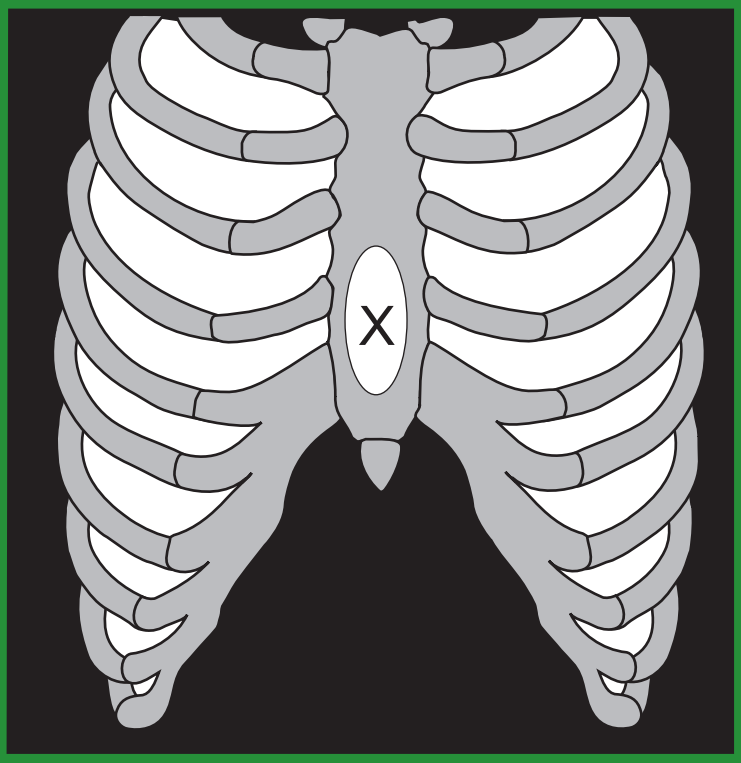
Basic Guide to Resuscitation for Developing Countries



Daniel D. Moos

The intent of this manual is to be freely used, copied, translated, and distributed in Developing Countries for the teaching and promotion of basic resuscitation skills.

The purpose of this manual is to provide developing countries with a copyright free basic cardiopulmonary resuscitation manual. This manual can be freely copied and translated into a native language for the promotion of basic resuscitation skills. Contributors with credited pictures and illustrations have graciously given permission for their material to be used for this specific purpose. The author and publishers of this manual can not accept liability concerning the use of this manual or errors in translation. It is up to each translator to ensure that the translation is correct. In addition, knowledge concerning basic resuscitation continues to evolve. It is up to each provider of basic resuscitation to ensure that their knowledge and skills are up to date.

“Every prudent man acts out of knowledge.”
Proverbs 13:15

This manual is dedicated to healthcare workers who desire
to learn basic resuscitation techniques in the developing world.
May this guide give you the skills and knowledge to help your fellow
countrymen and women.

Soli Deo Gloria

Acknowledgements

This project would not have been possible without the help of the World Health Organization, the American Red Cross, and Michael B. Dobson M.D., author of Anaesthesia at the District Hospital. Permission was granted to use illustrations from Anaesthesia at the District Hospital for an earlier manual, produced to supplement a basic anesthesia manual for use in Afghanistan. The current manual has been created to be a copyright-free version. Thanks to Madeline Schmidt RN; Kathy Ortegren RN; Ashish Sinha MD, PhD, DABA; and Richard Henker PhD, CRNA for reviewing the contents of this manual. William H. Hartland Jr. CRNA, PhD was extremely helpful with reviewing the recent changes for CPR, editing, and providing photographs. I would like to thank Mary Jo Chatelain and Sandra Rosse for their editing skills. This manual would not be complete without the illustrations provided by Dianne Moos and Cody Stubbe. The cover was designed by Steve "Human" Pfauter. It is my hope that this information will be useful.

Note: The Guide to Basic Resuscitation (Afghanistan) was published prior to the new recommendations for CPR. The manual contains excellent information concerning CPR. The following changes should be substituted for the previous recommendations. The major changes include: 100 compression for all ages with a 30 compression to 2 ventilations; with 2 person CPR for children and infants the ratio is 15 compressions to 2 ventilations; hand placement for all ages should be in the middle of the chest between the nipples. This manual contains the new changes.

Introduction

This manual is an extension of a basic resuscitation chapter that I wrote for an anesthesia manual. The chapter I wrote was a quick review of basic resuscitation. I felt that an enlarged manual, as a supplement to the anesthesia manual, would be of benefit to anesthesia personnel as well as other workers in the health care setting.

The purpose of this manual is to help teach the basic skills of resuscitation. CPR stands for cardiopulmonary resuscitation. This manual will cover basic CPR and treatment of a foreign body obstruction of the airway for adults, children, and infants.

Every effort was made to ensure that the material and information contained in this manual is correct and up-to-date. The publishers and author cannot accept any liability for errors that may occur from the use of this manual.

It is my sincere hope that the information in this manual will save lives.

If this manual is published, translated, or used for the promotion of basic resuscitation skills, the author would appreciate an email. If there are any questions, concerns, suggestions, or comments please contact the author at moosd@charter.net.

Daniel D. Moos

Note: Definitive treatment of cardiac arrest due to ventricular fibrillation or ventricular tachycardia is defibrillation. Unfortunately, an automated external defibrillator (AED) or manual defibrillator may not be available in most developing countries. This manual was written for environments with limited resources. If there is access to an AED or manual defibrillator, the reader is encouraged to review guidelines provided by the European Resuscitation Council at http://erc.edu or the American Heart Association at http://www.americanheart.org.

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Basic Adult Resuscitation

Adult Resuscitation

This manual is designed to teach the basic concepts involved in basic life support. The first steps of resuscitation are critical to survival. Without the correct application of cardiopulmonary resuscitation (CPR), the chance of survival drops significantly. In any arrest situation it is important to send or ask for help. It is important to be able to recognize when a person is experiencing:

- A cardiopulmonary arrest
- A respiratory arrest
- An obstructed airway due to food or other materials.

Your prompt recognition and action may save a life!

Adult Respiratory Arrest

A primary respiratory arrest may be caused by many things. Some causes of respiratory arrest include:

- Near drowning
- Electrocution or lightning strike
- Stroke
- Choking on a foreign object or food
- Medication/drug overdose
- Smoke inhalation
- Coma
- Trauma

It must be remembered that a primary respiratory arrest is not caused by a cardiac arrest ***but*** if not treated promptly the lack of oxygen will result in brain damage and cardiac arrest. For the first few minutes the heart will continue to pump blood but without oxygen, and the person will rapidly develop cardiac arrest.

Establishing a clear and patent airway and providing rescue breathing is the first step in resuscitating the victim of a primary respiratory arrest. The term 'ABC's' are often used for the first steps of any resuscitation.

A stands for airway

You must have a clear and patent airway.

B stands for breathing

If the person has a clear airway but is unable to breathe, you must provide rescue breathing. If the person is able to breathe adequately on their own once their airway is clear, this may be the only intervention that may be required.

C stands for circulation

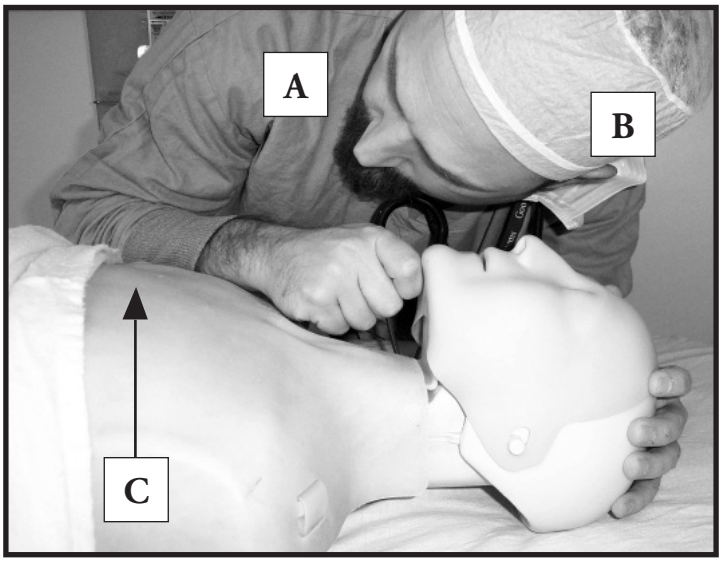
If the victim has a pulse, then CPR does not need to be performed. If there is no pulse then CPR must be performed.

Rescue breathing can sustain a victim without supplemental oxygen. The air we breathe contains approximately 21% oxygen. Our bodies only use a small portion of this. When we exhale air it still contains approximately 16% oxygen. That means our bodies use only 5% of the oxygen we breathe during normal circumstances. The 16% of oxygen that is left over, when we exhale, has enough oxygen to support a person who is not breathing on their own. However, if there is an oxygen source nearby it should be utilized, as soon as possible, to give the victim more oxygen.

Steps in Treating a Respiratory Arrest

The ***first*** step, when finding a person who is unconscious or who was witnessed falling down, is to assess their responsiveness. Gently shake their shoulder and ask, "Are you all right?" If the person is found face down they should be rolled to a supine position (face up). It is important to keep their head, shoulders, torso, and legs in alignment (straight). Log roll the victim, moving them as a unit, as you move them to their back. Do not twist their head, neck, legs, and/or back. They may have suffered a traumatic event such as a fall or vehicle accident that resulted in a neck injury. If they are not moved properly, they may be injured and become paralyzed.

The ***second*** step is to assess if the patient is breathing. Open the airway and "look, listen, and feel" for the presence of breathing. This is done by placing one hand on the forehead and the other under the chin. When a person is unconscious the tongue and other tissues relax and may block the back of the throat . Look for movement of the chest, listen for the sounds of breathing, and feel for chest and air movement from the patient's nose and mouth.



A. Look

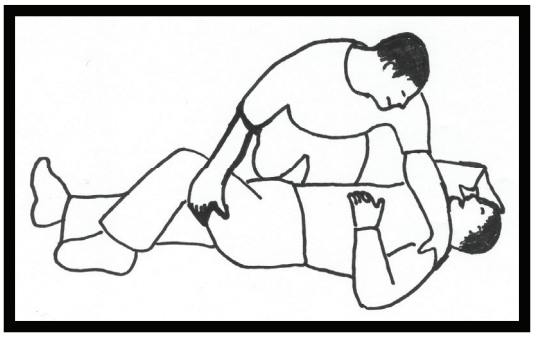
B. Listen

C. Feel

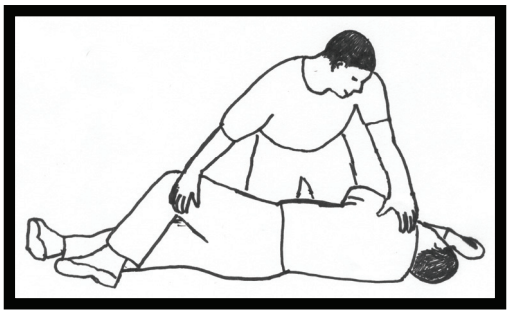
Gloves should always be worn during resuscitation attempts.

If the patient is breathing adequately, then you may need to place the patient in a recovery position.

The Recovery Position

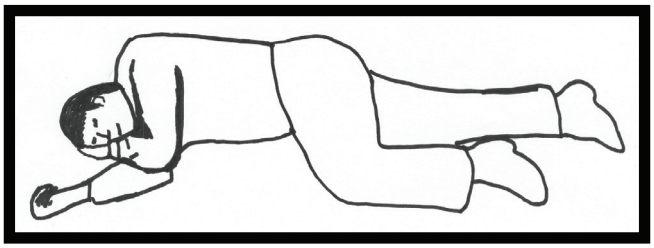


A



B

C

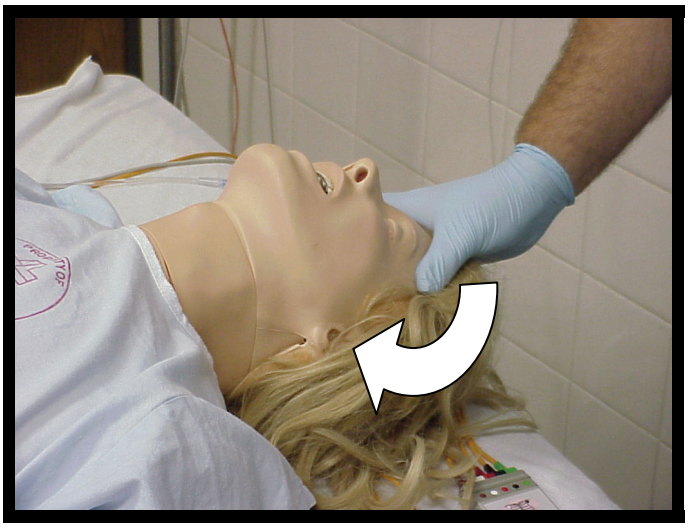


The recovery position is accomplished by kneeling by the person, straightening their legs, and moving the arm closest to you in a position that resembles someone waving goodbye. Place the other hand over the person's chest and grasp the leg just above the knee with one hand **(A)**. Your other hand should be placed at the shoulder. Pull the person towards you and place the upper leg so it is slightly bent **(B)**. Put the hand under the person's cheek **(C)**.

If the Victim is not Breathing Adequately

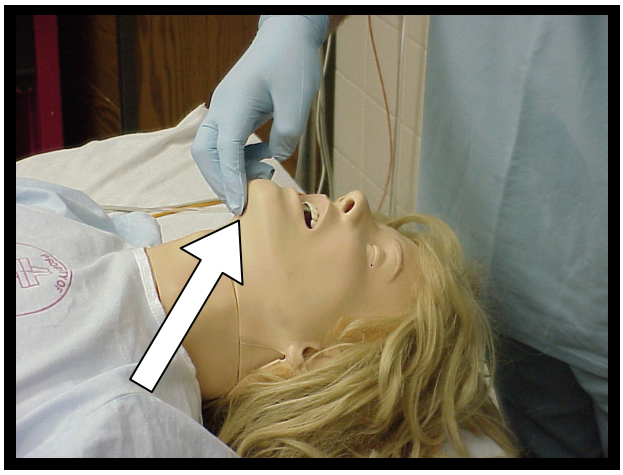
If the victim is not breathing, has a poor breathing effort, or has an obstructed airway do not place them in a recovery position. Keep the victim in a supine (face up) position and open the airway. Tilt the head back to keep the airway open and continue to monitor breathing by "looking, listening, and feeling."

Head Tilt



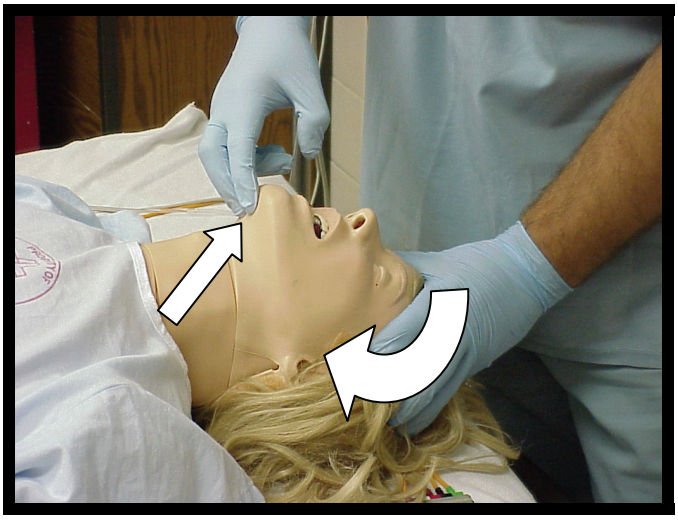
Head Tilt—The patient's head is tilted backwards and the neck is hyperextended. This maneuver is contraindicated in the presence of possible cervical neck injury. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA)*

Chin Lift Technique



Chin Lift—The rescuer places two fingers under the bony portion of the lower jaw, near the chin, and pushes the patient's chin upward with moderate pressure. (*Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA.)*

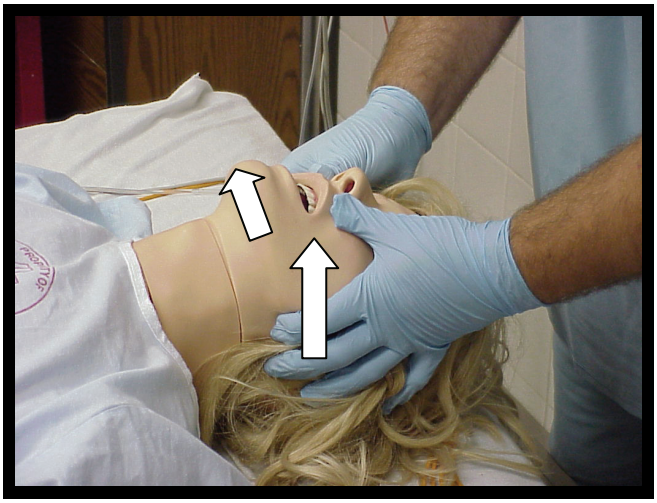
Head Tilt and Chin Lift Maneuver



The head tilt and chin lift maneuver are often done collectively. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA.)*

An alternative way to open the airway is to place your fingers at the angle of the jaw and pull gently up and out.

Jaw Thrust



Jaw Thrust—The rescuer grasps the angles of the patient's lower jaw and lifts with both hands. The jaw thrust can be done with the head tilt, as pictured above, or it can be done alone without the head tilt. The jaw thrust without head tilt is the technique of choice for a patient with a suspected neck injury since it causes the least movement of the cervical spine. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA)*

If there is adequate breathing when the airway is opened, keep the airway open, and send someone for help.

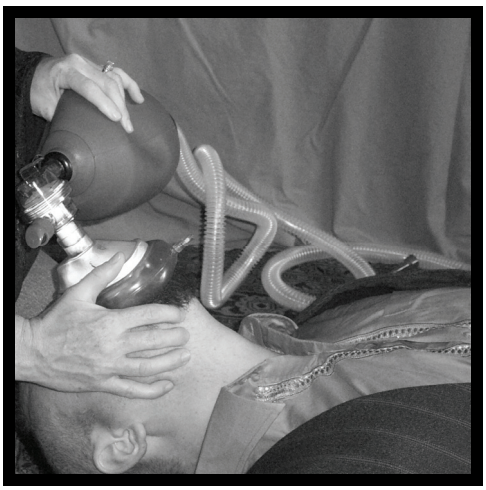
No Spontaneous Breathing or Poor Effort

If the victim is gasping, breathing weakly, or not breathing at all, prepare to start rescue breathing. Rescue breathing can be accomplished by mouth-to-mouth, mouth-to- nose, mask-to-mouth breathing, or use of a bag-mask device.

With the mouth-to-mouth technique, open the airway, and pinch the nose with the thumb and forefinger of your free hand. This is done so that the air you exhale into the victim's mouth does not come out of the nose instead of going into the lungs. Take a deep breath, place your mouth over the victim's mouth and give two breaths at 1 second per breath. Make sure that the chest rises. Pause briefly between each breath to allow for passive exhalation by the victim.

If your first attempt at rescue breathing does not result in a chest rise, then you may need to reposition the airway and try again. If it is not possible to ventilate the person through the mouth, the nose can be used. Just tilt the head back, create a tight seal around the nose, and give two slow breaths, making sure that the chest rises. Pause briefly between each breath to allow for passive exhalation. Alternatively, a mask or bag-mask device may be used.

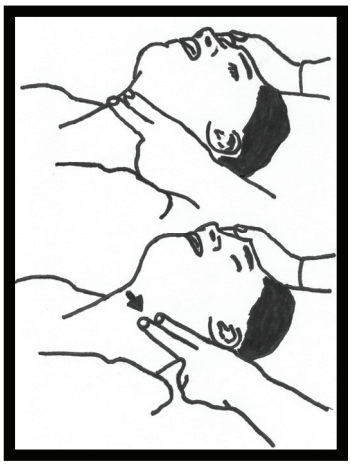
Use of a Bag-Mask Device for Ventilation



The hand position should be noted in the picture. The thumb and first finger are in the shape of a "C". The remaining fingers are on the jaw. This hand position helps the rescuer maintain a tight seal while mask ventilating the victim. Gloves should always be worn during resuscitation attempts.

After giving two breaths, check for a pulse at the carotid artery. This should only take no more than 10 seconds.

Carotid Pulse Check



To check for a carotid pulse, first locate the projection of the thyroid cartilage that is easily noticed in men. This is sometimes referred to as the 'Adam's apple' (A). With your fingers in the midline of the neck, slide your fingers in the anatomical groove to the side of the neck (B). This is where you should be able to feel a pulse.

If there is a pulse present but no spontaneous respiratory effort, give 10 to 12 breaths per minute or one every 5 to 6 seconds. Make sure you allow for passive exhalation. If there is no pulse, then chest compressions must be started.

If the victim starts to have adequate spontaneous respiration and is able to keep their airway open without your intervention, then place them in a recovery position and allow them to breathe as additional help is being sought.

Adult Cardiopulmonary Resuscitation (CPR)

If you find a person who is unresponsive, assess the person for three signs of cardiac arrest:

- No response to stimulation
- Abnormal or absent breathing
- No signs of circulation (they are cyanotic and/or have no pulse)

If you witness a cardiac arrest consider a "chest thump". A carefully aimed "thump" to the center of the chest may produce a normal heart rhythm in a small number of patients. This should only be performed once.

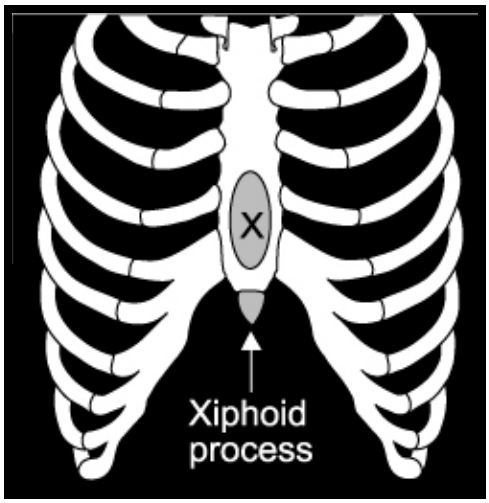
First check to see if the victim is responsive. If they are unresponsive and not breathing, position the airway and give 2 breaths. Next, check for a pulse. Checking for a pulse should not take longer than 10 seconds. In adults check the carotid pulse. The carotid pulse (neck) is usually stronger and more reliable than a radial pulse (at the wrist), especially in an unconscious person. All of these actions need to take place very rapidly. Delays will result in a lower chance of survival.

Chest compressions create blood flow by increasing the pressure in the chest and by directly compressing the heart. Effective chest compressions are essential. If chest compressions are performed improperly or inadequately, the potential for the patient surviving a cardiac arrest declines rapidly. Chest compressions should be performed by pushing ***hard*** and pushing ***fast***. The compression rate should be at a rate of 100 per minute. Current research supports the use of a rapid compression rate to help improve blood flow and blood pressure in the patient experiencing a cardiac arrest. It is important to allow the chest to fully recoil after each compression. If the chest does not fully recoil or if pressure is maintained on the chest, then the heart will not fill with blood. This will not benefit the patient in cardiac arrest. Interruptions in chest compressions should be kept at a minimum. Whenever you stop chest compressions, potentially life saving blood flow/circulation also stops. If external chest compressions are done correctly, systolic blood pressure will reach 60-80 mmHg and diastolic pressure will be zero. Mean blood pressure in the carotid artery will seldom exceed 40 mmHg. The cardiac output generated from chest compressions will be only 25-33% of normal cardiac output. It is important that chest compressions are regular, smooth, and uninterrupted.

The victim should be level on a flat, firm surface when performing chest compressions. If the victim's head is elevated, the blood pumped by chest compressions may not reach the brain, decreasing the chance of survival. If compressions are attempted while the victim is on a bed or mattress the chest compressions will not be as effective. The patient will 'move' as you perform CPR. To determine if you are performing effective chest compressions you should have someone palpate (feel) for a pulse. Effective chest compressions should produce a palpable pulse.

You should position yourself at the side of the patient. If there is no pulse after two rescue breaths, start chest compressions. Locate the center of the chest between the nipples. Place the palm of one hand at the nipple line and your other hand on top of it. If your hands are not properly positioned, it's possible to harm the person you are intending to help. For example, positioning your hand too low may break the bottom of the sternum causing trauma.

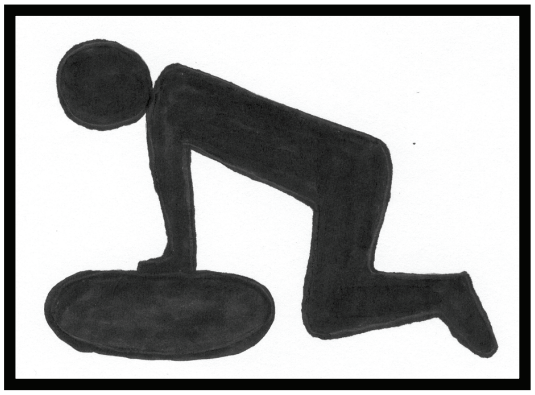
Hand Position

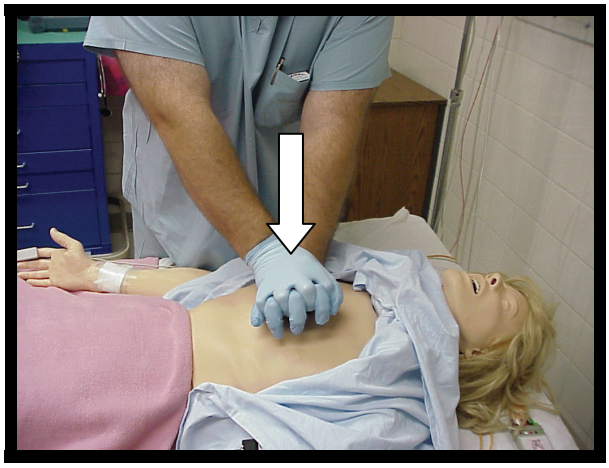


To begin external cardiac compressions, the rescuer should place the heel of one of his/her hands over sternum between the nipples at the center of the chest. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University. Richmond, VA)*

Keep your arms locked at the elbow. Use the heal of one hand on the center of the victim's chest NOT the entire hand.

Adult CPR





The rescuer's free hand should be placed on top of the hand already positioned on the patient's chest. The rescuer should keep his/her arms straight and shoulders directly over the adult patient's sternum. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA.)*

The depth of compressions is also important. In the adult it should be 4-5 cm (1.5 to 2 inches). Less than this will be ineffective. Excessive compression depth can cause unnecessary tissue trauma. This may include breaking more ribs than would normally have been broken with proper compressions. During normal, properly performed chest compressions it is not unusual to have some ribs break or crack.

You should deliver 30 compressions followed by 2 rescue breaths. The 30:2 ratio is used whether you are the only rescuer or if there are two rescuers present. When delivering ventilations by mouth-to-mouth, mouth-to-nose, mouth-to-mask, or a bag-mask device you will need to deliver the 2 breaths followed by 30 compressions then 2 breaths followed by 30 compressions, etc. If there is an endotracheal tube, laryngeal mask airway, or other advanced airway in place and you have two rescuers, one can perform compressions while the other ventilates the patient. Ventilation should be at a rate of 8 to 10 breaths per minute. This would be one breath every 6-8 seconds. There should be no interruption in chest compressions to allow for ventilation. However, it is important to "time" the ventilation. Ventilation should occur during chest recoil and not during chest compression. If you attempt to ventilate during a chest compression you will not be able to deliver the correct amount of air/oxygen to the patient. The person performing chest compressions should push fast and push hard at a rate of 100 compressions per minute. If an oxygen source is available always use it! An easy way to maintain your compression rate is to count and say, "1" as you compress down. Next say "and" as you relax the pressure. Continue counting by saying "2 and 3 and 4 and . . . etc." as you are doing chest compressions.

Both the pressure exerted with the chest compression and the release of pressure following the compression is important. When you compress the heart, blood moves out of the heart. When you release this pressure then blood flows into the chest and heart. With each compression keep your hand in contact with the sternum and your arms locked. Do not 'bounce' but always maintain contact with the victim's chest.

Putting it all together:

1. Is the victim responsive?

Assess responsiveness- gently shake the person and talk or shout to get their attention. If they're unresponsive, send someone for help.

2. Is an airway open?

Position the airway by lifting the chin or jaw thrust. 'Look, listen, and feel' for spontaneous breathing. If breathing, place in recovery position and closely monitor the victim.

3. Is the victim breathing?

If he/she is not breathing, provide two rescue breaths. The chest should rise. Allow time in between each breath for passive exhalation. If the first breath does not raise the victim's chest, reposition the head and try again.

4. Does the victim have a pulse?

Check for circulation, after 2 successful breaths, by palpation of the carotid pulse in adults. This should not take any longer than 10 seconds. If there is a pulse but no breathing, provide rescue breathing at a rate of 10 to 12 breaths per minute (once every 5 seconds).

5. Are chest compressions necessary?

If no pulse, place your hands correctly on the person's lower sternum. Compress at a rate of 100 compressions a minute. This is accomplished by a compression/ventilation ratio of 30 compressions to 2 ventilations (30:2). The compression depth should be 1.5-2 inches (4-5 cm).

6. Is the victim responding after 5 cycles?

After 30 compressions, give 2 breaths. The patient should be rapidly assessed for spontaneous breathing and circulation after every 5 cycles or two minutes of CPR. During this assessment, chest compressions should be interrupted for no longer than 10 seconds.

7. Does the victim need continued CPR?

If there is no return of breathing or circulation, continue CPR and recheck for return of breathing or circulation every few minutes.

8. Is a second rescuer available?

If a second rescuer appears that has been trained in CPR, then one can perform ventilations while the other performs chest compressions, at the same ratio of 30:2. It is important to switch duties so the compressor does not get tired. Effective chest compressions are important to the chance of survival. If an advanced airway device is in place (for example an endotracheal tube or laryngeal mask airway) then one rescuer should perform chest compressions at a rate of 100 compressions per minute. The second rescuer may perform ventilations at a rate of 8-10 breaths per minute or one every 6-8 seconds. Ventilation should be timed to occur during chest recoil.

Adult Foreign Body Airway Obstruction

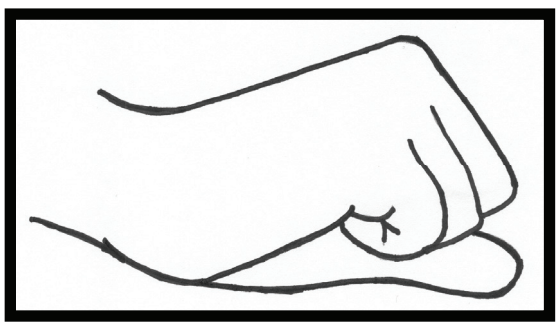
Airway obstruction in the unconscious victim may be caused by tissue such as the tongue. In the conscious victim, airway obstruction is often caused by food but may be caused by any object that a person may have in their mouth. The foreign body obstruction in the conscious victim may be partial or complete.

With a partial obstruction the person will be able to cough as they attempt to expel the object. Do not interfere with them at this point. Let them try to get it out themselves.

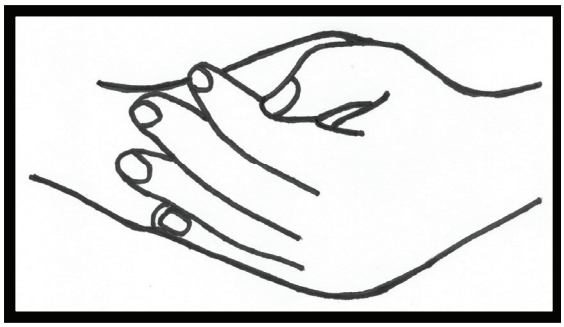
If there is poor exchange of air and the person is unable to cough, speak, or breathe, the obstruction may be complete. This needs immediate treatment. The lack of oxygen will rapidly turn into a cardiac arrest.

To help a person who is standing and choking, do the following:

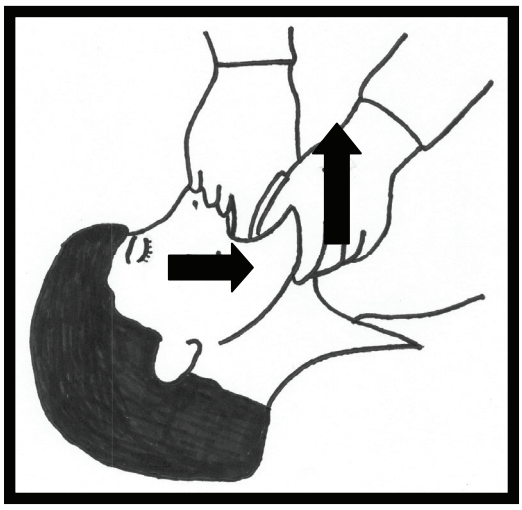
- Stand behind the person and wrap your arms around the abdomen, making a fist with one hand. This hand should be placed above the umbilicus (belly button) in the middle of the abdomen.



- Use your free hand to grasp the fisted hand and give quick, forceful, upward and inward thrusts until the object is expelled.



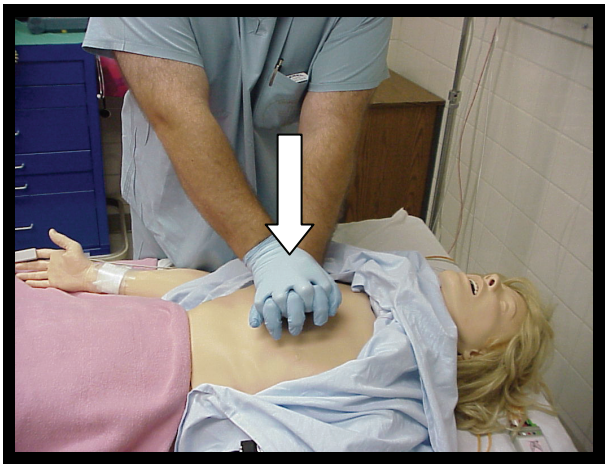
If the chocking victim becomes unresponsive and collapses, lay the victim in a supine position (face up on their back). Check for a foreign object by opening the airway and performing a finger sweep. The finger sweep should only be done in unresponsive adults. If conscious, they may bite down on your finger.



To perform a finger sweep, open the airway to bring the tongue away from the hypopharynx (back of the throat). Place your thumb inside the mouth and grasp the jaw, pulling gently in an upward motion. Insert the index finger of your free hand and move it along the cheek and into the person's throat. If you can feel the object, try to hook it with your finger and remove it. Do not force the object deeper. This will make it more difficult to dislodge.

If the object is found, remove it. If the victim is not breathing, give two rescue breaths and check for a pulse. You may need to perform chest compressions if there is no pulse.

If the object is not found, position the airway and attempt to give two breaths. If the chest does not rise, the obstruction is still present and chest compressions are necessary. Prepare to give chest compressions as you would for a victim with no pulse. Place your other hand on top and interlace your fingers. Use the heel of the hand on the center of the victim's chest. NOT the entire hand. Perform 30 chest compressions.



(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA.)

After 30 chest compressions, open the airway, and check for the object. If the obstruction is seen, remove the object. If the obstruction is not seen, perform a finger sweep. Attempt to give two rescue breaths. If unsuccessful, continue with 30 chest compressions, and attempt two rescue breaths. Continue this sequence until the object is removed.

Putting it all together:

1. Is the victim conscious but choking?

If a conscious person is choking but able to move air and cough, allow them to attempt to clear their airway by themselves. If they're unable to move air, then stand behind the person and perform abdominal thrusts. Continue until the object is expelled or the patient becomes unconscious.

2. Is the victim unconscious?

Position the person on their back. Open the airway and perform a finger sweep. If object is found, remove it. If the object is not found, attempt to give two rescue breaths. If unable to get the chest to rise, proceed with 30 chest compressions.

3. Will chest compressions dislodge the object?

Perform 30 chest compressions, open the airway, perform a finger sweep checking for the foreign object, and attempt two rescue breaths.

4. Is the airway still obstructed?

Continue this cycle until the object is dislodged and removed.

5. Is the object removed?

If obstruction is removed, check for breathing. If the victim is not breathing, start rescue breathing and check for a pulse. If there is no pulse, start chest compressions.

6. Has the person started to breathe spontaneously?

If the person starts to breathe spontaneously, position them in a recovery position and monitor them closely.

Note: A recent recommendation from the American Heart Association has supported hands only CPR for by standers who are unwilling to provide ventilation. The recommendations have not changed for healthcare providers.

Review Questions for Basic Adult Resuscitation

1. The air we normally breathe contains approximately _____percent oxygen.

a. 18 percent

b. 19 percent

c. 20 percent

d. 21 percent

2. When we exhale air from our lungs it contains _____percent oxygen, which helps support a person who is not breathing on their own.

a. 16 percent

b. 17 percent

c. 18 percent

d. 19 percent

3. After opening a patient's airway, you should 'look, listen, and feel' for the presence of breathing.

a. True

b. False

4. The most common cause of an airway obstruction in an unconscious person is the _____. This is why opening the airway with a chin tilt or jaw thrust is helpful.

a. epiglottis

b. tongue

c. teeth

d. uvula

5. In an adult, the best place to check an adult's pulse is the _____.

a. ulnar pulse

b. radial pulse

c. carotid pulse

d. brachial pulse

6. If there is a pulse present but no spontaneous respiration in an adult, you need to give rescue breaths at a rate of _____ per minute.

a. 8 to 10

b. 10 to 12

c. 12 to 14

d. 14 to 16

7. Chest compressions are performed on an adults _____.

a. top half of the sternum

b. xiphoid process

c. sternum between the nipples

d. ribs

8. The depth of chest compressions for an adult should be:

a. 0.5 to 1 inch (1-2 cm)

b. 1 to 1.5 inches (2-3 cm)

c. 1.5 to 2 inches (4-5 cm)

d. 2 to 2.5 inches (5-6 cm)

9. The ratio of compressions to ventilations during adult CPR is _____.

a. 20:2

b. 15:1

c. 10:1

d. 30:2

10. If a person is choking but moving air well, as noted by forceful coughing, you should _____.

a. let them try to clear their airway on their own.

b. perform abdominal thrusts anyway

c. perform CPR

d. give them rescue breaths

11. If an adult choking victim has a complete airway obstruction caused by a foreign object that you are unable to remove, and the victim is unconscious, you must perform chest compressions.

a. True

b. False

12. You should never perform a finger sweep in an adult who is conscious.

a. True

b. False

13. If an adult choking victim becomes unconscious you will need to perform chest compressions and attempted rescue breathing in a ratio of _____.

a. 20:2

b. 10:1

c. 30:2

Answers to Questions on Basic Adult Resuscitation

1. d
2. a
3. a
4. b
5. c
6. a
7. c
8. c
9. d
10. a
11. a
12. a
13. c

Basic Pediatric Resuscitation

Pediatric Resuscitation

In the pediatric population the most common causes of cardiac arrest are respiratory complications from choking, lung illnesses, drowning, and trauma. A child is defined, for resuscitation purposes, as a person aged 1 through 8 years of age. An infant is defined as less than 1 year. There are some important differences between adults, children, and infants in resuscitation. Using adult techniques on a pediatric victim could cause trauma. Understanding the differences between an adult and pediatric victim is vital.

Pediatric Respiratory Arrest

If the child or infant is not breathing, open the airway. Place one hand on the forehead and the other under the chin. When a child or infant is unconscious, the tongue and tissue in the hypopharynx (back of the throat) relax and may block the airway. This is one of the most common causes of airway obstruction. After the airway is open 'look, listen, and feel.' If there is adequate breathing, keep the airway open. If the victim is gasping, breathing weakly or not breathing at all, prepare to perform rescue breathing. Rescue breathing can be done by mouth to mouth, mouth to nose in older children, mouth over nose and mouth of a small child, mouth to mask, or a bag-mask device.

With the mouth to mouth technique, open the airway, pinch the nose with your thumb and forefinger of your free hand. This is done so that the air you exhale into the victim's mouth does not come out of the nose instead of going into their lungs. Take a deep breath, press your mouth firmly against the mouth of the victim, and give 2 slow breaths. Make sure that the chest rises. Give only enough of a breath to cause the chest of the child or infant to rise. Your lung capacity is much larger than a child's or infant's. Take care not to over inflate their lungs.

Pause briefly between each breath, allowing for passive exhalation by the victim. For children aged 1 to 8 years, mouth-to-mouth or mouth-to-nose is acceptable. If using a bag-mask device it is important not to deliver too much air as it can cause trauma. The bag-mask device should be age appropriate. For example use an infant-sized resuscitation bag for an infant rather than an adult bag-mask device. For infants of 1 year or less, the best technique is mouth to mouth-and-nose. Always give just enough of a ventilation to make the chest rise. Each breath that you give should last about one second. The infant is often too small to be able to pinch the nose and perform adequate rescue breathing. If your mouth is too small to cover the nose and mouth of an infant than you can provide ventilation through the infant's nose while holding their mouth closed so air will not escape. If the infant is large enough and a good seal can be created with no air escaping, you may do mouth-to-mouth resuscitation.

After you have given two breaths, assess for circulation. Remember the A B Cs: Airway, Breathing, and Circulation. This is the order of importance in which resuscitation should be administered. Without an airway you can not have breathing, and without breathing you will not have circulation for very long. Check a child's pulse in the carotid area of the neck. Check an infant's pulse in the brachial area.

Pulse Check in the Pediatric Victim

Infant- Brachial Pulse

Child- Carotid Pulse

If a pulse is present and greater than 60 beats per minute but there is an absence of spontaneous breathing, you will need to provide rescue breathing at a rate of 1 breath every 3 to 5 seconds, or 12-20 breaths per minute. Once spontaneous breathing occurs, place the child in a recovery position as you would an adult.

If there is no pulse or the rate is less than 60 beats per minute with signs of poor circulation, such as cyanosis (the victim turns a bluish color), then you will need to start chest compressions.

Putting it together - infant/child rescue breathing

1. Is the child/infant responsive?

Assess responsiveness- gently touch the victim, talk, or shout to get their attention. If the child/infant is unresponsive send someone for help.

2. Is the airway open?

Open the airway by head tilt, chin lift, or jaw thrust. 'Look, listen, and feel' for breathing.

3. Is the child/infant breathing?

If the victim is not breathing, give two slow breaths, enough to allow the chest to rise. Pause to allow for passive exhalation by the child. Do not over ventilate the child or infant. Just enough to allow the chest to rise!

4. Does the child/infant have a pulse?

Check for a pulse. In an infant check for a brachial pulse, in a child check for a carotid pulse. If there is a pulse and it is over 60 beats per minute, continue with rescue breathing alone. If the heart rate is less than 60 beats per minute, with signs of poor circulation, then you need to start CPR. (See the next section).

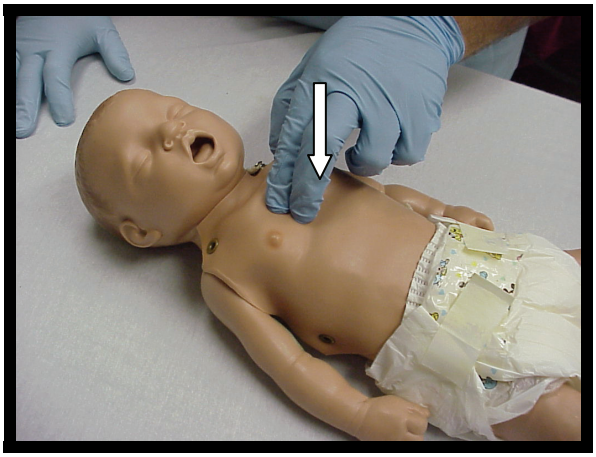
5. The child/infant has a pulse over 60 beats per minute but is not breathing. What do I do next?

Rescue breathing should be done at a rate of 12-20 breaths per second or 1 breath every 3-5 seconds for both the child and infant.

Pediatric CPR

There are differences between compression techniques performed on adults and those used on children and infants. The rate of compressions for a child or infant is 100 compressions per minute. A 30:2 ratio (chest compressions to ventilation) is used for the single rescuer. A 15:2 ratio (chest compressions to ventilation) is used for two rescuers. The correct area for hand placement in the child is the area of the chest between the nipples. To determine the correct placement of compressions for an infant, draw an imaginary line between the nipples and locate a spot just below this line for chest compression application. There are two compression techniques in the infant. These include the one handed technique or the two handed technique.

One Handed Technique in Infants



In infants, the sternum is compressed with the tips of two fingers when only one rescuer is present. This frees the rescuer's other hand to open the airway for ventilations. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA)*

An alternative to the use of a single hand, two finger technique is the use of a two handed technique. This technique uses the thumb.

Two Handed Technique in Infants

If two rescuers are present, one rescuer can perform compressions with the thumbs of his/her encircling hands while the other rescuer performs ventilations. *(Courtesy: Department of Nurse Anesthesia, Virginia Commonwealth University, Richmond, VA)*

In a child (1-8 years) use one hand to perform chest compressions.

Hand Placement in Children

Compressions should be straight down. Gloves should always be worn during resuscitation attempts.

The depth of compressions on a child is different from those performed on adults. You should compress, in both infants and children, to a depth of one-third to one-half of the diameter of the chest. To test if the compressions are adequate you should be able to palpate a pulse. Remember to check the brachial pulse in infants and the carotid pulse in children.

The compression to ventilation ratio is 30:2, for both children and infants, when one rescuer is performing CPR. The compression to ventilation ratio is 15:2, for both children and infants, when two rescuers are performing CPR. The victim should be rapidly assessed for spontaneous breathing and circulation approximately every 5 cycles of compressions and ventilations or two minutes of CPR. Check for a pulse. If there is no pulse, then continue with a 30:2 or 15:2 ratio of cardiac compressions to ventilation.

Putting it all together – infant or child CPR:

1. Is the child/infant responsive?

Assess responsiveness—gently touch the victim, talk, or shout to get their attention. If the child/infant is unresponsive send someone for help.

2. Is the airway open?

Open the airway by head tilt, chin lift, or jaw thrust. 'Look, listen, and feel' for breathing.

3. Is the child/infant breathing?

If the child/infant is not breathing, give two breaths at 1 second each, enough to allow the chest to rise. Pause to allow for passive exhalation by the child. Do not over ventilate the child or infant.

4. Does the child/infant have a pulse?

Check for a pulse. In an infant check for a brachial pulse, in a child check for a carotid pulse. If there is a pulse and it is over 60 beats per minute, continue with rescue breathing alone. If the heart rate is less than 60 beats per minute with signs of poor circulation, then you need to start chest compressions.

5. Are chest compressions necessary?

The chest compression to ventilation ratio in the child and infant is 30:2 for the single rescuer and 15:2 for two rescuers. Use one hand for compressions on a child. Use the one handed technique (using two fingers) for a single rescuer in the infant or the two handed technique (using two thumbs) for two rescuers. Compress the chest only one third or one half of the chest diameter. Use the area of the chest between the patient's nipples in the child. Use the area just below the nipple line in infants.

6. Is the child/infant responding after 5 cycles of chest compression to ventilation?

The patient should be rapidly assessed (less than 10 seconds) for spontaneous breathing and circulation approximately every 5 cycles (2 minutes) of CPR.

7. What do I do when the child/infant regains a pulse that is faster than 60 beats per minute?

If spontaneous circulation returns, determined by a pulse that is greater than 60 beats per minute, with spontaneous breathing, place the child in a recovery position. If the pediatric victim has a pulse but no spontaneous breathing, then you must perform rescue breathing.

Pediatric Foreign Body Airway Obstruction

Airway obstruction in children and infants is often caused by food or by objects placed in their mouths. The treatment of an airway obstruction in a child is similar to that of an adult but not for an infant. Because of these differences we will treat each one separately.

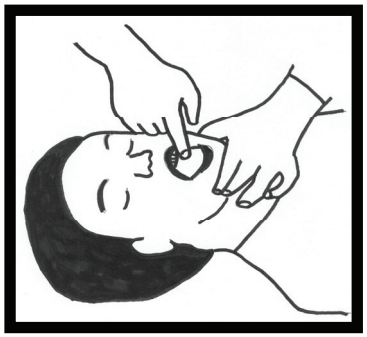
Foreign Body Airway Obstruction in the Child

1. Is the child conscious but choking?

If a conscious child is choking but able to move air and cough, allow them to attempt to clear their airway by themselves. In a child who is choking and not moving air, stand or kneel behind them. Encircle your arms around them and give several abdominal thrusts, inward and upward. Avoid the xiphoid process. Continue until the object is expelled or the child becomes unconscious.

2. Is the child unconscious?

Position the child on their back. Open the airway and if the object is found, remove it.



DO NOT DO A BLIND FINGER SWEEP IN A CHILD. This may result in forcing the object deeper or causing trauma to the child. If the object is not found, attempt 2 rescue breaths. If the breath goes in and the chest rises then check for a pulse. If there is no pulse, start chest compressions immediately. If you are unable to get the chest to rise, proceed with 30 chest compressions followed by two breath attempts.

3**. Will chest compressions dislodge the object?**

Continue to perform 30 chest compressions, open the airway, check for the foreign object, and attempt two rescue breaths. Chest compressions may dislodge the object obstructing the airway.

4. Is the airway still obstructed?

Continue this cycle until the object is dislodged and removed.

5. Is the object removed?

If obstruction is removed, check for breathing. If the victim is not breathing, start rescue breathing and check for a pulse. If there is no pulse, continue chest compressions.

6. Has the child started to breathe spontaneously?

If the child starts to breathe spontaneously, position them in a recovery position and monitor them closely.

Foreign Body Airway Obstruction in the Infant

Choking is a major cause of death in infants. As infants learn explore the world around them they tend to put objects in their mouth. Small objects are dangerous to an infant. Infants do not have the eating skills of an adult or child and can easily choke on food.

1. Is the infant conscious but choking?

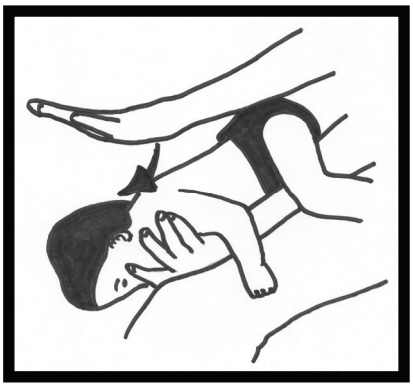
If a conscious infant is choking but able to move air and cough, allow them to attempt to clear their airway by themselves. A severe or complete airway obstruction in an infant is noted by a weak cough, the absence of a strong cry, or extreme difficulty in breathing. In the case of a severe or complete airway obstruction, in an infant, you will need to perform back blows and chest thrusts.

2. How do I do back blows and chest thrusts on an infant?

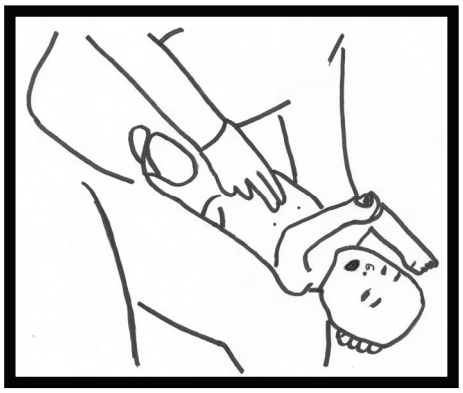
Position the infant face down on your forearm, while supporting the head. Place the infant so their head is lower than their chest. With the palm of your hand, strike the infant between the shoulder blades 5 times. Then turn the infant over so they are face up. Locate the correct position for chest thrusts. Draw an imaginary line between the nipples. Place two fingers one finger breadth below this line on the infant's sternum. Give 5 chest thrusts, one per second. Continue this until the object becomes dislodged and the infant starts to breathe and cough or the infant becomes unconscious.

Note there are no abdominal thrusts in infants!

Back Blows



Chest Thrusts



3. Is the infant unconscious?

Look for the foreign object. Remove it with your little finger only if you see it. DO NOT PERFORM A BLIND FINGER SWEEP IN AN INFANT. This may result in forcing the object deeper or causing trauma to the child's hypopharynx. If the object is removed give one rescue breath. If it makes the chest rise then check for a pulse and for the return of spontaneous breathing. If the infant does not spontaneously breath, then perform rescue breathing. Check the infants pulse in the brachial area. If no pulse, then start chest compressions. If there is a pulse greater than 60 and the infant is breathing, then monitor the infants pulse and breathing

4. Is the infant's airway still obstructed?

If the object was not seen and removed, and the rescue breath does not make the chest rise, then place the infant in a supine position on a flat, firm surface. Find your finger placement for infant chest compressions. Administer 30 chest compressions. Look for the object. If seen remove it and give rescue breaths. If an object is not seen attempt to administer two rescue breaths. Continue this cycle until the object is removed.

5. Is the object removed?

If the object is removed, check for breathing. If the infant is not breathing, start rescue breathing with 12-20 breaths per minute or one breath every 3-5 seconds. Each breath should be 1 second in duration. Check for a pulse. If no pulse, start chest compressions and ventilations at a ratio of 30:2 for 5 cycles. Check the patient for a pulse and breathing. This should take no longer than 10 seconds.

6. Has the infant started to breath spontaneously?

If the infant starts to breathe spontaneously check for a pulse. If no pulse or a pulse rate less than 60, then continue chest compressions. If the patient is breathing with a pulse rate greater than 60, then place them in a recovery position and monitor them closely.

Review Questions for Basic Pediatric Resuscitation

1. To determine how much of a breath is needed to ventilate a child or infant you should give _____.

a. enough to make the chest rise
b. as much as you can
c. as little as possible
d. there is no way to determine how much you should give

2. You should check a child's pulse by using the _____ pulse.

a. ulnar
b. radial
c. carotid
d. brachial

3. You should check an infant's pulse by using the _____ pulse.

a. ulnar
b. radial
c. carotid
d. brachial

4. CPR should be done in children and infants if the pulse is less than ____ beats per minute.

a. 60
b. 70
c. 80
d. 90

5. During rescue breathing you should provide ventilation to a child or infant at a rate of _____ ventilations per minute.

a. 6-10
b. 12-20
c. 20-30
d. 30-40

6. The appropriate rate of ventilation in a child or infant is about one ventilation every _____ seconds.

a. 1-2

b. 2-3

c. 3-5

d. 6-8

7. The rate of chest compressions in a child should be about _____ per minute.

a. 80

b. 90

c. 100

d. 110

8. Hand placement on a child should be between the nipples. You should use _____.

a. the heal of one hand

b. 2-handed technique

c. 2-finger technique

d. the thumb technique

9. Hand placement in an infant should be made by drawing an imaginary line between the nipples and placing your fingers just below that line. For compressions you should use the _____.

a. the heal of one hand

b. 2-handed technique

c. 2-finger technique

d. the one thumb technique

10. The depth of chest compressions in children and infants should be _____.

a. as far as you can

b. one-third to one-half of the chest diameter

c. one-half to two-thirds of the chest diameter

d. as little as possible

11. The ratio of chest compressions to ventilation for child and infant CPR for the single rescuer is _____.

a. 15:2

b. 15:1

c. 30:1

d. 30:2

12. You never do a blind finger sweep in children and infants.

a. True

b. False

13. You only remove an object from a child or infants airway if you see it.

a. True

b. False

14. If the child has a foreign body obstruction of the airway and becomes unconscious you need to perform _____ chest compressions.

a. 10

b. 20

c. 30

d. 40

15. For an infant with a foreign body obstruction of the airway you need to give ___ back blows followed by ____ chest compressions.

a. 3, 3

b. 4, 4

c. 5, 5

d. 6, 6

Answers for Pediatric Resuscitation

1. a
2. c
3. d
4. a
5. b
6. c
7. c
8. a
9. c
10. b
11. d
12. a
13. a
14. c
15. c

Appendix

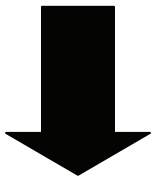
The A, B, C's
Basic Assessment

Stimulate the victim.

Gently shake the victim's shoulder and ask "Are you all right?"

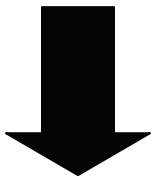
A- Airway

Look, listen, and feel.
Is the airway patent or obstructed?
You may need to clear & open the airway.



B- Breathing

Is the victim breathing? Is it adequate?
If not breathing you may need to perform rescue breathing. Give 2 breaths.



C- Circulation

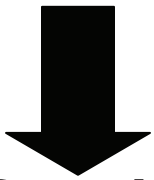
Does the victim have a pulse?
You may need to perform chest compressions.

Adult Respiratory Arrest

Stimulate the victim.
Gently shake the victim's shoulder and ask
"Are you all right?"

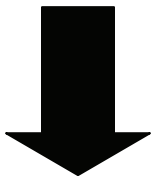
A- Airway

Look, listen, and feel.
Is the airway patent or obstructed?
You may need to clear & open the airway.



B- Breathing

Is the victim breathing? Is it adequate?
If not breathing you may need to perform rescue breathing. Give 2 breaths.



C- Circulation

Does the victim have a carotid pulse?
If the victim has a pulse, but is not breathing, perform rescue breathing at a rate of 10-12 breaths per minute or 1 breath every 5 seconds.

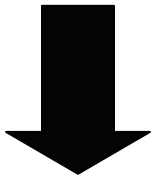
Adult CPR

Stimulate the victim.

Gently shake the victim's shoulder and ask "Are you all right?"

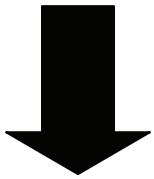
A- Airway

Look, listen, and feel.
Is the airway patent or obstructed?
You may need to clear & open the airway.



B- Breathing

Is the victim breathing? Is it adequate?
If not breathing, give 2 breaths.



C- Circulation

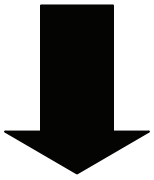
Does the victim have a pulse?

If no pulse, start chest compressions.

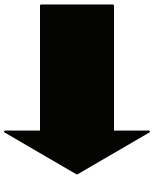
Push hard, push fast at a rate of 100 compressions per minute. The compression to ventilation ratio is 30:2.
Check the carotid pulse after 5 cycles or 2 minutes.

Adult Foreign Body Obstruction

Allow the victim to attempt to expel the object. If unable, stand behind the victim. Wrap arms around the abdomen, make a fist with one hand, use free hand to grasp the fisted hand, and give abdominal thrusts.



If the victim collapses, place supine, perform a finger sweep. Remove the object if found. Give 2 rescue breaths. If still obstructed . . .



Perform chest compressions and ventilations at a rate of 30:2 until the object is removed.

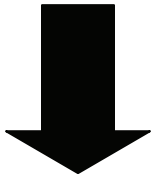
Pediatric Respiratory Arrest

Stimulate the victim.

Gently shake the victim's shoulder and ask "Are you all right?"

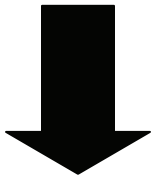
A- Airway

Look, listen, and feel.
Is the airway patent or obstructed?
You may need to clear & open the airway.



B- Breathing

Is the victim breathing? Is it adequate?
If not breathing you may need to perform rescue breathing. Give 2 slow breaths, just enough to make the chest rise.



C- Circulation

Does the victim have a carotid pulse (child) or brachial pulse (infant)? If the victim has a pulse that is greater than 60, but is not breathing, perform rescue breathing at a rate of 12-20 breaths per minute or 1 breath every 3-5 seconds.

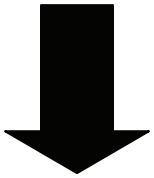
Pediatric CPR

Stimulate the victim.

Gently shake the victim's shoulder and ask "Are you all right?"

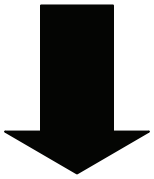
A- Airway

Look, listen, and feel.
Is the airway patent or obstructed?
You may need to clear & open the airway.



B- Breathing

Is the victim breathing? Is it adequate?
If not breathing you may need to perform rescue breathing. Give 2 slow breaths, just enough to make the chest rise.

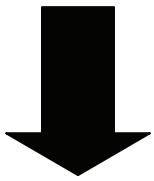


C- Circulation

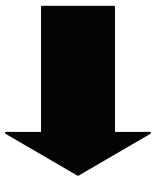
Does the victim have a carotid pulse (child) or brachial pulse (infant)? If the victim has a pulse that is less than 60 or absent, perform chest compressions and ventilations at a rate of 30:2 for 1 rescuer and 15:2 for 2 rescuers. Check the pulse after every 5 cycles of CPR.

Foreign Body Obstruction—Child

Allow the victim to attempt to expel the object. If unable, stand behind the victim. Wrap arms around the abdomen, make a fist with one hand, use free hand to grasp the fisted hand, and give abdominal thrusts.



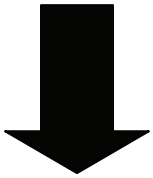
If the victim collapses, place supine. Remove the object if found. NEVER DO A BLIND FINGER SWEEP. Give 2 rescue breaths. If still obstructed . . .



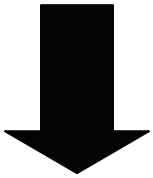
Perform chest compressions and ventilations at a rate of 30:2 until the object is removed.

Foreign Body Obstruction—Infant

Allow the victim to attempt to expel the object. If unable, perform 5 back blows followed by 5 chest compressions. Repeat until object is seen and removed.



If the infant becomes unresponsive, give 2 rescue breaths. Remove the object if found. NEVER DO A BLIND FINGER SWEEP. If still obstructed . . .



Perform chest compressions and ventilations at a rate of 30:2 until the object is removed.

Comprehensive Basic Resuscitation Exam

1. The air we normally breathe contains approximately _____percent oxygen.

a. 18 percent

b. 19 percent

c. 20 percent

d. 21 percent

2. When we exhale a breath of air there is _____percent oxygen, which helps support a person who is not breathing on their own.

a. 16 percent

b. 17 percent

c. 18 percent

d. 19 percent

3. When you open a patients airway you should 'look, listen, and feel' for the presence of breathing.

a. True

b. False

4. The most common cause of an airway obstruction in an unconscious person is the _____. This is why opening the airway with a chin tilt or jaw thrust is helpful.

a. epiglottis

b. tongue

c. teeth

d. uvula

5. In an adult, the best place to take an adult's pulse is the _____.

a. ulnar pulse

b. radial pulse

c. carotid pulse

d. brachial pulse

6. If there is a pulse present but no spontaneous respiration in an adult, then you need to give rescue breaths at a rate of _____ per minute.

a. 8-10

b. 10-12

c. 12-14

d. 14-16

7. Chest compressions are performed on an adults _____.

a. top half of the sternum

b. xiphoid process

c. between the nipples

d. ribs

8. The depth of compressions for adults should be:

a. 1.5 to 1 inch (1-2 cm)

b. 1 to 1.5 inches (2-3 cm)

c. 1.5 to 2 inches (4-5 cm)

d. 2 to 2.5 inches (5-6 cm)

9. In adult CPR the ratio of compressions to ventilations is _____.

a. 15:1

b. 15:2

c. 30:1

d. 30:2

10. If a person is chocking and moving air well, as noted by forceful coughing, you should _____.

a. let them try to clear their airway

b. perform the abdominal thrusts anyway

c. perform CPR

d. give them rescue breaths

11. If an adult has a complete airway obstruction caused by a foreign object that you are unable to remove and the victim becomes unconscious you should perform chest compressions.

a. True

b. False

12. You should never perform a finger sweep in an adult choking victim who is conscious.

a. True

b. False

13. If an adult choking victim becomes unconscious you will need to perform chest compressions and attempt rescue breathing in a ratio of _____.

a. 15:2

b. 30:1

c. 30:2

d. 5:3

14. To determine how much of a breath you need to ventilate a child or infant you should give _____.

a. enough to make the chest rise

b. as much as you can

c. as little as possible

d. there is no way to determine how much you should give

15. You should check a child's pulse by using the _____ pulse.

a. ulnar

b. radial

c. carotid

d. brachial

16. You should check an infant's pulse by using the _____ pulse.

a. ulnar

b. radial

c. carotid

d. brachial

17. CPR should be done in children and infants if their pulse is less than ____ beats per minute.

a. 60

b. 70

c. 80

d. 90

18. You should provide ventilation to a child or infant at a rate of _____ ventilations per minute during rescue breathing.

a. 6-10

b. 12-20

c. 20-30

d. 30-40

19. The appropriate rate of ventilation in a child or infant is about one ventilation every _____ seconds during rescue breathing.

a. 1-3

b. 2-3

c. 3-5

d. 6-10

20. The rate of chest compressions in a child should be about _____ per minute.

a. 80

b. 90

c. 100

d. 110

21. Hand placement on a child should be between the nipples, and you should use _____.

a. the heal of one hand

b. 2-handed technique

c. 2-finger technique

d. the one thumb technique

22. Hand placement in an infant should be made by drawing an imaginary line between the nipples and placing your fingers just below the line. For compressions you should use the _____.

a. the heal of one hand

b. 2-handed technique

c. 2-finger technique

d. the one thumb technique

23. The depth of chest compressions in children and infants should be _____.

a. as far as you can

b. one-third to one-half of the chest diameter

c. ne-half to two-thirds of the chest diameter

d. as little as possible

24. The ratio of chest compressions to ventilation for child and infant CPR is _____.

a. 20:1

b. 30:1

c. 40:2

d. 30:2

25. You never do a blind finger sweep in children and infants.

a. True

b. False

26. You only remove an object from a child or infants airway if you see it.

a. True

b. False

27. If the child has a foreign body obstruction of the airway and becomes unconscious you need to perform ___ abdominal thrusts, carefully avoiding the xiphoid but above the umbilicus.

a. 3

b. 4

c. 5

d. 6

28. For an infant with a foreign body obstruction of the airway you need to give ___ back blows followed by _____ chest compressions.

a. 3, 3

b. 4, 4

c. 5, 5

d. 6, 6

Answers to Comprehensive Resuscitation Exam Questions

1. d
2. a
3. a
4. b
5. c
6. b
7. c
8. c
9. d
10. a
11. a
12. a
13. c
14. a
15. c
16. d
17. a
18. b
19. c
20. c
21. a
22. c
23. b
24. d
25. a
26. a
27. c
28. c