- place the mask over the patient's nose and mouth;
- hold the mask in place with your right hand, by clamping your thumb over the mask and using your fingers to hook under the patient's jaw and pull it up towards the mask;
- use your left hand to compress the bag, forcing air into the patient's lungs;
- there is a valve which allows air to escape from the lungs when you release the bag: DO NOT take the mask off the patient's face between breaths;
- inflate the patient's lungs at a rate of about 12 per minute;
- check with each breath that there is little or no leak of air around the mask: common causes of a leak are the patient's head being turned to one side, and the jaw not being pulled upward firmly enough.

How to administer oxygen

- Note that:
  - oxygen is given to a patient who is breathing spontaneously but has difficulty breathing or has a disorder that impairs the uptake of oxygen into the lungs or the delivery of oxygen to the tissues;
  - spontaneous combustion can occur in the presence of oxygen: smoking, naked lights or fires must not be allowed where oxygen is being administered;
  - if an illness is serious enough to warrant the use of oxygen it is serious enough to seek medical advice;
  - oxygen delivered through valve and bag resuscitation kits – used primarily for victims who are not breathing – should be given only by trained personnel.
- Ensure that the airway is open.
- If the patient is unconscious, insert a Guedel airway (see above under *Mouth-to-mouth rescue breathing*).
- Check that the oxygen cylinder is not empty and that the regulator and flow meter are properly attached to the cylinder and turned off.
- Turn the main oxygen cylinder valve fully on.
- Fit the mask snugly over the patient's nose and mouth.
- Set the flow meter to the chosen rate.

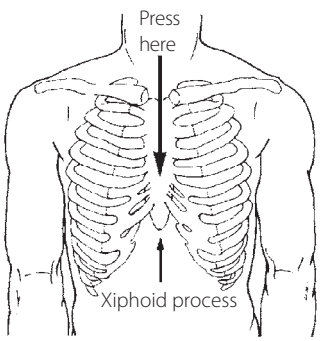

Figure 1.8 Where to press when doing chest compression.

How to perform chest compression

- Note that chest compression should always be performed in conjunction with rescue breathing: ideally, one rescuer gives chest compression and a second rescuer gives rescue breathing.
- Place the patient on a solid surface, if it is possible to do this without delay.
- Kneel at the patient's side and place your hand (**hand A**) that is closest to the patient's feet on the on lower half of the patient's sternum (Figure 1.8).
- Keep the index and middle fingers of **hand A** together and with the middle finger locate the bottom edge of the lowest rib nearest to you.
- Slide both fingers medially (inwards) along this rib to the point where the rib joins the sternum.
- Place your middle finger on this point and your index finger on the sternum.

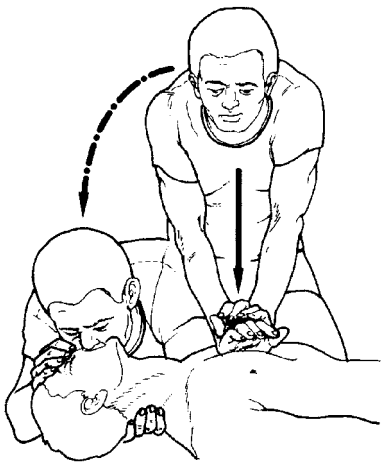

Figure 1.9 How to do chest compression with one rescuer.

- Slide the heel of your other hand (**hand B**) down the sternum until it reaches the index finger of **hand A**: this should bring **hand B** to the middle of the lower half of the sternum or about 4 cm above the lower tip of the sternum (xiphoid process).
- Place the heel of **hand A** on top of **hand B**.
- Extend or lock together the fingers of both hands and lift them to check that you are not going to press on the patient's ribs.
- Rock forwards so that your shoulders are almost directly above the patient's chest.
- Keep your arms straight and push down on the sternum so as to depress it by 4–5 cm.
- Release the pressure but keep your hand in contact with the patient's chest.
- If you are the only rescuer, you should give 100 chest compressions per minute (one to two compressions a second) with two very quick rescue breaths after every 15 chest compressions (Figure 1.9).
- Count compressions aloud.
- Do not wait for the patient to exhale before resuming chest compressions.
- If there are two rescuers one should be at the patient's head giving one rescue breath after every five compressions, in which case chest compressions should be given at a rate of 60 per minute (if the victim is an adult): chest compressions should be continuous, with no pause for rescue breaths (Figure 1.10).
- Check the reaction of the patient's pupils:
  - if the pupils narrow (contract) when exposed to light (the light of a pocket lamp, for example), the brain is receiving adequate blood and oxygen;
  - if the pupils remain widely dilated and do not react to light, serious brain damage is imminent or has occurred.
- Check the carotid (neck) pulse after the first minute of heart compression/rescue breathing and every five minutes thereafter to see if the heart is beating spontaneously.
- If there are two rescuers they should change roles every few minutes.
- Look for other positive signs, such as:
  - expansion of the chest each time air is forced into the patient's lungs;
  - a detectable pulse each time the chest is compressed;
  - return of colour to the skin;
  - a spontaneous gasp for breath.

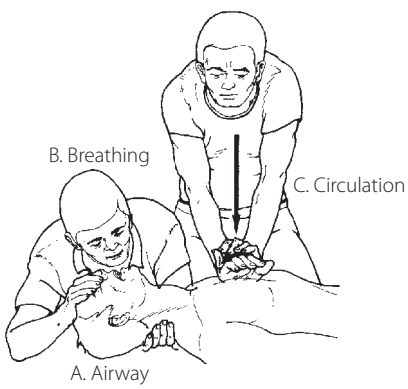

Figure 1.10 How to do chest compression with two rescuers.

✗ *What not to do when giving chest compression*

- **DO NOT START CHEST COMPRESSIONS** if the patient shows any evidence of a heart beat or pulse, even if the heart beat is very slow or very weak: in such cases, chest compression could cause dangerous abnormal heart rhythms and further complications.
- **DO NOT EXERT PRESSURE** on the lower tip of the sternum (xiphoid process) in case you tear the liver and cause severe internal bleeding.
- **DO NOT PRESS** on the patient's ribs: you risk causing rib fractures.
- **DO NOT STOP GIVING CHEST COMPRESSIONS UNTIL**:

- a physician tells you to; **OR**
- the patient's heart beat and breathing have returned; **OR**
- you are too exhausted to continue.

USE OF AUTOMATIC EXTERNAL DEFIBRILLATORS

Defibrillation is the use of a direct-current electrical shock to restore normal heart rhythm to a person whose heart has stopped pumping because it is in the abnormal rhythm ventricular fibrillation (cardiac arrest or sudden cardiac death). The Automatic External Defibrillator (AED) is a battery-powered device that detects the electrocardiogram of a person, uses a computer programme to determine whether the person's heart rhythm is ventricular fibrillation, then prompts the operator to trigger an electrical shock whose intensity is automatically adjusted by the AED.

AEDs can be used safely by people without medical training, and **if** used within 2 or 3 minutes of a cardiac arrest **and** followed up by hospital care, can improve short-term outcomes.

AEDs are not appropriate equipment for the majority of vessels. Vessels which often carry elderly passengers (who are much more likely to suffer cardiac arrest than younger people) and vessels whose operations expose crew to a risk of electrocution should consider carrying one or more AEDs. If AEDs are carried crew should be trained in their use, and in the care of patients surviving cardiac arrest.

✔ *What to do in the case of spinal injury* (for a more detailed action checklist see Chapter 6, Bone, joint, and muscle injuries, under Neck (cervical spine) injuries)

- Remember that in a patient whose spine is injured any movement, particularly extension of the neck, can cause permanent damage to the spinal cord.
- To move a patient with suspected spinal injury onto a stretcher, use the "log-rolling" manoeuvre: gently roll the patient onto the stretcher, keeping the patient's back and neck straight (Figure 1.11).
- Suspect a spinal injury if the patient meets any one of the following conditions:
  - is unconscious;
  - has fallen from a height of more than five metres;
  - has fallen on the head or heels;
  - has been struck on the head or neck;
  - has been rescued after diving into shallow water;
  - cannot move the toes when asked to;
  - complains of:
    - neck pain; **OR**
    - tingling or absence of sensation in the feet or legs.
- If any of the above conditions is met:
  - seek medical advice;
  - take particular care in handling and resuscitating the patient;
  - keep the patient's head, neck, and chest aligned;
  - use a spinal board and/or cervical collar, if available;

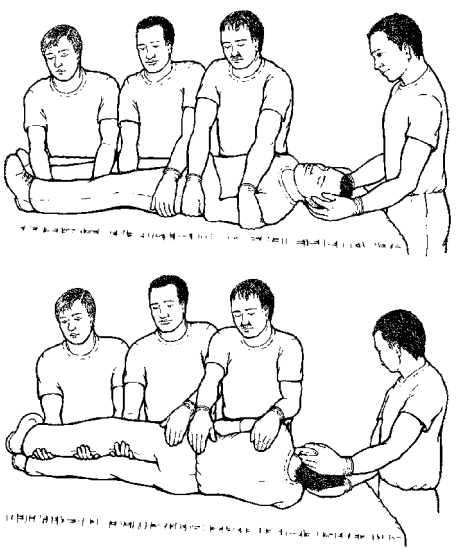

Figure 1.11 How to move a patient with a suspected spinal injury.

- keep the patient horizontal during the rescue procedure in order to minimize the consequences of low blood pressure, which is common in spinal injury.

How to apply the recovery position

- Use the recovery position for unconscious patients who are breathing and whose heart is beating: it prevents the tongue from blocking the airway and promotes drainage of fluids (blood or vomit) from the mouth, thereby reducing the risk of choking (see below).
- Make sure there are no pillows under the patient's head.
- Kneel at the side of the patient.
- Remove any fragile or potentially dangerous objects, such as glasses and loose-fitting dentures.
- Straighten the patient's legs.
- Take the patient's arm that is nearest to you and place it at right angles to the body, with the elbow bent and the hand with the palm facing up.
- Take the patient's other arm and place it across the chest so that the hand rests palm down on the cheek nearest to you.
- Place one of your hands on the patient's far shoulder, keeping the patient's hand on the cheek, and with your other hand grasp the patient's far leg just above the knee and roll the patient towards you.
- Adjust the patient's upper leg so that both the hip and the knee are bent at right angles (see Figure 1.3).
- Tilt the head back to make sure the airway remains open: use minimal tilt if you suspect a spinal injury.
- If necessary, adjust the position of the patient's hand under the cheek to keep the head tilted.
- Check regularly for breathing.
- Check blood circulation in the lower arm.
- To prevent bedsores, from time to time turn the patient gently onto the opposite side (see Chapter 26, *Nursing care and medical procedures*).
- After 12 hours of unconsciousness, administer fluid intravenously.
- Check now and again to ensure that all limbs are in mid-position – neither completely straight nor fully bent.
- Check that the eyelids remain closed at all times: if not, tape them shut to avoid damage to the eyeballs.
- Every two hours moisten the eyes with saline solution (0.9% sodium chloride) by opening the eyelids slightly and letting some saline solution drip gently into the corner of each eye.
- Every three hours moisten the mouth, cheeks, tongue, and teeth with a small swab moistened with water.

✗ *What not to do when rescuing an unconscious patient*

- DO NOT LEAVE THE PATIENT ALONE.
- DO NOT ALLOW THE PATIENT'S HEAD TO BEND FORWARDS with the chin sagging.

- DO NOT FORGET TO CHECK REGULARLY FOR BREATHING.
- DO NOT PULL, STRAIN, OR STRETCH ANY JOINTS.
- DO NOT GIVE ANYTHING BY MOUTH.

How to take the pulse

- Note that the best pulse to take in an emergency is the carotid (neck) pulse (see Figure 1.4).
- Use your index and middle fingers, not your thumb.
- To take the carotid (neck) pulse:
  - keep the patient's head tilted back and place your index and middle fingers on the larynx (Adam's apple);
  - slide your fingers down into the groove of the neck to the far side of the larynx.
- If you cannot feel the pulse for at least five seconds, there is too little or no blood circulation.

CHOKING

Choking is the result of an obstruction in the upper airway, either in the larynx (voice box) or trachea (windpipe). Choking prevents air from reaching the lungs and, as a result, oxygen from reaching the brain. Without immediate action, the patient loses consciousness. A complete obstruction of the airway is immediately life-threatening: if the obstruction or constriction is not removed, the patient will suffer brain damage and die within four to six minutes.

An obstruction of the upper airway may be caused by:

- a solid or semi-solid object, such as food, a foreign body, or a blood clot:
  - an inadequately chewed piece of meat is a very common cause of choking: in a third of cases the meat lodges above the vocal cords; in two thirds of cases it passes through the vocal cords and lodges in the trachea;
- an external constricting force, as in strangulation or hanging;
- swelling of the tissue lining the upper airway: this can be due to:
  - an allergic mechanism, as occurs with asthma or an insect sting;
  - the irritant or burning effect of gas fumes or smoke.

✔ *What to do*

- Suspect choking in a person:
  - whose skin turns blue or purple; **OR**
  - who cannot speak or breathe but only gasp; **OR**
  - who clutches the throat with one or both hands (a universal sign for choking), especially in mid-meal; **OR**
  - whose attempts to breathe in or out produce coughing or wheezing or whistling sounds.
- If you suspect that food or a foreign body is blocking the airway:
  - try to unblock the airway (see above, under *Basic life support*);
  - encourage the patient to cough;
  - if the patient cannot cough, perform the Heimlich manoeuvre (see below);

- do not attempt to hook the obstructing body out with a finger: you are likely to push it in further and worsen the obstruction.

How to perform the Heimlich manoeuvre (*abdominal thrusts*)

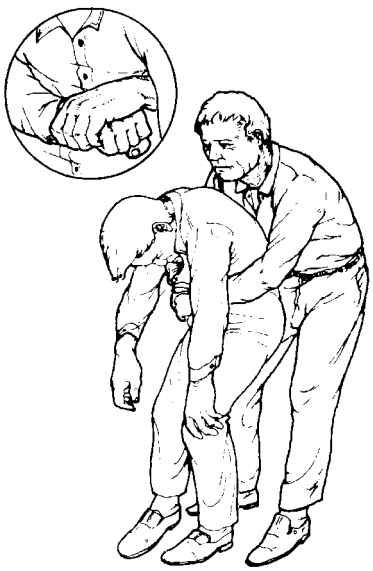

Figure 1.12 How to do the Heimlich manoeuvre on a standing patient.

IN A CONSCIOUS PATIENT

- Stand behind the patient and wrap your arms around the patient's waist.
- Make a fist with one hand and place it on the patient's abdomen between the navel and the rib cage (Figure 1.12).
- Grasp your fist with your other hand and bend the patient slightly forwards (if need be, using for support the back of a chair, corner of a table, or other protruding object).
- Keeping your arms away from the patient's rib cage, give four or five quick inward and upward thrusts to make the patient cough.
- Repeat these abdominal thrusts until the obstructing object is coughed out.

IN AN UNCONSCIOUS PATIENT

- Lay the patient down face up, head to one side.
- Kneel astride the patient's hips.
- Place one of your hands on top of the other, with the palm of the lower hand on the patient's abdomen, just above the navel (Figure 1.13).
- With the heel of the lower hand, make rapid inward and upward thrusts.
- Repeat this sequence until the obstructing object is ejected.

ON YOURSELF

- Put your fist on your upper abdomen, just above the navel.
- Grasp your fist with the other hand.
- Thrust your fist inwards and upwards; **OR**:
  - bend over a hard object with a protruding point (chair, wash-basin, etc.) and force your fist upwards into your upper abdomen.

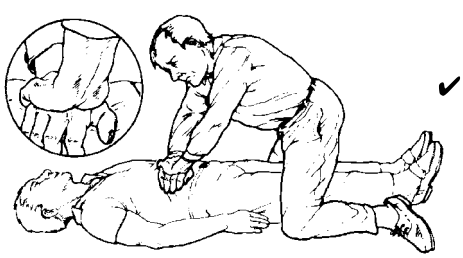

Figure 1.13 How to do the Heimlich manoeuvre on an unconscious patient.

What to do in a case of hanging or strangulation

- Cut the rope and lay the patient on a firm, flat surface.
- If breathing has stopped, start cardio-pulmonary resuscitation (see above).
- Give oxygen, six litres per minute, using a non-rebreathing mask.
- Seek medical advice.

BLEEDING

Bleeding is the result of damage to blood vessels. The damage can be due to trauma or disease, such as peptic ulcer. Breaks in very small blood vessels occur all the time in healthy people and if the clotting system is abnormal there can be spontaneous bleeding.