (adult) pads may be used if pediatric pads are not available. If using standard (adult) pads, DO NOT let the pads touch. For infants less than a year old, a manual defibrillator should be used if available. If a manual defibrillator is not available, an AED may be used.

Some AEDs have a switch that can be set to deliver a pediatric shock. If available, turn the switch on when using on children less than eight years old. If the AED cannot deliver a pediatric shock, an adult shock should be given. It is important to remember an electric shock may be the cure for a fatal heart rhythm.

AED steps for infants & children

1. Retrieve the AED (*Fig. 1*)
 - Open the case
 - Turn on the aed



Fig. 1

2. Expose the victim's chest (*Fig. 2*)
 - If wet, dry chest
 - Remove medication patches



Fig. 2

3. Open the Pediatric AED pads (*Fig. 3*)
 - Peel off backing
 - Check for pacemaker or defibrillator



Fig. 3

4. Apply the pads (*Fig. 4*)
 - Upper right chest above breast
 - Lower left chest below armpit



Fig. 4

5. Ensure wires are attached to AED box (*Fig. 5*)



Fig. 5

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6. Move away from the victim (*Fig. 6*)
 - Stop CPR
 - Instruct others not to touch victim



Fig. 6

7. AED analyzes the rhythm
8. Message “Check Electrodes”
 - Ensure electrodes make good contact
9. Message “Shock”
 - Ensure electrodes make good contact
10. Resume CPR for 2 minutes (*Fig. 7 & Fig. 8*)



Fig. 7



Fig. 8

11. Repeat cycle

6.1 Self Assessment

1. What age is a considered an infant for BLS purposes?
 - a) Under 1
 - b) 2
 - c) 3
 - d) 4

2. Why are ventilations delivered to a pediatric arrest patient before seeking assistance in single rescuer scenarios?
 - a) 9-1-1 response times are generally slow
 - b) The parents are often nearby
 - c) Most pediatric cardiac arrests are due to respiratory arrest
 - d) The use of an AED is contraindicated in pediatric patients

3. What is the first step in managing this case?
 - a) Back blows
 - b) Blind finger sweep
 - c) Call 9-1-1
 - d) Deliver 2 minutes of CPR

4. The child begins to breath spontaneously at a rate of 18. Her pulse is 50. What is the next step?
 - a) Faster rescue breaths
 - b) Carotid massage
 - c) Begin CPR
 - d) Monitor breathing

Answers are on following page.

Answers

1. A
For BLS definitions, an infant is under 1 year of age. A child is 1 to 8 years of age. The BLS algorithms place children over 8 years of age into the adult category.

2. C
Respiratory arrest is the most common cause of cardiac arrest in children. Restoration of oxygen delivery can be lifesaving and prevent a cardiac arrest.
(a) 9-1-1 response times vary by location and EMS service. (b) If the parents are nearby, ask them to call 9-1-1 while you begin CPR. (d) Incorrect. An AED can and should be used in pediatric patients.

You are a daycare provider and find a 3-year-old child unresponsive. She had laid down for a nap because she was not feeling well and when you checked on her, she was not breathing and appeared blue. You are by yourself.

3. D

If you are alone, unwitnessed arrest in a child requires 2 minutes of CPR before activating EMS. If assistance is available, send them to call 9-1-1 while you begin CPR.

(a) Back blows are indicated for infant foreign body/choking. (b) Do not perform a blind finger sweep as it may push a foreign body farther into the airway. (c) If you are the only responder, administer 2 minutes of CPR before calling 9-1-1.

4. C

CPR should be initiated for pediatric patients with a heart rate (pulse) that is 60 or less.

(a) Rescue breaths are not indicated in this spontaneously breathing patient with a respiratory rate of 18. (b) Carotid massage is not part of BLS and is used on occasion for treatment of abnormally fast heart rates by specially-trained providers. (d) Observing and monitoring is incorrect. You must intervene due to the slow heart rate.

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7 Airway management

Until an advanced airway is inserted, the rescue team should use mouth-to-mouth, mouth-to-mask, or bag-mask ventilation. An advanced airway (supraglottic airway, laryngeal mask airway, or endotracheal tube) provides a more stable way of providing breaths and should therefore be inserted as early as possible in a resuscitation effort. Once an advanced airway is in place, the compression/breath ratio should be adjusted as noted below. NOTE: The compression rate for all victims is always AT LEAST 100/minute.

COMPRESSION TO BREATH RATIO	NO ADVANCED AIRWAY	WITH ADVANCED AIRWAY
ADULT	30 compressions followed by 2 breaths	1 Breath every 6-8 seconds without pauses in compressions
CHILD/INFANT	15 compressions followed by 2 breaths	

7.1 Mouth-to-mouth rescue breathing

When a pocket mask or bag-mask is not available, it may be necessary to give mouth-to-mouth breaths during CPR. Mouth-to-mouth breathing is very effective in delivering oxygen into the victim's lungs without putting the rescuer at a high level of risk. The rescuer's exhaled air contains approximately 17% oxygen and 4% carbon dioxide. This is in contrast to the 100% oxygen available with ventilation with 100% high flow oxygen.

7.1.1 Adult and older children mouth-to-mouth

Do not give breaths too rapidly or too forcefully. Doing this may cause air to be forced into the stomach, resulting in distention and less room for lung expansion, and vomiting may occur.

1. Open the airway using the head tilt/chin lift. (*Fig. 1*)



Fig. 1

2. Pinch the victim's nose closed with your hand on the victim's head. (*Fig. 2*)



Fig. 2

3. Create a seal when using your lips to surround the victim's mouth. (*Fig. 3*)



Fig. 3

4. Blow into the victim's mouth for one full second and watch for their chest to rise. Tilt the victim's head further back if the chest does not rise. (*Fig. 4*)

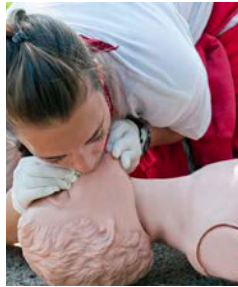


Fig. 4

5. Give an additional breath over one second.
6. If you cannot see the chest rise in two breaths, continue giving chest compressions.

7.1.2 Infant mouth-to-mouth/nose

When performing rescue breathing on an infant, the rescuer should cover the infant's mouth and nose when possible:

1. Open the airway using a head tilt/chin lift. (Fig. 5)



Fig. 5

2. Create a seal using your lips to surround the infant's nose and mouth. (Fig. 6)



Fig. 6



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3. Gently blow into the infant's nose and mouth for one second. Remember, an infant's lungs are small and need a smaller volume of air. Watch for the infant's chest to rise. If you cannot see the chest rise, readjust the tilt of their head. (*Fig. 7*)



Fig. 7

4. Give an additional breath and watch for the victim's chest to rise. If unable to cover both mouth and nose entirely with your mouth, use the following method for rescue breathing: (*Fig. 8*)

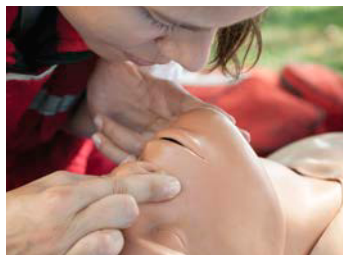


Fig. 8

1. Open the airway using the head tilt/chin lift.
2. Pinch the victim's nose closed.
3. Create a seal using your lips to surround the infant's mouth.
4. Gently blow into the infant's nose and mouth for one second. Remember, an infant's lungs are small and need a smaller volume of air. Watch for the infant's chest rise. If you cannot see the chest rise, readjust the tilt of their head.
5. Give an additional breath and watch for the chest to rise.

7.2 Rescue breathing

In many cases, cardiac arrest is preceded by respiratory arrest. Therefore, it is important to be able to recognize respiratory issues in order to take steps to prevent cardiac arrest.

When a victim of any age has a pulse but is not breathing (or is not breathing well), immediately open the airway using head tilt/chin lift and begin rescue breathing.

AGE GROUP	HOW OFTEN	NUMBER PER MIN	DURATION	EVALUATION
ADULT	Every 5-6 Seconds	10-12 per minute	Each breath should last 1 second	Check for chest rise and breathing. Check pulse and begin CPR if necessary.
CHILD/INFANT	Every 3-5 Seconds	12-20 per minute		

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8 Relief of choking

Choking is a common preventable cause of cardiac arrest. The correct response for a choking victim depends on the degree of airway obstruction, whether the victim is responsive or not, and the age of the victim.

8.1 Choking in an adult or child older than one year

DEGREE OF OBSTRUCTION	RESPONSIVENESS	RESCUER ACTIONS
MILD OBSTRUCTION	<ul style="list-style-type: none"> • Victim is breathing but may also be wheezing • Victim is coughing and making noise 	<ul style="list-style-type: none"> • Stay with victim; try to keep them calm • Encourage them to cough • Call EMS if they seem to be getting worse
SEVERE OBSTRUCTION	<ul style="list-style-type: none"> • Clutching the neck (universal sign of choking) (Fig. 1) • Weak or no cough • Not able to make noise or talk; may make high-pitched noise • Little or no breathing • Victim may be cyanotic (blue around lips and finger tips) 	<ul style="list-style-type: none"> • Use abdominal thrusts (Heimlich maneuver) to attempt to remove obstruction • Call EMS • If victim becomes unresponsive, begin steps of BLS

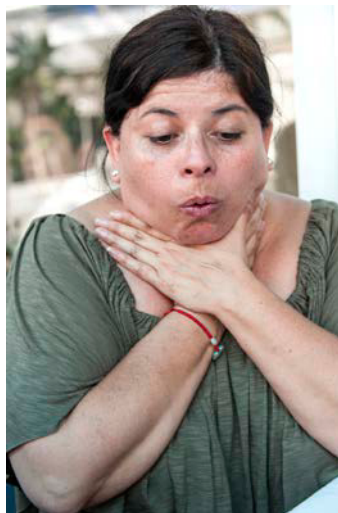


Fig. 1 Universal sign of choking

8.1.1 Abdominal thrusts (Heimlich maneuver)

The Heimlich maneuver should only be used when a victim is responsive and older than one year of age.



To properly perform the Heimlich maneuver:

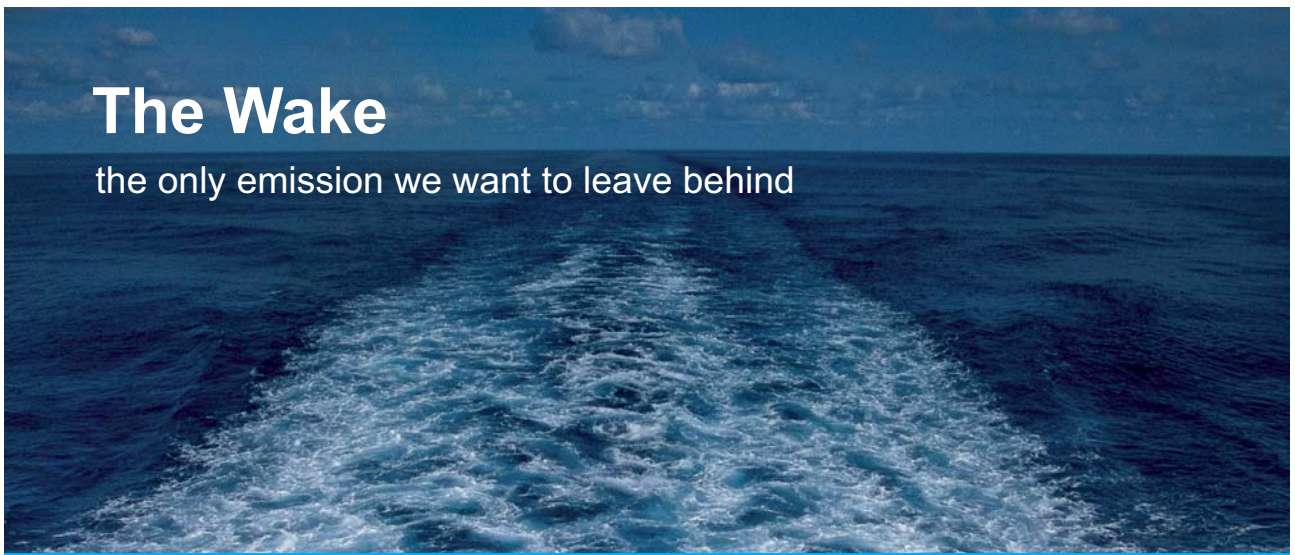
1. Stand behind the responsive victim; wrap your arms around their waist under their ribcage.
2. Put the side of your fist above the victim's navel in the middle of their belly. Do not press on the lower part of the sternum.
3. With your other hand, hold the first fist and press forcefully into the victim's abdomen and up toward their chest.
4. Continue performing these thrusts until the obstruction is relieved or the victim becomes unresponsive.

8.1.2 Successful relief of choking

If you can see a foreign object in the victim's mouth and can easily remove it, remove it. Watch and feel for breathing to begin. If the victim does not begin breathing, continue to provide CPR and rescue breathing until help arrives.

8.2 Choking in infants (less than one year old)

DEGREE OF OBSTRUCTION	RESPONSIVENESS	RESCUER ACTIONS
MILD OBSTRUCTION	<ul style="list-style-type: none"> • Infant is breathing but may also be wheezing • Infant may be coughing and making noise 	<ul style="list-style-type: none"> • Stay with the infant; try to keep them calm • Do not do blind finger sweep • Call EMS if infant does not rapidly clear the obstruction
SEVERE OBSTRUCTION	<ul style="list-style-type: none"> • Weak or no cough • Not able to make noise; may make high-pitched noise • Little or no breathing • Infant may be cyanotic (blue around lips and finger tips) 	<ul style="list-style-type: none"> • Use Back Blows/Chest Thrusts to attempt to remove obstruction • Call EMS • If victim becomes unresponsive, begin steps of BLS • Assess if obstruction is visible; if so remove it



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8.2.1 Back blows and chest thrusts in infants

In a choking but responsive infant less than one year old, back blows and chest thrusts are used instead of the Heimlich maneuver.

1. Hold the child in your lap.
2. Put the infant with their face down and their head lower than their chest; they should be resting on your forearm. Put your forearm on your thigh. (*Fig. 1*)



Fig. 1

3. Support the child's head and neck with your hand and be sure to avoid putting pressure on their throat.
4. Using the heel of your free hand, deliver five back blows between the child's shoulder blades. (*Fig. 1*)

- Using both hands and arms, turn the child face up so they are now resting on your other arm; this arm should now be resting on your thigh. (*Fig. 2*)



Fig. 2

- Make sure the child's head is lower than their chest.
- Using the fingers of your free hand, provide up to five quick downward chest thrusts over the lower half of the breastbone; perform one thrust every second. (*Fig. 2*)
- If the obstruction is not relieved, turn the infant face down on your other forearm and repeat the process. (*Fig. 3*)



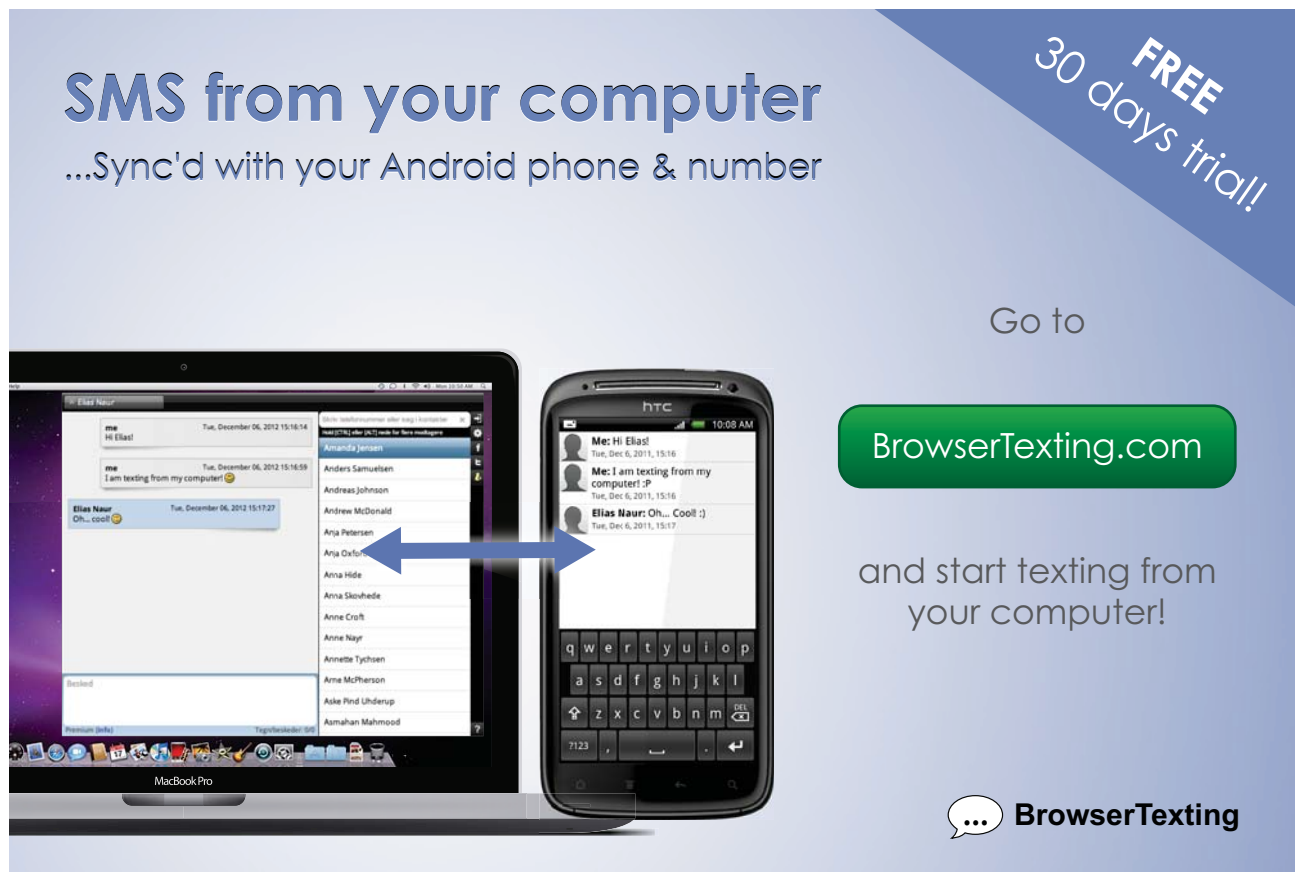
Fig. 3

- Continue doing these steps until the infant begins to breathe or becomes unresponsive.

8.2.2 Self assessment

A 21-year-old intoxicated college student turns blue and collapses while eating a hot dog at a bar.

1. What is the most likely cause?
 - a) Cardiac arrest
 - b) Alcohol poisoning
 - c) Choking
 - d) Drug ingestion
2. You assess that the patient still has a pulse, what is the next step in managing this case?
 - a) Begin CPR
 - b) Open airway
 - c) Apply AED



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3. You are concerned that this person may have choked. What is the best method to clear a foreign body from the airway?
 - a) Heimlich maneuver
 - b) Abdominal thrust
 - c) Back blow/chest thrust
 - d) Blind finger sweep

A 21-year-old intoxicated college student turns blue and collapses while eating a hot dog at a bar.

Answers

1. C
The color change suggests that he is choking. Patients who are intoxicated are at increased of choking and aspirating food. (a) Less likely in this age group. (b) Loss of consciousness can occur, but the color change while eating suggests choking. (d) Possible, but less likely in this scenario.
2. B
After determining unresponsiveness and activating EMS, open his airway.

(a) CPR is not indicated if he has a pulse. The choking due to a hot dog being lodged in the airway must be dealt with first. (c) An AED can be applied, but in this scenario, choking is the cause of unresponsiveness. (d) Medical alert bracelets are helpful and can alert the responder to underlying conditions such as diabetes.
3. B
Abdominal thrusts are the preferred method for unresponsive choking victims over the age of 1 year.

(a) The Heimlich maneuver is used in responsive choking victims over the age of 1 year. This patient is unresponsive.
(c) This technique is used for choking infants. (d) Avoid blind finger sweeps to prevent pushing a foreign body farther into the airway.

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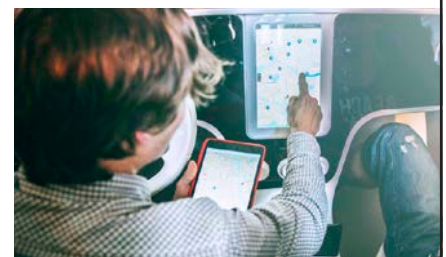
Review questions

1. The 2010 AHA Guidelines for CPR recommended BLS sequence of steps are:
 - a) Airway, Breathing, Check Pulse
 - b) Chest compressions, Airway, Breathing
 - c) Airway, Breathing, Chest Compressions
 - d) Airway, Check Pulse, Breathing
2. Critical characteristics of high-quality CPR include which of the following?
 - a) Start chest compressions within 10 seconds of recognition of cardiac arrest
 - b) Allow complete chest recoil after each compression
 - c) Minimize interruptions of CPR
 - d) All of the above
3. At what age is it preferable to use the child AED pads?
 - a) 8 years of age or older
 - b) 8 years of age or younger
 - c) 12 years of age or younger
 - d) 18 years of age or younger

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4. The compression to ventilation ratio for the one-rescuer giving CPR to a victim of ANY age is:
 - a) 30:1
 - b) 30:2
 - c) 15:1
 - d) 15:2

5. Where should you attempt to perform a pulse check in an adult?
 - a) Brachial artery
 - b) Carotid artery
 - c) Popliteal artery
 - d) Temporal artery

6. An AED can be used safely in all of the following situations EXCEPT:
 - a) Victim lying in the snow
 - b) Victim with an implanted pacemaker
 - c) Victim with a transdermal medication patch on
 - d) Victim lying partially in water

7. The 5 links in the adult Chain of Survival include all of the following EXCEPT:
 - a) Early CPR
 - b) Rapid Defibrillation
 - c) c. Use of Cardiovascular Medications
 - d) d. Integrated Post-Cardiac Arrest Care

8. You are alone when you encounter a patient in what appears to be cardiac or respiratory arrest. What are the first three steps you should take to stabilize the patient? Check for danger, _____, and send for help.
 - a) Establish IV access
 - b) Insert an advanced airway
 - c) Check for response
 - d) Start CPR

9. In both infants and children, the compression to ventilation ratio for one-rescuer CPR is:
 - a) 15:1
 - b) 15:2
 - c) 30:1
 - d) 30:2

10. The proper steps for operating an AED are:
- Power on the AED, attach electrode pads, shock the patient, analyze the rhythm
 - Power on the AED, attach electrode pads, analyze the rhythm, shock the patient
 - Power on the AED, analyze the rhythm, attach electrode pads, shock the patient
 - Power on the AED, shock the patient, attach electrode pads, analyze the rhythm

Review question answers

- b. Chest compressions, Airway, Breathing
- d. All of the above
- b. 8 years of age or younger
- b. 30:2
- b. Carotid artery
- d. Victim lying partially in water
- c. Use of Cardiovascular Medications
- c. Check for response
- d. 30:2
- b. Power on the AED, attach electrode pads, analyze the rhythm, shock the patient



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Endnotes

1. American Heart Association. Advanced Cardiovascular Life Support Provider Manual. AHA: 2011; p 183.

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