



BASIC LIFE SUPPORT

Resuscitation Guidelines 2000

Contents

1. Introduction
2. History
3. Theory of chest compression
4. Pulse check
5. Sequence of actions for adult basic life support
6. Resuscitation with two persons
7. Notes on techniques of BLS and choking
8. Variations in cardiopulmonary resuscitation techniques
9. BLS algorithm
10. Further reading

Introduction

Basic life support (BLS) comprises the elements: initial assessment, then airway maintenance, expired air ventilation (rescue breathing), and chest compression. Basic life support implies that no equipment is employed; where a simple airway or facemask for mouth to mouth ventilation is used, this is defined as "basic life support with airway adjunct".

The purpose of BLS is to maintain adequate ventilation and circulation until means can be obtained to reverse the underlying cause of the arrest. It is therefore a "holding operation", although on occasions, particularly when the primary pathology is respiratory failure, it may itself reverse the cause and allow full recovery. Failure of the circulation for three to four minutes (less if the victim is initially hypoxaemic) will lead to irreversible cerebral damage. Delay, even within that time, will lessen the eventual chances of a successful outcome. Emphasis must therefore be placed on rapid institution of basic life support by a rescuer, who nonetheless should follow the recommended sequence of action.

History

It is often said that the earliest reference to mouth to mouth ventilation is the biblical account of the revival of an apparently dead child by the prophet Elisha. The first medical report of success was in 1744 by Tossach. Following this report, however, there was no further progress with the technique, and attention was turned towards the manual methods such as those described by

Silvester, Schafer, and Nielsen. It is possible that the prudery of the Victorian era prevented acceptance of any method which involved lip contact. It was not until the 1950s that mouth to mouth ventilation was rediscovered and became accepted universally as the method of choice. The inefficiency of the manual methods has led to them being abandoned.

Closed chest cardiac massage was first described in 1878 by Boehm and successfully applied in a few cases of cardiac arrest over the next 10 years or so. After that, however, open chest massage became the standard management for cardiac arrest until 1960, when the classic paper on closed chest massage by Kouwenhoven, Jude, and Knickerbocker was published. As this coincided with the rebirth of mouth to mouth ventilation, 1960 could be considered the year in which modern cardiopulmonary resuscitation was born.

Theory of chest compression

The original term "cardiac massage" and its successor "external cardiac compression" reflect the initial theory as to how chest compressions achieve an artificial circulation- by squeezing the heart. This "heart pump theory" was criticised in the mid-1970s, firstly because echocardiography demonstrated that the cardiac valves become incompetent during resuscitation, and secondly, because coughing alone was shown to produce a life sustaining circulation. The alternative "thoracic pump" theory proposes that chest compression, by increasing intrathoracic pressure, propels blood out of the thorax, forward flow occurring because veins at the thoracic inlet collapse while the arteries remain patent.

The recommended rate of 100/minute reflects a compromise between scientific evidence in favour of faster compression, and the ability of the rescuers to maintain the higher speeds. It is important, however, to recognise that even when performed optimally chest compressions do not achieve more than 30% of the normal cerebral perfusion.

The three elements of basic life support after initial assessment are commonly remembered as "ABC": *Airway / Breathing / Circulation*

Pulse check

The "gold standard" sign of cardiac arrest is an absent carotid (or other large artery) pulse. It has been shown, however, that assessment of the carotid pulse is time consuming and leads to an incorrect conclusion (present or absent) in up to 50% of cases. For this reason, training in detection of the carotid pulse as a sign of cardiac arrest is no longer recommended for *non-healthcare persons*.

Sequence of actions for adult basic life support

For the purposes of these guidelines an adult is considered a person aged 8 years or over.

1. **Ensure safety of rescuer and victim**
2. **Check the victim and see if he responds:**
 - Gently shake his shoulders and ask loudly: "Are you all right?"
3. **A. If he responds by answering or moving:**
 - Leave him in the position in which you find him (provided he is not in further danger), check his condition and get assistance if needed
 - Reassess him regularly
- B. If he does not respond:**
 - Shout for help
 - Unless you can assess him fully in the position you find him, turn the victim on to his back and then open the airway:
 - Place your hand on his forehead and gently tilt his head back keeping your thumb and index finger free to close his nose if rescue breathing is required
 - Remove any visible obstruction from the victim's mouth, including dislodged dentures, but leave well fitting dentures in place
 - With your fingertips under the point of the victim's chin, lift the chin to open the airway

Try to avoid head tilt if trauma (injury) to the neck is suspected

4. **Keeping the airway open, look, listen and feel for breathing (more than an occasional gasp or weak attempts at breathing):**
 - Look for chest movement
 - Listen at the victim's mouth for breath sounds
 - Feel for air on your cheek

Look, listen and feel for no more than **10 seconds** to determine if the victim is breathing normally
5. **A. If he is breathing normally:**
 - Turn him into the recovery position (**see below**)
 - Send or go for help
 - Check for continued breathing

B. If he is *not* breathing or is only making occasional gasps or weak attempts at breathing:

- Send someone for help or, if you are on your own, leave the victim and go for help; return and start rescue breathing as below
- Turn the victim onto his back if he is not already in this position
- Give **2 slow, effective** rescue breaths, each of which makes the chest rise and fall:
 - Ensure head tilt and chin lift
 - Pinch the soft part of his nose closed with the index finger and thumb of your hand on his forehead
 - Open his mouth a little, but maintain chin lift
 - Take a deep breath to fill your lungs with oxygen, and place your lips around his mouth, making sure that you have a good seal
 - Blow steadily into his mouth whilst watching his chest; take about 2 seconds to make his chest rise as in normal breathing
 - Maintaining head tilt and chin lift, take your mouth away from the victim and watch for his chest to fall as air comes out
- Take another breath and repeat the sequence as above to give 2 effective rescue breaths in all

- If you have difficulty achieving an effective breath:
 - Recheck the victim's mouth and remove any obstruction
 - Recheck that there is adequate head tilt and chin lift
 - Make up to 5 attempts in all to achieve 2 effective breaths
 - Even if unsuccessful, move on to assessment of the circulation

6. Assess the victim for signs of a circulation:

- Look, listen and feel for normal breathing, coughing or movement by the victim
- **Only if you have been trained to do so**, check the carotid pulse
- Take **no more than 10 seconds** to do this

7. A. If you are confident that you have detected signs of a circulation:

- Continue rescue breathing until the victim starts breathing on his own
- About every 10 breaths (or about every minute) recheck for signs of a circulation; take no more than 10 seconds each time
- If the victim starts to breathe normally on his own but remains unconscious, turn him into the recovery position. Be ready to turn him on to his back and re-start rescue breathing if he stops breathing

B. If there are no signs of a circulation, or you are at all unsure, start chest compressions:

- With your hand that is nearest the victim's feet, locate the lower half of the sternum (breastbone):
 - Using your index and middle fingers, identify the lower rib edge nearest to you. Keeping your fingers together, slide them upwards to the point where the ribs join the sternum. With your middle finger on this point, place your index finger on the sternum itself
 - Slide the heel of your other hand down the sternum until it reaches your index finger; this should be the middle of the lower half of the sternum
 - Place the heel of the other hand on top of the first
 - Extend or interlock the fingers of both hands and lift them to ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or bottom tip of the sternum
 - Position yourself vertically above the victim's chest and, with your arms straight, press down on the sternum to depress it between 4 - 5 cms
 - Release all the pressure without losing contact between the hand and sternum, then repeat at a rate of about 100 times a minute (a little less than 2 compressions a second); it may be helpful to count aloud. Compression and release should take an equal amount of time
- Combine rescue breathing and chest compression:
 - After 15 compressions tilt the head, lift the chin, and give 2 effective breaths
 - Return your hands without delay to the correct position on the sternum and give 15 further compressions, continuing compressions and breaths in a ratio of 15:2
 - Only stop to recheck for signs of a circulation if the victim makes a movement or takes a spontaneous breath; otherwise resuscitation should not be interrupted

8. **Continue resuscitation until:**
- Qualified help arrives and takes over;
 - The victim shows signs of life;
 - You become exhausted

When to go for help:

It is vital for rescuers to get help as quickly as possible.

- When **more than one rescuer** is available, one should start resuscitation while another rescuer goes for help immediately it has been established that the victim is not breathing
- A **single** rescuer will have to decide whether to start resuscitation or to go for help first. If the victim is an **adult**, the single rescuer should normally assume that he has a heart problem and go for help immediately it has been established that he is not breathing. This decision may be influenced by the availability of emergency medical services

However, if the likely cause of unconsciousness is a breathing problem, as in:

- **trauma (injury)**
- **drowning**
- **choking**
- **drug or alcohol intoxication**
- **or if the victim is an infant or a child**

the rescuer should perform resuscitation for **about 1 minute** before going for help.

Resuscitation with two persons

Two person CPR is less tiring than single person CPR. However, it is important that both rescuers are proficient and practised in the technique. Therefore it is recommended that this technique is only used by trained healthcare providers and those lay persons who are members of trained teams, such as first aid and rescue organisations. The following points should be noted:

1. The first priority is to summon help. This may mean that one rescuer has to start CPR alone whilst the other leaves to find a telephone.
2. It is preferable that the rescuers work from opposite sides of the victim.
3. A ratio of 15 compressions to 2 inflations should be used. By the end of each series of 15 compressions, the rescuer responsible for ventilation should be positioned ready to give 2 inflations with the least possible delay. It is helpful if the rescuer giving compressions counts out aloud.
4. Chin lift and head tilt should be maintained at all times. Ventilations should take 2 seconds each during which chest compressions should cease; they should be resumed immediately after the second inflation of the chest, waiting only for the rescuer to remove his lips from the victim's face.
5. If the rescuers wish to change places, usually because the one giving compressions becomes tired, this should be undertaken as quickly and smoothly as possible.

Notes on techniques of BLS

Rescue Breathing

- a) Only a small amount of resistance to breathing should be felt during rescue breathing and each rescue breath should take 2 seconds.
- b) If inflation is too quick resistance will be greater and less air will get into the lungs.
- c) The tidal volume to be achieved is about 700 - 1000 ml in an adult, which is the amount normally required to produce visible lifting of the chest.
- d) The rescuer should wait for the chest to fall fully during expiration before giving another breath. This should normally take about 2 - 4 seconds; each sequence of 10 breaths will therefore take about 40 to 60 seconds to complete.
- e) The exact timing of expiration is not critical; the chest should be allowed to fall before another breath is given.

Chest compression

- a) In an adult the aim should be to press down approximately 4-5 centimetres and apply only enough pressure to achieve this.
- b) At all times the pressure should be firm, controlled and applied vertically. Erratic or violent action is dangerous.
- c) The recommended rate of compression is a **rate** and not the number of compressions which are to be given in a minute; this will depend upon interruptions for rescue breathing.
- d) About the same time should be spent in the compression phase as in the released phase.
- e) As the chances are remote that effective spontaneous cardiac action will be restored by BLS without other techniques of advanced life support (including defibrillation), time should not be wasted by further checks for the presence of a circulation. If, however, the victim makes a movement or takes a spontaneous breath, the rescuer should check for signs of a circulation; take no more than ten seconds to do this. Otherwise resuscitation **SHOULD NOT BE INTERRUPTED**.
- f) The presence of dilated pupils has in the past been variously used as a sign of cardiac arrest, failure of the circulation during resuscitation, and the presence of established brain damage. This sign is unreliable and should not be used to influence management decisions before, during, or after cardiopulmonary resuscitation.

Choking

If blockage of the airway is only partial, the victim will usually be able to clear it by coughing, but if obstruction is complete urgent intervention is required to prevent asphyxia.

Victim is conscious and breathing, despite evidence of obstruction:

- Encourage him to continue coughing but do nothing else

Obstruction is complete or the victim shows signs of exhaustion or becomes cyanosed:

If the victim is conscious:

- Carry out back blows:
 - Remove any obvious debris or loose teeth from the mouth
 - Stand to the side and slightly behind him
 - Support his chest with one hand and lean the victim well forwards so that when the obstructing object is dislodged it comes out of the mouth rather than goes further down the airway
 - Give **up to 5** sharp blows between the scapulae (shoulder blades) with the heel of your other hand; each blow should be aimed at relieving the obstruction, so all 5 need not necessarily be given.
- If the back blows fail, carry out abdominal thrusts:
 - Stand behind the victim and put both your arms around the upper part of the abdomen
 - Make sure the victim is bending well forwards so that when the obstructing object is dislodged it comes out of the mouth rather than goes further down the airway.
 - Clench your fist and place it between the umbilicus (navel) and xiphisternum (bottom tip of the sternum). Grasp it with your with your other hand
 - Pull sharply inwards and upwards; the obstructing object should be dislodged
 - If the obstruction is still not relieved, recheck the mouth for any obstruction that can be reached with a finger, and continue alternating 5 back blows with 5 abdominal thrusts.

If the victim at any time becomes unconscious:

This may result in the relaxation of the muscles around the larynx (voicebox) and allow air to pass down into the lungs. If at any time the choking victim loses consciousness carry out the following **sequence of life support**:

- Tilt the victim's head and remove any visible obstruction from the mouth
- Open his airway further by lifting his chin
- Check for breathing by looking, listening, and feeling
- Attempt to give 2 effective rescue breaths
- If effective breaths **can** be achieved within 5 attempts:
 - Check for signs of a circulation
 - Start chest compressions and/or rescue breaths as appropriate
- If effective breaths **cannot** be achieved within 5 attempts:
 - Start chest compressions immediately to relieve the obstruction. Do not check for signs of a circulation
 - After 15 compressions, **check the mouth for any obstruction**, then attempt further rescue breaths
 - Continue to give cycles of 15 compressions followed by attempts at

rescue breaths

- If at any time effective breaths **can** be achieved:
 - Check for signs of a circulation
 - Continue chest compressions and/or rescue breaths as appropriate.

An [algorithm for the management of choking in adults](#) is available in Adobe PDF format.

Recovery position

When circulation and breathing have been restored, it is important to maintain a good airway and ensure that the tongue does not cause obstruction. It is also important to minimize the risk of inhalation of gastric contents.

For this reason the victim should be placed in the recovery position. This allows the tongue to fall forward, keeping the airway clear.

- Remove the victim's spectacles
- Kneel beside the victim and make sure that both his legs are straight
- Place the arm nearest to you out at right angles to his body, elbow bent with the hand palm uppermost
- Bring his far arm across the chest, and hold the back of the hand against the victim's cheek nearest to you
- With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot on the ground
- Keeping his hand pressed against his cheek, pull on the leg to roll the victim towards you onto his side
- Adjust the upper leg so that both the hip and knee are bent at right angles
- Tilt the head back to make sure the airway remains open
- Adjust the hand under the cheek, if necessary, to keep the head tilted
- Check breathing regularly.

Care should be taken to monitor the peripheral circulation of the lower arm, and to ensure that the duration for which there is pressure on this arm is kept to a minimum. If the victim has to be kept in the recovery position for **more than 30 minutes** he should be turned to the opposite side.

Finally, it must be emphasized that in spite of possible problems during training and in use, it remains above doubt that placing the unconscious, breathing victim into the recovery position can be life saving.

Variations in cardiopulmonary resuscitation techniques

Mouth-to-nose ventilation

There are several situations in which mouth-to-nose ventilation may be preferable to mouth-to-mouth ventilation:

- a) If mouth to mouth ventilation proves technically difficult, for example

because of unusual or absent dentition

b) If mouth obstruction cannot be relieved

c) During rescue of a victim from the water, when one hand is required to support the body and cannot be used to close the nose

d) When resuscitation is being carried out by a child whose mouth may not be large enough to seal an adult's mouth

e) For aesthetic reasons

To carry out mouth-to-nose ventilation:

- Release the victim's nose and close his mouth
- Seal your mouth around his nose and blow in steadily as for the mouth-to-mouth technique
- Allow his mouth to open to let the breath out.

Cervical spine injury

If spinal cord injury is suspected (for example if the victim has sustained a fall, been struck on the head or neck, or has been rescued after diving into shallow water) particular care must be taken during handling and resuscitation to maintain alignment of the head, neck, and chest in the neutral position. A spinal board and/or cervical collar should be used if available. As hypotension often accompanies spinal cord injury care should be taken to maintain the victim in a horizontal position during rescue.

When obtaining an airway, head tilt may be employed, but the tilt should be the minimum that allows unobstructed ventilation or intubation. Jaw thrust rather than chin lift is preferable. During resuscitation, assistance from others may be required to maintain head, back, and chest alignment if adequate splinting is not available. Remember that successful resuscitation that results in paralysis is a tragedy, but failure to carry out adequate ventilation in cases of respiratory arrest will result in death.

Adult BLS algorithm

The adult [BLS algorithm](#) is available in Adobe PDF format.

Further reading

1. An advisory statement by the Basic Life Support Working Group of the International Liaison Committee on Resuscitation 1997; 34: 101-107.
2. The American Heart Association in collaboration with the International

Committee on Resuscitation (ILCOR). Guidelines 2000 for
Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. An
international consensus on science. Resuscitation 2000; 46: 29-71.

SUPERSEDED
BY 2005
GUIDELINES