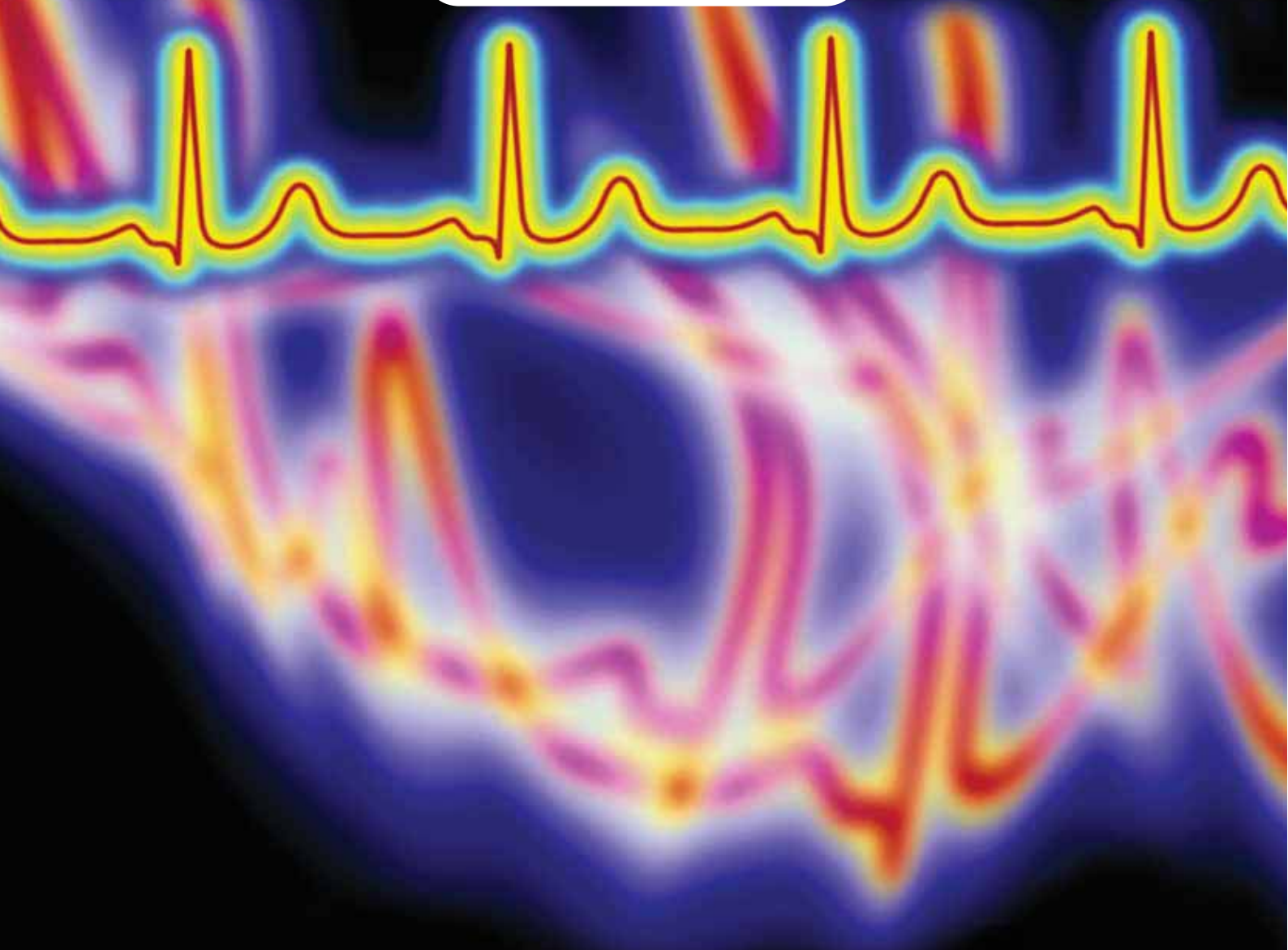
ABC OF RESUSCITATION

Fifth edition



Edited by M C Colquhoun, A J Handley and T R Evans

BMJ Books

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Cover image shows a computer-enhanced image of an electrocardiogram trace showing showing an abnormal heart beat (red). A healthy heartbeat is seen at the top (yellow) for comparison with permission from Mehan Kulyk/Science Photo Library

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Introduction

The modern era of resuscitation began in 1960 with the publication of the classic paper by Jude, Kouwenhoven, and Knickerbocker on closed chest cardiac compression, which showed that the circulation could be maintained during cardiac arrest without the need for thoracotomy. A few years earlier Elam, Safar, and Gordon had established expired air ventilation as the most effective method for providing artificial ventilation for a patient who had stopped breathing. The effectiveness of closed chest defibrillation had been demonstrated by Zoll a few years earlier. By combining the techniques of chest compression with expired air ventilation, it became possible to maintain the viability of a patient in cardiopulmonary arrest until a defibrillator could be brought to the scene. Special units were established that were able to resuscitate patients at high risk of developing cardiac arrest, and special hospital cardiac arrest teams were created.

After coronary care units were established for patients with acute myocardial infarction, it became apparent that most deaths from the condition occurred in the early stages, not because the myocardium was severely damaged, but because of potentially treatable disturbances in the cardiac rhythm. Once the effectiveness of resuscitation in hospital was established, the realisation that two thirds of deaths from coronary heart disease occurred before hospital admission led to attempts to provide coronary care, and particularly defibrillation, in the community. The credit for this development goes to Pantridge in Belfast, who pioneered the first mobile coronary care unit staffed by a doctor and nurse. This early experience confirmed the high incidence of lethal arrhythmias at the onset of myocardial infarction and many patients attended by the mobile units were successfully resuscitated from cardiac arrest. Pantridge and his coworkers also drew attention to the value of cardiopulmonary resuscitation (CPR) performed by bystanders before the arrival of the mobile unit.

In the early 1970s, Leonard Cobb, a cardiologist in Seattle, inspired by these results, equipped paramedics with defibrillators and trained firefighters to act as first responders and perform basic life support. The fire service in Seattle is highly coordinated and a standard fire appliance can reach any part of the city within four minutes. CPR was, therefore, already in progress when more highly trained ambulance paramedics arrived some minutes later.

Two factors were found to be crucial determinants of survival from cardiac arrest. The first was the presence of bystanders able to perform basic life support. The second was the speed with which defibrillation was performed. To reduce this time interval further, the firefighters in Seattle were equipped with defibrillators, a process facilitated by the development of the semi-automatic advisory models that require less training to use.

Vickery, the chief of the fire service in Seattle, made the important suggestion that CPR by members of the public should be the first stage in the provision of coronary care outside hospital. Together with Cobb, he inaugurated training in resuscitation techniques for the public to further increase the practice of CPR. The widespread provision of bystander CPR in the community, coupled with the provision of prompt defibrillation, has resulted in survival rates of up to 40% being reported from that area of the United States.

In the United Kingdom, progress in community resuscitation was slower to gain momentum, but progress has been rapid in recent years. Scotland became the first country in the world to equip every emergency ambulance with a defibrillator. These are now standard equipment throughout the United Kingdom, with survival rates of up to 50% reported when cardiac arrest is witnessed by an ambulance crew. Initiatives to train the public in CPR techniques have proved popular and have made an important contribution to improved survival rates.

More recently, resuscitation in the community has made a crucial advance with the introduction of "public access defibrillation"—a concept intended to further reduce the delay in defibrillation by placing defibrillators in busy public places for use by trained lay people before the arrival of the ambulance service. The rhythm recognition algorithms in modern automated defibrillators have proved sufficiently accurate and the machines are simple to operate by suitably trained lay people. Some public access defibrillation programmes have reported impressive results and England now has the first national public access defibrillation programme in the world. The British Heart Foundation has been instrumental in supplying defibrillators for use by the public, and although public access defibrillation is in its early stages in the United Kingdom, several people who have collapsed at railway stations or airports have been resuscitated by lay people before the arrival of the emergency medical services.

Major efforts have been made to improve hospital resuscitation in the United Kingdom. Increasingly, proficiency in resuscitation skills is expected at postgraduate examinations and has been become a pre-requisite for appointment to many specialist posts. The automated defibrillator has enabled a wider range of staff to administer the first crucial shocks with the minimum of delay. In the ideal situation, a patient is promptly defibrillated by those present at the time of the arrest well before the arrival of the hospital cardiac arrest team. These may be junior medical or nursing staff with relatively limited experience.

The recognition that many hospital patients who suffer cardiopulmonary arrest display warning signs indicating an underlying deterioration in their clinical condition has led to a redefinition of the roles of hospital cardiac arrest team. Increasingly, medical emergency teams are called at the first appearance of such premonitory signs to prevent cardiac arrest by the intensive management of the factors complicating the patient's underlying condition. Should cardiac arrest occur the chances of resuscitation are increased by concentrating the experienced staff and equipment at the patient's bedside.

Training in resuscitation techniques for hospital staff has improved greatly with the appointment of specialist resuscitation training officers and the provision of standardised, validated, advanced life support courses available nationally. Separate courses administered by the Resuscitation Council (UK) teach adult, paediatric, or neonatal resuscitation.

The Resuscitation Council (UK) comprises doctors from many disciplines and others who share the desire to improve standards of resuscitation both in hospital and in the community. Members of the Resuscitation Council (UK), with invited experts, produced the first edition of the *ABC of Resuscitation* in 1986 with the intention that it should serve as a practical guide to resuscitation for the 1980s. The second, third, and fourth editions moved into the 1990s and it is our intention that the fifth edition will perform the same function in the new millennium.

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Introduction to the Fifth Edition

The formation of the International Liaison Committee on Resuscitation (ILCOR) in 1992 was a landmark in international cooperation to improve the management of patients who suffer cardiopulmonary arrest. By the second half of the 1990s, common resuscitation guidelines were in use throughout most of Europe and in many other countries worldwide. At the same time, it became widely recognised that there was inadequate scientific evidence on which to base recommendations for best practice in many areas of resuscitation.

During the late 1990s an extensive review was undertaken of the scientific evidence on which current resuscitation practice was based. Two international conferences, and extensive work by subcommittees that examined individual topics in detail, led to the publication of the *International Guidelines 2000*. This represents a consensus based on a critical evaluation of the scientific evidence on which current practice is based. New procedures had to pass a rigorous evidence-based evaluation before being recommended. Revision or deletion of some practices or procedures from the existing guidelines resulted when a lack of evidence confirmed the effectiveness of a procedure or when new evidence suggested harm or ineffectiveness, or indicated that superior therapies were now available. These guidelines are seen as the most effective and easily teachable resuscitation guidelines that current knowledge, research, and experience can provide.

In the fifth edition of the *ABC of Resuscitation*, the guidelines and treatment algorithms recommended are based on guidelines published by the European Resuscitation Council and the Resuscitation Council (UK), which are, in turn, derived from the *International Guidelines 2000 Consensus on Science*.

Reference

International Guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care—an international consensus on science. *Resuscitation* 2000;46:1-448
Resuscitation Guidelines 2000. London: Resuscitation Council (UK), 2000.

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Notes on the algorithm approach to resuscitation

Resuscitation algorithms first appeared during the 1980s and have become a major method used to depict critical points in the assessment and treatment of victims of cardiac arrest. They serve as educational tools and are designed to act as *aides mémoires* to assist the performance of rescuers, providing a convenient and illustrative summary of large amounts of information. They are not designed, however, to be comprehensive or proscriptive; the clinician in charge should always determine whether a step in an algorithm is appropriate for an individual patient, and should be prepared to deviate from the algorithm if the patient's condition requires this. It is not expected that all the algorithms will be memorised in all their detail. They provide a ready source of reference to lead the clinician through the process of assessment and treatment necessary during a resuscitation procedure.

The following important recommendations apply to the interpretation of all resuscitation algorithms:

- Treat the patient not the monitor
- When proceeding through an algorithm it is assumed that the previous stage has been unsuccessful, and that the patient remains in cardiac arrest
- The algorithms assume that basic life support is always performed
- Interventions should only be undertaken when an appropriate indication exists
- Most of the stages in the algorithms are based on procedures for which there is good scientific evidence of effectiveness. Procedures that are less likely to be effective but which are worthy of consideration are contained in footnotes
- The provision of an adequate airway, ventilation, and oxygenation with chest compression and defibrillation are considered the more important interventions and take precedence over establishing intravenous access or the administration of drugs
- Several drugs, such as adrenaline (epinephrine), lignocaine (lidocaine) and atropine can be administered via the tracheal tube when intravenous access is not available. The endotracheal dose is 2-2.5 × the intravenous dose and should be diluted in an adequate quantity (10 ml) of carrier fluid
- Where a peripheral intravenous line is employed, intravenous drugs should usually be administered rapidly as a bolus and followed with a 20-30 ml bolus of intravenous fluid to enhance delivery into the central circulation

Acknowledgements

The editors are grateful to the following companies for their help with illustrations of equipment.

Ambu Ltd, St Ives, Cambridgeshire; Medtronic Physio Control, Watford; Cook Critical Care (UK), Letchford, Hertfordshire; Laerdal Medical Ltd, Orpington, Kent; Medtronic, Watford, Hertfordshire; St Jude, Coventry, Warickshire; Vitalograph Ltd, Maids Moreton, Buckingham; Zoll Medical (UK) Ltd, Manchester. The figure of implantable cardioverter defibrillators from 1992 and 2002 is supplied by C D Finlay, CRT coordinator, Guidant Canada Corporation, Toronto.

The diagram of a laryngeal mask airway in situ on page 30 is adapted from Kirk RM, ed. *General surgical operations*. London: Churchill Livingstone, 1987.

We would like to thank the following people for their help in providing photographs: Michael Colquhoun; Cliff Randall, Welsh Ambulance Service NHS Trust; Dr Rupert Evans and staff of the accident and emergency department, University Hospital of Wales, Cardiff; the resuscitation training department, Worcester Royal Hospitals, Worcester; Gavin D Perkins, Simon Giles, and John Dodds at Birmingham Heartlands Hospital.

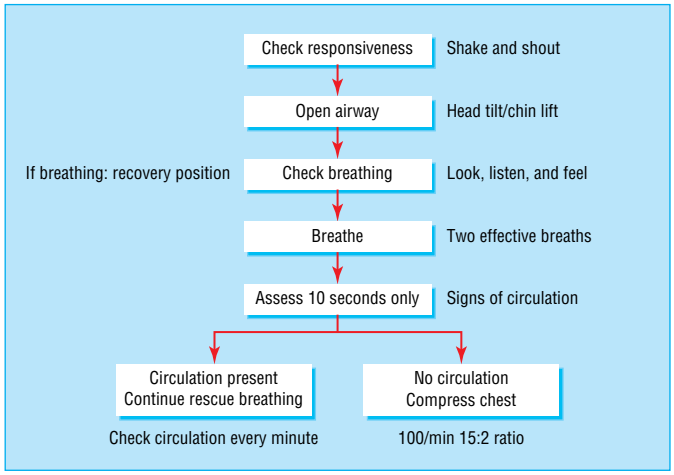
Thanks also to Judy Wood and Linda Sullivan for their secretarial help.

1 Basic life support

Anthony J Handley

Basic life support is the maintenance of an airway and the support of breathing and the circulation without using equipment other than a simple airway device or protective shield. A combination of expired air ventilation (rescue breathing) and chest compression is known as cardiopulmonary resuscitation (CPR), which forms the basis of modern basic life support. The term "cardiac arrest" implies a sudden interruption of cardiac output, which may be reversible with appropriate treatment. It does not include the cessation of heart activity as a terminal event in serious illness; in these circumstances the techniques of basic life support are usually inappropriate.

Survival after cardiac arrest is most likely to be the outcome in the following circumstances: when the event is witnessed; when a bystander summons help from the emergency services and starts resuscitation; when the heart arrests in ventricular fibrillation; and when defibrillation and advanced life support are instituted at an early stage. Basic life support is one link in this chain of survival. It entails assessment followed by action—the ABC: A is for assessment and airway, B is for breathing, and C is for circulation.



Adult basic life support. Send or go for help as soon as possible according to guidelines. Adapted from *Resuscitation Guidelines 2000*, London: Resuscitation Council (UK), 2000

Assessment

Rapidly assess any danger to the patient and yourself from hazards such as falling masonry, gas, electricity, fire, or traffic because there is no sense in having two patients. Establish whether the patient is responsive by gently shaking his or her shoulders and asking loudly "Are you all right?" Be careful not to aggravate any existing injury, particularly of the cervical spine.

If no response is given, shout for help

Airway

Establishing and maintaining an airway is the single most useful manoeuvre that the rescuer can perform.

Loosen tight clothing around the patient's neck. Extend, but do not hyperextend, the neck, thus lifting the tongue off the posterior wall of the pharynx. This is best achieved by placing your hand on the patient's upper forehead and exerting pressure to tilt the head. Remove any obvious obstruction from the mouth; leave well fitting dentures in place. Place two fingertips under the point of the chin to lift it forwards. This will often allow breathing to restart.

Look, listen, and feel for breathing: look for chest movement, listen close to the mouth for breath sounds, and feel for air with your cheek. Look, listen, and feel for 10 seconds before deciding that breathing is absent.

Establishing responsiveness

Recovery position

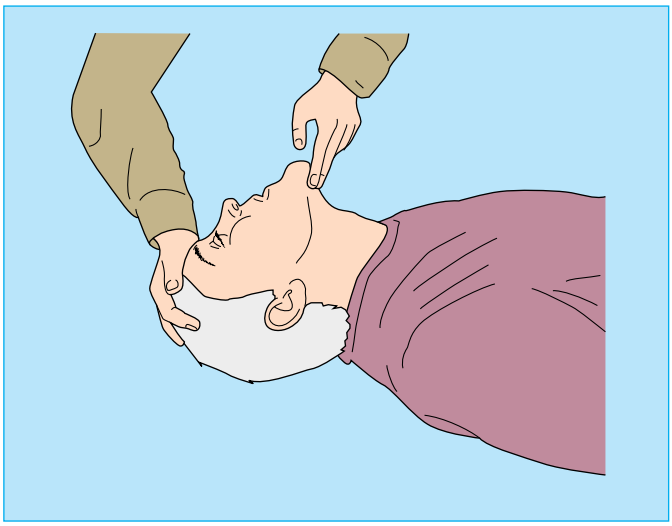
If the patient is unconscious but is breathing, place him or her in the recovery position. If necessary, support the chin to maintain an airway. In this position the tongue will fall away from the pharyngeal wall and any vomit or secretion will dribble out of the corner of the mouth rather than obstruct the airway or, later on, cause aspiration.

Breathing

If breathing is absent, send a bystander to telephone for an ambulance. If you are on your own, go yourself. The exception to this rule is when the patient is a child or the cause of the patient's collapse is near drowning, drug or alcohol intoxication, trauma, or choking. Under these circumstances it is likely that you are dealing with a primary respiratory arrest and appropriate resuscitation should be given for about one minute before seeking help.

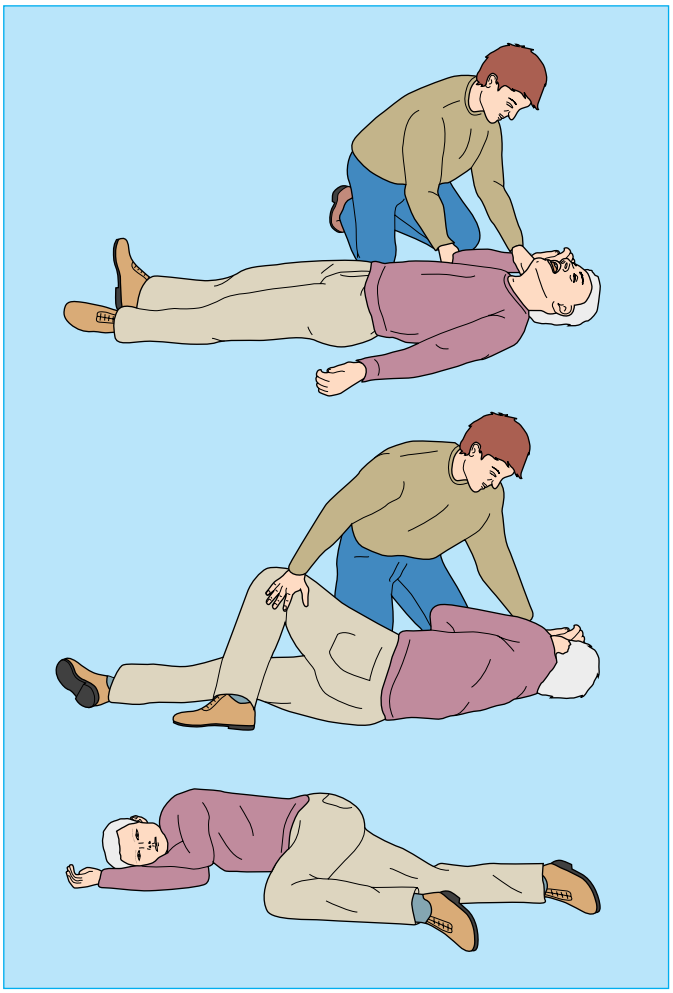
Return to the patient and maintain an airway by tilting the head and lifting the chin. Pinch the nose closed with the fingers of your hand on the forehead. Take a breath, seal your lips firmly around those of the patient, and breathe out until you see the patient's chest clearly rising. It is important for each full breath to last about two seconds. Lift your head away, watching the patient's chest fall, and take another breath of air. The chest should rise as you blow in and fall when you take your mouth away. Each breath should expand the patient's chest visibly but not cause overinflation as this will allow air to enter the oesophagus and stomach. Subsequent gastric distension causes not only vomiting but also passive regurgitation into the lungs, which often goes undetected.

If the patient is still not breathing after two rescue breaths (or after five attempts at ventilation, even if unsuccessful), check for signs of a circulation. Look and listen for any movement, breathing (other than an occasional gasp), or coughing. Take no more than 10 seconds to make your check.

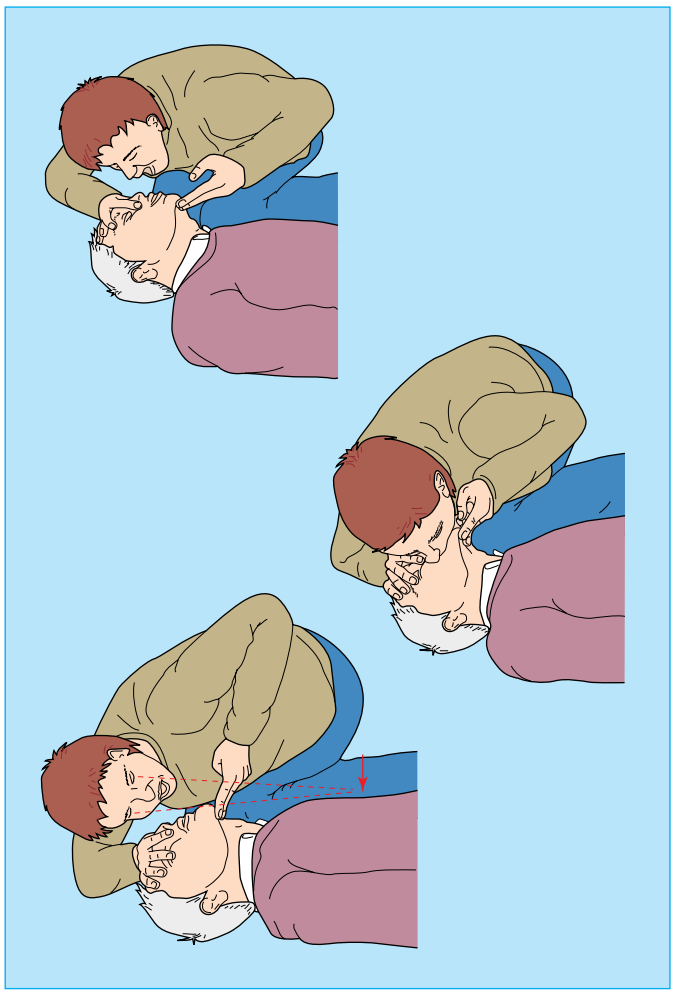


Head tilt and jaw lift

The best pulse to feel in an emergency is the carotid pulse, but if the neck is injured the femoral pulse may be felt at the groin



Turning casualty into the recovery position



Expired air resuscitation

If you are a healthcare provider, and have been trained to do so, feel for a pulse as part of your check for signs of a circulation.

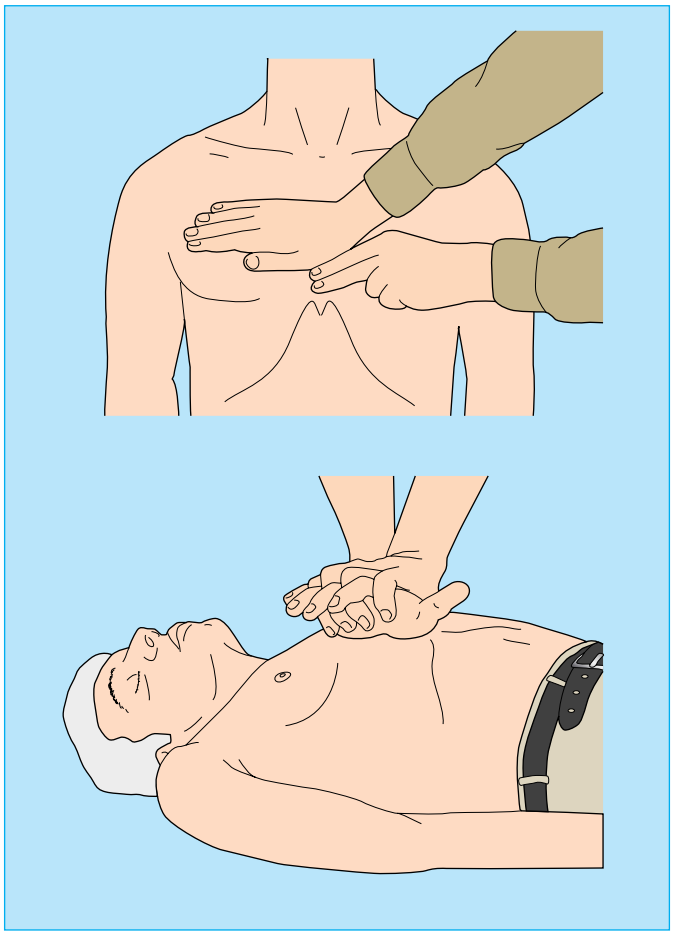
If no signs of a circulation are present continue with rescue breaths but recheck the circulation after every 10 breaths or about every minute.

Circulation

If there are no signs of a circulation (cardiac arrest) it is unlikely that the patient will recover as a result of CPR alone, so defibrillation and other advanced life support are urgently required. Ensure that the patient is on his or her back and lying on a firm, flat surface, then start chest compressions.

The correct place to compress is in the centre of the lower half of the sternum. To find this, and to ensure that the risk of damaging intra-abdominal organs is minimised, feel along the rib margin until you come to the xiphisternum. Place your middle finger on the xiphisternum and your index finger on the bony sternum above, then slide the heel of your other hand down to these fingers and leave it there. Remove your first hand and place it on top of the second. Press down firmly, keeping your arms straight and elbows locked. In an adult compress about 4-5 cm, keeping the pressure firm, controlled, and applied vertically. Try to spend about the same amount of time in the compressed phase as in the released phase and aim for a rate of 100 compressions/min (a little less than two compressions per second). After every 15 compressions tilt the head, lift the chin, and give two rescue breaths. Return your hands immediately to the sternum and give 15 further compressions, continuing compressions and rescue breaths in a ratio of 15:2. It may help to get the right rate and ratio by counting: "One, two, three, four ...."

If two trained rescuers are present one should assume responsibility for rescue breaths and the other for chest compression. The compression rate should remain at 100/min, but there should be a pause after every 15 compressions that is just long enough to allow two rescue breaths to be given, lasting two seconds each. Provided the patient's airway is maintained it is not necessary to wait for exhalation before resuming chest compressions.



Hand position for chest compression

Precordial thump

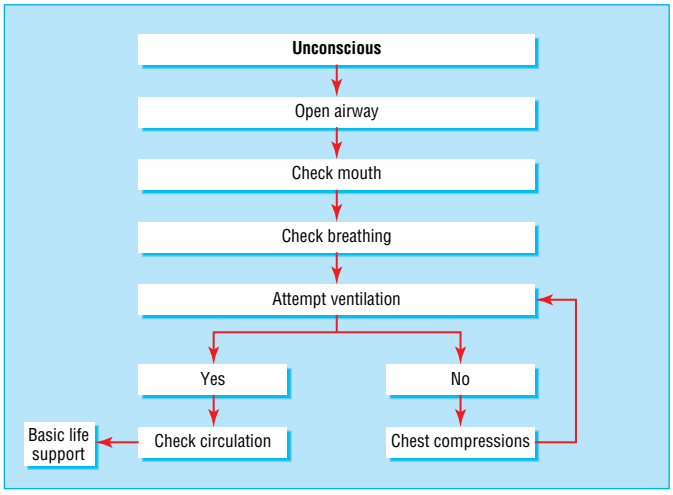
Studies have shown that an initial precordial (chest) thump may restart the recently arrested heart. This is particularly the case if the onset of cardiac arrest is witnessed.

The precordial thump is taught as a standard part of advanced life support

Choking

A patient who is choking may have been seen eating or a child may have put an object into his or her mouth. Often the patient grips his or her throat with their hand.

If the patient is still breathing, he or she should be encouraged to continue coughing. If the flow of air is completely obstructed, or the patient shows signs of becoming weak, try to remove the foreign body from the mouth. If this is not successful give five firm back blows between the scapulae; this may dislodge the obstruction by compressing the air that remains in the lungs, thereby producing an upward force behind it. If this fails to clear the airway then try five abdominal thrusts. Make a fist of one of your hands and place it just below the patient's xiphisternum. Grasp this fist with your other hand and push firmly and suddenly upwards and posteriorly. Then alternate abdominal thrusts with back slaps.



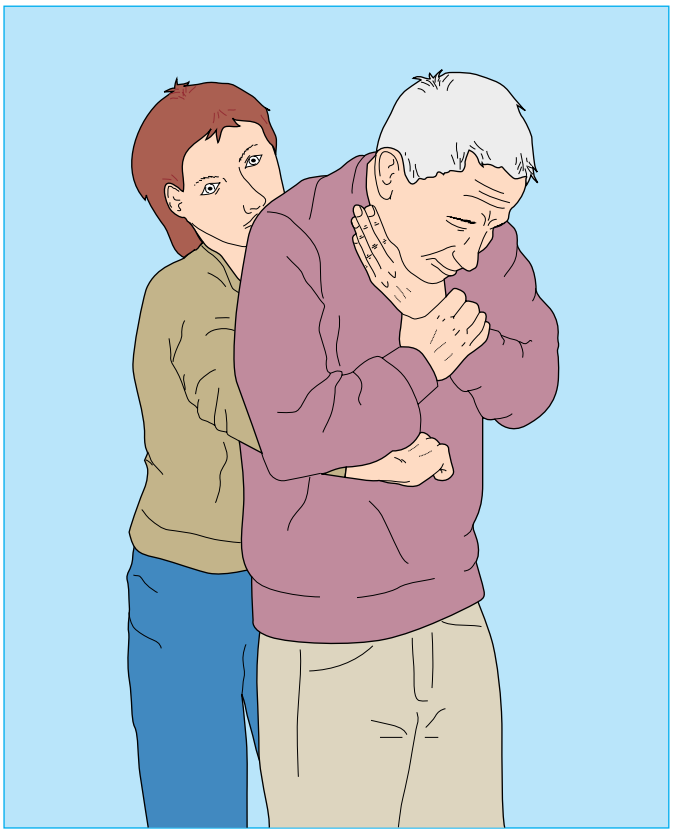
Management of choking in adults. Adapted from *Resuscitation Guidelines 2000*, London: Resuscitation Council (UK), 2000

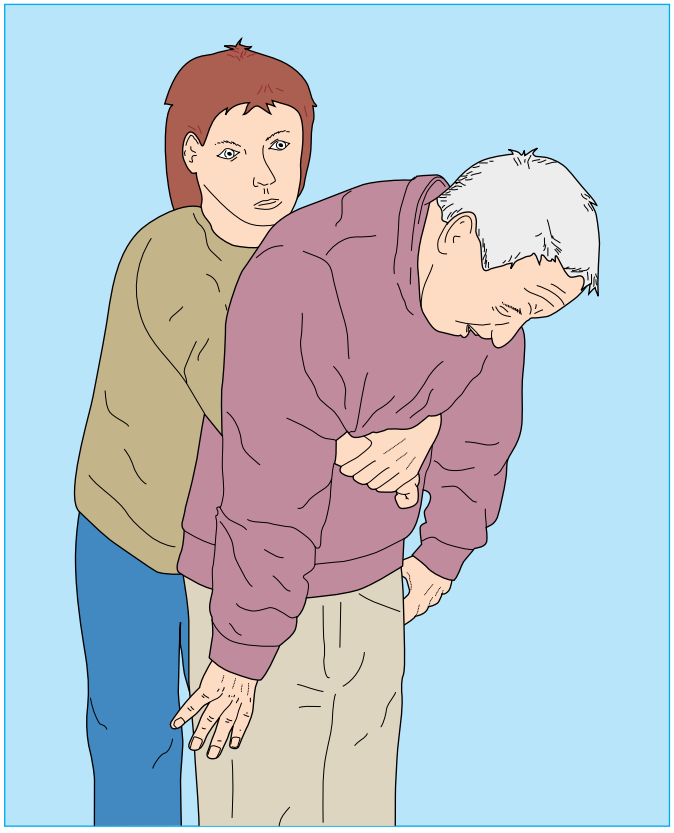
If a choking patient becomes unconscious, this may result in the muscles around the larynx relaxing enough to allow air past the obstruction. If breathing does not resume, open the patient's airway by lifting the chin and tilting the head, and then attempt to give two effective rescue breaths. If this fails, start chest compressions, alternating 15 compressions with a further attempt to give rescue breaths. In this situation, the chest compressions are given to relieve airway obstruction rather than to circulate the blood as in cardiac arrest.

Choking and back blows

Dangers of resuscitation

Until fairly recently the main concern in resuscitation was for the patient, but attention has now been directed towards the rescuer, particularly in the light of fears about the transmission of AIDS. However, no case of AIDS due to transfer from patient to rescuer (or vice versa) by mouth to mouth resuscitation has been reported. Despite the presence of the virus in saliva, it does not seem that transmission occurs via this route in the absence of blood to blood contact. Nevertheless, there is still concern about the possible risk of infection, and those who may be called on to administer resuscitation should be allowed to use some form of barrier device. This may take the form of a ventilation mask (for mouth to mask ventilation) or a filter device placed over the mouth and nose. The main requirement of these devices is that they should not hinder an adequate flow of air and not provide too large a dead space. Resuscitation must not be delayed while such a device is being sought.





Abdominal thrusts in a conscious patient

Further reading

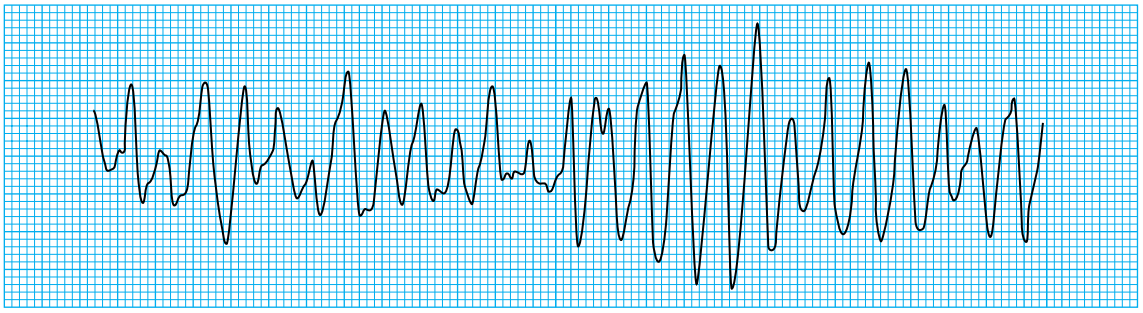
- Handley AJ, Monsieurs KG, Bossaert LL. European Resuscitation Council guidelines 2000 for adult basic life support. *Resuscitation* 2001;48:199-205.
- Ornato JP. Efficacy vs. effectiveness: The case of active compression-decompression (ACD) CPR. *Resuscitation* 1997;34:3-4.
- International guidelines 2000 for cardiopulmonary resuscitation and emergency cardiovascular care—an international consensus on science. Part 3: adult basic life support. *Resuscitation* 2000; 46:29-71.

2 Ventricular fibrillation

Michael Colquhoun, Charles D Deakin, Douglas Chamberlain

The normal cardiac cycle is controlled by an orderly sequence of depolarisation spreading into the ventricular myocardium through specialised conducting tissue. In ventricular fibrillation (VF) this coordinated sequence is lost and individual muscle cells depolarise in an apparently random fashion with the loss of all coordinated muscular activity. The heart stops functioning as an effective pump and, in the absence of cardiac output, the myocardium becomes more ischaemic and irreversible cerebral anoxic damage occurs within a few minutes.

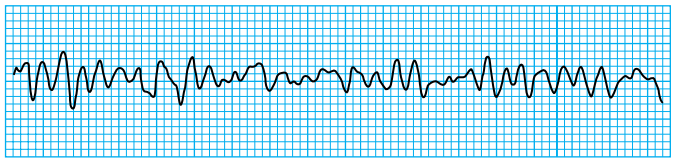
The definite treatment for VF is to apply an electrical countershock from a defibrillator



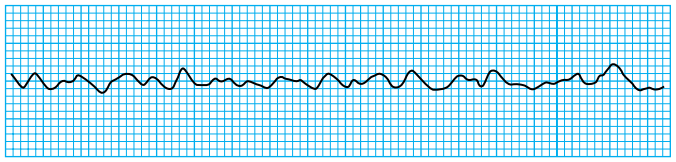
Onset

The sooner an electrical countershock from a defibrillator can be given after the onset of VF, then the greater the chance of successful defibrillation. Several clinical studies have shown that the probability of successful defibrillation and subsequent survival to hospital discharge is inversely related to the time interval between the onset of VF and delivery of the first countershock. The chance of success declines by about 7-10% for each minute delay in administering the shock.

During VF the myocardial cells continue to contract rapidly and exhaust the limited oxygen and high energy phosphate stores contained in the cells, which are not replenished. Anaerobic metabolism results in intracellular acidosis as cellular homeostasis breaks down. In the absence of defibrillation, the amplitude of the fibrillatory waveform decreases progressively as myocardial oxygen and energy reserves are exhausted and terminal asystole eventually supervenes. This process may be slowed by effective basic life support techniques that provide a limited supply of blood to the myocardium.



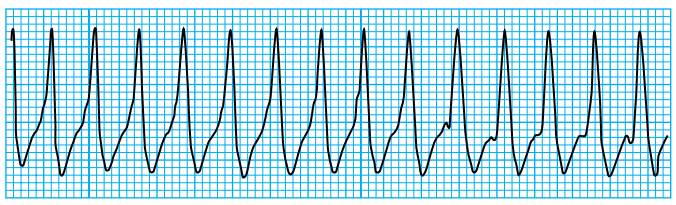
Five minutes



10 minutes

Electrocardiographic appearances

In VF the electrocardiograph shows a bizarre, irregular waveform that is apparently random in both frequency and amplitude. VF is sometimes classified as either coarse or fine, depending on the amplitude of the complexes. The treatment of each form is the same and the only practical implication of a distinction is to give some indication of the potential for successful defibrillation and to serve as a reminder that VF may be mistaken for asystole.



Pulseless ventricular tachycardia is treated in the same way as VF

Epidemiology

VF is the commonest initial rhythm leading to cardiac arrest, particularly in patients with coronary heart disease. VF may be