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To stay alive we need an adequate supply of oxygen to enter the lungs and be transferred to all cells in the body by the circulating blood. If a person is deprived of oxygen for any length of time, the brain will begin to fail. As a result, the casualty will eventually become unresponsive, breathing will cease, the heart will stop and death results.

The casualty's airway must be kept open so that breathing can occur, allowing oxygen to enter the lungs and be circulated in the body.

Therefore, the priority of a first aider when treating any collapsed casualty is to establish an open airway and maintain breathing and circulation. An AED (automated external defibrillator) may be used to "shock" a fibrillating heart back into a normal rhythm. This chapter outlines the priorities to remember when dealing with an unresponsive adult, child or infant.

There are important differences in the treatment for unresponsive infants, children and adults; this chapter gives separate step-by-step instructions for dealing with each of these groups.

AIMS AND OBJECTIVES

- To maintain an open airway, to check breathing and resuscitate if required
- To call **999/112 for emergency help**

THE UNRESPONSIVE CASUALTY



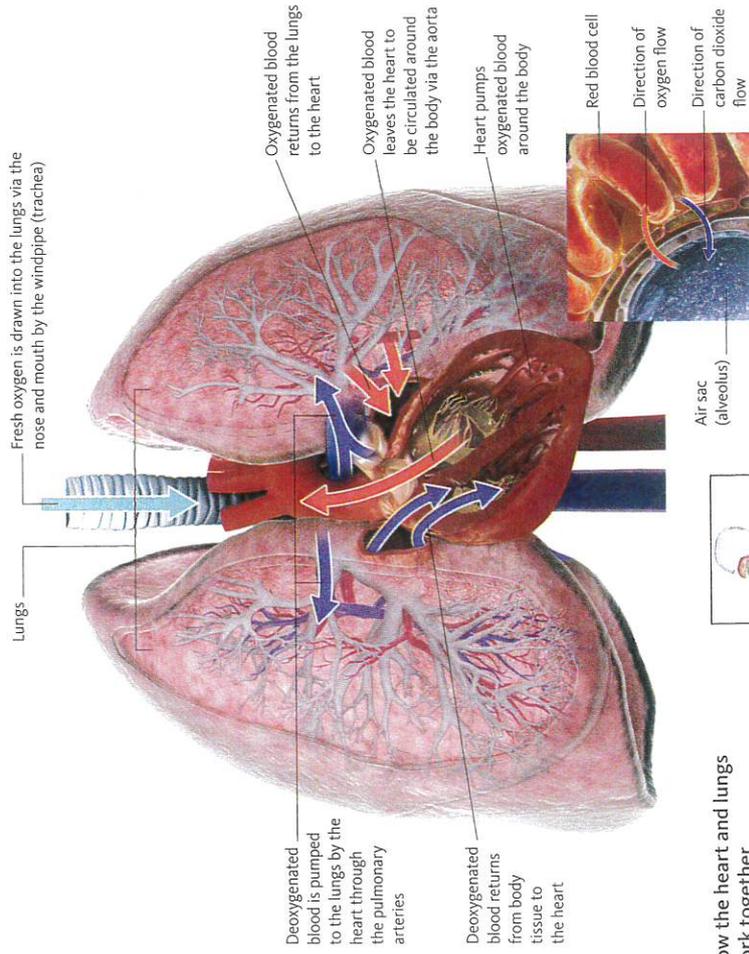
BREATHING AND CIRCULATION

Oxygen is essential to support life. Without it, cells in the body die – those in the brain survive only a few minutes without oxygen. Oxygen is taken in when we breathe in (pp.90–91), and it is then circulated to all the body tissues via the circulatory system (p.108). It is vital to maintain breathing and circulation in order to sustain life.

The process of breathing enables air, which contains oxygen, to be taken into the air sacs (alveoli) in the lungs. Here, the oxygen is transferred across blood vessel walls into the blood, where it combines with blood cells. At the same time, the waste product of breathing,

carbon dioxide, is released and exhaled in the breath. When oxygen has been transferred to the blood cells it is carried from the lungs to the heart through the pulmonary veins. The heart then pumps the oxygenated blood to the rest of the body via blood vessels called arteries.

After oxygen is given up to the body tissues, deoxygenated blood is brought back to the heart by blood vessels called veins (p.108). The heart pumps this blood to the lungs via the pulmonary arteries, where the carbon dioxide is released and the blood is reoxygenated before circulating around the body again.



How the heart and lungs work together

Air containing oxygen is taken into the lungs via the mouth and nose. Blood is pumped from the heart to the lungs, where it absorbs oxygen. Oxygenated blood is returned to the heart before being pumped around the body.

Exchange of gases in the air sacs
Carbon dioxide passes out of blood cells into air sacs (alveoli). Oxygen crosses the walls of alveoli into blood cells.

The procedures set out in this chapter can maintain a casualty's circulation and breathing.

With an unresponsive casualty your priorities are to maintain an open airway, to maintain blood circulation (to get oxygenated blood to the tissues), and to breathe for the casualty (to get oxygen into the body). In an adult during the first minutes after the heart stops (cardiac arrest), the blood oxygen level remains constant, so chest compressions are more important than rescue breaths in the initial phase of resuscitation. After about two to four minutes, the blood oxygen level falls and rescue breathing becomes more important. The combination of chest compressions and rescue breaths is known as cardiopulmonary resuscitation, or CPR.

In addition to CPR, a machine called an AED (automated external defibrillator) can be used to deliver an electric shock that may restore a normal heartbeat (pp.84–87). In children and infants, a problem with breathing is the most

likely reason for the heart to stop. Because of this they should therefore be given FIVE initial rescue breaths before the chest compressions are started.

CHEST-COMPRESSION-ONLY CPR

If you have not had any training in CPR, or you are unwilling or unable to give rescue breaths, you can give chest compressions only. The emergency services will give instructions for chest-compression-only CPR (pp.70–71).

KEY ELEMENTS FOR SURVIVAL

If all of the following elements are complete, the casualty's chances of survival are as good as they can possibly be:

- **Emergency help** is called quickly
- **CPR** is used to provide circulation and oxygen to the body tissues
- **AED** is used promptly
- **Specialised treatment** and advanced care arrive quickly

LIFE-SAVING PRIORITIES

CHAIN OF SURVIVAL

EARLY HELP
Call 999/112 for emergency help so that an AED and expert help can be brought to the casualty.



EARLY CPR
Chest compressions and rescue breaths are used to "buy time" until expert help arrives.



EARLY DEFIBRILLATION
A controlled electric shock from an AED is given. This can "shock" the heart into a normal rhythm.



EARLY ADVANCED CARE
Specialised treatment by paramedics and in hospital stabilises the casualty's condition.



▶▶ LIFE-SAVING PRIORITIES

IMPORTANCE OF MAINTAINING CIRCULATION

If the heart stops beating, blood does not circulate through the body. As a result, vital organs – most importantly the brain – become starved of oxygen. Brain cells are unable to survive for more than three to four minutes without a supply of oxygen.

Some circulation can be maintained artificially with chest compressions (pp.66–67). These act as a mechanical aid to the heart in order to get blood flowing around the body. Pushing vertically down on the centre of the chest increases the pressure in the chest cavity, expelling blood from the heart and forcing it into the tissues. As pressure on the chest is released, the chest recoils, or comes back up, and more blood is “sucked” into the heart; this blood is then forced out of the heart by the next compression. It is possible to find the hand position for chest compressions without removing clothing.

To ensure that the blood is supplied with enough oxygen, chest compressions should be combined with rescue breathing (opposite).



GIVING CHEST COMPRESSIONS

RESTORING HEART RHYTHM

A machine called an AED (automated external defibrillator) will be used to attempt to restart the heart when it has stopped (pp.84–87). The earlier the AED is used, the greater the chance of the casualty surviving. With each minute's delay, the chances of survival fall – however, do not leave a casualty to search for an AED; ask a bystander to fetch one (p.60). AEDs can be used safely and effectively without any prior training in their use.

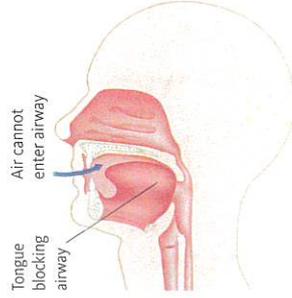
AEDs are found in many public places, such as railway stations, shopping centres, airports, coach stations and ferry ports. They are generally housed in cabinets, often marked with a recognised symbol (p.85), and placed where they can be easily accessed – on station platforms for example. The cabinets are not locked, but most are fitted with an alarm that is activated when the door is opened.



USING AN AED

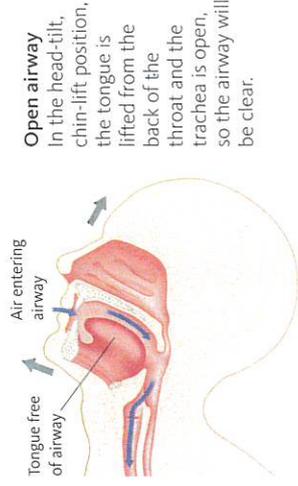
AN OPEN AIRWAY

An unresponsive casualty's airway can become narrowed or blocked. This can be the result of muscular control being lost, which allows the tongue to fall back and block the airway. When this happens, the casualty's breathing becomes



Blocked airway
In an unresponsive casualty, the muscle control in the tongue is lost so it falls back, blocking the throat and airway.

difficult and noisy and may stop altogether. Lifting the casualty's chin and tilting the head back lifts the tongue away from the entrance of the air passage, which allows the casualty to breathe.



BREATHING FOR A CASUALTY

Exhaled air contains about 16 per cent oxygen (only 5 per cent less than inhaled air) and a small amount of carbon dioxide. Your exhaled breath therefore contains enough oxygen to supply another person with oxygen – and potentially keep him alive – when it is forced into his lungs during rescue breathing.

By giving a casualty rescue breaths (p.67), you force air into his air passages. This reaches the air sacs (alveoli) in the lungs, and oxygen is then transferred to the blood vessels in the lungs.

When you take your mouth away from the casualty's, his chest falls, and air containing waste products is pushed out, or exhaled, from his lungs. This process, performed together with chest compressions (pp.66–67), can supply the tissues with oxygen until help arrives.

CAUTION

AGONAL BREATHING

This type of breathing usually takes the form of short, irregular gasps for breath. It is common in the first few minutes after a cardiac arrest. It should not be mistaken for normal breathing and, if it is present, chest compressions and rescue breaths (cardiopulmonary resuscitation/CPR) should be started without hesitation.



GIVING RESCUE BREATHS

◀◀ LIFE-SAVING PRIORITIES

ADULT RESUSCITATION

This action plan is a summary of the techniques following pages. Carry out the following steps in rapid succession to minimise interruption to CPR.

CHECK CASUALTY'S RESPONSE

- Try to get a response by asking questions and gently shaking his shoulders (p.62).

Is there a response?



YES

Leave the casualty in the position found. Use the primary survey (pp.44–45) to identify the most serious injury and treat in order of priority.

NO

OPEN THE AIRWAY; CHECK FOR BREATHING

- Tilt the head back and lift the chin to open the airway (p.63).
- Check for breathing (p.63).

Is he breathing normally?



YES

If possible, leave the casualty in the position found. Use the primary survey (pp.44–45) to identify the most serious injury and treat in order of priority. Place the casualty in the recovery position (pp.64–65). **Call 999/112 for emergency help.**

NO



Ask a helper to **call 999/112 for emergency help** and fetch an AED

- If you are on your own, make the call yourself.

BEGIN CPR

- Give 30 chest compressions (pp.66–67).
- Give TWO rescue breaths (p.67).
- Alternate 30 chest compressions with TWO rescue breaths (30:2) until help arrives; the casualty shows signs of becoming responsive, for example, coughing, opening his eyes, speaking, or moving purposefully, and starts to breathe normally; or you are too exhausted to continue.



CHILD/INFANT RESUSCITATION

This action plan shows the order for the techniques to use when attending a child

between the ages of one and puberty or an infant under one year.

CHECK CHILD'S RESPONSE

- Try to get a response by asking questions and gently tapping the child's shoulder or an infant's foot.

Is there a response?



YES

Leave the child in the position found. Use the primary survey (pp.44–45) to identify the most serious injury and treat in order of priority.

NO

OPEN THE AIRWAY; CHECK FOR BREATHING

- Tilt the head back and lift the chin to open the airway (Child, p.73; infant, p.80).
- Check for breathing (Child, p.73; infant, p.81).

Is she breathing normally?



YES

If possible, leave the casualty in the position found. Use the primary survey (pp.44–45) to identify the most serious injury and treat in order of priority. Place the child in the recovery position (pp.74–75), or hold an infant (p.81). **Call 999/112 for emergency help.**



NO

Ask a helper to **call 999/112 for emergency help** and, for a child, fetch an AED, ideally with paediatric pads.

- Do not use an AED on an infant.

GIVE INITIAL RESCUE BREATHS

- Carefully remove any visible obstruction from the mouth.
- Give FIVE initial rescue breaths (Child, p.76; infant, p.80).



BEGIN CPR

- Give 30 chest compressions (Child, p.77; infant, p.83).
- Follow with TWO rescue breaths.
- Alternate 30 chest compressions with TWO rescue breaths (30:2) until emergency help arrives; the child shows signs of becoming responsive, such as coughing, opening her eyes, speaking, or moving purposefully, and starts to breathe normally; or you are too exhausted to continue.



■ It is better to give a combination of rescue breaths and chest compressions with infants and children. However, if you have not had training in CPR, or you are unwilling or unable to give rescue breaths, you may give chest compressions only (pp.70–71). The emergency services will give instructions for chest-compression-only CPR.

- If you are alone, carry out CPR for one minute before calling for emergency help. Take the infant or child with you to the phone if necessary – never leave a child to search for an AED.
- If the child starts breathing normally, but remains unresponsive, place her in the recovery position (Child, pp.74–75; infant, p.81).

UNRESPONSIVE ADULT

The following pages describe techniques for the management of an unresponsive adult who may require resuscitation.

Always approach and treat the casualty from the side, kneeling down next to his head or chest. You will then be in the correct position to perform all the stages of resuscitation: opening the airway; checking breathing; and giving chest compressions and rescue breaths (together called cardiopulmonary resuscitation, or CPR). At each stage you will have decisions to make –

for example, is the casualty breathing? The steps given here tell you what to do next; work through them in rapid succession with minimal interruption.

The first priority is to open the casualty's airway so that he can breathe or you can give rescue breaths. If normal breathing returns at any stage, you should place the casualty in the recovery position. If the casualty is not breathing, the early use of an AED (automated external defibrillator) may increase his chance of survival.

HOW TO CHECK THE RESPONSE

On discovering a collapsed casualty, you should first make sure the scene is safe and then establish whether he is responsive or unresponsive. Do this by gently shaking the casualty's shoulders. Ask "What has happened?" or give a command such as, "Open your eyes". Always speak loudly and clearly to the casualty.

CAUTION

- Always assume that there is a neck injury and shake the shoulders very gently.



IF THERE IS A RESPONSE

- If there is no further danger, leave the casualty in the position in which he was found. Use the primary survey (pp.44–45) to identify the most serious injury and treat conditions in order of priority. Summon help if needed.
- Monitor and record vital signs – breathing, pulse and level of response (pp.52–53) – until help arrives or the casualty recovers.

IF THERE IS NO RESPONSE

- Shout for help. Leave the casualty in the position in which he was found and open the airway.
- If you are unable to open the airway in the position in which he was found, roll him on to his back and open the airway. Go to *How to open the airway* (opposite).

HOW TO OPEN THE AIRWAY

- Place one hand on his forehead. Gently tilt his head back. As you do this, the mouth will fall open slightly.



HOW TO CHECK BREATHING

Keeping the airway open, look, listen and feel for normal breathing: look for chest movement; listen for sounds of breathing; and feel for breaths on your cheek. Do this for no more than



- Place the fingertips of your other hand on the point of the casualty's chin and lift the chin. Check the casualty's breathing. Go to *How to check breathing*, below.



10 seconds before deciding whether or not the casualty is breathing normally. Breathing may be agonal (p.59). If there is any doubt, act as if it is not normal.

IF THE CASUALTY IS BREATHING

- Use the primary survey (pp.44–45) to identify the most serious injury and treat conditions in order of priority.
 - Place the casualty in the recovery position (pp.64–65) and **call 999/112 for emergency help**.
 - Monitor and record vital signs – breathing, pulse and level of response (pp.52–53) – while waiting for help to arrive. Go to *How to place casualty in recovery position* (pp.64–65).
- IF THE CASUALTY IS NOT BREATHING**
- Ask a helper to **call 999/112 for emergency help**. Ask the person to bring an AED if one is available. If you are alone, make the call yourself; ideally use your mobile device set to speaker phone to make the call.
 - Begin CPR with chest compressions – do not leave a casualty in search of an AED. Go to *How to give CPR* (pp.66–67).

UNRESPONSIVE ADULT

HOW TO PLACE CASUALTY IN RECOVERY POSITION

If the casualty is found lying on his side or front, rather than his back, not all the following steps will be necessary to place him in the

recovery position. If the mechanism of injury suggests a spinal injury, treat as described opposite and on pp.157–59.

WHAT TO DO

- 1 Kneel beside the casualty. Remove his spectacles and any bulky objects, such as mobile phones or large bunches of keys, from his pockets. Do not search his pockets for small items.
- 2 Make sure that both of the casualty's legs are straight. Place the arm that is nearest to you at right angles to the casualty's body, with the elbow bent and the palm facing upwards.



- 3 Bring the arm that is farthest from you across the casualty's chest, and hold the back of his hand against the cheek nearest to you. With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot flat on the ground.



- 4 Keeping the casualty's hand pressed against his cheek, pull on the far leg and roll the casualty towards you and on to his side.



- 5 Adjust the upper leg so that both the hip and the knee are bent at right angles.



- 6 Tilt the casualty's head back and tilt his chin so that the airway remains open (p.63).



- 7 If necessary, adjust the hand under the cheek to keep the airway open.



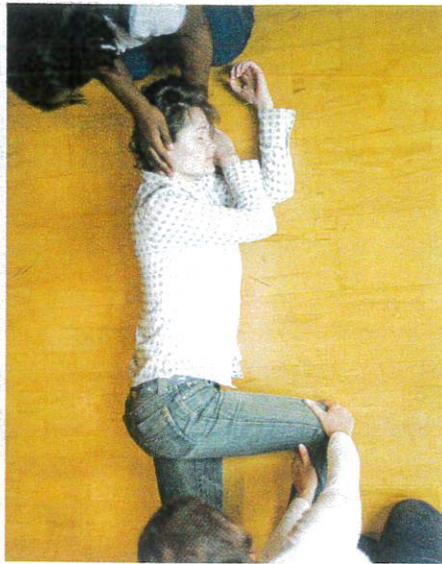
- 8 If it has not already been done, call 999/112 for emergency help. Monitor and record vital signs – breathing, pulse and level of response (pp.52–53) – while waiting for help to arrive.

- 9 If the casualty is likely to remain in the recovery position for a while, after 30 minutes roll him on to his back, and then roll him on to the opposite side – unless other injuries prevent you from doing this.

SPECIAL CASE RECOVERY POSITION FOR SUSPECTED SPINAL INJURY

If you suspect a spinal injury (pp.157–59) and need to place the casualty in the recovery position because you cannot maintain an open airway, try to keep the spine straight using the following guidelines:

- If you are alone, use the technique shown opposite and above.
- If you have one helper, one of you should steady the head while the other turns the casualty (right).
- With three people, one person should steady the head while another turns the casualty. The third person should keep the casualty's back straight during the manoeuvre.
- If there are four or more people in total, use the log-roll technique (p.159).



UNRESPONSIVE ADULT

HOW TO GIVE CPR

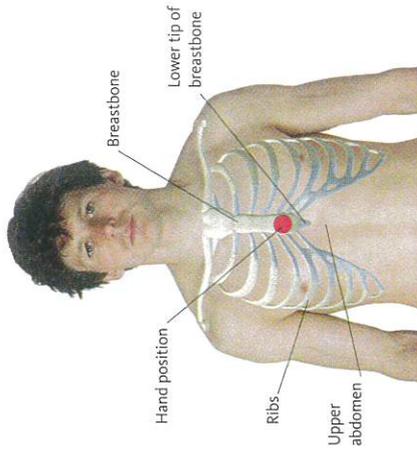
WHAT TO DO

1 Kneel beside the casualty level with his chest. Place the heel of one hand on the centre of the casualty's chest. You can identify the correct hand position for chest compressions through a casualty's clothing.



HAND POSITION

Place your hand on the casualty's breastbone as indicated here. Make sure that you do not press on the casualty's ribs, the lower tip of the breastbone or the upper abdomen.



2 Place the heel of your other hand on top of the first hand, and interlock your fingers, making sure the fingers are kept off the ribs.



3 Leaning over the casualty, with your arms straight, press down vertically on the breastbone and depress the chest by 5–6cm (2–2½in). Release the pressure without removing your hands from his chest. Allow the chest to come back up fully (recoil) before giving the next compression.



4 Compress the chest 30 times at a rate of 100–120 compressions per minute. The time taken for compression and release should be about the same.



5 Move to the casualty's head and make sure that the airway is still open. Put one hand on his forehead and two fingers of the other hand under the tip of his chin. Move the hand that was on the forehead down to pinch the soft part of the nose with the finger and thumb. Allow the casualty's mouth to fall open



6 Take a breath and place your lips around the casualty's mouth, making sure you have a good seal. Blow into the casualty's mouth until the chest rises. A complete rescue breath should take one second. If the chest does not rise, you may need to adjust the head position (How to open the airway, p.63).



7 Maintaining head tilt and chin lift, take your mouth off the casualty's mouth and look to see the chest fall. If the chest rises visibly as you blow and falls fully when you lift your mouth away, you have given a rescue breath – one second. Give a second rescue breath.



8 Continue the cycle of 30 chest compressions followed by TWO rescue breaths (30:2) until: emergency help arrives and takes over; the casualty shows signs of becoming responsive – such as coughing, opening his eyes, speaking, or moving purposefully – and starts to breathe normally; or you are too exhausted to continue.



CAUTION

If there is more than one rescuer, change over every 1–2 minutes, with minimal interruption to chest compressions.

UNRESPONSIVE ADULT

SPECIAL CONSIDERATIONS FOR CPR

- There are circumstances when it may be more difficult to deliver CPR:
- If you have not been trained in CPR or are unwilling or unable to give rescue breaths you can give chest compressions only (pp.70–71). An ambulance dispatcher will give instructions for chest-compression-only CPR.
 - If there is more than one rescuer, change over every 1–2 minutes, with minimal interruption to chest compressions.
 - If the casualty vomits during CPR, roll him away from you onto his side, ensuring that his head is turned towards the floor to allow vomit to drain away. Clear any residual debris
- from his mouth, then immediately roll him onto his back again and recommence CPR.
- If a woman in the late stage of pregnancy requires CPR, raise her right hip off the ground by tilting it upwards before you begin compressions, see below.
 - Modified rescue breathing may be necessary in some cases: for example, if a casualty has a chemical around the mouth, you can give rescue breaths through the nose (opposite).
- A casualty may breathe through a hole in the front of the neck – a stoma – opposite). You can also use a pocket mask or face shield when giving rescue breaths.

CPR IN LATE STAGES OF PREGNANCY

If a heavily pregnant woman is lying on her back, the pregnant uterus will press against the large blood vessels in the abdomen. This restricts blood from the lower part of the body returning to the heart, which reduces the amount of blood circulation that can be achieved with chest compressions. To prevent this from happening, tilt her right hip upwards.



Positioning the woman

Keep the woman's upper body as flat on the floor as possible in order to give good-quality compressions. Raise her right hip and ask a helper to kneel beside the woman so that his knees are underneath the raised hip. If you are on your own, place tightly rolled up clothing or towels under the woman's hip to lift it.

PROBLEMS WITH RESCUE BREATHING

- If a casualty's chest does not rise when giving rescue breaths:
- Re-check the head tilt and chin lift.
 - Re-check the casualty's mouth and remove any obvious obstructions, but do not do a finger sweep of the mouth.
 - Make no more than two attempts to achieve rescue breaths before repeating compressions.

VARIATIONS FOR RESCUE BREATHING

There are some situations where mouth-to-mouth rescue breaths are not appropriate and you need to use a mouth-to-nose or mouth-to-stoma technique.



Mouth-to-nose rescue breathing

If a casualty has injuries to the mouth that make it impossible to achieve a good seal, you can use the mouth-to-nose method for giving rescue breaths. With the casualty's mouth closed, form a tight seal with your lips around the nose and blow steadily into the casualty's nose. Then allow the mouth to fall open to let the air escape.



Mouth-to-stoma rescue breathing

A casualty who has had his voice-box surgically removed breathes through an opening in the front of the neck (a stoma), rather than through the mouth and nose. Always check for a stoma before giving rescue breaths. If you find a stoma, close off the mouth and nose with one hand and then breathe into the stoma.

WHEN THE AMBULANCE ARRIVES

The ambulance service may initially send a sole responder in a fast-response vehicle or a community first responder ahead of the ambulance. If an AED is not already attached to the casualty, the ambulance personnel will do that. They will also use additional drugs and equipment to provide advanced care (p.57). If

FACE SHIELDS AND POCKET MASKS
Face shields are plastic barriers with a filter that is placed over the casualty's mouth. A pocket mask has a mouthpiece through which breaths are given. If you have one of these barrier devices, avoid unnecessary interruptions to CPR when you use it.



Using a face shield

Tilt the casualty's head back to open the airway. Place the shield over the casualty's face so that the filter is over the mouth and pinch the nostrils shut. Deliver rescue breaths through the filter.



Using a pocket mask

Kneel behind the casualty's head. Open the airway and place the mask, narrow end towards you, over the casualty's mouth and nose. Deliver rescue breaths through the mouthpiece.

you are asked to help you should listen carefully and follow the instructions given (p.23).

The ambulance personnel will make a decision whether to transfer the casualty to hospital immediately or to continue treatment at the scene. Any decision to stop resuscitation can only be made by a health care professional.

UNRESPONSIVE ADULT

CAUTION

- If there is more than one rescuer swap every 1–2 minutes to prevent fatigue. Make sure there is minimal interruption when you change over to maintain the quality of the compressions.
- For unresponsive children and infants who are not breathing, it is best to give CPR using rescue breaths with chest compressions (pp.76–77 and pp.82–83).
- If a casualty has been rescued from water and is not breathing, it is best to give CPR using rescue breaths and chest compressions (Drowning, p.100).

CHEST-COMPRESSION-ONLY CPR

Healthcare professionals and trained first aiders will deliver CPR using chest compressions combined with rescue breaths (pp.66–67). However, if you have not had training in CPR or you are unwilling or unable to give rescue breaths, chest-compression-only CPR has been shown to be of great benefit certainly in the first minutes after the heart has stopped. The emergency services will give instructions for chest-compression-only resuscitation for an unresponsive casualty when advising an untrained person by telephone. Put your device on speaker-phone mode so that you can deliver first aid and talk to the dispatcher. Start chest compressions as soon as possible and continue them until: emergency help arrives and takes over; the casualty shows signs of becoming responsive – such as coughing, opening his eyes, speaking or moving purposefully – and starts breathing normally; or you are too exhausted to continue.

WHAT TO DO



1

Check for a response.
Gently shake the casualty's shoulders, and talk to him or give a command (p.62).

IF THERE IS A RESPONSE

Use the primary survey (pp.44–45) to identify the most serious injury and treat conditions in order of priority.

IF THERE IS NO RESPONSE

Shout for help and open the airway, step 2.

2

Open the casualty's airway.
Place one hand on the forehead and gently tilt the head – the mouth should fall open. Place the fingertips of your other hand on the chin and lift it.



3

Check breathing: look, listen and feel for signs of breathing for no more than 10 seconds.

IF HE IS BREATHING

Use the primary survey (pp.44–45) to identify the most serious injury and treat conditions in order of priority. Place in the recovery position (pp.66–65).

IF HE IS NOT BREATHING

Call 999/112 for emergency help then begin chest compressions, step 4.

4

Kneel beside the casualty, level with his chest. Place one hand on the centre of the chest (p.66) – you can identify the position through clothing. Put the heel of your other hand on top of the first and interlock your fingers. Make sure your fingers are not in contact with the ribs.

5

Begin chest compressions: lean over the casualty, with your arms straight and press down vertically on his breastbone, depressing the chest by about 5–6cm (2–2½in). Release the pressure – but do not take your hands off the chest – and let the chest come back up. The time taken for compression and release should be about the same.

6

Continue with chest compressions at a rate of 100–120 per minute until: emergency help arrives; the casualty shows signs of becoming responsive – such as coughing, opening his eyes, speaking or moving purposefully – and starts breathing normally; or you are too exhausted to continue.