Adult Basic Life Support

Introduction

This section contains the guidelines for out-of-hospital, single rescuer, adult basic life support (BLS). Like the other guidelines in this publication, it is based on the document *2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations* (CoSTR), which was published in November 2005. Basic life support implies that no equipment is employed other than a protective device.

Guideline changes

There are two main underlying themes in the BLS section of CoSTR: the need to increase the number of chest compressions given to a victim of cardiac arrest, and the importance of simplifying guidelines to aid acquisition and retention of BLS skills, particularly for laypersons.

It is well documented that interruptions in chest compression are common[1] and are associated with a reduced chance of survival for the victim.[2] The 'perfect' solution is to deliver continuous compressions whilst giving ventilations independently. This is possible when the victim has an advanced airway in place, and is discussed in the adult advanced life support (ALS) section. Chest-compression-only CPR is another way to increase the number of compressions given and will, by definition, eliminate pauses. It is effective for a limited period only (about 5 min) [3] and is not recommended as standard management of out-of-hospital cardiac arrest.

The following changes in the BLS guidelines have been made to reflect the greater importance placed on chest compression, and to attempt to reduce the number and duration of pauses:

1) Make a diagnosis of cardiac arrest if a victim is unresponsive and not breathing normally.
2) Teach rescuers to place their hands in the centre of the chest, rather than to spend more time using the 'rib margin' method.
3) Give each rescue breath over 1 sec rather than 2 sec.
4) Use a ratio of compressions to ventilations of 30:2 for all adult victims of sudden cardiac arrest. Use this same ratio for children when attended by a lay rescuer.
5) For an adult victim, omit the initial 2 rescue breaths and give 30 compressions immediately after cardiac arrest is established.

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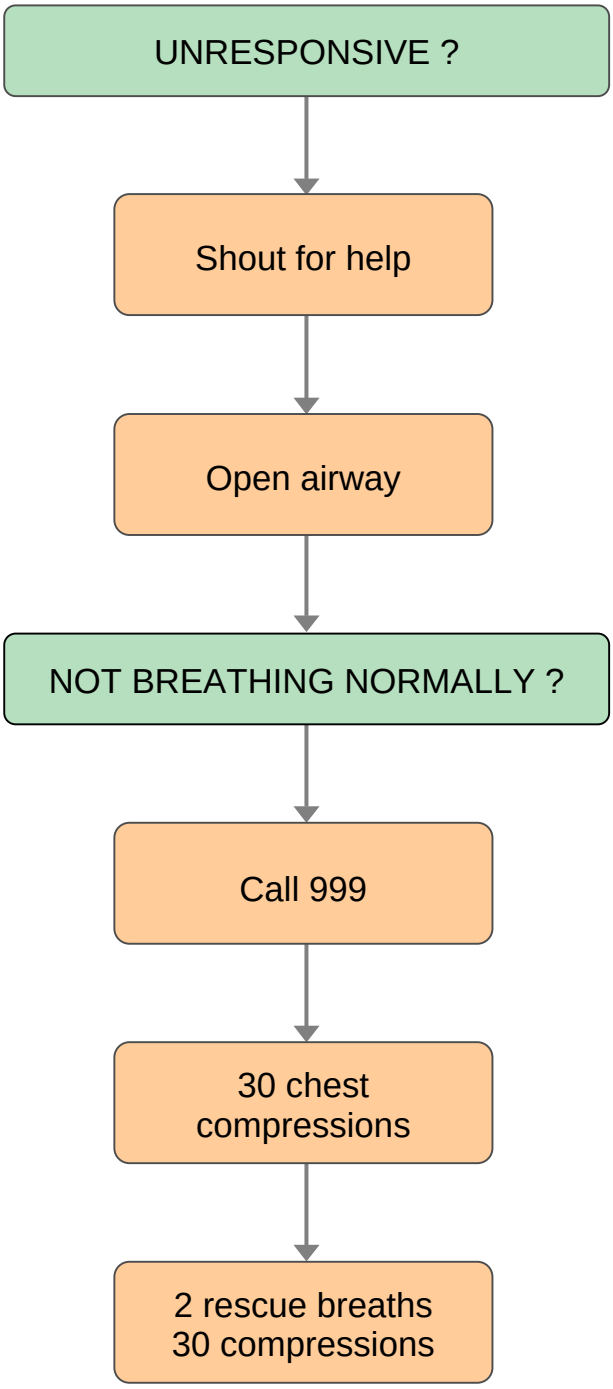


To aid teaching and learning, the sequence of actions has been simplified. In some cases, simplification has been based on recently published evidence; in others there was no evidence that the previous, more complicated, sequence had any beneficial effect on survival.

There are other changes in the guidelines. In particular, allowance has been made for the rescuer who is unable or unwilling to perform rescue breathing. It is well recorded that reluctance to perform mouth-to-mouth ventilation, in spite of the lack of evidence of risk, inhibits many would-be rescuers from attempting any form of resuscitation. These guidelines encourage chest compression alone in such circumstances.

Guidelines 2000 introduced the concept of checking for 'signs of a circulation'. This change was made because of the evidence that relying on a check of the carotid pulse to diagnose cardiac arrest is unreliable and time-consuming, mainly, but not exclusively, when attempted by non-healthcare professionals.[4] Subsequent studies have shown that checking for breathing is also prone to error, particularly as agonal gasps are frequently misdiagnosed as normal breathing.[5] In Guidelines 2005 the absence of breathing, in a non-responsive victim, continues to be the main sign of cardiac arrest. Also highlighted is the need to identify agonal gasps as another, positive, indication to start CPR.

Finally, there is recognition that delivering chest compressions is tiring. It is now recommended that, where more than one rescuer is present, another should take over the compressions (with a minimum of delay) about every 2 min to prevent fatigue and maintain the quality of performance.

Adult BLS sequence

Basic life support consists of the following sequence of actions:

1 Make sure the victim, any bystanders, and you are safe.

2 Check the victim for a response.

- Gently shake his shoulders and ask loudly, 'Are you all right?'

3 A If he responds:

- Leave him in the position in which you find him provided there is no further danger.
- Try to find out what is wrong with him and get help if needed.
- Reassess him regularly.

3 B If he does <u>not</u> respond:

- Shout for help.
- Turn the victim onto his back and then open the airway using head tilt and chin lift:
  - Place your hand on his forehead and gently tilt his head back.
  - With your fingertips under the point of the victim's chin, lift the chin to open the airway.

4 Keeping the airway open, look, listen, and feel for normal breathing.

- Look for chest movement.
- Listen at the victim's mouth for breath sounds.
- Feel for air on your cheek.

In the first few minutes after cardiac arrest, a victim may be barely breathing, or taking infrequent, noisy, gasps. Do not confuse this with normal breathing.

Look, listen, and feel for **<u>no more</u>** than **10 sec** to determine if the victim is breathing normally. If you have any doubt whether breathing is normal, act as if it is **<u>not</u>** normal.

5 A If he <u>is</u> breathing normally:

- Turn him into the recovery position (**see below**).
- Send or go for help, or call for an ambulance.
- Check for continued breathing.

5 B If he is <u>not</u> breathing normally:

- Ask someone to call for an ambulance or, if you are on your own, do this yourself; you may need to leave the victim. Start chest compression as follows:
  - Kneel by the side of the victim.
  - Place the heel of one hand in the centre of the victim's chest.
  - Place the heel of your other hand on top of the first hand.
  - Interlock the fingers of your hands and ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or the bottom end of the bony sternum (breastbone).
  - Position yourself vertically above the victim's chest and, with your arms straight, press down on the sternum 4 - 5 cm.
  - After each compression, release all the pressure on the chest without losing contact between your hands and the sternum. Repeat at a rate of about 100 times a minute (a little less than 2 compressions a second).
  - Compression and release should take an equal amount of time.

6 A Combine chest compression with rescue breaths.

- After 30 compressions open the airway again using head tilt and chin lift.
- Pinch the soft part of the victim's nose closed, using the index finger and thumb of your hand on his forehead.
- Allow his mouth to open, but maintain chin lift.
- Take a normal breath and place your lips around his mouth, making sure that you have a good seal.
- Blow steadily into his mouth whilst watching for his chest to rise; take about one second to make his chest rise as in normal breathing; this is an effective rescue breath.
- 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 normal breath and blow into the victim's mouth once more to give a total of two effective rescue breaths. Then return your hands without delay to the correct position on the sternum and give a further 30 chest compressions.
- Continue with chest compressions and rescue breaths in a ratio of 30:2.
- Stop to recheck the victim only if he starts breathing **normally**; otherwise **do not interrupt resuscitation.**

If your rescue breaths do not make the chest rise as in normal breathing, then before your next attempt:

- Check the victim's mouth and remove any visible obstruction.
- Recheck that there is adequate head tilt and chin lift.
- Do not attempt more than two breaths each time before returning to chest compressions.

If there is more than one rescuer present, another should take over CPR about every 2 min to prevent fatigue. Ensure the minimum of delay during the changeover of rescuers.

6 B Chest-compression-only CPR.

- If you are not able, or are unwilling, to give rescue breaths, give chest compressions only.
- If chest compressions only are given, these should be continuous at a rate of 100 a minute.
- Stop to recheck the victim only if he starts breathing **normally**; otherwise do not interrupt resuscitation.

7 Continue resuscitation until:

- qualified help arrives and takes over,
- the victim starts breathing normally, or
- you become exhausted.

Explanatory notes

Risk to the rescuer

The safety of both the rescuer and victim are paramount during a resuscitation attempt. There have been few incidents of rescuers suffering adverse effects from undertaking CPR, with only isolated reports of infections such as tuberculosis (TB) and severe acute respiratory distress syndrome (SARS). Transmission of HIV during CPR has never been reported. There have been no human studies to address the effectiveness of barrier devices during CPR; however, laboratory studies have shown that certain filters, or barrier devices with one-way valves, prevent oral bacteria transmission from the victim to the rescuer during mouth-to-mouth ventilation. Rescuers should take appropriate safety precautions where feasible, especially if the victim is known to have a serious infection, such as TB.

Initial rescue breaths

During the first few minutes after non-asphyxial cardiac arrest the blood oxygen content remains high. Ventilation is, therefore, less important than chest compression at this time.

It is well recognised that skill acquisition and retention are aided by simplification of the BLS sequence of actions. It is also recognised that rescuers are frequently unwilling to carry out mouth-to-mouth ventilation for a variety of reasons, including fear of infection and distaste for the procedure. For these reasons, and to emphasise the priority of chest compressions, it is recommended that, in most adults, CPR should start with chest compressions rather than initial ventilations.

Jaw thrust

The jaw thrust technique is not recommended for lay rescuers because it is difficult to learn and perform. Therefore, the lay rescuer should open the airway using a head-tilt-chin-lift manoeuvre.

Agonal gasps

Agonal gasps are present in up to 40% of cardiac arrest victims. Laypeople should, therefore, be taught to begin CPR if the victim is unconscious (unresponsive) and not breathing normally. It should be emphasised during training that agonal gasps occur commonly in the first few minutes after sudden cardiac arrest. They are an indication for starting CPR immediately and should not be confused with normal breathing.

Mouth-to-nose ventilation

Mouth-to-nose ventilation is an effective alternative to mouth-to-mouth ventilation. It may be considered if the victim's mouth is seriously injured or cannot be opened, the rescuer is assisting a victim in the water, or a mouth-to-mouth seal is difficult to achieve.

Mouth-to-tracheostomy ventilation

Mouth-to-tracheostomy ventilation may be used for a victim with a tracheostomy tube or tracheal stoma who requires rescue breathing.

Bag-mask ventilation

Considerable practice and skill are required to use a bag and mask for ventilation. The lone rescuer has to be able to open the airway with a jaw thrust whilst simultaneously holding the mask to the victim's face. It is a technique that is appropriate only for lay rescuers who work in highly specialised areas, such as where there is a risk of cyanide poisoning or exposure to other toxic agents. There are other specific circumstances in which non-healthcare providers receive extended training in first aid which could include training, and retraining, in the use of bag-mask ventilation. The same strict training that applies to healthcare professionals should be followed and the two-person technique is preferable.

Chest compression

In most circumstances it will be possible to identify the correct hand position for chest compression without removing the victim's clothes. If in any doubt, remove outer clothing.

In Guidelines 2000 a method was recommended for finding the correct hand position by placing one finger on the lower end of the sternum and sliding the other hand down to it. It has been shown that the same hand position can be found more quickly if rescuers are taught to 'place the heel of your hand in the centre of the chest with the other hand on top', provided the teaching includes a demonstration of placing the hands in the middle of the lower half of the sternum.[6]

Whilst performing chest compression:

a) Each time compressions are resumed, the rescuer should place his hands without delay 'in the centre of the chest'.
b) Compress the chest at a rate of about 100 a minute.
c) Pay attention to achieving the full compression depth of 4-5 cm (for an adult).
d) Allow the chest to recoil completely after each compression.
e) Take approximately the same amount of time for compression and relaxation.
f) Minimise interruptions in chest compression.
g) Do not rely on a palpable carotid or femoral pulse as a gauge of effective arterial flow.
h) 'Compression rate' refers to the speed at which compressions are given, not the total number delivered in each minute. The number delivered is determined not only by the rate, but also by the number of interruptions to open the airway, deliver rescue breaths, and allow AED analysis.

Compression-only CPR

Studies have shown that chest-compression-only CPR may be as effective as combined ventilation and compression in the first few minutes after non-asphyxial arrest. Laypeople should, therefore, be encouraged to do compression-only CPR if they are unable or unwilling to provide rescue breaths, although combined chest compression and ventilation is the better method of CPR.

Over-the-head CPR

Over-the-head CPR for a single rescuer and straddle CPR for two rescuers may be considered for resuscitation in confined spaces.

Recovery position

There are several variations of the recovery position, each with its own advantages. No single position is perfect for all victims. The position should be stable, near a true lateral position with the head dependent, and with no pressure on the chest to impair breathing.

The Resuscitation Council (UK) recommends this sequence of actions to place a victim in the recovery position:

- 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 the 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 far 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.

If the victim has to be kept in the recovery position for **more than 30 min** turn him to the opposite side to relieve the pressure on the lower arm.

Choking

Recognition

Because recognition of choking (airway obstruction by a foreign body) is the key to successful outcome, it is important not to confuse this emergency with fainting, heart attack, seizure, or other conditions that may cause sudden respiratory distress, cyanosis, or loss of consciousness.

Foreign bodies may cause either mild or severe airway obstruction. The signs and symptoms enabling differentiation between mild and severe airway obstruction are summarised in the table below. It is important to ask the conscious victim 'Are you choking?'

<table>
<tr><th colspan="2">General signs of choking</th></tr>
<tr><td colspan="2">• Attack occurs while eating
• Victim may clutch his neck</td></tr>
<tr><th>Signs of mild airway obstruction</th><th>Signs of severe airway obstruction</th></tr>
<tr><td>Response to question 'Are you choking?'
• Victim speaks and answers yes

Other signs
• Victim is able to speak, cough, and breathe</td><td>Response to question 'Are you choking?'
• Victim unable to speak
• Victim may respond by nodding

Other signs
• Victim unable to breathe
• Breathing sounds wheezy
• Attempts at coughing are silent
• Victim may be unconscious</td></tr>
</table>

Adult choking sequence

(This sequence is also suitable for use in children over the age of 1 year)

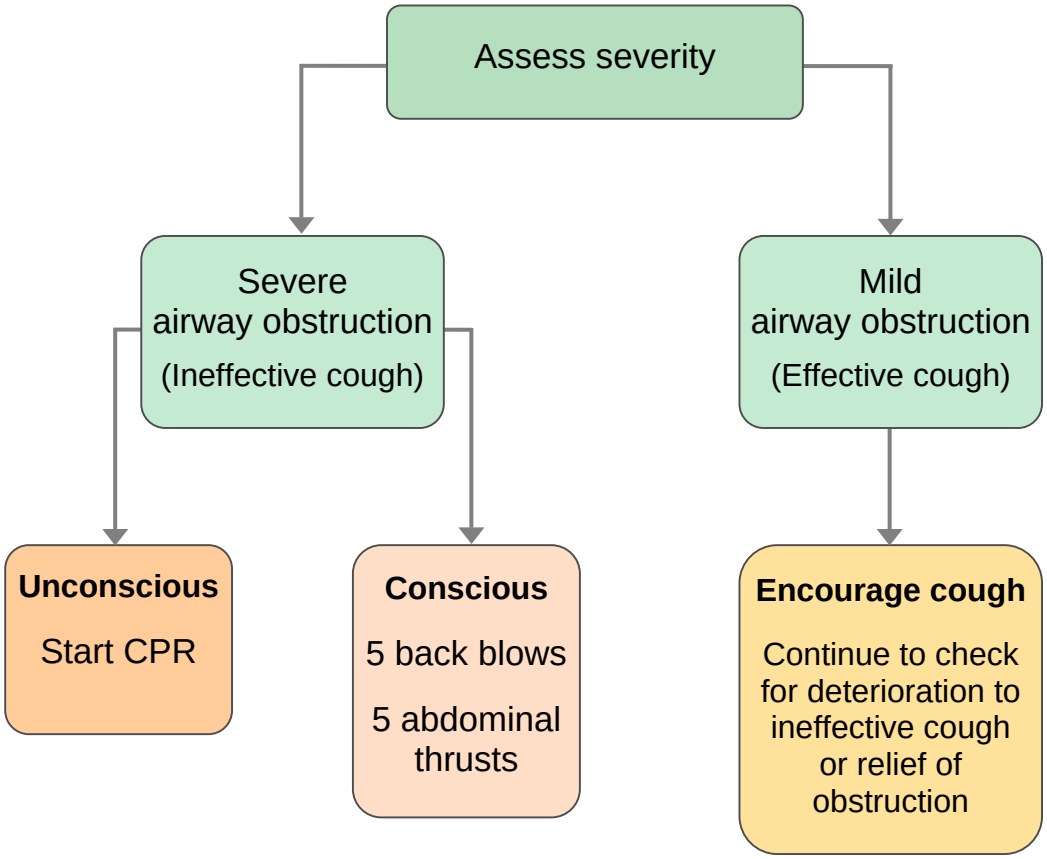
1 If the victim shows signs of mild airway obstruction:

- Encourage him to continue coughing, but do nothing else.

2 If the victim shows signs of severe airway obstruction and is conscious:

- Give up to five back blows.
  - Stand to the side and slightly behind the victim.
  - Support the 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** five sharp blows between the shoulder blades with the heel of your other hand.

Adult choking treatment



- Check to see if each back blow has relieved the airway obstruction. The aim is to relieve the obstruction with each blow rather than necessarily to give all five.
- If five back blows fail to relieve the airway obstruction give up to five abdominal thrusts.
    - Stand behind the victim and put both arms round the upper part of his abdomen.
    - Lean the victim forwards.
    - Clench your fist and place it between the umbilicus (navel) and the bottom end of the sternum (breastbone).
    - Grasp this hand with your other hand and pull sharply inwards and upwards.
    - Repeat up to five times.
- If the obstruction is still not relieved, continue alternating five back blows with five abdominal thrusts.

3 If the victim becomes unconscious:

- Support the victim carefully to the ground.
- Immediately call an ambulance.
- Begin CPR (from 5B of the Adult BLS Sequence). Healthcare providers, trained and experienced in feeling for a carotid pulse, should initiate chest compressions even if a pulse is present in the unconscious choking victim.

Explanatory notes

Following successful treatment for choking, foreign material may nevertheless remain in the upper or lower respiratory tract and cause complications later. Victims with a persistent cough, difficulty swallowing, or with the sensation of an object being still stuck in the throat should therefore be referred for a medical opinion.

Abdominal thrusts can cause serious internal injuries and all victims receiving abdominal thrusts should be examined for injury by a doctor.

Resuscitation of children and victims of drowning

Both ventilation and compression are important for victims of cardiac arrest when the oxygen stores become depleted – about 4-6 min after collapse from ventricular fibrillation (VF), and immediately after collapse for victims of asphyxial arrest. Previous guidelines tried to take into account the difference in causation, and recommended that victims of identifiable asphyxia (drowning; trauma; intoxication) and children should receive 1 min of CPR before the lone rescuer left the victim to get help. The majority of cases of sudden cardiac arrest out of hospital, however, occur in adults and are of cardiac origin due to VF. These additional recommendations, therefore, added to the complexity of the guidelines whilst affecting only a minority of victims.

Also important is that many children do not receive resuscitation because potential rescuers fear causing harm. This fear is unfounded; it is far better to use the adult BLS sequence for resuscitation of a child than to do nothing.

For ease of teaching and retention, therefore, laypeople should be taught that the adult sequence may also be used for children who are not responsive and not breathing.

The following minor modifications to the adult sequence will, however, make it even more suitable for use in children:

- Give five initial rescue breaths before starting chest compressions (adult sequence of actions 5B).
- If you are on your own perform CPR for approximately 1 min before going for help.
- Compress the chest by approximately one-third of its depth. Use two fingers for an infant under 1 year; use one or two hands for a child over 1 year as needed to achieve an adequate depth of compression.

The same modifications of five initial breaths, and 1 min of CPR by the lone rescuer before getting help, may improve outcome for victims of drowning. This modification should be taught only to those who have a specific duty of care to potential drowning victims (e.g. lifeguards).

Drowning is easily identified. It can be difficult, on the other hand, for a layperson to determine whether cardiorespiratory arrest has been caused by trauma or intoxication. These victims should, therefore, be managed according to the standard protocol.

References

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