Resuscitation Council (UK)

Adult basic life support and automated external defibrillation

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1. The guideline process

The process used to produce the Resuscitation Council (UK) Guidelines 2015 has been accredited by the National Institute for Health and Care Excellence. The guidelines process includes:

- Systematic reviews with grading of the quality of evidence and strength of recommendations. This led to the 2015 International Liaison Committee on Resuscitation (ILCOR) Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations.[1,2]
- The involvement of stakeholders from around the world including members of the public and cardiac arrest survivors.
- Details of the guidelines development process can be found in the Resuscitation Council (UK) Guidelines Development Process Manual. www.resus.org.uk/publications/guidelines-development-process-manual/
- These Resuscitation Council (UK) Guidelines have been peer reviewed by the Executive Committee of the Resuscitation Council (UK), which comprises 25 individuals and includes lay representation and representation of the key stakeholder groups.

2. Summary of changes in basic life support and automated external defibrillation since the 2010 Guidelines

- Guidelines 2015 highlights the critical importance of the interactions between the emergency medical dispatcher, the bystander who provides cardiopulmonary resuscitation (CPR) and the timely deployment of an automated external defibrillator (AED). An effective, co-ordinated community response that draws these elements together is key to improving survival from out-of-hospital cardiac arrest.
- The emergency medical dispatcher plays an important role in the early diagnosis of cardiac arrest, the provision of dispatcher-assisted CPR (also known as telephone CPR), and the location and dispatch of an AED. The sooner the emergency services are called, the earlier appropriate treatment can be initiated and supported.
- The knowledge, skills and confidence of bystanders will vary according to the circumstances, of the arrest, level of training and prior experience. The bystander who is trained and able should assess the collapsed victim rapidly to determine if the victim is unresponsive and not breathing normally and then immediately alert the emergency services. Whenever possible, alert the emergency services without leaving the victim.
- The victim who is **unresponsive** and **not breathing normally** is in cardiac arrest and requires CPR. Immediately following cardiac arrest blood flow to the brain is reduced to virtually zero, which may cause seizure-like episodes that may be confused with epilepsy. Bystanders and emergency medical dispatchers should be suspicious of cardiac arrest in any patient presenting with seizures and carefully assess whether the victim is breathing normally.

3. Introduction

The community response to cardiac arrest is critical to saving lives. Each year, UK ambulance services respond to approximately 60,000 cases of suspected cardiac arrest. Resuscitation is attempted by ambulance services in less than half of these cases (approximately 28,000).[3] The main reasons are that either the victim has been dead for several hours or has not received bystander CPR so by the time the emergency services arrive the person has died. Even when resuscitation is attempted, less than one in ten victims survive to go home from hospital. Strengthening the community response to cardiac arrest by training and empowering more bystanders to perform CPR and by increasing the use of automated external defibrillators (AEDs) at least doubles the chances of survival and could save thousands of lives each year.[4,5]

This guideline is based on the International Liaison Committee on Resuscitation (ILCOR) 2015 Consensus on Science and Treatment Recommendations (CoSTR) for Basic Life Support and Automated External Defibrillation and the European Resuscitation Council Guidelines for Resuscitation 2015 Section 2 Adult basic life support and automated external defibrillation.[2,6] These contain all the reference material for this section.

4. Chain of Survival

The Chain of Survival (Figure 1) describes four key, inter-related steps, which if delivered effectively and in sequence, optimise survival from out-of-hospital cardiac arrest.[7]

1: Early recognition and call for help

If untreated, cardiac arrest occurs in a quarter to a third of patients with myocardial ischaemia within the first hour after onset of chest pain.

Once cardiac arrest has occurred, early recognition is critical to enable rapid activation of the ambulance service and prompt initiation of bystander CPR.

2: Early bystander CPR

The immediate initiation of bystander CPR can double or quadruple survival from out-of-hospital cardiac arrest.[5,8-13] Despite this compelling evidence, only 40% of victims receive bystander CPR in the UK.[14]

3: Early defibrillation

Defibrillation within 3–5 min of collapse can produce survival rates as high as 50–70%.[15] This can be achieved through public access defibrillation, when a bystander uses a nearby AED to deliver the first shock.[4,15-17] Each minute of delay to defibrillation reduces the probability of survival to hospital discharge by 10%. In the UK, fewer than 2% of victims have an AED deployed before the ambulance arrives.[18]

4: Early advanced life support and standardised post-resuscitation care

Advanced life support with airway management, drugs and the correction of causal factors may be needed if initial attempts at resuscitation are unsuccessful. The quality of treatment during the post-resuscitation phase affects outcome and is addressed in the Adult advanced life support and Post-resuscitation care sections.[19]
www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/ www.resus.org.uk/resuscitation-guidelines/post-resuscitation-care/

Figure 1. The Chain of Survival

5. Improving survival from out-of-hospital cardiac arrest

The Resuscitation Council (UK) recommends that to improve survival from cardiac arrest:

1. All school children are taught CPR and how to use an AED.
2. Everyone who is able to should learn CPR.
3. Defibrillators are available in places where there are large numbers of people (e.g. airports, railway stations, shopping centres, sports stadiums), increased risk of cardiac arrest (e.g. gyms, sports facilities) or where access to emergency services can be delayed (e.g. aircraft and other remote locations).
4. Owners of defibrillators should register the location and availability of devices with their local ambulance services.
5. Systems are implemented to enable ambulance services to identify and deploy the nearest available defibrillator to the scene of a suspected cardiac arrest.
6. All out-of-hospital cardiac arrest resuscitation attempts are reported to the National Out-of-Hospital Cardiac Arrest Audit. www.warwick.ac.uk/ohcao.

6. The Resuscitation Council (UK) BLS/AED guidelines

The remainder of this section contains guidance on the initial resuscitation of an adult cardiac arrest victim where the cardiac arrest occurs outside a hospital. This includes basic life support (BLS: airway, breathing and circulation support without the use of equipment other than a protective barrier device) and the use of an automated external defibrillator (AED). Simple techniques used in the management of choking (i.e. foreign body airway obstruction) are also included. Guidelines for the use of manual defibrillators and starting in-hospital resuscitation are found in Advanced life support guidelines section.
www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/

The guidelines are based on the ILCOR 2015 Consensus on Science and Treatment Recommendations (CoSTR) for BLS/AED and European Resuscitation Council Guidelines for BLS/AED.[2,6]

7. Key messages from Guidelines 2015

- Ensure it is safe to approach the victim.
- Promptly assess the unresponsive victim to determine if they are breathing normally.
- Be suspicious of cardiac arrest in any patient presenting with seizures and carefully assess whether the victim is breathing normally.
- For the victim who is unresponsive and not breathing normally:
    - Dial 999 and ask for an ambulance. If possible stay with the victim and get someone else to make the emergency call.
    - Start CPR and send for an AED as soon as possible.
    - If trained and able, combine chest compressions and rescue breaths, otherwise provide compression-only CPR.
    - If an AED arrives, switch it on and follow the instructions.
    - Minimise interruptions to CPR when attaching the AED pads to the victim.
- Do not stop CPR unless you are certain the victim has recovered and is breathing normally or a health professional tells you to stop
- Treat the victim who is choking by encouraging them to cough. If the victim deteriorates give up to 5 back slaps followed by up to 5 abdominal thrusts. If the victim becomes unconscious – start CPR.
- The same steps can be followed for resuscitation of children by those who are not specifically trained in resuscitation for children – it is far better to use the adult BLS sequence for resuscitation of a child than to do nothing.

8. Adult BLS sequence

The sequence of steps for the initial assessment and treatment of the unresponsive victim are summarised in Figure 2. Further technical information on each of the steps is presented in Table 1 and below.

The sequence of steps takes the reader through recognition of cardiac arrest, calling an ambulance, starting CPR and using an AED. The number of steps has been reduced to focus on the key actions. The intent of the revised algorithm is to present the steps in a logical and concise manner that is easy for all types of rescuers to learn, remember and perform CPR and use an AED.

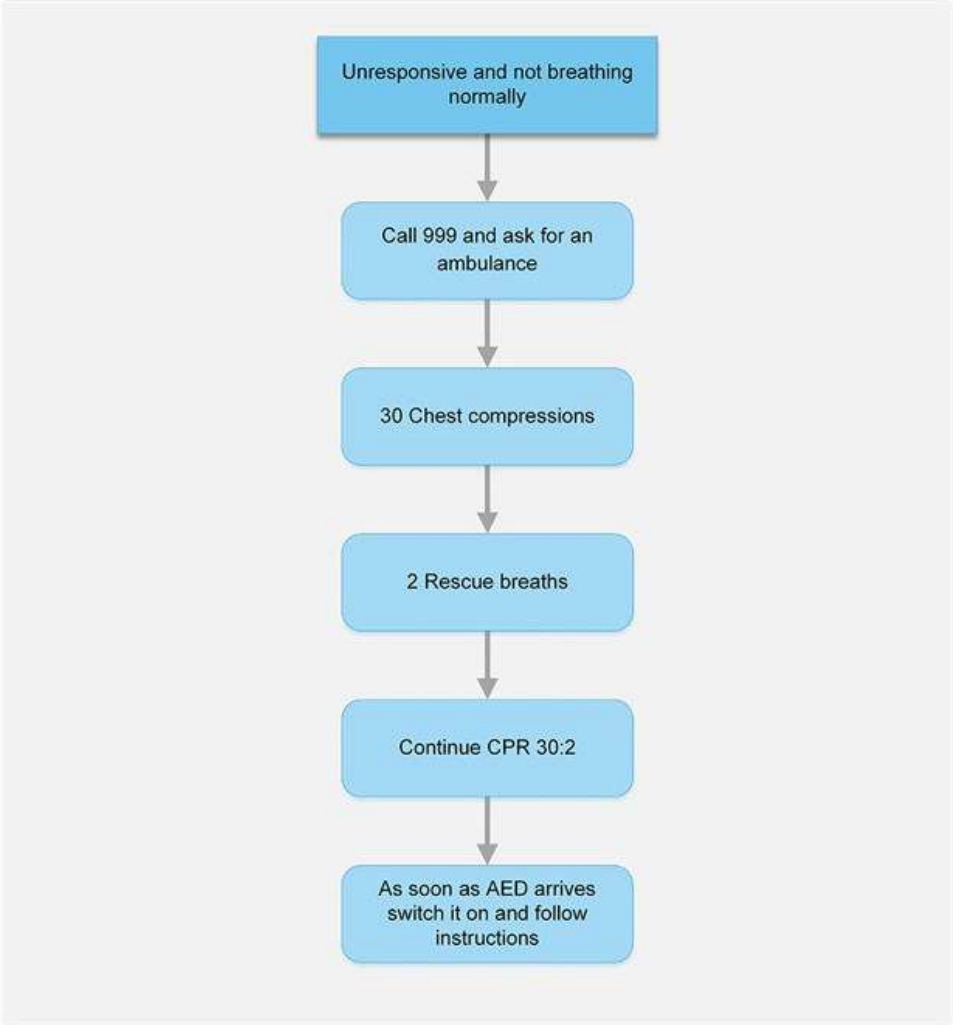

Figure 2. Adult basic life support algorithm

A4-size algorithm: http://resus.org.uk/_resources/assets/attachment/full/0/6444.pdf

Table 1: BLS/AED detailed sequence of steps

SEQUENCE	Technical description
SAFETY	**Make sure you, the victim and any bystanders are safe**
RESPONSE	**Check the victim for a response** • Gently shake his shoulders and ask loudly: "Are you all right?" 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
AIRWAY	**Open the airway** • Turn the victim onto his back • 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
BREATHING	**Look, listen and feel for normal breathing for no more than 10 seconds** In the first few minutes after cardiac arrest, a victim may be barely breathing, or taking infrequent, slow and noisy gasps. Do not confuse this with normal breathing. If you have any doubt whether breathing is normal, act as if it is they are not breathing normally and prepare to start CPR

Table 1: BLS/AED detailed sequence of steps

SEQUENCE	Technical description
DIAL 999	**Call an ambulance (999)** • Ask a helper to call if possible otherwise call them yourself • Stay with the victim when making the call if possible • Activate the speaker function on the phone to aid communication with the ambulance service
SEND FOR AED	**Send someone to get an AED if available** If you are on your own, do not leave the victim, start CPR
CIRCULATION	**Start chest compressions** • Kneel by the side of the victim • Place the heel of one hand in the centre of the victim's chest; (which is the lower half of the victim's breastbone (sternum)) • 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 • Keep your arms straight • Do not apply any pressure over the upper abdomen or the bottom end of the bony sternum (breastbone) • Position your shoulders vertically above the victim's chest and press down on the sternum to a depth of 5–6 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 100–120 min^{-1}
GIVE RESCUE BREATHS	**After 30 compressions open the airway again using head tilt and chin lift and give 2 rescue breaths** • Pinch the soft part of the nose closed, using the index finger and thumb of your hand on the forehead • Allow the 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 the mouth while watching for the chest to rise, taking about 1 second 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 the chest to fall as air comes out • Take another normal breath and blow into the victim's mouth once more to achieve a total of two effective rescue breaths. Do not interrupt compressions by more than 10 seconds to deliver two 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 If you are untrained or unable to do rescue breaths, give chest compression only CPR (i.e. continuous compressions at a rate of at least 100–120 min^{-1})
IF AN AED ARRIVES	**Switch on the AED** • Attach the electrode pads on the victim's bare chest

Table 1: BLS/AED detailed sequence of steps

SEQUENCE	Technical description
	• If more than one rescuer is present, CPR should be continued while electrode pads are being attached to the chest • Follow the spoken/visual directions • Ensure that nobody is touching the victim while the AED is analysing the rhythm **If a shock is indicated, deliver shock** • Ensure that nobody is touching the victim • Push shock button as directed (fully automatic AEDs will deliver the shock automatically) • Immediately restart CPR at a ratio of 30:2 • Continue as directed by the voice/visual prompts **If no shock is indicated, continue CPR** • Immediately resume CPR • Continue as directed by the voice/visual prompts
CONTINUE CPR	**Do not interrupt resuscitation until:** • A health professional tells you to stop • You become exhausted • The victim is definitely waking up, moving, opening eyes and breathing normally It is rare for CPR alone to restart the heart. Unless you are certain the person has recovered continue CPR
RECOVERY POSITION	**If you are certain the victim is breathing normally but is still unresponsive, place in the recovery position** • Remove the victim's glasses, if worn • 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-up • 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 on to 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 that the airway remains open • If necessary, adjust the hand under the cheek to keep the head tilted and facing downwards to allow liquid material to drain from the mouth • Check breathing regularly **Be prepared to restart CPR immediately if the victim deteriorates or stops breathing normally**

Initial assessment

For clarity, the algorithm is presented as a linear sequence of steps. It is recognised that the early steps of ensuring the scene is safe, checking for a response, opening the airway, checking for breathing and calling the ambulance may be accomplished simultaneously or in rapid succession.

Airway

Open the airway using the head tilt and chin lift technique whilst assessing whether the person is breathing normally. Do not delay assessment by checking for obstructions in the airway. The jaw thrust and finger sweep are not recommended for the lay provider.

Breathing

Agonal breaths are irregular, slow and deep breaths, frequently accompanied by a characteristic snoring sound. They originate from the brain stem, which remains functioning for some minutes even when deprived of oxygen. The presence of agonal breathing can be interpreted incorrectly as evidence of a circulation and that CPR is not needed. Agonal breathing may be present in up to 40% of victims in the first minutes after cardiac arrest and, if correctly identified as a sign of cardiac arrest, is associated with higher survival rates.[20-29] The significance of agonal breathing should be emphasised during basic life support training. Bystanders should suspect cardiac arrest and start CPR if the victim is **unresponsive** and **not breathing normally**.

Immediately following cardiac arrest, blood flow to the brain is reduced to virtually zero. This may cause a seizure-like episode that can be confused with epilepsy. Bystanders should be suspicious of cardiac arrest in any patient presenting with seizures. Although bystanders who have witnessed cardiac arrest events report changes in the victims' skin colour, notably pallor and bluish changes associated with cyanosis, these changes are not diagnostic of cardiac arrest.

Checking the carotid pulse (or any other pulse) is an inaccurate method for confirming the presence or absence of circulation.[30-34]

Dial 999

Early contact with the ambulance service will facilitate dispatcher assistance in the recognition of cardiac arrest, telephone instruction on how to perform CPR and locating and dispatching the nearest AED.

If possible, stay with the victim while calling the ambulance. If the phone has a speaker facility, switch it to speaker mode as this will facilitate continuous dialogue with the dispatcher including (if required) CPR instructions.[6] It seems reasonable that CPR training should include how to activate the speaker phone. Additional bystanders may be used to call the ambulance service.

Circulation

In adults needing CPR, there is a high probability of a primary cardiac cause for their cardiac arrest. When blood flow stops after cardiac arrest, the blood in the lungs and arterial system remains oxygenated for some minutes. To emphasise the priority of chest compressions, start CPR with chest compressions rather than initial ventilations.

Deliver compressions 'in the centre of the chest'

Experimental studies show better haemodynamic responses when chest compressions are performed on the lower half of the sternum. Teach this location simply, such as, "place the heel of your hand in the centre of the chest with the other hand on top". Accompany this instruction by a demonstration of placing the hands on the lower half of the sternum.

Chest compressions are most easily delivered by a single CPR provider kneeling by the side of the victim, as this facilitates movement between compressions and ventilations with minimal interruptions. Over-the-head CPR for single CPR providers and straddle-CPR for two CPR providers may be considered when it is not possible to perform compressions from the side, for example when the victim is in a confined space.

Compress the chest to a depth of 5–6 cm

Fear of doing harm, fatigue and limited muscle strength frequently result in CPR providers compressing the chest less deeply than recommended. Four observational studies, published after the 2010 Guidelines, suggest that a compression depth range of 4.5–5.5 cm in adults leads to better outcomes than all other compression depths during manual CPR.[35-38] The Resuscitation Council (UK) endorses the ILCOR recommendation that it is reasonable to aim for a chest compression depth of approximately 5 cm but not more than 6 cm in the average sized adult.[2,6] In making this

a chest compression depth of approximately 5 cm but not more than 6 cm in the average sized adult.[4] In making this recommendation, the Resuscitation Council (UK) recognises that it can be difficult to estimate chest compression depth and that compressions that are too shallow are more harmful than compressions that are too deep. Training should continue to prioritise achieving adequate compression depth.

Compress the chest at a rate of 100–120 per minute (min^{-1})

Two studies, with a total of 13,469 patients, found higher survival among patients who received chest compressions at a rate of 100–120 min^{-1}.[6] Very high chest compression rates were associated with declining chest compression depths.[39,40] The Resuscitation Council (UK) therefore recommends that chest compressions are performed at a rate of 100–120 min^{-1}.

Minimise pauses in chest compressions

Delivery of rescue breaths, defibrillation shocks, ventilations and rhythm analysis lead to pauses in chest compressions. Pre- and post-shock pauses of less than 10 seconds, and minimising interruptions in chest compressions (proportion of resuscitation attempt delivering chest compression >60% (chest compression fraction) are associated with improved outcomes.[41-45] Pauses in chest compressions should be minimised and training should emphasise the importance of close co-operation between CPR providers to achieve this.

Chest recoil

Leaning on the chest preventing full chest wall recoil is common during CPR.[46,47] Allowing complete recoil of the chest after each compression results in better venous return to the chest and may improve the effectiveness of CPR.[46,48-50] CPR providers should, therefore, take care to avoid leaning forward after each chest compression.

Duty cycle

The proportion of a chest compression spent in compression compared to relaxation is referred to as the duty cycle. There is very little evidence to recommend any specific duty cycle and, therefore, insufficient new evidence to prompt a change from the currently recommended ratio of 50%.

Feedback on compression technique

CPR feedback and prompt devices (e.g. voice prompts, metronomes, visual dials, numerical displays, waveforms, verbal prompts, and visual alarms) should be used when possible during CPR training. Their use during clinical practice should be integrated with comprehensive CPR quality improvement initiatives rather than as an isolated intervention.[51,52]

CPR provider fatigue

Chest compression depth can decrease as soon as two minutes after starting chest compressions. If there are sufficient trained CPR providers, they should change over approximately every two minutes to prevent a decrease in compression quality. Changing CPR providers should not interrupt chest compressions.

Rescue breaths

CPR providers should give rescue breaths with an inflation duration of 1 second and provide sufficient volume to make the victim's chest rise. Avoid rapid or forceful breaths. The maximum interruption in chest compression to give two breaths should not exceed 10 seconds.[53]

Mouth-to-nose ventilation

Mouth-to-nose ventilation is an acceptable alternative to mouth-to-mouth ventilation. It may be considered if the victim's mouth is seriously injured or cannot be opened, the CPR provider 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.

Barrier devices for use with rescue breaths

Barrier devices decrease transmission of bacteria during rescue breathing in controlled laboratory settings. Their effectiveness in clinical practice is unknown.

If a barrier device is used, care should be taken to avoid unnecessary interruptions in CPR. Manikin studies indicate that the quality of CPR is improved when a pocket mask is used, compared to a bag-mask or simple face shield during basic life support.

Compression-only CPR

CPR providers trained and able to perform rescue breaths should perform chest compressions and rescue breaths as this may provide additional benefit for children and those who sustain an asphyxial cardiac arrest or where the EMS response interval is prolonged.[54-57] Only if rescuers are unable to give rescue breaths should they do compression-only CPR.

The Resuscitation Council (UK) has carefully considered the balance between potential benefit and harm from compression-only CPR compared to standard CPR that includes ventilation. Our confidence in the equivalence between chest-compression-only and standard CPR is not sufficient to change current practice. The Resuscitation Council (UK), therefore, endorses the ILCOR and ERC recommendations that CPR providers should perform chest compressions for all patients in cardiac arrest. CPR providers trained and able to perform rescue breaths should perform chest compressions and rescue breaths as this may provide additional benefit for children and those who sustain an asphyxial cardiac arrest or where the EMS response interval is prolonged.

When an untrained bystander dials 999, the ambulance dispatcher should instruct him to give chest-compression-only CPR while awaiting the arrival of trained help. Further guidance on dispatcher-assisted CPR is given in the Prehospital resuscitation guidelines. www.resus.org.uk/resuscitation-guidelines/prehospital-resuscitation/

9. Use of an automated external defibrillator

AEDs are safe and effective when used by laypeople, including if they have had minimal or no training.[58] AEDs may make it possible to defibrillate many minutes before professional help arrives. CPR providers should continue CPR with minimal interruption to chest compressions both while attaching an AED and during its use. CPR providers should concentrate on following the voice prompts, particularly when instructed to resume CPR, and minimising interruptions in chest compression.

Public access defibrillation (PAD) programmes

Public access AED programmes should be actively implemented in public places with a high density and movement of people such as airports, railway stations, bus terminals, sport facilities, shopping malls, stadiums, centres, offices, and casinos – where cardiac arrests are frequently witnessed and trained CPR providers can quickly be on scene.[15,59-62] AEDs should also be provided in remote locations where an emergency ambulance response would be likely to be delayed (e.g. aircraft, ferries and off-shore locations). The potential benefits of AEDs being placed in schools as a method to raise awareness and familiarity with this lifesaving equipment is highlighted in the Education and implementation of resuscitation section. www.resus.org.uk/resuscitation-guidelines/education-and-implementation-of-resuscitation/

Registration of defibrillators with the local ambulance services is highly desirable so that dispatchers can direct CPR providers to the nearest AED.[63]

When implementing an AED programme, community and programme leaders should consider factors such as the development of a team with responsibility for monitoring and maintaining the devices, training and retraining individuals who are likely to use the AED, and identification of a group of volunteer individuals who are committed to using the AED in victims of cardiac arrest.[64] Funds must be allocated on a permanent basis to maintain the programme.

The Resuscitation Council (UK) and British Heart Foundation have produced information endorsed by the National Ambulance Service Medical Directors Group about AEDs and how they can be deployed in the community – A guide to Automated External Defibrillators. www.resus.org.uk/publications/a-guide-to-aeds/

Risks to recipients of CPR

It is extremely rare for bystander CPR to cause serious harm in victims who are eventually found not to be in cardiac arrest. Those who are in cardiac arrest and exposed to longer durations of CPR are likely to sustain rib and sternal fractures. Damage to internal organs can occur but is rare.[65] The balance of benefits from bystander CPR far outweighs the risks. CPR providers should not, therefore, be reluctant to start CPR because of the concern of causing harm.

Risks to the CPR provider

CPR training and actual performance is safe in most circumstances. Although rare occurrences of muscle strain, back symptoms, shortness of breath, hyperventilation, pneumothorax, chest pain, myocardial infarction and nerve injury have been described in rescuers, the incidence of these events is extremely low. Individuals undertaking CPR training should be advised of the nature and extent of the physical activity required during the training programme. Learners and CPR providers who develop significant symptoms (e.g. chest pain or severe shortness of breath) during CPR training should be advised to stop and seek medical attention.

Although injury to the CPR provider from a defibrillator shock is extremely rare, standard surgical or clinical gloves do not provide adequate electrical protection. CPR providers, therefore, should not continue manual chest compressions during shock delivery. Avoid direct contact between the CPR provider and the victim when defibrillation is performed. Implantable cardioverter defibrillators (ICDs) can discharge without warning during CPR and rescuers may therefore be in contact with the patient when this occurs. However the current reaching the rescuer from the ICD is minimal and harm to the rescuer is unlikely.

Adverse psychological effects after performing CPR are relatively rare. If symptoms do occur the CPR provider should consult their general practitioner.

10. Choking

Choking is an uncommon but potentially treatable cause of accidental death. As most choking events are associated with eating, they are commonly witnessed. As victims are initially conscious and responsive, early interventions can be life-saving.

Recognition

Recognition of airway obstruction is the key to successful outcome, so do not confuse this emergency with fainting, myocardial infarction, seizure or other conditions that may cause sudden respiratory distress, cyanosis or loss of consciousness. Choking usually occurs while the victim is eating or drinking. People at increased risk of choking include those with reduced consciousness, drug and/or alcohol intoxication, neurological impairment with reduced swallowing and cough reflexes (e.g. stroke, Parkinson's disease), respiratory disease, mental impairment, dementia, poor dentition and older age.[66]

Table 2 and Figure 3 present the treatment for the adult with choking. Foreign bodies may cause either mild or severe airway obstruction. It is important to ask the conscious victim "Are you choking?" The victim that is able to speak, cough and breathe has mild obstruction. The victim that is unable to speak, has a weakening cough, is struggling or unable to breathe, has severe airway obstruction.

Table 2: Sequence of steps for managing the adult victim who is choking

SEQUENCE	Technical description
SUSPECT CHOKING	**Be alert to choking particularly if victim is eating**
ENCOURAGE TO COUGH	**Instruct victim to cough**
GIVE BACK BLOWS	**If cough becomes ineffective give up to 5 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 five sharp blows between the shoulder blades with the heel of your other hand

Table 2: Sequence of steps for managing the adult victim who is choking

SEQUENCE	Technical description
GIVE ABDOMINAL THRUSTS	**If back blows are ineffective give up to 5 abdominal thrusts** • Stand behind the victim and put both arms round the upper part of the abdomen • Lean the victim forwards • Clench your fist and place it between the umbilicus (navel) and the ribcage • 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
START CPR	**Start CPR if the victim becomes unresponsive** • Support the victim carefully to the ground • Immediately activate the ambulance service • Begin CPR with chest compressions

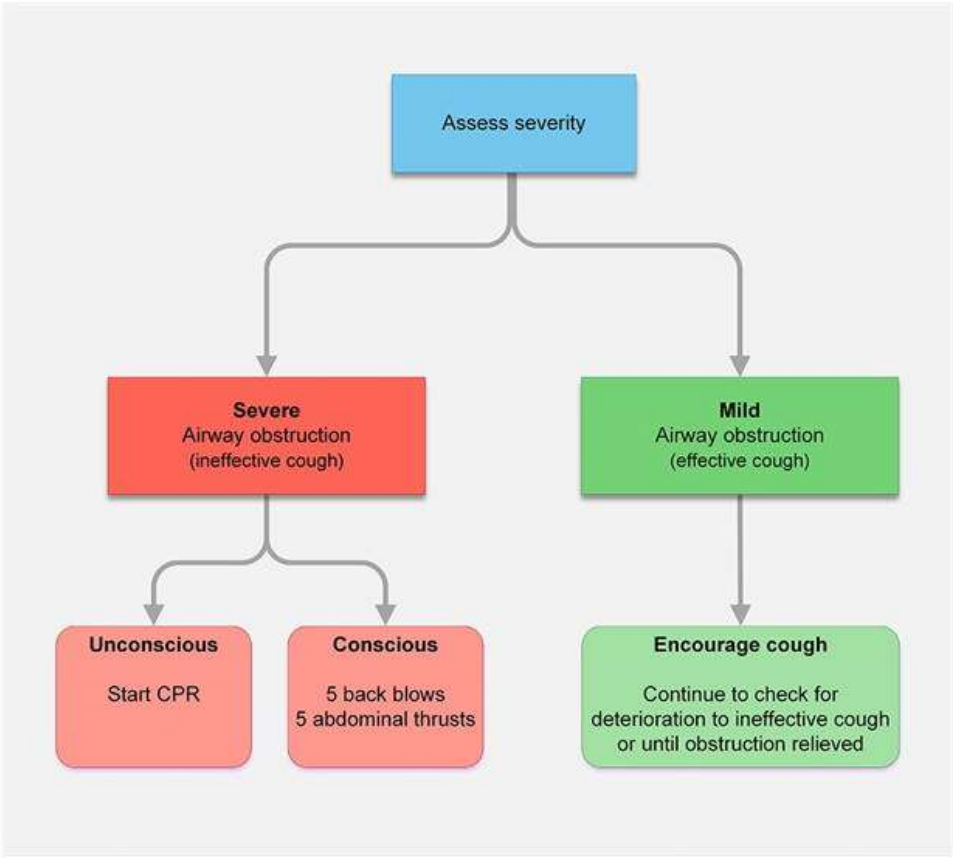

Figure 3. Adult choking algorithm

A4-size algorithm: http://resus.org.uk/_resources/assets/attachment/full/0/6446.pdf

Treatment for mild airway obstruction

Coughing generates high and sustained airway pressures and may expel the foreign body. Aggressive treatment with back blows, abdominal thrusts and chest compressions at this stage may cause harm and can worsen the airway obstruction. These treatments are reserved for victims who have signs of severe airway obstruction. Victims with mild airway obstruction should remain under continuous observation until they improve, as severe airway obstruction may subsequently develop.

Treatment for severe airway obstruction

The clinical data on choking are largely retrospective and anecdotal. For conscious adults and children over one year of age with complete airway obstruction, case reports show the effectiveness of back blows or 'slaps' and abdominal thrusts. Approximately half of cases of airway obstruction are not relieved by a single technique. The likelihood of success is increased when combinations of back blows or slaps, and abdominal and chest thrusts are used.

Treatment of choking in an unresponsive victim

Higher airway pressures can be generated using chest thrusts compared with abdominal thrusts. Bystander initiation of chest compressions for unresponsive or unconscious victims of choking is associated with improved outcomes. Therefore, start chest compressions promptly if the victim becomes unresponsive or unconscious. After 30 compressions, attempt 2 rescue breaths, and continue CPR until the victim recovers and starts to breathe normally.

Aftercare and referral for medical review

Following successful treatment of choking, foreign material may nevertheless remain in the upper or lower airways and cause complications later. Victims with a persistent cough, difficulty swallowing or the sensation of an object being still stuck in the throat should, therefore, seek medical advice. Abdominal thrusts and chest compressions can potentially cause serious internal injuries and all victims successfully treated with these measures should be examined afterwards for injury. Patients receiving antiplatelet and/or anticoagulant drugs are at increased risk of intra-abdominal haemorrhage and we suggest a low threshold for obtaining a senior clinical opinion and thoracoabdominal CT scan if a thoraco-abdominal injury is suspected.

11. Resuscitation of children and victims of drowning

Many children do not receive resuscitation because potential CPR providers fear causing harm if they are not specifically trained in resuscitation for children. 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, laypeople are taught that the adult sequence may also be used for children who are not responsive and not breathing normally. The following minor modifications to the adult sequence will make it even more suitable for use in children:

- Give 5 initial rescue breaths before starting chest compressions.
- If you are on your own, perform CPR for 1 minute before going for help.
- Compress the chest by at least one third of its depth, approximately 4 cm for the infant and approximately 5 cm for an older child. Use two fingers for an infant under 1 year; use one or two hands as needed for a child over 1 year to achieve an adequate depth of compression.

The same modifications of 5 initial breaths and 1 minute of CPR by the lone CPR provider 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).

12. Acknowledgements

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