BASP
Outdoor First Aid
Safe, Confident Responders

For BASP Outdoor, Emergency and First Aid at Work Courses

Contents

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The Thirteen Edition 2020 Outdoor First Aid Manual has been updated from information gained from the Resuscitation Council (UK) Guidelines 2015. 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.

1. Introduction

BASP trainers are from a variety of backgrounds. Most are active ski patrollers. Some are part time patrollers with regular jobs (including hospital and ambulance personnel) and others are co-opted from mountain rescue teams.

First Aid: The immediate but temporary care of some one who has been injured or suddenly become ill.
In some situations the provision of care may be somewhat delayed. You may have to search for the casualty or it may difficult or dangerous to reach them. It should also be noted that 'temporary care' may become prolonged due to the accident location, time delay in raising the alarm or difficulty of access and evacuation of the casualty. However, the Basic Life Support and Casualty Care as described in this manual still apply.

Good Basic Life Support saves lives

The basic principles of first aid are to:
Preserve Life
Prevent The Condition Worsening
Promote Recovery

The primary aim of a First Aider is to preserve the life of a casualty by following the appropriate actions, organising help, carrying out Basic Life Support which includes resuscitation, stopping major bleeding etc. To prevent the casualty's condition worsening may take a simple action like putting them into the recovery position, stabilizing a fractured limb, dressing wounds or protecting the casualty from the elements. Actions to promote recovery are an integral part of the principles of first aid, including reassurance, patient comfort and organizing further care if required. The key premise of these principles is to do no further harm.

2. Accident Procedure

Objectives:
- To confidently assess an accident scene
- To develop a safety management plan.

Having a simple procedure to work to is a great comfort to anyone thrust into the position of having to deal with an accident or sudden medical emergency. The following section is more to do with a common sense approach to managing an incident rather than the 'hands on' part of casualty care.

First priority – Safety!
There may be occasions when the necessity to get to a casualty is out-weighed by the dangers involved, such as dangerous terrain, access difficulties, fire or flood. Your first priority at an incident is to make an assessment of the scene, ensuring it is safe for yourself, any bystanders and the casualty, the prime rule is: Avoid a second accident!

It is all too easy to rush in without taking stock, to find that an already difficult situation has become worse through lack of forethought.

Action:
Make the scene as safe as possible for yourself and those around you.

Assess and prioritise any casualties then use your first aid skills to the best of your ability.

Alert the emergency services while continuing to manage the situation until help arrives.

Alerting the emergency services:
When making contact with the emergency services you will usually be asked for:

- Your name and the phone number that you are calling from
- A brief outline of what has happened
- An accurate location of the incident
- The number of casualties
- The nature and severity of the injuries/illness

Remember:
A cool head and common sense are equally as important as your first aid skills. A delay in the arrival of rescue services, due to misinformation, or a lack of attention to basic outdoor skills while going to summon help can be just as life threatening to the casualty as any injury.

Summary:
- Ensure no danger to yourself, bystanders and the casualty.
- Remember the ABC of first aid.
- Know where you are.
- Summon help.
- Pass on pertinent information.

Use common sense.
Do no further harm.
Avoid a second accident.

Notes

3. Casualty Assessment

Objectives:
- To accurately assess casualties
- To identify and treat life threatening problems
- To develop an effective patient management and evacuation plan

In the heat of the moment a First Aider may find it all too easy to become overwhelmed by the stress of the situation. It is therefore essential to have an easy to remember systematic approach to casualty assessment.

3A PRIMARY SURVEY

The casualty assessment is split into two phases, Primary and Secondary Survey.

Primary Survey – The simultaneous assessment, identification and management of any immediate life threatening problems using the simple protocol: look, listen and feel – look for deformity, swelling and wounds, listen to what the patient says, and for breathing difficulties, feel for deformity, swelling and tenderness.

Guidelines for the primary survey:
- Danger?
- Response?
- Airway (consider the possibility of a neck injury)
- Breathing (ensure adequate ventilation)
- Circulation (with control of external bleeding)
- Disability (check Level Of Consciousness (AVPU)) (see page 13)
- Expose and examine (consider weather conditions/temperature)

A breakdown of these bullet points is as follows:

Danger:
Is it safe for me to approach the casualty, think, is there an electrical danger, a fire hazard, is there any gas/poisonous fumes, broken glass or anything else sharp to harm me? In the outdoors consider: rock fall, avalanche, traffic danger etc. Look at the patient as you approach: what position are they in? Are they sitting or lying? Is there an indication of the MOI – mechanism of injury (how did the accident happen)? (MOI: This could be a high speed collision, fall from height, or suddenly felt unwell and collapsed etc. The MOI can give clues as to possible injuries sustained.)

Response:
Squeeze the casualty's shoulder and shout loudly 'are you all right?' (see section 4a).

No response = Start Basic Life Support protocol (see section 4b).

If the casualty responds by answering and appears conscious, leave them in the position in which you found them (provided they are not at further risk).

- Check the casualty's condition, ask: What happened? Where does it hurt the most? Can you take a deep breath? The answers to these questions will tell you whether the casualty remembers the incident (were they knocked out), which injury hurts the most, and if there is any chest injury which may be affecting breathing. Send or go for help, or call 999 for an ambulance.

- If possible get a SAMPLE history:
  - Signs/symptoms
  - Allergies
  - Medication
  - Past medical history
  - Last meal/drink the casualty had
  - Events – history of incident (what happened, where and when)
- Monitor the casualty and reassess their condition regularly.
- If the casualty is breathing but has a reduced level of consciousness carefully place them in the recovery position (see section 4a).

Airway – consider the possibility of a neck injury:

- Use head tilt and chin lift to gently open the airway.

- If you suspect a neck injury and you have competent help, one person can provide manual immobilization to stabilise the head while the other examines the patient.
- The lone First Aider must concentrate on maintaining an open airway and monitoring breathing.

Breathing – with adequate ventilations:

- Sufficient air must be going in and out to maintain life!
- If there is no breathing or only an occasional gasp (see section 4b).
- If the casualty is unconscious and still breathing,
- place him in the Recovery Position (see section 4a) and continue with your examination.
- If the casualty is conscious, assess breathing – is it distressed, particularly fast or slow, noisy or laboured? (see section 3c).
- If there are breathing difficulties, try to relieve the problem (see section 4d).
- Consider patient positioning to improve airway and breathing.

Circulation – with control of external bleeding:

- Loss of blood will lead to shock, and shock, unless the under laying cause is reversed, will lead to death (see section 5).
- Is the casualty showing signs of shock? Consider patient positioning.
- Is there any external bleeding? Treat serious bleeding.
- Could there be internal bleeding? Get help fast.
- Could shock develop? Monitor your patient.
- Look at the casualty, is the skin pale and sweaty? If so it is a sign of shock.
- Are the limbs in a 'normal anatomical position'? (Broken bones bleed).
- Can you see wounds, blood on the skin or soaking through clothing?
- Expose and treat serious bleeding. Beware of hidden bleeding from wounds underneath the casualty or concealed by waterproof clothing.
- Carry out a rapid body sweep – Re-assess airway and breathing, then using gloved hands run your fingers through the casualty's hair feeling the scalp for swellings or wounds, look at your gloves for signs of blood. Look at the face; are there signs of injury? Is there any sign of bleeding form the nose and/or ears? Check the neck, collar bones and breast bone. Check the integrity of the chest wall by gently compressing side to side, and front to back, start with light pressure building to a firm squeeze. Check that the abdomen is soft and there is no swelling or tenderness. It is not advised to compress or rock the pelvis, but to consider the MOI (mechanism of injury), if there is a high index of suspicion of the likelihood of a pelvic injury? (a high velocity impact from a motor vehicle, or fall onto rocks

etc.), this could indicate major fractures with associated serious blood loss. Feel down both upper and lower legs for pain, swelling or deformity then check each shoulder and arm.

Disability:
- This is assessing possible damage to the nervous system by checking the casualty's level of consciousness (LOC) (see section 4a) and if
- appropriate check the eyes and the pupil reaction to light.

Expose – examine:
- Open, or if necessary cut clothing to allow a visual examination of any injuries found – re-cover the patient! Consider the temperature and weather conditions – don't cause hypothermia!

3B THE SECONDARY SURVEY (To be carried out only if time permits)

An assessment of signs and symptoms, and complete head to toe examination.

Having dealt with any potentially life threatening problems, the secondary survey is intended to assess the patient's vital signs (see section 3c Vital Signs) and provide a detailed head to toe examination.

Remember: be sensitive to the age, sex and culture of the casualty.

Explain to the casualty what you are going to do and why you are doing it. Listen to what the casualty tells you while you are doing your examination.

Head:
- Bleeding
- Bruising/swelling/pain or tenderness
- Look for cerebrospinal fluid (CSF) coming from nose or ears, possibly tinged with blood
- Ask casualty to bite, and look for stepping of the teeth to check for a fractured jaw

Neck:
- Bleeding
- Bruising/swelling/tenderness
- Deformity
- Tingling (pins and needles) or numbness
- Ask casualty to wiggle fingers and toes
- Look for a Medic Alert necklace

Shoulder/Chest:
- Bleeding or chest wound with frothy blood bubbling out
- Fractures/dislocations
- Bruising/swelling
- Gently 'spring' the ribs to check for pain or tenderness
- Look for equal/unequal rise and fall of the chest with each breath

Abdomen:
- Bleeding or wound with protruding abdominal contents
- Pain
- Swelling/tenderness
- Rigidity of abdominal wall

Pelvis:
- Bleeding
- Bruising/swelling/tenderness
- Incontinence
- Consider MOI and index of suspicion

Extremities:
- Bleeding
- Fractures/dislocations
- Pain or tenderness
- Ask the casualty to squeeze your hands, check for equal, or loss of strength
- Look for a Medic Alert bracelet
- Check circulation/capillary refill in extremities
- Ask casualty to move each limb in turn

Back/Spine:
- Carry out a 'spinal log roll' to inspect the back (extra personnel are required to carry out this manoeuvre safely).
- Bleeding
- Pain/tenderness
- Deformity

Notes

3C VITAL SIGNS (SIGNS OF LIFE)

- Breathing
- Pulse
- Colour
- Temperature

The above are the signs that can be relatively easily monitored by a First Aider. It is the assessment of these vital signs and their comparison against the normal values of the 'average' adult, child or infant that gives the First Aider an indication as to the condition of the casualty. For example, the respiratory rate of the 'average' adult, at rest, is between 12 and 20 breaths per minute, therefore, a casualty who is initially breathing at 25 breaths per minute, and three minutes later is breathing at 28 breaths per minute is most likely going into shock caused by blood loss. An evaluation of the other vital signs can help in confirming this diagnosis (see section 5).

An assessment of the vital signs is made during the secondary survey.

This initial assessment is a 'snapshot', one moment in the casualty's treatment. It is the on-going monitoring and recording of vital signs which provides an important picture of how the casualty is progressing, whether their condition is improving, remaining stable or deteriorating. Monitoring and recording vital signs is an important function of the First Aider particularly if further help is likely to be delayed.

After dealing with any airway, breathing or circulatory problems, and providing any initial treatment required, monitor vital signs at least every two to three minutes and record every ten minutes. These trends provide key information on which a receiving hospital will base further treatment.

Breathing:
Breathing is essential to life. Its purpose, by breathing in, is to take oxygen into the body via the respiratory system and expel waste gases such as carbon dioxide by breathing out. The qualities of breathing are that it is normally regular, rhythmical, quiet, effortless and painless

Normal breathing rates for the average adult at rest are between 12 – 20 breaths per minute. Variations in respiratory rate can be due to drink, drugs, injury, illness, fitness or age. Children are in the range of 15 – 30 breaths per minute and infants between 30 – 40 breaths per minute.

To assess breathing look for chest / abdominal movement, listen for breath sounds and feel for air movement. (see section 4).

Pulse:
The pulse is a pressure wave caused by the pumping action of the heart. It is possible to feel a pulse where an artery lies close to the surface of the body.

The qualities of the pulse are that it is normally regular, rhythmical and strong.

Variations in pulse rate are triggered by the same causes as for the respiratory rate. Normal pulse rates for the average adult at rest are between 60 – 80 beats per minute. Children are in the range of 60 – 140 beats/min and infants between 110 – 160 beats/min.

There are several sites around the body where a First Aider can assess a pulse, commonly used sites are the radial pulse on the thumb side of the inner aspect of the wrist, and the carotid pulse which is found in the neck, this is the preferred site when assessing an unresponsive casualty. To locate the carotid pulse use the pads of your first two or three fingers, place them on the casualty's Adams apple, run your fingers down around the windpipe towards your side of the neck and into the dip between the windpipe and the neck muscle, apply light pressure to feel for a pulse.

Factors affecting pulse and breathing rates:
Physical exercise will increase the pulse and breathing rate as will blood loss leading to clinical shock, whereas hypothermia and a loss of the shivering reflex will lead to a depression of these vital signs. Drugs may also have the effect of slowing or speeding up breathing and pulse rates.

Colour:
Often just looking at a casualty can give you an indication as to whether they are 'sick' or 'not sick'. A pale or 'ashen' skin colour would indicate a poor peripheral circulation, this could be caused by an external factor such as the weather, leading to the onset of hypothermia, or blood loss leading to shock, or even a combination of the two.

Cyanosis (a blueish tinge), initially observed around the lips and nose, and spreading as the casualty's condition worsens, indicates an inadequate amount of oxygen in the blood, and is associated with blood loss, heart failure, or a respiratory problem.

A 'flushed' skin could indicate a problem with the body's thermoregulatory system, such as heat stroke (see section 9b), or the possibility of neurogenic shock (see section 5 Shock).

Temperature:
The core temperature of the body (that of the brain, heart, lungs and vital organs) is normally 37°C, and requires specific equipment to measure it. It would be rare for the average First Aider to have such equipment, and that equipment is of little use when determining initial treatment (see section 9 Environmental injuries).

4. Basic Life Support

4A THE UNCONSCIOUS CASUALTY

Unconsciousness, a condition of being unaware of one's surroundings, as in sleep, or having a reduced level of response to normal stimuli. An unnatural state of unconsciousness may be caused by factors that produce reduced brain activity, such as lack of oxygen, head injuries, poisoning, blood loss, and many diseases, or it may be brought about deliberately during general anaesthesia.

When dealing with an unconscious casualty attention to the basic provision of Airway, Breathing and Circulation are paramount.

Initially the greatest potential risk stems from reduced muscle tone causing the tongue to become floppy, and blocking or partially blocking the airway. The oesophageal sphincter, a muscle that normally stops the back-flow of stomach contents also relaxes allowing reflux into the oesophagus, this fluid can pool at the back of the throat causing airway blockage, or damage to lung tissue if inhaled.

Other risks come from the fact that the unconscious casualty is unable to protect himself from external / environmental hazards.

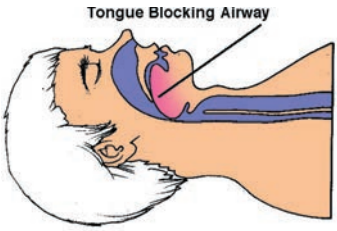
The assessment process:
Assess the overall scene, is it safe, or can you make the scene safe?

Control / organise the control of traffic, skiers, mountain bikers etc.

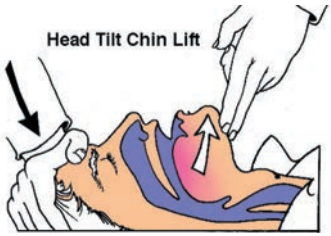
If too dangerous to approach the casualty, maintain bystander safety and summon the appropriate rescue service – dial 999 or 112.

Assess the casualty for a response 'Squeeze and Shout'.

If there is no response open the airway using 'Head tilt, chin lift'.



Tongue Blocking Airway
Bill Smith



Head tilt chin lift
Bill Smith

Maintaining chin lift – Look, listen and feel for breathing for up to 10 seconds.

Casualty is breathing normally (non trauma incident)

Place in recovery position.

Call for help – dial 999 or 112.

Carry out primary survey, note vital signs and monitor.

With a trauma related incident, unless the airway is at immediate risk, carry out a rapid primary survey looking for life threatening problems, deal with these to the best of your ability then place casualty in recovery position.

Casualty is not breathing or not breathing normally, follow Resuscitation Guide Lines (see 4b).

Recovery Position:
There are several variations of the recovery position, and achieving it; each has its own advantages. No one position is ideal for all casualties. There are some basic criteria that should be followed and have particular pertinence in the out-door environment:

1. The position should be stable.
2. Near a true lateral position (across a slope) with the head dependant (facing down the slope to allow free drainage).
3. With no pressure on the chest to impair breathing.
4. Good observation of and access to the airway should be possible.
5. It should be possible to turn the casualty onto their side and return to the back easily and safely, having particular regard to the possibility of cervical spine injury.
6. The position should take any injuries into account and should cause no further harm.

Placing a casualty in the recovery position is intended to protect the airway by allowing their tongue to fall forward and permit free drainage of body fluids. The method described is for a single rescuer and can be modified and greatly enhanced if more than one rescuer is available.

Remove the casualty's glasses, if present.

Place the arm that is nearest to you out to the side.

Bring their far arm across the chest, and hold the back of their hand against their cheek.

With your other hand, grasp the far leg just above the knee and pull it up, keeping the foot on the ground.

Keeping their hand pressed against their cheek, with your other hand still grasping the far leg, pull the casualty towards you onto their side – carefully, consider any injury the casualty may have.

In an outdoor setting consider rolling the casualty onto some form of insulation if possible.

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

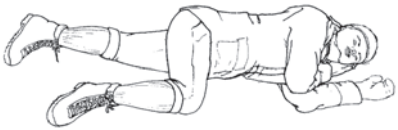
Tilt the head back to maintain an open airway. Ensure the mouth is open to allow drainage.

Adjust the hand under the cheek, if necessary, to keep the head tilted.

Check breathing regularly.

Call the Emergency Services 999 or 112.

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



Talk to your casualty even if they are unable to talk or do not appear to be able to hear. Tell your casualty what you are doing and why (you must be able to justify everything that you do). Keep them informed of when things are going to happen. Not only are you then keeping your casualty informed but everyone who is present and may be a witness in the unlikely but possible event of an enquiry.

Summary:
Attention to A B C save lives
Follow the assessment process
Provide the response that your casualty needs
Monitor the casualty's condition
To measure level of consciousness use A.V.P.U.

A – alert
V – vocal – responds to vocal stimulus
P – pain – responds to painful stimulus
U – unresponsive

Notes

4B BASIC LIFE SUPPORT SEQUENCE

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.[1] 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.[2 3]

The Resuscitation Council (UK) 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 following information is recommended in the 2015 Guidelines.

1. Uninterrupted, high quality chest compression is vital, with attention being paid to all components of each chest compression including the rate, depth and allowing adequate time for chest recoil to occur.
2. When obtaining help, ask for an automated external defibrillator (AED), if one is available.
3. Compress the chest to a depth of 5-6 cm and at a rate of 100-120 min.
4. Give each rescue breath over 1 s rather than 2 s.
5. Do not stop to check the casualty or discontinue CPR unless the casualty starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally.
6. The casualty 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 casualty is breathing normally.
7. 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. 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

[1] Perkins GD, Lockey AS, de Belder MA, Moore F, Weissberg P, Gray H. National initiatives to improve outcomes from out of hospital cardiac arrest in England. Emergency Medicine Journal 2015. doi: 10.1136/emermed-2015-204847

[2] Blom MT, Beesems SG, Homma PC, et al. Improved survival after out-of-hospital cardiac arrest and use of automated external defibrillators. Circulation 2014;130:1868-75.

[3] Hasselqvist-Ax I, Riva G, Herlitz J, et al. Early cardiopulmonary resuscitation in out-of-hospital cardiac arrest. N Engl J Med 2015;372:2307-15.

unresponsive and not breathing normally.
8. Checking the carotid pulse (or any other pulse) is an inaccurate method for confirming the presence or absence of circulation.
9. Teach CPR to laypeople with an emphasis on chest compression, but include ventilation as the standard, particularly for those with a duty of care.

Basic life support consists of the following sequence of actions:

1 Ensure it is safe to approach the casualty. Make sure the casualty, any bystanders, and you are safe.

2 Check the casualty for a response and if they are breathing normally.
Gently squeeze his shoulders and ask loudly, 'Are you all right?'

3a 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.

3b If he does not respond:
- Turn the casualty onto his back and then open the airway using head tilt and chin lift:
- Place your hand on his forehead and gently tilt his head back.
- With your fingertips under the point of the casualty's chin, lift the chin to open the airway.

4 Keeping the airway open, look, listen, and feel for normal breathing.
- Look for chest movement.
- Listen at the casualty's mouth for breath sounds.
- Feel for air on your cheek.
- In the first few minutes after cardiac arrest, a casualty may be barely breathing, or taking infrequent, noisy, gasps. Do not confuse this with normal breathing. Look, listen, and feel for no more than 10 s to determine if the casualty is breathing normally. If you have any doubt whether breathing is normal, act as if it is not normal.

5a If he is breathing normally:
- Turn him into the recovery position (see 4a).
- Summon help from the ambulance service by mobile phone. If this is not possible, send a bystander. Leave the casualty only if no other way of obtaining help is possible.
- Continue to assess that breathing remains normal. If there is any doubt about the presence of normal breathing, start CPR (5B).

5b If he is 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. If you are on your own, and if the phone has a speaker facility, switch it onto speaker mode as this will facilitate continuous dialogue with the dispatcher including (if required) CPR instructions.
- Send for an AED as soon as possible. Ask someone to bring an AED (if available). Do not leave the casualty.
- Start CPR. Chest compression as follows:
  - Kneel by the side of the casualty.
  - Place the heel of one hand in the centre of the casualty's chest.
  - Place the heel of your other hand on top of the first hand.
  - Interlock the fingers of your hands and ensure that pressure is not applied over the casualty'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 yourself vertically above the casualty's chest and press down on the sternum 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 about 100 - 120 times a minute (a little less than 2 compressions a second).
  - Compression and release should take an equal amount of time.

6a Combine chest compression with rescue breaths.

If trained and able, combine chest compressions and rescue breaths, otherwise provide compression-only CPR.

- After 30 compressions open the airway again using head tilt and chin lift.
- Pinch the soft part of the casualty's nose closed, using the index finger and thumb of your hand on his forehead.
- Allow his mouth to open, but maintain chin lift.
- Take a normal breath and place your lips around his mouth, making sure that you have a good seal.
- Blow steadily into his mouth whilst watching for his chest to rise; take about one second to make his chest rise as in normal breathing; this is an effective rescue breath.
- Maintaining head tilt and chin lift, take your mouth away from the casualty and watch for his chest to fall as air comes out.
- Take another normal breath and blow into the casualty's mouth once more to give 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 your rescue breaths do not make the chest rise as in normal breathing, then before your next attempt:

- Check the casualty's mouth and remove any visible obstruction.
- Recheck that there is adequate head tilt and chin lift.
- Do not attempt more than two breaths each time before returning to chest compressions. If there is more than one rescuer present, another should take over CPR about every 2 min to prevent fatigue. Ensure the minimum delay during the changeover of rescuers, and do not interrupt chest compressions.

6b Chest-compression-only CPR.

- If you are not trained, or are unwilling, to give rescue breaths, give chest compressions only.
- If chest compressions only are given, these should be continuous at a rate of 100 - 120 a minute.
- Stop to recheck the casualty only if he starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally; otherwise **do not interrupt resuscitation**.

7 Continue resuscitation until:

- qualified help arrives and takes over,
- he casualty starts to show signs of regaining consciousness, such as coughing, opening his eyes, speaking, or moving purposefully AND starts to breathe normally OR
- You become exhausted.

Whilst performing chest compression:

- Each time compressions are resumed, the rescuer should place his hands without delay 'in the centre of the chest'.
- Compress the chest at a rate of about 100 – 120 a minute.
- Pay attention to achieving the full compression depth of 5-6 cm (for an adult).
- Allow the chest to recoil completely after each compression.
- Take approximately the same amount of time for compression and relaxation.
- Minimise interruptions in chest compression.
- Do not rely on a palpable carotid or femoral pulse as a gauge of effective arterial flow.

- 'Compression rate' refers to the speed at which compressions are given, not the total number delivered in each minute. The number delivered is determined not only by the rate, but also by the number of interruptions to open the airway, deliver rescue breaths, and allow AED analysis (see section 4c).

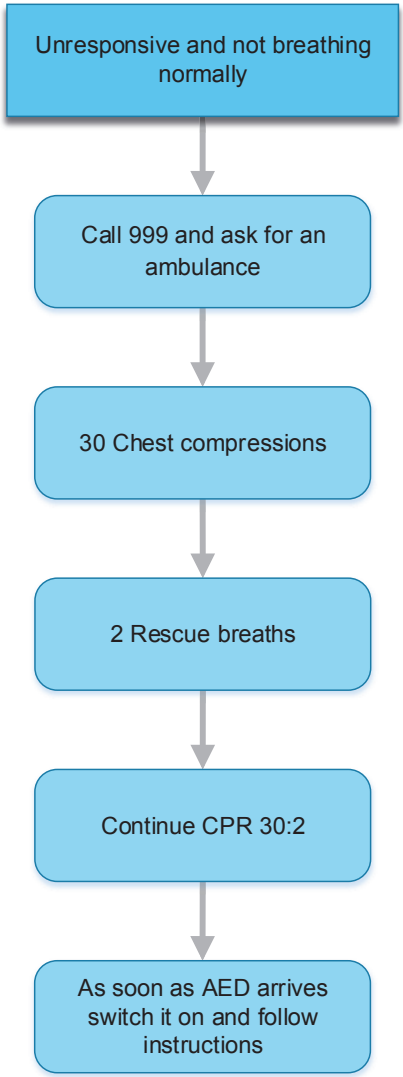
Compression-Only CPR
Studies have shown that compression-only CPR may be as effective as combined ventilation and compression in the first few minutes after nonasphyxial arrest. However, chest compression combined with rescue breaths is the method of choice for CPR by trained lay rescuers and professionals and should be the basis for layrescuer education. Lay rescuers who are unable or unwilling to provide rescue breaths, should be encouraged to give chest compressions alone.

When advising untrained laypeople by telephone, ambulance dispatchers should give instruction on compression-only CPR.

Regurgitation during CPR
Regurgitation of stomach contents is common during CPR, particularly in victims of drowning.

If regurgitation occurs:
- Turn the victim away from you.
- Keep him on his side and prevent him from toppling on to his front.
- Ensure that his head is turned towards the floor and his mouth is open and at the lowest point, thus allowing vomit to drain away.
- Clear any residual debris from his mouth with your fingers; and immediately turn him on to his back, re-establish an airway, and continue rescue breathing and chest compressions at the recommended rate.

Adult Basic Life Support 2015



Resuscitation Council (UK) Guidelines 2015

4C THE USE OF EXTERNAL DEFIBRILLATORS (AED)

Sudden cardiac arrest is a leading cause of death in Europe, affecting about 700,000 individuals a year. Many victims of sudden cardiac arrest can survive if bystanders act immediately while ventricular fibrillation (VF) is still present; successful resuscitation is unlikely once the rhythm has deteriorated to asystole.

Electrical defibrillation is well established as the only effective therapy for cardiac arrest caused by VF or pulseless ventricular tachycardia (VT). The scientific evidence to support early defibrillation is overwhelming; the delay from collapse to delivery of the first shock is the single most important determinant of survival. The chances of successful defibrillation decline at a rate of 7-10% with each minute of delay; basic life support will help to maintain a shockable rhythm but is not a definitive treatment.

Types of Aeds
AEDs are sophisticated, reliable, safe, computerised devices that deliver defibrillatory shocks to victims of cardiac arrest. They use voice and visual prompts to guide rescuers, and are suitable for use by lay rescuers and health care professionals. There are two types of AED: most are semi-automatic, but a few fully automatic AEDs are available. All AEDs analyse the victim's rhythm, determine the need for a shock, and then deliver a shock. A semi-automatic AED advises the need for a shock, but this has to be delivered by the operator when prompted. Some semi-automatic AEDs have the facility to enable the operator (normally a health care professional) to override and deliver a shock manually, independently of any prompts.

Heartstream FR2 Defib
Fiona Gunn

Sequence of Actions When Using an Aed
The following sequence is for the use of both semiautomatic and automatic AEDs.

1. **Make sure that you, any bystanders, and the victim are safe.**
- If two rescuers are present, assign tasks.
2. **If the victim is unresponsive and not breathing normally:**
- Send someone for the AED and to call for an ambulance. If you are on your own do this yourself; you may need to leave the victim.
3. **Start CPR according to the guidelines for BLS.**
4. **As soon as the AED arrives:**
- Switch on the AED and attach the electrode pads. If more than one rescuer is present, continue CPR while this is done. (Some AEDs may automatically switch on when the AED lid is opened)
- Follow the voice / visual prompts. Ensure that nobody touches the victim while the AED is analysing the rhythm.

5a If a shock is indicated:
- Ensure that nobody touches the victim.
- Push the shock button as directed. (Fully-automatic AEDs will deliver the shock automatically).
- Continue as directed by the voice/visual prompts

5b If no shock is indicated:
- Immediately resume CPR using a ratio of 30 compressions to 2 rescue breaths.
- Continue as directed by the voice/visual prompts.

6 Continue to follow the AED prompts until:
- Qualified help arrives and take over,
- the victim starts to breathe normally, or
- you become exhausted.

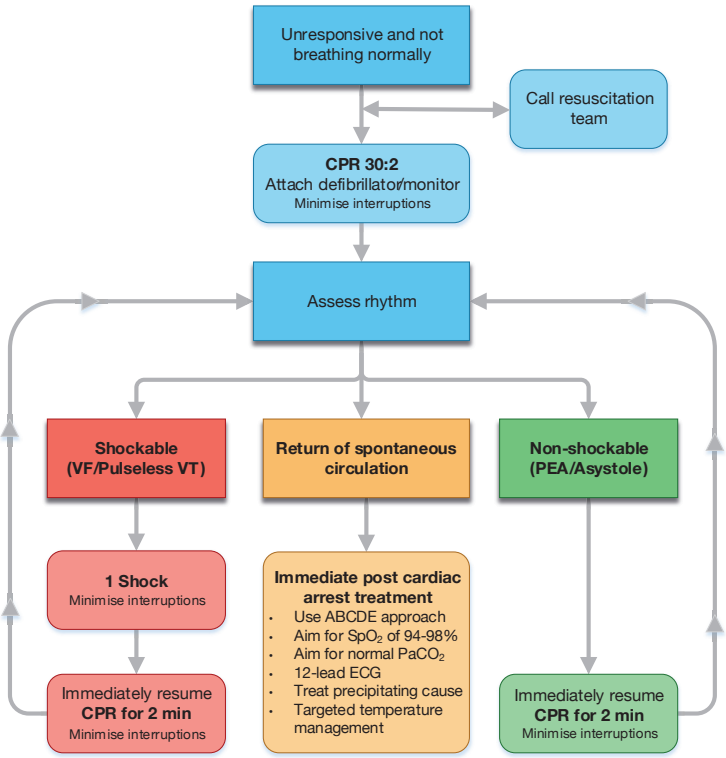
Cardiac science defib showing placement of pads
Mark Fair

Placement of AED pads
The victim's chest must be sufficiently exposed to enable correct electrode pad placement. Chest hair will prevent the pads adhering to the skin and will interfere with electrical contact. Shave the chest only if the hair is excessive, and even then spend as little time as possible on this. Do not delay defibrillation if a razor is not immediately available.

Although most AED pads carry a picture of their correct placement it does not matter if they are reversed. If an 'error' is made, the pads should not be removed and replaced as this wastes time and they may well not adhere adequately when re-attached.

Children
Smaller, paediatric, self-adhesive pads, that reduce the strength of the delivered current during defibrillation, are available for use with AEDs. Standard AEDs are suitable for use in children older than 8 years. In children between 1 and 8 years paediatric pads or a paediatric mode used if available; if not, the AED should be used as it is. There is insufficient evidence to support a recommendation for or against the use of AEDs in children less than 1 year.

AED Algorithm



During CPR

- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

Treat Reversible Causes

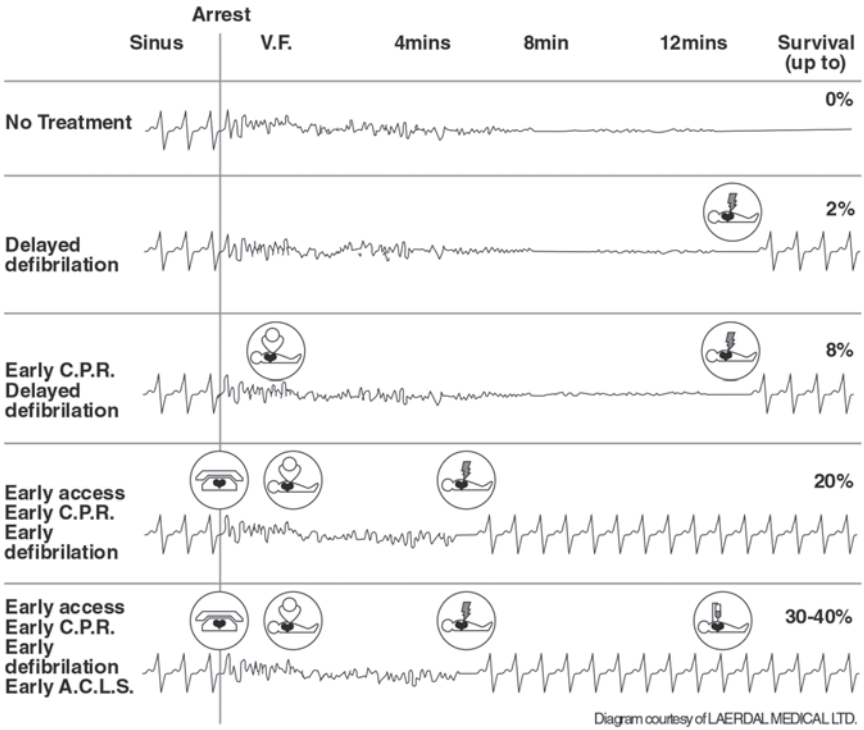
- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia
- Thrombosis - coronary or pulmonary
- Tension pneumothorax
- Tamponade – cardiac
- Toxins

Consider

- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

Chain of Survival

Resuscitation Council (UK) Guidelines 2015



Notes

4D CHOKING

Recognition
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 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. Foreign bodies may cause either mild or severe airway obstruction. The signs and symptoms enabling differentiation between mild and severe airway obstruction are summarised below.

General signs of choking
- Attack occurs while eating
- Victim may clutch his neck

Signs of mild airway obstruction
Response to question 'Are you choking?'
- Victim speaks and answers yes

Other signs
- Victim is able to speak, cough, and breathe

Signs of severe airway obstruction
Response to question 'Are you choking?'
- Victim unable to speak
- Victim may respond by nodding

Other signs
- Victim is struggling or unable to breathe
- Breathing sounds wheezy
- Attempts at coughing are weak or silent
- Victim may be unconscious

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

1. **If the victim shows signs of mild airway obstruction:**
- Encourage him to continue coughing, but do nothing else.

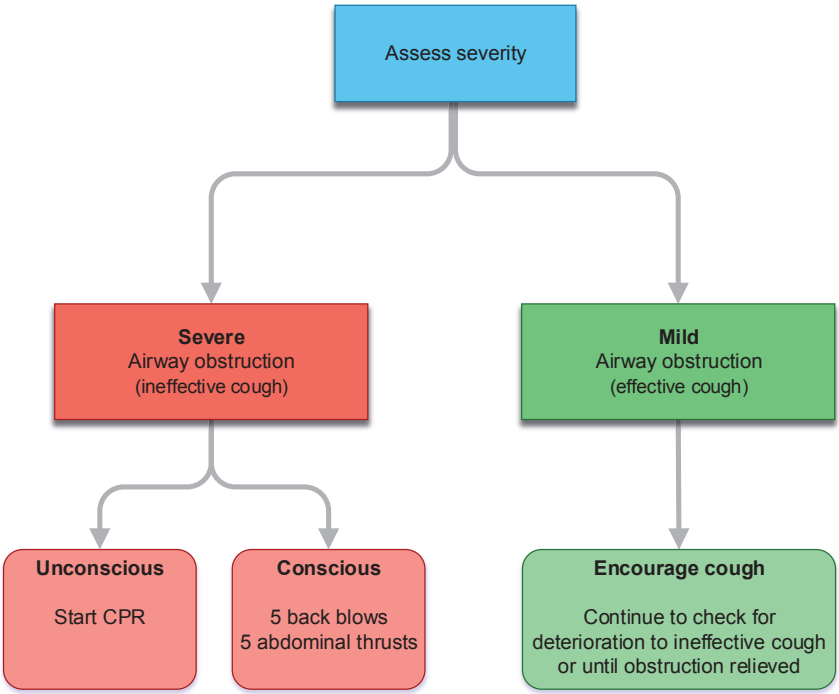
2. **If the victim shows signs of severe airway obstruction and is conscious:**
- Instruct victim to cough
- Give up to **five back blows** by doing the following:
  - Stand to the side and slightly behind the victim.
  - Support the chest with one hand and lean the victim well forwards so that when the obstructing object is dislodged it comes out of the mouth rather than goes further down the airway.
  - Give up to five sharp blows between the shoulder blades with the heel of your other hand.
- Check to see if each back blow has relieved the airway obstruction. The aim is to relieve the obstruction with each blow rather than necessarily to give all five.
- If five back blows fail to relieve the airway obstruction give up to **five abdominal thrusts** by doing the following:
  - Stand behind the victim and put both arms round the upper part of his abdomen.
  - Lean the victim forwards.
  - Clench your fist and place it between the umbilicus (navel) and the bottom end of the sternum (breastbone).
  - Grasp this hand with your other hand and pull sharply inwards and upwards.
  - Repeat up to five times.
  - If the obstruction is still not relieved, continue alternating five back blows with five abdominal thrusts.

Abdominal Thrust
(Heimlich Manoeuvre)

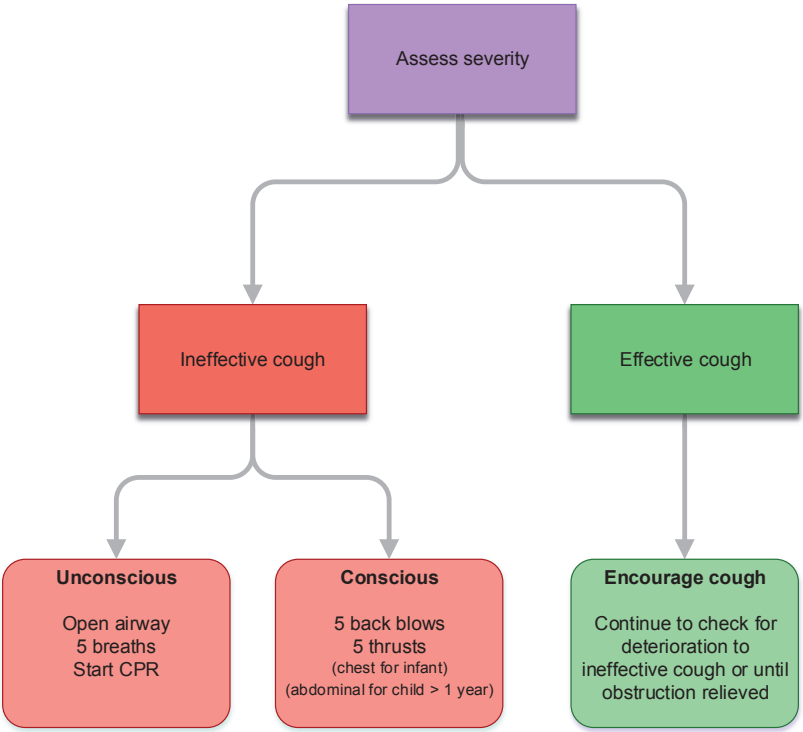
3 If the victim becomes unconscious:

- Support the victim carefully to the ground.
- Immediately call an ambulance.
- Begin CPR with chest compressions (from 5B of the Adult BLS sequence (page 19). Healthcare providers, trained and experienced in feeling for a carotid pulse, should initiate chest compressions even if a pulse is present in the unconscious choking victim.

Adult Choking Algorithm



Paediatric Choking Algorithm



Resuscitation Council (UK) Guidelines 2015

Explanatory notes

Following successful treatment for choking, foreign material may nevertheless remain in the upper or lower respiratory tract and cause complications later. Victims with a persistent cough, difficulty swallowing, or with the sensation of an object being still stuck in the throat should therefore be referred for a medical opinion. Abdominal thrusts can cause serious internal injuries and all victims receiving abdominal thrusts should be examined for injury by a doctor.

4E RESUSCITATION OF CHILDREN

Both ventilation and compression are important for victims of cardiac arrest when the oxygen stores become depleted – about 4-6 min after collapse from ventricular fibrillation (VF), and immediately after collapse for victims of asphyxial arrest. Since the vast majority of arrests in children are from asphyxia rather than cardiac arrest, it follows that children will benefit from initial rescue breaths.

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

- Give five initial rescue breaths before starting chest compressions (adult sequence of actions 5B (page 19))
- If you are on your own perform CPR for approximately 1 min before going for help.
- Compress the chest by at least one-third of its depth, approximately 4 cm for an infant and approximately 5 cm for an older child. Use two fingers for an infant under 1 year; use one or two hands for a child over 1 year to achieve an adequate depth of compression.
- The compression rate should be 100–120 min.

Notes

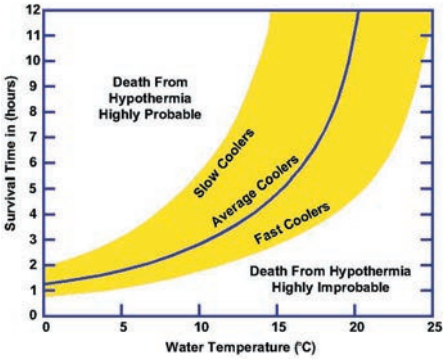
4F RESUSCITATION OF THE VICTIMS OF DROWNING

Drowning is the third most common cause of accidental death worldwide and can be defined as 'The process of experiencing respiratory impairment from submersion / immersion in liquid' (World Health Organisation 2005). The respiratory impairment will lead to asphyxia unless the cause is removed and ultimately will result in death. Near Drowning occurs when a casualty survives submersion or is successfully rescued.

The events leading up to a drowning (or near drowning) usually follow one of two specific sequences.

If the casualty is suddenly exposed to cold water, eg by falling or jumping in, there is a reflex inspiratory gasp which can result in cold water being inhaled. This triggers a reflex which closes the airway (laryngospasm) but does not usually prevent the aspiration of some water first; in 85% of drownings, water is aspirated. The closed airway together with aspiration of water leads to severe hypoxia and other blood chemistry changes leading to cardiac arrest and death. The sudden exposure of the back of the throat to cold water can also directly trigger cardiac arrest in some casualties.

If, on the other hand, a casualty is immersed in water without any immediate submersion, the body starts to cool. An early effect of cooling is that, as a result of the limbs cooling much more quickly than the core, coordinated muscle action becomes impossible and so called 'Swim Failure' occurs. The casualty becomes unable to swim or hold onto anything and may submerge unless a life jacket is being worn. The time to 'swim failure' depends on the temperature of the water and other factors but is about ten minutes in icy cold water and about ninety minutes in water at 10°C. A casualty who is not submerged at this time, will eventually succumb to hypothermia, becoming unconscious and liable to aspirate water as a result of being splashed in the face. The aspiration of water, either as a result of submersion following swim failure or splashing following unconsciousness, leads to the same changes as are experienced in sudden submersion and death by drowning will follow.



The treatment for drowning is complicated by the fact that it will almost invariably first be necessary to rescue the casualty from the water and, as always, safety must be the first consideration.

- Assess response.
- Check ABC and treat accordingly.
- Give five initial rescue breaths before starting chest compressions (adult sequence of actions 5B under Basic Life Support Sequence).
- If you are on your own perform CPR for approximately 1 min before going for help.
- Cautious rewarming may be appropriate.
- Give oxygen if it is available and you are suitably trained.
- Arrange urgent medical help.
- Remember that people, especially children, can survive extended periods of submersion in cold water because of the combined effects of the mammalian dive reflex, which causes oxygen to be retained in the tissues, and the reduced demand for oxygen due to hypothermia.

Sometimes, following a near drowning incident, severe respiratory problems can occur up to three days after the incident. This is due to damage to the lungs from inspiration of a small amount of water leading to an accumulation of fluid within the lungs (pulmonary oedema). Anyone who has been involved in a near drowning should be advised to consult their doctor or, at least, to be very aware of the risk of severe, life threatening complications developing in the following three days.

5. Shock

By the end of this section you should be able to demonstrate an understanding of:

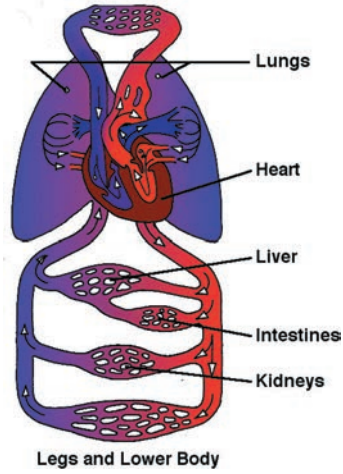
- the processes by which shock develops;
- the body's reaction to shock;
- the way in which the fundamental cause of shock affects the different signs and symptoms which develop;
- the possible treatments which may be appropriate;
- the likely need for urgent medical attention for the casualty.

In this chapter, we will consider clinical (medical) shock. It is important to realise that this is very different from the condition suffered by someone who has, for instance, witnessed an accident and is said to have been taken to hospital suffering from shock. This condition is associated with an adrenaline surge resulting from the stressful experience, the so called fight or flight response, and only usually needs medical treatment if it is associated with some underlying condition which is exacerbated by the sudden surge of adrenaline.

The human body requires an adequate supply of oxygen for cells, tissue and organ systems to function. Temperature control, blood chemistry (must not be either too acid or too alkaline) and the ability to break down sugars to produce energy are also vital for these systems to survive.

Shock, and the body's reaction to it, is a very complex process. In simple terms, it can be defined as the condition of the body when there is a lack of oxygen perfusing the tissues; this causes poor perfusion. The common causes of shock encountered by first aiders are all related to falling blood pressure which results in poor perfusion. The resulting lack of oxygen can be life threatening.

It may help our understanding of shock to think of the circulatory system in the terms of plumbing. There is a pump (the heart), the pipes (blood vessels) and the fluid (blood). If there is a problem with any one of the components a fall in blood pressure can result.



Blood circulation system
Bill Smith

- If the heart does not work properly, the pressure will fall.
- If the blood volume decreases, the pressure will fall.
- If the capacity of the blood vessels increases because they get bigger, the pressure will fall.

A problem with the heart such as a heart attack will cause the blood pressure to fall; the result is a reduction in oxygen perfusing vital organs. This is called Cardiogenic shock. Cardiogenic shock can also be caused by an injury which has resulted in pericardial tamponade (a condition in which fluid or gas fills the space between the heart muscle and its fibrous lining).

Blood Loss Signs and Symptoms

<15%	Up to 750ml	No noticeable change in vital signs
15% – 30%	750ml – 1500ml	Anxiety or aggression. Pulse and respiratory rate increase. Capillary refill > 2 seconds.
30% – 40%	1500ml – 2000ml	Compensatory mechanism failing. Skin pale and sweaty. Anxiety, aggression, drowsiness. Shallow, rapid breathing. Pulse > 100.
> 40%	> 2000ml	Becoming more deeply unconscious. Skin pale cold and clammy. Coma. Death.

Hypovolaemic shock is the result of blood being lost from the circulatory system, there will again be a drop in blood pressure. Knowledge of how the body reacts to this fall helps us to understand why the symptoms of shock present as they do. Reduced circulating blood volume can also be caused by fluid loss through severe burns, vomiting or diarrhoea.

The table lists the normal signs and symptoms of shock associated with percentage of blood loss. The normal blood volume in a human is about 100ml / kg of body weight (1 pint / stone). The blood volumes indicated in the table are approximate for a small adult.

A knowledge of how the body reacts to falling blood pressure due to blood loss helps to understand why the symptoms of shock present as they do.

In the early stages of blood loss the elastic walls of arteries and veins contract to accommodate the loss and maintain blood pressure. This 'compensatory mechanism' will handle up to around 15% blood loss and explains why the signs and symptoms of shock do not normally show at this stage.

As more blood is lost the elasticity of the blood vessels fail to cope and blood pressure begins to fall. This drop in pressure quickly affects the perfusion of the brain bringing about anxiety and / or aggression.

The development of clinical shock is insidious. Oxygen levels in the blood fall while the level of carbon dioxide rises, the body responds by increasing heart and respiratory rate in an attempt to circulate more oxygenated blood. As blood loss increases, peripheral circulation closes down, making the skin cool and pale. Circulation to the digestive system shuts down often causing feelings of nausea, and the body's surface becomes clammy because sweat cannot evaporate on the cold skin.

In the very late stages of blood loss, pulse and respiration may slow down, this is a very ominous sign and death is imminent.

Although cardiogenic and hypovolaemic shock are probably the most common types of shock which the first aider may come across, there are other types which are also important.

Neurogenic shock is caused by damage to the central nervous system either from head or spinal injury resulting in a loss of sympathetic stimulus (See section on anatomy) which causes the blood vessels to dilate resulting in rapidly falling blood pressure. Because part of the nervous system pathway has been lost, the peripheral circulation does not shut down and the heart rate does not increase so that casualties with neurogenic shock present as warm, pink and dry and may have a decreased heart rate. These casualties lose heat very rapidly because there is no peripheral shutdown and therefore must be protected from the cold.

Epipen medic alert necklace
Fiona Gunn

Anaphylactic shock is a severe, acute allergic reaction. The body's normal response to exposure to an allergen is to release histamines at the site of the exposure as part of the mechanism to deal with the allergen. In anaphylaxis, there is a system wide release of histamines which causes massive peripheral vasodilation and plummeting blood pressure. The dilated capillaries also become leaky and fluid leaks from the blood vessels into the surrounding tissues causing swelling. This is commonly very evident around the face and, because it also happens in the throat, causes difficulty in swallowing and potentially life threatening problems with the airway. Extensive hives (nettle rash) is also common. The fundamental cause of the problem is that the blood vessels have expanded. Therefore the skin will not be pale cold and clammy but the pulse and breathing will be rapid. A casualty who has been diagnosed as suffering from anaphylaxis will probably be carrying one (or two) epipens which are devices for the automatic injection of adrenaline into a muscle. This can be life saving and the first aider should help the casualty to self administer. Adrenaline is a specific exception to the regulations governing the administration of injectable medicines so, if the casualty is not capable of self administering, the first aider may actually administer the drug. It is important to realise that, even after the administration of adrenaline, anaphylaxis remains a life threatening condition and urgent medical help is still required.

Another condition which causes shock by making the blood vessels dilate is septic or toxic shock. This is uncommon but could be found in someone with an untreated septic wound.

Epipen medication
Fiona Gunn

Epipen self administration
Fiona Gunn

Immersion trauma is another blood pressure related condition. It is rare but may be of significance to first aiders involved in water sports. Details of this condition will be found in Section 11 – Special First Aid Issues.

Action In all cases and causes of shock, the first absolute requirement is to recognise and treat the underlying cause appropriately.

- Treat the blood loss, remembering that internal blood loss necessitates urgent evacuation to hospital.
- Treat the heart attack. This includes urgent evacuation to hospital.

- Recognise and treat possible spinal injury.
- Manage the airway.
- Protect from cold.
- Do not give anything to eat or drink. Although this is a valid rule, we must never forget that we are treating a person and not an injury and, if looking after a conscious casualty, it is quite in order to alleviate thirst by moistening the lips or permitting occasional small sips of water. Remembering that the blood supply to the digestive system may be shut down, it is important to limit the amount of water intake as much as possible to reduce the risk of nausea.
- Do not allow the casualty to smoke. There is enough carbon monoxide in cigarette smoke to reduce the blood's ability to transport oxygen by 30% and this could be very significant in a casualty in shock.
- Give constant reassurance.
- Constantly monitor vital signs and level of consciousness and respond appropriately to any changes.

As a general rule, the following actions should be considered.

- Elevate the feet to return more blood to the core as long as this is not contraindicated by the casualty's injuries.
- Give oxygen if it is available and you are trained to do so.
- Give constant reassurance.

Shock has been well described as a pause in the act of dying and there is always a high potential for shock to be quite quickly life threatening.

Remember

- Recognise and treat the underlying cause if possible.
- Arrange urgent evacuation to hospital.
- Look after the A-B-C.
- Suspect serious internal bleeding in a casualty who is showing the signs and symptoms of shock without any evident external bleed. In addition, ensure that a thorough check is carried out for any external bleed which may have been missed in an initial examination.
- When blood loss occurs, the compensatory mechanism of a young person reacts far more effectively than that of older people. The down side of this is that it is possible for young people to have lost so much blood before the blood pressure falls and triggers the body's normal responses that death is imminent. A young person who appears to have lost a lot of blood but is not showing the signs and symptoms of shock is in a life threatening condition.
- Think of the possibility of head and / or spinal injury in the casualty who appears to have lost a lot of blood but is not exhibiting the classic signs and symptoms.
- A useful way to monitor peripheral perfusion is the so-called capillary refill test. Press for five seconds on a nail or anywhere where the skin lies close over a bone to blanche the skin. The normal pink colour should return in two seconds.

Questions

True/False

- Shock is caused by a lack of oxygen in the body's tissues.
- Hypovolaemia is uncommon in mountain trauma.
- Anxiety is a late sign of shock.
- One sign of shock is a weak, rapid pulse.
- The signs and symptoms of shock are the same no matter what the underlying cause.

6. Trauma

Trauma, a physical wound or injury, such as a fracture or blow.

6A BLEEDING

Blood is carried around the body in the circulatory system (see section 12) If this system is compromised and bleeding occurs it will cause a drop in blood pressure. The causes are many: cuts, wounds, blunt trauma and penetrating injuries.

Blood loss can be external and visible or internal and hidden. External bleeding can be treated by a first aid provider, while internal bleeding can only be treated effectively in a hospital. It is worth noting that in a remote setting even minor wounds that seep for long periods result in significant blood loss. 'The tap is running and the plug is out'!

We can compensate for about 15%-30% of blood loss before the effects of hypovolaemic shock develop. (see section 5 Shock)

Remember: Protective gloves should be worn at all times when handling casualties.

The European Resuscitation Council (ERC) recommends that elevation and indirect pressure points are no longer recommended for the treatment of bleeding. They also recommend haemostatic dressings and tourniquets are to be used when direct pressure cannot control severe bleeding.

External Bleeding
Actions:

- Quickly examine the wound to ensure that there is no foreign object embedded, then apply.
- Direct Pressure
- Do not remove the first dressing even if it becomes saturated with blood.
- Subsequent saturated dressings may be removed and a new dressing applied.
- Embedded objects should not be removed.

Wrist laceration
Jeff Starkey

Hip laceration
Jeff Starkey

- Treat for 'Shock'
- Call 999 (if at all serious)

Cover the wound with a pressure dressing or improvise, even a gloved hand will do if nothing else is available. Apply direct firm pressure.

Any penetrating object should ideally be left in place and secured before evacuation. 'Do Not Pull it Out' A casualty with severe bleeding should ideally be lying down, with legs elevated to improve circulation to core organs; any such casualty should be rapidly evacuated to hospital. Splint wounds where appropriate to reduce movement.

Fish hook
John Holmes

Abrasions
Clean with water or a proprietary swab, cover with a non-stick dressing taped or bandaged in place, beware of infection. An abrasion that cannot be properly cleaned should go to hospital for a more detailed inspection and cleaning.

Lacerations
(See photographs on page 37). Clean off gross contamination, try to bring wound sides together and apply a suitable dressing, ideally non-stick. Further padding may need to be added to provide sufficient pressure to the wound. A laceration over a joint may benefit from splinting to reduce movement and subsequent disruption of any clotting.

Evisceration
A wound to the abdomen with the protrusion of abdominal contents: Apply a suitably sized non-stick dressing, plastic kitchen wrap or a clean wet dressing with a supporting bandage. Do not apply any material that will stick to the protruding organs. Do not attempt to replace organs. Raise the casualty's knees to reduce abdominal tension, if unresponsive – recovery position with legs bent.

Traumatic Amputation
Treat the 'live' end first! – Pressure and a dressing sufficient to stem bleeding. The amputated part should be kept dry and not washed clean, secure in a clean plastic bag and place the bag in iced water. Do not put the amputated part in direct contact with ice as freezing will kill the tissue.

Bandages – Splints
Any bandage or splint, if applied too tightly, may impair the circulation and/or could cause loss of sensation beyond the site of the injury. These must always be checked and monitored as, if left undetected for a period of time, may cause permanent damage to the tissue. Sensation is easily tested by pain response and circulation can be checked using capillary refill test.

Internal Bleeding
Actions:
- Lie casualty down
- Reassure and inform casualty.
- Monitor vital signs.
- Nothing to eat or drink
- Prompt medical attention

Internal bleeding is frequently hidden to the first aider but if suspected should be of major cause for concern. This occurs most commonly in the chest, pelvis or abdomen. Any trauma victim should be suspected of having an internal bleed if signs of Shock become apparent. If this is the case then speed is of the essence and the casualty should be dispatched to hospital as quickly as possible as the first aider can do little to prevent further blood loss.

Remember a penetrating object should ideally be left in place and secured before evacuation. 'Do Not Pull it Out'

It is essential that a check is made for hidden bleeding from wounds that are not immediately obvious. For example, huge quantities of blood can be lost from a scalp wound dripping into the ground, from a compound fracture or the blood loss concealed by clothing.

A severely injured casualty should be lying down with the legs elevated if possible, to increase blood flow to the core organs.

In all cases of bleeding consider the onset of Shock (see section 5).

Head Injuries
All injuries to the head are potentially life threatening and require a careful and thorough assessment, particularly if the casualty has an altered level of consciousness. This could indicate damage to the brain, rupture of blood vessels inside the skull, a skull fracture or spinal injury. A scalp wound should cause the first responder to consider a deeper, underlying injury, but often there will be little in the way of visible signs. On the other hand, an altered level of consciousness may mask other injuries: hence the necessity for a thorough casualty examination. The 'Do not remove the first dressing' rule does not always apply to bleeds from the head. The exception is when a false clot is forming ie there is a mixture of cerebral spinal fluid and blood. It will form a jelly like substance and will not stop the bleed. After about seven minutes (when generally with a serious bleed the clot starts to form) with a severe head bleed lift a corner of the dressing and examine the clot, even if it is jelly like remove and apply a fresh dressing.

Remember that a head injury may cause unconsciousness; however a casualty may have lost consciousness through some other reason and received the head injury in a subsequent fall.

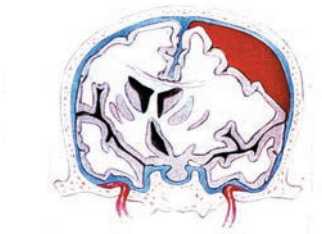
Concussion:
Concussion is the result of the brain being 'shaken' by a violent blow, causing a temporary disturbance of the brain cells. A brief period of unconsciousness can be followed by a complete recovery. Note: Any casualty who has been unconscious should receive medical attention or be taken to hospital for observation.

Signs and Symptoms:
- Brief or partial loss of consciousness following a blow to the head.
- Confusion, dizziness and/ or nausea on recovery.
- Loss of memory of events at the time, immediately preceding or immediately following the injury.
- A generalised headache.

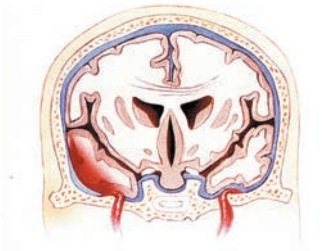
Action:
- Unconscious casualty: Apply Basic Life Support (see section 4b)
- Monitor and record vital signs and level of consciousness every 3-5 minutes.
- Treat for Shock
- Call an ambulance.
- If the casualty regains consciousness within a few minutes, monitor closely and accompany to hospital.

Remember casualties with head injuries may become unconscious some time after the accident.

Cerebral compression:
This is a condition generally associated with head injury and skull fracture; it can however be due to a stroke, tumour or infection. Cerebral Compression is caused by the swelling of an injured brain or by an accumulation of blood exerting pressure within the skull. Compression may develop immediately following a head injury, or may be delayed for some hours or even days.



Subdural
BASP collection



Intracerebral
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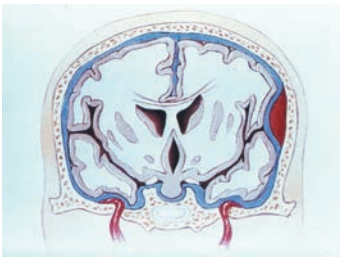


Epidural
BASP collection

Signs and Symptoms:

- Recent head injury followed by recovery.
- Later the casualty's condition may deteriorate.
- Intense headache.
- A decrease in the level of response as the condition develops.
- Weakness or paralysis down one side of the body.
- Unequal or dilated pupils (Do pupils react to light?)
- Personality or behavioural change/irritability.
- Slow, noisy breathing.
- Slow, bounding pulse.
- Fitting.

Action:

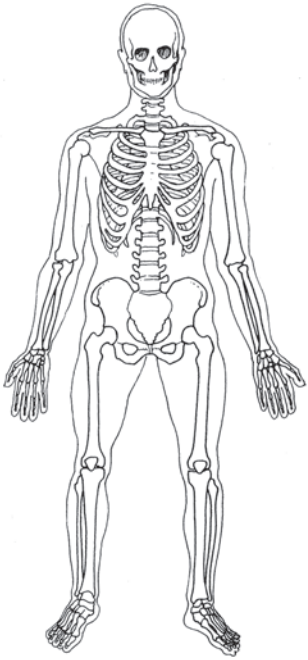
- Unconscious casualty: Apply Basic Life Support (see section 4a)
- Be aware of the possibility of cervical spine injury. (See section 6b)
- Conscious casualty: Should be supported in a comfortable position while maintaining immobilisation of the cervical spine if appropriate.
- Record vital signs.
- Monitor every 3-5 minutes.
- Get medical help urgently.

Questions

True/False

- First aid treatment if an external wound is 'direct pressure'.
- Vital signs change noticeably at 10% blood loss?
- Any foreign objects must be carefully removed from a wound before applying a dressings?
- Immobilisation of the cervical spine is a major part of head injuries management.

6B MUSCULOSKELETAL INJURIES



The musculoskeletal system is made up of the bones, muscles, ligaments, tendons and cartilage. Any injury is potentially serious.

- Fractures, particularly fractures of the pelvis or femur, can be life threatening due to blood loss leading to hypovolaemic shock.
- Rib fractures can be life threatening because they may compromise the casualty's ability to breathe adequately.
- Skull fractures can be life threatening because of underlying brain injury.
- If an injury leads to unconsciousness for whatever reason, that can also be life threatening.
- In the outdoor environment, any injury which prevents or limits movement can be life threatening because the casualty may not be able to escape to shelter.
- Fractures and dislocations can be limb threatening if circulation beyond the fracture site is compromised. This is called distal deficit and may also affect the function of motor and sensory nerves.
- Without adequate treatment, musculoskeletal injuries can lead to long term pain and mobility problems.
- Musculoskeletal injuries can be very painful.

It is clear, therefore, that the first aider must be very aware of all three of the priorities of first aid when dealing with any injury involving bones, joints or soft tissues.

The first aider must also be very aware that, because of the significant forces involved in causing fractures, it is not uncommon to find other associated injuries. Injuries to the organs of the abdomen and thorax should always be suspected with fractures of the pelvis or ribs and brain injury and spinal injury should always be suspected where there is any significant head injury.

Fractures

A fracture is any break in the continuity of a bone. Thus what might be described in lay terms as a crack is, clinically speaking, a fracture. It is important to remember that, in life, a bone is not just the inert material seen in skeletons but is living, growing tissue. As such, it has a significant blood supply and any damage to a bone will result in blood loss which can, in some cases such as the femur and pelvis, be life threatening. Fractures almost always result in damage to the surrounding tissues and this can increase the blood loss causing bruising and much of the swelling normally associated with a fracture.

Classification of Fractures

It is possible to identify a number of types of fracture based on the way that a bone breaks and the precise location of the fracture. Much of this is irrelevant to the first aider who does not have the benefit of X-Rays but there are two things which are very important in deciding what treatment is appropriate. Fractures can be classified as open (compound), where there is a wound associated with the fracture, or closed, where there is no wound. The significance of the presence of a wound lies in the increased risk of bleeding and infection.

Broken wrist
Jeff Starkey

Open (compound) fracture
John Holmes

Broken collar bone
Jeff Starkey

Crushed thumb
John Holmes

Fractures may also be classified as simple or complicated. In a complicated fracture, there is some compromise to the function of blood vessels or nerves resulting either from damage from the broken bone ends or from pressure exerted by the bone or resulting from a gross deformity. With a complicated fracture, there may be such a reduction in the blood supply beyond the injury that it becomes limb threatening.

Causes
Fractures are caused by force being exerted on a bone. The force may be direct or indirect. Taking the example of a fall with the casualty landing on their feet, the heel bone may be fractured by direct force while the force transmitted from the heel up through the bones of the leg to the pelvis and on to the spine and base of skull may result in fractures in any of these areas as a result of indirect force. This is also an interesting example of where pain from one, relatively innocuous injury (the fractured heel bone) may mask other potentially much more serious injuries.

Signs and Symptoms
The following signs and symptoms may be present to some degree but are not always obvious. In all cases, the history of the event and the mechanism of injury are vital considerations since knowledge of what has happened and an assessment of the likely severity of the forces involved is paramount in diagnosing a possible fracture. This is particularly true of spinal injury where signs and symptoms are often completely absent.

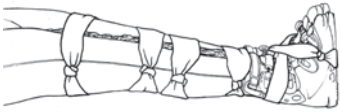
- Pain. Although it is probably the most common symptom of a fracture, it can be completely absent so the absence of pain cannot be taken to rule out a fracture when the mechanism of injury suggests that a fracture is possible. Pain originates from the fracture site largely due to sensory nerves in the periosteum, the fibrous lining of a bone, and also from the surrounding soft tissue. Individual perception of pain varies greatly so the apparent level of pain cannot be taken to indicate the severity of the injury. Pain is normally increased by movement.
- Deformity. This may be seen as angulation or shortening of a limb but is not always obvious.
- Swelling. This is often a late sign. Swelling can be massive and contain large amounts of blood.
- Bruising. Again, this can be a late sign. It may be extensive.
- Loss of function. This may be seen as loss of mobility at a joint or as an inability to weight bear.
- Crepitus. This is the grating sound which results from the broken ends of bone rubbing together. This should be noted but not actively sought.

General Rules for Treatment:
With the one exception noted below, the first aid treatment of a fracture should always be conservative.

- Immediately, or at an early stage, carry out a full primary survey to identify and treat life threatening injuries. Ensure that the airway is protected and that the casualty is breathing adequately. Place the casualty in the recovery position if appropriate.
- If a fracture is suspected, either from information given by the casualty or by others or from examination, the fracture site must be exposed down to skin level to ensure that any treatable complications are identified.
- Treat any complications found, e.g. the wound associated with an open fracture.
- Ensure that medical help, ambulance, mountain rescue, ski patrol as appropriate, is summoned.
- Support the injury in the position of greatest comfort. If the casualty is conscious, this will be in the ‘as found’ position.
- With a limb fracture, check for circulation and response beyond the fracture. If circulation or sensation is impaired or absent, this must be regarded as a limb threatening situation and consideration should be given to

manipulating the fracture to restore circulation or sensory ability. This is the one exception to the rule of conservative treatment. It must be recognised that this is likely to be painful, the casualty should be informed and give permission. In order to restore circulation, the limb should be moved into a more normal anatomical position. While the fracture is being manipulated, the limb should be well supported with the application of slight traction. The limb beyond the fracture is rotated and straightened, towards a normal anatomical position. This problem is particularly common with fractures of the upper arm close to the elbow where the brachial artery is likely to be compromised. These fractures are extremely painful and mobility of the elbow joint is significantly reduced. If the radial pulse is absent, the arm should be slowly straightened until the pulse returns. If this cannot be achieved, the injury must be treated as a surgical emergency and immediate evacuation to hospital arranged.

- Splinting a fracture will provide support and relieve pain but should only be considered by the first aider in most cases if medical help is delayed and it is necessary to move the casualty. Generally speaking, the first aider will not have access to proper splints and, if a limb must be immobilised, it will be necessary to improvise. Slings can be very helpful in immobilising arm and shoulder injuries; it may also be useful to bind the injured arm to the body. Injured legs can be immobilised by binding to the uninjured leg



Leg fracture
immobilised with triangular bandages

Elevation sling
Mark Fair

Triangular sling
Mark Fair

Collar and cuff sling
Jane Dunbar

LOTS splint
Tony Cardwell

Considerations for Specific Fractures
Skull Fractures

All injuries to the head require careful assessment as they may indicate damage to the brain, bleeding inside the skull (see page 39), or a skull fracture. Any blow to the head which has caused a wound is also a strong indicator for spinal injury. Scalp wounds frequently bleed profusely and the bleeding must be controlled but direct pressure should be avoided if there is any depression or boggy swelling suggesting an underlying skull fracture. The following are indicators for skull fracture.

- A wound or bruising to the head. Beware of deteriorating level of consciousness.
- A boggy swelling or depression in the skull.
- Blood in the white of the eye. If the bleeding into the white of the eye extends to the outer limit of the eye, this is strongly indicative of a skull fracture whereas more localised bleeding is more likely to be due to damage to the eye itself.
- Blood and / or cerebro spinal fluid (CSF – the clear, straw coloured liquid which bathes the brain inside the skull) leaking from the nose or ear.
- Black eyes on both sides (racoon eyes). This is normally a late sign.
- Bruising over the bony prominences behind the ears (Battles sign). This is a late sign.

Head injury
Davy Gunn

Action:

- If the casualty is unconscious, look after A-B-C. Consider the possibility of spinal injury.
- A conscious casualty should be supported in a position of comfort. Lying down with the shoulders slightly raised may be beneficial.
- Allow any discharge from the nose or ear to drain. Do not plug.
- Arrange urgent medical help. Monitor constantly while waiting for help to arrive.

Facial Fractures

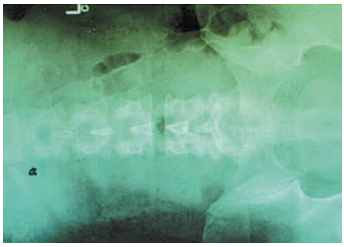
Distortion or misalignment of the face or jaw may be evident. Fractures of the bones of the face – jaw, face, cheek and nose – often result in profuse bleeding inside the mouth which can compromise the airway. With double fractures of the mask of the face, the face may fall backwards taking the soft tissue structures of the roof of the mouth with it. This will result also in compromise of the airway.

Action:

- Look after A-B-C. The conscious casualty must be placed in a position which, as well as being comfortable, must allow drainage of blood to protect the airway and reduce the risk of nausea arising from blood getting into the stomach.
- Consider the possibility of spinal injury.
- Consider manipulating the mask of the face if necessary to protect the airway where there are double fractures of the mask of the face.
- Get urgent medical help and monitor.

Spinal Fractures

Spine fracture
David Sedgwick



Spine fracture x-ray of injury above
David Sedgwick

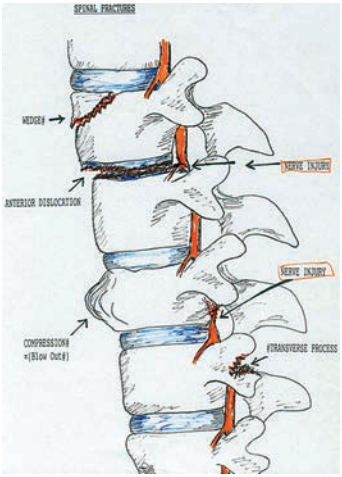


Diagram of spine
Jane Dunbar

Although spinal fractures are, in fact, relatively rare, the consequences of mishandling a casualty with a spinal injury can be devastating. For this reason and because there will often be no positive indication permitting the diagnosis or the exclusion of spinal injury, the first aider must always have a high index of suspicion of spinal injury. Where the history and the mechanism of injury suggest the possibility of spinal injury, it should be assumed and treated. Never forget that, even in the presence of suspected spinal injury, the normal priorities must be followed. Safety and the management of A-B-C will always take precedence. For airway management of a potential spinal injury use a jaw thrust manoeuvre if trained to do so.

The following are strong indicators for possible spinal injury.

- Any significant wound above the level of the collar bones.
- Any fall
  - From a height greater than ten feet.
  - From any height with a bad or awkward landing (including from a horse or bicycle).
  - On stairs from higher than the sixth step.
- Road traffic accidents involving speeds of greater than 20mph.
- The conscious casualty may also complain of pain and / or loss of sensation or motor ability.

Action:

- Safety.
- A-B-C
  - Manual immobilisation of the casualty's head in the neutral position. The casualty's head should be moved into the neutral position if necessary unless:
  - It is impossible due to muscle spasm or the conscious casualty resists movement.
  - It causes pain in the conscious casualty.
  - It adversely affects sensation or motor ability in the conscious casualty.
  - It results in a compromise to the airway or respiration.
- Primary survey and deal with any life threatening injuries while, if possible, protecting the spine.
- Get urgent medical help.
- If the casualty must be moved, eg to a place of safety or to a position where examination and treatment is possible, great care must be taken to protect the spine keeping the head in neutral alignment at all times and preventing any bending or twisting.
- Beware of spinal shock. Protection from the cold may become a priority.

Neck Stabilisation
Davy Gunn

Shoulder posterior view Thorax
BASP collection

Rib Fractures
Rib fractures, unless breathing is compromised, are always treated conservatively. The most effective treatment is usually to place the arm on the injured side in an elevation sling and bind it to the body to provide light splinting of the injury. It is, however, possible that rib injuries may compromise the casualty's breathing to the extent that they become life threatening and it is essential that, if a rib injury is identified during the primary survey, it is exposed down to skin level and examined to treat or eliminate penetrating chest injury or flail segment.

Penetrating Chest Injury
Not commonly associated directly with rib fractures. A penetrating chest injury will be very painful accompanied with obvious respiratory distress. There may be an accumulation of air in the fatty tissues directly under the skin which gives the skin the appearance and feel of bubble wrap. Cyanosis may also be evident due to the poor oxygenation resulting from reduced lung function.

If the chest wall is penetrated, air can be drawn into the chest cavity by the pressure changes which occur during the process of respiration, it being easier for air to pass through the hole in the chest wall than down the airway and into the lung. Without treatment, this has the following results.

- The lung on the injured side does not function. This has an immediate effect on the casualty's oxygenation and vital functions.
- If the same quantity of air can escape from the chest during expiration as that which is drawn in during inspiration, lung function is normal. If there is a difference due to a penetrating wound, the lung on the injured side will collapse because air builds up in the chest cavity.
- Air will continue to build up in the chest with each succeeding breath until the structures which are suspended in the middle of the chest, the heart and great vessels, are compromised. The function of the heart will be impaired as pressure builds up.

- The structures in the middle of the chest will be pushed across resulting in the trachea being displaced away from the injured side. This is a late and ominous sign.
- The lung on the uninjured side will be pressurised and will begin to collapse.
- Death.

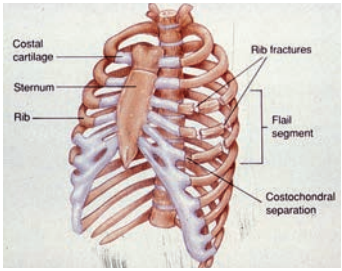
Action:

- The European Resuscitation Council (ERC) suggest against the application of an occlusive dressing to individuals with an open chest wound. In making this recommendation, they place higher value on the avoidance of the potential life-threatening complication of tension pneumothorax, compared with other risks associated with an open chest wound.
- Get urgent medical help and monitor the casualty.

Remember, a tension pneumothorax can arise from lung tissue damage without any penetration of the chest wall. It can also arise spontaneously without any history of injury but this is uncommon.

Flail Segment

Like the penetrating chest wound, this is a relatively uncommon injury which can be life threatening but is easily treatable if it is identified. It involves a double fracture line through two or more ribs which leaves a small section of rib cage attached to the surrounding ribs only by muscle. Because of the pressure changes within the chest during respiration, the loose, or flail, segment tends to move in while the rest of the chest wall is moving out during inspiration and out while the rest of the chest wall is moving in on expiration. This is known as paradoxical breathing. The movement of the flail segment in opposition to the rest of the chest wall causes the broken ends of bone to grate past each other at each breath. This is very painful and results in a significant reduction in respiratory effort, poor oxygenation and loss of respiratory drive as the brain is affected by the lack of oxygen. This further reduces oxygenation and the casualty



Flail segment
BASP collection

can become more and more hypoxic until death ensues.

Action:

- Using a gloved hand, hold the flail segment below the level of the surrounding ribs as the casualty breaths in and out.
- Splint the flail segment by placing a thick pad over it and taping the pad to the adjacent sound ribs.
- Get urgent medical help and monitor the casualty.

Femur (Thigh) Fractures

Mid shaft fractures of the femur and fractures of the neck of femur are commonly associated with shortening of the injured limb and a pronounced out turning of the toes. Significant bleeding is common; shock will develop and may be life threatening. The casualty should not be moved before medical help is available unless it is absolutely necessary. If it is indeed necessary to move the casualty, eg to a place of safety, the injured leg should be splinted by binding it to the uninjured leg using lots of padding. The legs should be bound firmly together from the ankle – figure of eight bandage – to the pelvis, the principal of splinting in this way being that there should be bandages above and below the fracture site and that the joints on either side of the fracture should be immobilised as far as possible. Always check for circulation at the foot after splinting in case bandages have been tied

too tightly. See page 6b. Urgent medical help should be called for any casualty with a fractured femur because of the risk of life threatening bleeding. In general, the first aider's action should be limited to making the casualty as comfortable as possible while waiting for help, treating for shock if necessary, giving reassurance and monitoring the casualty's condition. Should the level of consciousness deteriorate, look after A-B-C.

Pelvic Fractures
Pelvic fractures require considerable force and are commonly associated with internal injuries, profuse bleeding and extreme pain. Because of the risk of exacerbating internal injuries, the first aid treatment of a fractured pelvis must be conservative and may be limited to making the casualty as comfortable as possible without any attempt at splinting.

In all cases, urgent medical help is required. As with the femur fracture, the first aider's action should be limited to making the casualty as comfortable as possible while waiting for help, treating for shock if necessary, giving reassurance and monitoring the casualty's condition. Should the level of consciousness deteriorate, look after A-B-C

Other Limb Fractures
Fractures of the lower leg, arms, feet and hands should be dealt with in line with the general rules for treatment. Injuries to the arms and hands can be dealt with very well by placing the arm in a sling and, in many cases, the casualty will be able to self evacuate.

Dislocations
All bones in the human body are joined to other bones in some way. Fibrous joints such as the joints between the bones of the skull allow very little movement, cartilaginous joints, such as those between the ribs and the sternum, because of the flexibility of the cartilage allow limited movement. The main, mobile joints in the body are classed as synovial joints and allow a great range of movement. There are six different types of synovial joint which permit different ranges of movement in one or more planes; in all of them, the bones are lined by cartilage and lubricated by synovial fluid. Any joint may be dislocated.

The signs and symptoms of dislocations are similar to those of fractures but deformity and loss of mobility are generally more obvious. Dislocations are frequently excruciatingly painful and must be dealt with carefully. Because of the risk of fractures associated with a dislocation and of damage to the soft tissues, muscles, tendons but mainly ligaments.

Action:
Follow the normal rules for casualty approach and assessment, i.e. think safety, A-B-C.

In relation to any dislocation identified during the examination the following points are important:
- In many cases, the casualty will be unable or unwilling to self evacuate because of an inability to weight bear or because of pain or discomfort so appropriate assistance must be summoned.
- Support the conscious casualty in a position of comfort.

- If the casualty is prepared and able to self evacuate, immobilise the joint by splinting, ie by binding to the body, in the position in which it was found.
- Do not manipulate a dislocation unless:
  - There is no circulation beyond the injury. In this case very gentle straightening may be attempted but it is unlikely that the casualty will tolerate this. If a distal deficit cannot be corrected, the situation must be treated as a surgical emergency and urgent medical help summoned.
  - It is a recurrent dislocation. This is not uncommon in shoulder dislocation where the casualty may well be able to reduce the dislocation with (or without) the help of the first aider.
- Continue to monitor the casualty.

Shoulder dislocation
Mike Langran

Strains and Sprains
Injuries to muscle and tendons are classified as strains and injuries to ligaments are classified as sprains. It is frequently impossible to differentiate between fractures, dislocations and soft tissue injuries and, quite commonly all three will be present. Soft tissue injury will always accompany a fracture or a dislocation. If in doubt, always treat as a fracture and arrange evacuation to hospital for assessment by a doctor.

Sprained ankle
Jeff Starkey

The urgency of evacuation and whether or not the casualty can self evacuate will be decided by the precise nature of the injury. In relation to ankle and knee injuries, it should be noted that, even when a casualty is able and willing to self evacuate, this may be very damaging and this must be taken into consideration when making any decision.

Tendons, cartilage and ligaments have a relatively poor blood supply and so heal very slowly and the aim of the first aid treatment is to minimise swelling and maximise the blood flow to the injury site. All except very minor soft tissue injures will benefit from the attention of a doctor or, preferably, a physiotherapist no later than the second day after the injury occurs.

Action:
The treatment for soft tissue injuries is based on the PRICE system. Some of the actions in the following list are appropriate for a number of days after the injury. Strictly speaking this is outwith the scope of first aid but they are included here for completeness.

Protect
- From further damage and stop activities which make things worse.
- Use crutches, sticks, braces, splints, slings as available and appropriate.
- Protective supports may be required from between three days for a minor injury to a week or longer for more severe injuries.

Rest
- The injured part should be rested completely for the first 24 hours at least. Between one and three days, gentle movement can restart but, to avoid damage, should be limited so as not to cause pain.

Ice
- The application of cold is very beneficial in the first 24 hours after injury but it must be done with care.
- Use crushed ice, frozen peas or similar sources of cold. Do not apply directly to the skin.
- Apply for five to ten minutes every hour.
- Reduce the time of application to no more than five minutes over bony prominences.

Compression
- Using tubigrip, crepe bandages etc., support the injured joint for 15cm to 20cm on either side of the joint.
- The pressure applied by the bandage should be uniform or increase slightly the closer the bandage gets to the heart.
- Ensure that the bandage is not too tight.
- Check that the skin underneath the bandage is well perfused and remains pink.
- Check that there is circulation to the limb beyond the bandage.
- Do not apply compression when the casualty is lying down, ie remove at night, or when the limb is elevated. Compression should be applied for up to three days.
- The bandage must be capable of accommodating swelling. Particularly in the first 24 hours after injury, regular checks must be made to ensure that swelling has not made the bandage too tight.

Elevation
- It will be beneficial to raise the injured limb slightly above the level of the heart.
- As noted above, do not apply compression to an elevated limb.
- Do not suddenly return an elevated limb to a dependent position or the sudden 'rebound' in blood flow may actually increase swelling.

6C BURNS AND SCALDS

Anatomy & Physiology
One of the largest organs, the skin plays key roles in protecting the body from injury and infection and in maintaining a constant body temperature. The skin consists of two layers of tissue – an outer layer (epidermis) and an inner layer (dermis) – which lie on a layer of subcutaneous fat. The outermost layer of the epidermis is made up of dead, flattened skin cells which are constantly shed and replaced by new cells from the lower part of this layer. The epidermis is protected by an oily substance called sebum, secreted from sebaceous glands, this substance keeps the skin supple and waterproof.

The inner layer of the skin, the dermis, contains the blood vessels, nerves, muscles, sebaceous glands, sweat glands and hair follicles. The ends of sensory nerves within the dermis register sensations from the body's surface, such as heat, cold, pain and even the slightest touch. Blood vessels supply the skin with nutrients and help to regulate body temperature by conserving or releasing heat.

Burns are injuries that damage and kill skin cells, and are most commonly caused by exposure to flames, hot objects, hot liquids, chemicals, radiation or a combination of these. Scalds are caused by contact with wet heat – boiling fluid or steam. Electrical burns are less common, but have the potential to be more serious as the depth of the burn is usually greater than is apparent, and heart irregularities may occur.

Burns are classified as either:
Superficial:
- Involves only outermost layer, skin becomes red, swollen, tender

Partial thickness:
- This affects the epidermis, the skin becomes red and raw, blisters form over the skin due to fluid released from damaged tissue.

Full thickness:
- All layers of the skin are affected, there may be damage to blood vessels, nerves, fat and muscle tissue.

Burns that need hospital treatment:

- If the casualty is an infant, child or elderly person
- All full thickness burns
- All burns involving the face, hands, feet or genitalia
- Facial burns may involve the airway, emergency life support may be required if the patient has respiratory difficulties
- All burns that extend right around a limb
- All partial thickness burns greater than 1% of the body surface area (an area the size of the palm of the casualty's hand)
- All superficial burns larger than 5% of the casualty's body surface area
- Burns with a mixed pattern of varying depths
- If the burn was caused by: Laser Industrial microwave equipment Infra-red or ultra-violet rays Nuclear radiation

If you are unsure about the severity of any burn, seek medical attention.

Casualty care and treatment:

- Ensure safety, and wear disposable gloves if available
- For thermal or radiation burns, cool the burn with cooled water for at least 10 minutes. For chemical burns, at least 20 minutes. For bitumen burns, at least 30 minutes. For phosphorus burns, keep wet at all times.
- Ensure that contaminated or smouldering clothing is removed unless it is still sticking to the skin
- Remove tight clothing and objects, eg rings, wrist watch etc.
- After cooling cover wound with a clean, non-stick sterile dressing or plastic wrap etc.
- Flush chemicals from the skin, pay special attention to the eyes
- Treat for shock
- Do not burst blisters

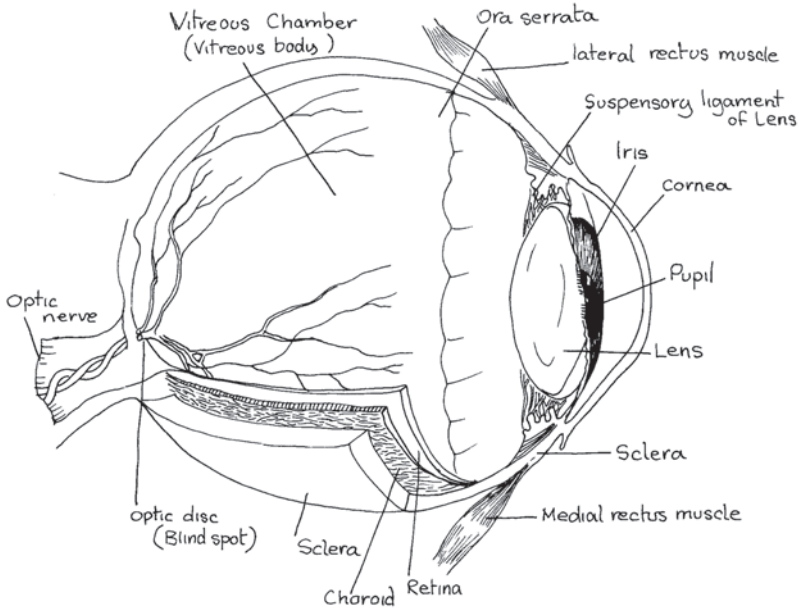
Scald
John Holmes

6D EYE INJURIES

Structure: The eyes are spherical structures approximately 2.5cm in diameter and are filled with fluid. They have focussing elements – the lens and cornea. The retina contains cells which are light and colour sensitive.

The eyes are robust, complex sensory organs, which allow us to see the world around us. The eye consists of an iris which is the coloured part, a pupil, a small opening which allows light to enter the eye, the size of the pupil changes depending on the amount of light entering. Rays of light are focused through the lens onto the retina at the back of the eye. The retina contains cells which convert this information into electrical impulses which travel along the optic nerve into the brain where we 'see' the images.

The eyes are protected by bony sockets within the skull. The front surfaces of the eyes are protected by delicate membranes called the conjunctiva. The eyelids blink frequently cleaning the surface of the eyes and shielding them from dust and other minute particles.



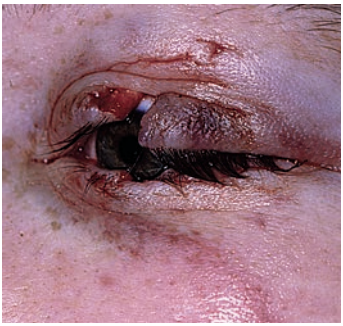
Structure of the eyeball

Foreign Body In The Eye:
A speck of grit or an eyelash on the surface of the eye can cause intense irritation but with irrigation is usually fairly easily washed off.

- Advise the patient not to rub the affected eye.
- If irrigation fails to remove the particle, touch it with the corner of a clean wet cloth to see if it will lift off the surface.
- If the particle cannot be washed out or lifted off, cover the eye and seek medical attention.

Anything resting on the pupil or iris (coloured parts of the eye) which does not move when blinking should not be touched, also anything stuck to the surface of the eye, or penetrating the globe. These conditions should receive medical attention as soon as possible.

Wounds To The Eye:
A direct blow can bruise the eye, the eye can be cut or penetrated by shards of debris, or the surface of the eye can be abraded by particles of grit. Because of the possible risk to the casualty's vision all eye injuries are considered potentially serious. A superficial abrasion to the eye can result in scarring and/or infection, which could result in a permanent deterioration of the casualty's vision.



Eye Injury
Ian McLaren

Characteristically these injuries present with severe pain and spasms, blood in the eye, vision disturbance, an actual penetrating object, with the possible protrusion of eye content.

- Lie the casualty flat and ensure complete rest.
- Cover the affected eye do not disturb anything penetrating the eye.
- Do not attempt to remove anything penetrating the eye.

Consider covering both eyes if the casualty will tolerate it.

Arrange for the casualty to be transported to hospital by ambulance.

Injury to Pupil
Ian McLaren

Chemical Burn To The Eye:
Chemicals splashed into the eye can cause serious damage if not treated properly and promptly. Such splashes can cause irreparable damage to the surface of the eye, leading to scarring or even permanent loss of vision.

Try to get a history of the incident from the casualty or bystanders. There may be evidence of chemicals, or chemical containers in the vicinity, try to find out what the substance was. There may be intense pain and watering of the eye, redness and swelling, and an inability to open the injured eye.

The affected eye requires copious irrigation to dilute and disperse the chemical.

Caution:
When irrigating the eye it is essential that rinsing water contaminated by the chemical does not run into the unaffected eye, or is not splashed onto you or the casualty.

- Put on protective gloves and apron if available.
- Hold the affected eye under gently running cold water for at least 20 minutes.
- Irrigate the eyelids both inside and out thoroughly.
- If the eye is in spasm and shut, gently pull the eyelids open to irrigate.
- Use a sterile eye dressing, or a clean non-fluffy dressing to cover the eye.
- Arrange to get the casualty to hospital as soon as possible.

Flash Burn To The Eye:
Caused by exposure to the flash from arc welding, similarly when the cornea is damaged by prolonged exposure to ultraviolet light such as the glare of sunlight reflected off snow.

This can be recognised by pain, and a 'gritty' feeling in the eyes, redness, watering, and sensitivity to light.

Protect the casualty from further exposure.

- A cool damp pad over the eyes will give some relief.
- Do not attempt to remove contact lenses.
- Arrange to get the casualty to hospital.

Notes

7. Medical Emergencies

Common Medical Emergencies are often seen as not being first aid issues but this is certainly not the case; statistically in the outdoors they are probably the most common reason for loss of life. Early recognition is paramount as a quick reaction to address a problem is essential. Having prior knowledge of people's health issues is the best approach to these emergencies. Most Outdoor centres/employers today ask specifically for a medical declaration. This is not always possible, so asking people and making yourself available for them to declare these possible emergencies to you on a one to one basis is good practise.

This is the best form of preventative medicine and the one that must be recommended along with then ascertaining their medication and the optimum treatment for that person.

The following sub sections are probably the most common of these medical emergencies.

7A BREATHING DIFFICULTIES

The process of respiration is vital to life in that it is this which draws oxygen in for ultimate distribution throughout the body. Breathing is controlled by the respiratory centre in the brain which, in a healthy person, responds primarily to levels of carbon dioxide, as well as to a lesser extent oxygen in the blood to regulate breathing. Because of complex physiological processes, some people with chronic respiratory problems may respond perversely to oxygen therapy and this can be a consideration in advanced first aid. This is not normally significant in first aid. The mechanism of breathing is detailed in Section 12.

The respiratory centre is located in the brain stem which is the part of the brain which narrows down to become the spinal cord after it passes through the base of the skull. This location makes the respiratory centre vulnerable to increases in pressure within the skull such as occur following bleeding into the skull (see page 39).

Breathing difficulties can be caused by acute (immediate) problems or by chronic (long term) problems.

ACUTE PROBLEMS

Asphyxia
This is the medical term for anything which prevents oxygenation of the blood. Any cause of asphyxia must be treated as a matter of extreme urgency since lack of oxygen (hypoxia) is rapidly life threatening. Common symptoms of hypoxia are increased respiratory rate, distressed breathing and gasping. Cyanosis, a blue colouration of the skin around the lips, ear lobes and cheeks, may also be evident. The casualty will rapidly become unconscious and breathing will cease. Some forms of poisoning, eg carbon monoxide, also cause asphyxia (see Section 4d).

Choking
This is covered in Section 4d.

Drowning
See Section 4f.

Hyperventilation
This is a persistent, rapid breathing pattern which may be caused by exercise or anxiety. A casualty who is hyperventilating will blow off much more carbon dioxide than normal from the blood and this change to the blood chemistry may begin to affect the brain resulting in anxiety (which can make the hyperventilation worse), confusion and a reduced level of consciousness. Someone who is hyperventilating as a result of exercise will usually recover to a normal breathing pattern naturally. If the cause is other than exercise (anxiety, panic attack), then the casualty should be reassured and calmed down as much as possible.

Chest Injury
Damage to the chest wall by multiple rib fractures or penetrating injury can lead to severe breathing difficulties.

Broken ribs can be very painful and, particularly if a flail segment is present, respiration can be so depressed that severe hypoxia develops. This affects the brain resulting in further respiratory depression and the downward spiral of respiratory effort can be life threatening. See page 49.

A possible complication of any chest injury is pulmonary contusion or bruising of the lung tissue. This results in the alveoli filling with blood and fluid and can lead to a significant reduction in the gas exchange in the injured lung. This is a significant cause of hypoxia.

A penetrating chest injury, results in air entering the chest cavity through the hole and creates pressure changes within the chest during breathing. If air can escape from the chest when the casualty is breathing out, this is called a simple pneumothorax and results in the lung on the injured side not functioning properly with consequent significant reduction in the effectiveness of the breathing. If air cannot escape, pressure builds up within the chest collapsing the lung on the injured side then putting pressure on the heart, leading to reduced cardiac output and shock, then, finally, pressurising the lung on the uninjured side. This is called a tension pneumothorax and the effect on the breathing can be catastrophic rapidly leading to death.

Symptoms of a penetrating chest injury may include frothy bleeding at the wound site, respiratory difficulty and a bubblewrap like accumulation of air under the skin called subcutaneous emphysema.

Tension pneumothorax can also result from damage to the lung itself and, in this case, is not treatable by the first aider but requires urgent transfer to hospital. A possible late sign of tension pneumothorax is deviation of the trachea (windpipe) away from the central position it usually occupies in the neck towards the uninjured side.

For treatment of a penetrating chest injury, see page 49.

The life threatening potential of chest injuries together with the ease of treatment in some cases highlights the importance of exposing any injuries that are identified during a casualty examination. A life could easily be lost just because a treatable life threatening injury was not identified and treated simply because it was not exposed and examined.

Dental and Facial Injuries
These injuries can lead to severe breathing problems because the airway can be compromised by bleeding, broken or loose teeth or by the tongue or the palate. Shock may also develop and spinal injury should always be suspected in the presence of facial injuries.

If there is profuse bleeding within the mouth, the casualty should be placed in the recovery position to encourage drainage whether they are unconscious or not. If possible, pressure should be applied to stop the bleeding.

Fractures to the mask of the face can result in the hard palate and upper teeth moving backwards and blocking the airway. In such cases, it will be necessary to pull the mask of the face forward to clear the airway. While doing this, a bite block should be used to prevent the casualty biting the rescuer's fingers if the jaw muscles go into spasm.

A fractured jaw can result in a loss of control of the tongue with airway blockage. This can be dealt with by using a jaw thrust to clear the airway.

Lightning Strike
As well as causing other, sometimes massive trauma, this can temporarily paralyse the respiratory centre and ventilatory support will be necessary until the paralysis recovers.

Chronic Problems
Chronic problems are typically not treatable by the first aider but, where identified, may highlight a need for urgent medical attention.

Adult Respiratory Distress Syndrome (ARDS)
This is a condition in which the capillary (small blood vessels) walls become permeable and the lungs fill with fluid from the blood stream (pulmonary oedema). It develops, usually in casualties with previously healthy lungs, following injury or illness affecting the lungs. Regardless of the specific cause, the lungs become congested and wet with reduced ability to transfer gas to and from the blood stream in the alveoli. ARDS leads to severe hypoxia and has a mortality rate of about 50%. A casualty with ARDS will have rapid, laboured breathing and may be cyanotic.

Chronic Obstructive Airway Disease (COAD)
This is a condition in which the size of the airway is reduced leading to breathing difficulties. The most common cause is chronic bronchitis in which the bronchi are filled with excess mucous. The resultant breathing difficulty will typically be evident on both breathing out and in. Chronic bronchitics are often cyanosed with swollen ankles and legs and distended neck veins and are sometimes known as 'blue bloaters' for this reason.

Chronic Obstructive Pulmonary Disease (COPD)
This is the end stage of a prolonged disease process resulting in emphysema which is a condition in which the alveoli are much enlarged and reduced in number resulting an a significant reduction in the area available for gas exchange. Because the condition reduces the natural elasticity of lung tissue, the normal recoil which assists in breathing out is absent and people with COPD find breathing out difficult. People with COPD commonly present as breathing rapidly through pursed lips and have a flushed complexion giving rise to the description of 'Pink Puffer'.

Notes

7B ASTHMA

Asthma is a condition which affects the airways. The airways are irritated or inflamed and react badly to viral infection or when in contact with a trigger. About 1 in 12 adults in the UK are treated for Asthma each year; the incidence in children is much higher and on the increase. Triggers are many and various, but are anything which irritates the airways. The effect of the trigger is that the muscle around the wall of the airway tightens and the airway narrows. The airway lining becomes inflamed and swollen, often sticky mucus or phlegm is produced, further reducing the size of the airway, resulting in a wheeze or cough. Aminor asthma attack can become a life threatening condition in a very short space of time.

Cross section of airways with and without inflammation
Asthma UK

Signs and Symptoms:

- These may be mild, moderate or severe.
- Anxious and distressed
- Shortness of breath
- Expiratory wheeze
- Difficulty in speaking
- Possible blueness in lips/ear lobes etc (oxygen low)
- Tightness in the chest
- Coughing

Triggers/Causes:

- Flu, viral infections.
- House dust mites.
- Cigarette smoke.
- Furry animals or feathered birds.
- Exercise.
- Pollen.
- Air pollutants.
- Weather.
- Mould & fungi.
- Medicines.
- Hormones.
- Work.
- Food.

The effect of any of these triggers can be increased by cold air and stress.

Action:

- Reassure and calm casualty
- Ensure supply of fresh air
- Have the casualty self administer their reliever inhaler (blue) and one puff every minute
- Sit them down and support them in a semi recumbent position in order that they can utilise their secondary muscles of inspiration (do not lie the casualty down).
- Encourage them to breathe more slowly
- Call an ambulance immediately if they stop wheezing or coughing, (a silent asthmatic attack is often life threatening) or if their reliever has no effect within 5-10 minutes.
- Have the casualty continue taking their reliever every few minutes until the ambulance arrives.

Children become exhausted more quickly than adults and could die from a prolonged untreated attack.

Asthma Medication:
There are two basic categories of inhaler medicines for Asthma:

- Preventers – help prevent the symptoms – Brown, Purple or Red
- Relievers – which treat the symptoms – Blue

Preventers are used every day to control the swelling and inflammation of the airways. They are usually taken morning and evening. Relievers are medicines that are taken immediately to relieve Asthma symptoms. They relax the muscles around the airway allowing the airway to widen and making it easier to breathe (known as bronchodilators). They may contain short acting medicines or longer acting. Reliever inhalers are usually blue in colour.

Asthma Medication
Fiona Gunn

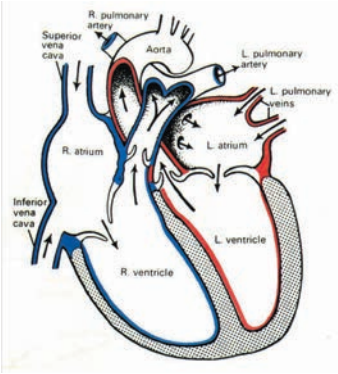
Summary:
First aiders must be trained in the various methods of administering a bronchodilator. Asthma is a disease which is increasing markedly in the UK especially with the younger generation but with appropriate treatment and management, most people with Asthma lead completely normal lives. Prompt action does not usually result in the need for hospitalisation.

A quiet asthmatic is a potentially dead asthmatic!

7C HEART CONDITIONS

Anatomy & Physiology:
Cardiovascular disease is a term which describes disease to the heart muscle and its blood vessels. According to the British Heart Foundation, cardiovascular disease is the leading cause of death in the UK, accounting for 40% of all deaths.

The heart is a hollow muscular pump with four chambers, two atria and two ventricles. It is approximately the same size as its owners fist, and is located behind the breastbone and slightly to the left of centre of the chest. The heart pumps oxygenated blood to all parts of the body providing it with the oxygen and nutrients it needs to function. Waste products picked up by the blood are removed from the body via the kidneys and lungs.



Heart and Circulation System
BASP collection

The body contains about five litres of blood which passes through the heart about every minute. But when necessary, such as when exercising, the heart can pump up to four times that amount per minute.

A network of blood vessels carries the blood pumped by the heart around the body. The heart and blood vessels together make up the circulatory system. Due to factors such as lack of exercise, poor diet, advanced age, and chronic disease, the heart is sometimes compromised, and serious cardiac conditions develop. The four major conditions are: angina, heart attack, heart failure, and cardiac arrest.

Chest Pain:
Chest pain can be one of the most difficult observations to make as every person has a different pain threshold. As with any patient assessment always ask open questions such as 'can you describe your pain' rather than 'is the pain sharp'.

Pain can be described as squeezing, crushing, vicelike, dull, heavy, sharp, pressure and many others. Cardiac pain is usually in the centre of the chest and the pain may spread or radiate to the shoulders, neck, jaw and or arms.

Angina:
Angina is caused by constriction of the vessels supplying blood to the heart muscle, the chest pain and breathlessness associated with this condition is due to the reduced supply of oxygen rich blood to the heart muscle.

Angina has very similar signs and symptoms to a heart attack. Some casualties do not feel 'pain', just an unpleasant sensation or discomfort in the chest. Angina will usually occur when the heart has to work harder than normal, such as during exercise, or in response to stress. It does not occur all the time because the blood supply, although reduced, is usually able to keep up with the heart's normal demands.

The symptoms of Angina are usually relieved by rest.

When rest alone does not bring rapid or effective relief then the use of nitrate tablets or spray is often the required treatment. The pain or discomfort is usually relieved within a couple of minutes, however, if the signs and symptoms last more than 10 to 15 minutes, an ambulance should be called immediately, and the casualty treated for heart attack.

The signs and symptoms of angina and heart attack are very similar. If you are in any doubt treat as heart attack.

- Anxiety
- Cool, pale, sweaty skin
- Chest pain or discomfort (usually centre of chest), pain may radiate to shoulders, neck, jaw and/or arms
- Onset usually triggered by physical activity or emotional upset
- Rapid, irregular or weak pulse
- Breathlessness
- Symptoms usually fade within 15 minutes of resting

Casualty care and treatment:
- Reassure the casualty and help them into a position of comfort (usually sitting)
- Assist the casualty to take their medication
- Monitor vital signs
- If in doubt as to angina or heart attack, treat as heart attack
- Call 999 for an ambulance if the casualty still feels unwell after 15 minutes

Heart Attack:
A heart attack occurs when a coronary artery is suddenly blocked by a blood clot and the part of the heart muscle supplied by that artery is damaged due to a lack of oxygenated blood. Also known as a myocardial infarction, a heart attack can occur at any time, at any age.

Fatty deposits called plaque build up inside blood vessels, which reduces the flow of blood. In some cases plaque builds up so that the vessel is completely blocked. Reduced blood flow can also allow a clot to form and the clot may block the vessel. When a blockage occurs, oxygen is not delivered to that part of the heart, and the muscle tissue dies. Blockage can occur in one of several coronary arteries. This condition can rapidly lead to cardiac arrest where the heart begins to fibrillate, and not pump effectively. At this point the patient may still be viable, time is of the essence, the chances of surviving diminish by 10% for every minute of delay in defibrillation (see sections 4b and 4c).

Certain people are at greater risk of heart attack, due to factors such as poor life style, smoking, lack of exercise, poor diet, and high blood pressure.

Urgent medical attention is vital for the heart attack victim. With a heart attack, every minute counts. If the warning signs are present, do not waste vital moments wondering whether it is a heart attack or not. Take immediate action!

Signs and symptoms:
- Anxiety
- Chest pain or discomfort (usually centre of chest), may radiate to shoulders, neck, jaw and/or arms
- Cool, pale, clammy skin
- Rapid, shallow breathing or breathlessness
- Nausea, may vomit
- Sweating
- Feeling faint
- Symptoms not relieved by resting or medication (nitrate tablets or spray).
- Collapse

Casualty care and treatment:
- Call 999 for an ambulance
- Reassure the patient and help them into a position of comfort (usually sitting)
- Assist the patient to take their medication. If asprin is available (and the patient is not allergic) encourage them to chew 1 x 300mg tablet
- Monitor vital signs

- If patient collapses start Basic Life Support, defibrillate if one is available (see section 4).

Heart Failure:
Heart failure, a condition in which the pumping action of the left ventricle is inadequate. This results in back pressure of blood, with congestion of the lungs and liver, neck veins become engorged and fluid accumulates in the tissues, swelling of the ankles and legs occurs as this fluid pools in the extremities. The patient will experience respiratory distress.

Signs and symptoms:
- Anxiety
- Cool, pale, clammy skin
- Chest pain / discomfort
- Difficulty breathing, 'bubbly' gasping breaths
- Frothy sputum
- Engorged neck veins, swelling of the extremities, especially ankles

Casualty care and treatment:
- Call 999 for an ambulance
- Reassure the patient, and help them into a position of comfort (usually sitting, do not lay flat, or elevate legs)

Notes

7D DIABETES MELLITUS

Diabetes is a relatively common condition affecting 1.6 million people in the UK and the number is rising, it is also one of the largest un-diagnosed conditions in the country.

Diabetes – The human body requires sugar for nourishment and insulin is a hormone, produced by the pancreas gland, that helps the body use the sugar. When the pancreas does not produce enough insulin, the sugar is not metabolised, the body becomes hyperglycaemic and this results in diabetes.

People with this condition take insulin to keep their diabetes under control. The insulin utilises and reduces the amount of glucose in the blood. However, if glucose levels drop too low the result is hypoglycaemia. This is a potentially serious condition that is most common among insulin-dependent diabetics. Blood sugars can be lowered too far by missing a meal, eating too little, eating late, or exercising more vigorously than usual without eating extra food. Hypoglycaemia can also be triggered by an infection, excessive doses of insulin, alcohol, and certain medicines.

There are two main types of Diabetes
Type 1 diabetes – insulin dependent diabetes
Type 2 diabetes – non insulin dependent diabetes

Type 1 diabetes is usually seen in young people and develops when the cells in the pancreas that produce insulin have been destroyed when the immune system ceases to protect the body from disease or infection, usually by an abnormal reaction of the body possibly triggered by a viral or other infection.

Type 2 diabetes develops when the body fails to make enough insulin or the body becomes insulin resistant. The majority of cases are linked to obesity and generally to people over 40, though South Asian and Afro-Caribbean people often develop it in their mid twenties. Recently children have been seen to develop it as young as seven. Type 2 diabetes can usually be treated with changes in lifestyle ie diet, weight loss, increased physical exercise. Tablets and or insulin may be needed to achieve normal blood glucose levels.

Medic Alert Emblem
Fiona Gunn

HYPERGLYCAEMIA
(High blood sugar)
Signs and Symptoms:

- Increased thirst caused by increased urination.
- Extreme tiredness resulting from the body being unable to move glucose into the cells.
- Weight loss caused by the body breaking down protein and fat stores as an alternative energy source.
- Genital itching caused by excess glucose irritation.
- Blurred vision resulting from abnormally high blood glucose changing the shape of the lens. The onset is slow, over 2/3 days and not usually encountered by the first aider.

Causes:

- Too little or no insulin.
- Eating more carbohydrates than their diet allows for.
- Infection, fever.
- Emotional stress.
- Less exercise taken than usual.

Action:

- If in doubt whether hyper or hypo

(conscious casualty) give sugar (Hypostop) a small extra amount will not do a great deal of harm to a hyper casualty but will improve a hypo casualty.
- Give fluids, if possible
- Unconscious – place in the recovery position.
- Call emergency services

HYPOGLYCAEMIA
(Low Blood Sugar)
- Has a rapid onset and is the condition most likely to be encountered.

Signs and Symptoms:
- Excessive sweating, faintness.
- Pallor.
- Headache.
- Tingling of lips.
- Strong bounding pulse.
- Blurred vision.
- Hunger.
- Irritability & aggression.
- Lack of concentration.
- Personality change.
- Deteriorating level of consciousness.

Causes:
- Too much insulin.
- Not eating enough food.
- An unusual amount of exercise.
- Delayed meal.
- Stress.
- Hot/Cold weather.

Action:
Aim to give the casualty 15-20g of glucose, this can be in the form of:
- Simple carbohydrate – Hypostop (very concentrated glucose) immediately
- Or any drink/food with a high sugar content, immediately.
- Follow this by complex carbohydrate – bread, biscuits, yoghurt or banana.
- Do not give fluid if the person is unconscious.
- Unconscious – place in the recovery position.
- Get medical help urgently.

Summary:
All forms of diabetes must be taken seriously, recognising that part of the regime is to allow for regular food breaks which is essential, especially in the outdoors. Long term serious health problems associated with diabetes: (High risk – over weight, smokers & physically inactive)
- Heart disease
- Stroke
- High blood pressure
- Circulatory problems (perhaps resulting in the need for limb amputation)
- Nerve damage
- Kidney failure – Diabetic Nephropathy (a major cause of death)
- Damage to eyes (perhaps with total loss of sight)

Medic Alert – Diabetes
Fiona Gunn

7E SEIZURES

Seizures/ fits/ convulsions can happen for a variety of different reasons. Diabetics for instance have seizures due to their blood sugar being too high. Other triggers are, poisons, alcohol, head injuries and brain diseases. Children most commonly have fits due to infection and high temperatures (febrile convulsion). Epilepsy is almost certainly the most usual basis and the most dramatic, for people having fits.

The brain is a complex structure with a vast network of cells called neurons. Messages are sent and received electrically between these cells and control a wide range of functions such as consciousness, movement, posture and awareness.

Usually these messages travel between the cells in an orderly way, and make these tasks happen however, sometimes they fire off randomly due to an upset in brain chemistry. When this happens mistakes in communications occur resulting in a brief break in all or some of the brains tasks. The neurons fire off faster than usual and in bursts; it is this disturbance that triggers a seizure. Epilepsy affects approximately 450,000 in the UK ie 1 in 130 adults and children and is the most common neurological condition. In the 2015 Resusitation Guidelines, increased emphasis has been given to seizure as a possible presentation of cardiac arrest. 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. (See Section 4B)

Treatment For Epilepsy

There are a large number of anti-epileptic or anticonvulsant drugs available. These work in two ways, either by suppressing or promoting excess electrical discharges. Some people with Epilepsy have an area of brain damage, which causes this activity while others have a problem due to an occasional malfunction. Around 75% of people with epilepsy can have their seizures completely controlled. Only 20% still have seizures, that are resistant to drugs. People who continue to have seizures will need medication for life. However more than 60% who remain seizure free can eventually cease to take their medication. Other treatments are available if drug therapies are not successful such as surgery or electrical stimulus to the vagus nerve.

Signs and Symptoms:

There are two classifications of fits/seizures

Both types can be preceded by

- Twitching of limbs, eye lids
- People can have a warning in the form of an aura, taste or smell
- Unusual actions – chewing, noises etc

Minor or Absences

- Switched off/daydreaming (but are in fact momentarily unconscious). Children are particularly prone, as it appears like a lapse in concentration.

Major or TonicClonic

- Switched off – may cry out
- Collapse unconscious
- 'Tonic' – muscles go rigid, possible arching of the back
- May stop breathing
- 'Clonic' – convulsion (ferocity varies – from a tic to violent movement)
- May lose bowel and bladder control
- Convulsion phase finishes
- Unconscious – muscles relax, breathing returns to normal
- Place in a Recovery Position
- Slowly regains consciousness

Causes

- Lack of sleep
- Alcohol/drugs
- Emotional upset
- Missing medication
- Flashing lights – strobes, television, video games, flash photography etc

Action:

Minor or Absences

- Most people make a full and almost immediate recovery
- Require no treatment.

Major or Tonic Clonic

- Protect from injury, guide away from danger.
- Break their fall
- Protect their head – if possible loosen anything tight around the neck
- Do not restrain the casualty except when there is danger
- Do not put any thing in their mouth
- Time the seizure (more than 5 minutes call 999)

When the convulsion finishes

- Open the airway and check for breathing
- If breathing, place in the recovery position and monitor
- Stay with the casualty until they are fully conscious
- Go over missing events.
- Do not give food or drink until fully conscious
- Plenty of reassurance
- If not breathing, follow the 'Resuscitation guide lines (see section 4b)

Call an ambulance:

- If you have no prior knowledge.
- Injuries have resulted from the seizure.
- If the casualty is disorientated or unaware
- Seizure phase lasts more than five minutes
- Lasts longer than is normal to that person (ie medical disclosure)
- Unconscious for more than ten minutes
- Second seizure occurs without the person regaining consciousness.

Status Epilepticus

Medical emergency – potentially life threatening

- Prolonged or series of seizures with no period of consciousness
- Lack of normal respiratory movement
- Extreme muscular contractions stressing the cardiovascular system.
- Continuing lack of oxygen may lead to brain damage.

Summary:

The Resuscitation Council (UK) Guidelines 2015 states that 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 casualty is breathing normally.

The majority of problems are Absences and do not require hospitalisation. Major fits do not always require hospitalisation especially those who have fits on a very regular basis for example someone who has 5 fits every day. The majority of casualties though will be absolutely exhausted afterwards and will want to sleep, particularly children. Seizures are sometimes difficult to deal with and certainly can be very distressing to those dealing with them, in particular when they are of long duration. Seizures can be life threatening especially when accompanied by other complications.

Epilepsy is covered by the Disability Discrimination Act (DDA)

Epilepsy
Fiona Gunn

7F STROKE

A stroke or cerebrovascular accident (CVA) happens when the arteries serving the brain are compromised either by a clot or a rupture starving part of the brain of the nutrients and the oxygen it needs to survive. When a part of the brain is starved of blood and oxygen it starts to die. The majority of strokes (approximately 83%) are caused by an artery being blocked (ischaemic stroke) the other 17% by a rupture (Haemorrhagic stroke). Ischaemic strokes are caused by blood clots that form in an artery serving the brain or that may have been formed elsewhere, most usually the heart and are carried by the blood to the brain. Haemorrhagic strokes are caused by a weakened blood vessel that ruptures and then bleeds into the surrounding brain. Stroke accounts for 250,000 people in the UK having severe disability, and is our third biggest killer. In the UK about 130,000 people have a stroke every year. The majority of these people will be over the age of 65, however anyone can have a stroke including children and even babies. Statistically; 33% will die within the first year, 33% will be left with a permanent disability and 33% will, in time make a good recovery.

Signs and Symptoms:

- Severe sudden headache
- Confusion and unsteadiness
- Facial spasm
- Sudden slurring of speech
- Dribbling from the mouth
- Drooping arm, leg or eyelid
- Warm flushed clammy skin
- Pupils of unequal sizes
- Sudden numbness
- Loss of bowel and/or bladder control
- Weakness or paralysis on one side or both
- Distended neck veins
- Nausea and/or vomiting
- Difficulty in understanding speech or finding words
- Blurring of sight or loss of sight, particularly in one eye

Note all of the above will not necessarily be present

Rapid assessment – FAST

Face – Can they smile, has their mouth/eye drooped?
Arm – Can they raise both arms?
Speech – Can they speak clearly – do they understand what you say ?
Time – Time to call 999

Causes:

- Part of the brain having an interrupted blood supply.
- High blood pressure
- Heart diseases
- Smoking
- Lack of exercise
- High fat diet
- High salt diet
- Heavy drinking
- Obesity

The brain requires a constant flow of blood to supply the nutrients and oxygen to allow it to function. The brain is the greediest organ in our body using more than 20% of the oxygen we require.

Action:

- Get Urgent Medical help
- Monitor and record Vital signs
- Loosen tight clothing that may impair breathing
- Reassure – talk even if unconscious
- Unconscious – place in the recovery position

TIA – Transient Ischaemic Attack
This occurs when there is a brief interruption of blood supply to the brain and lasts less than 24 hours and is self resolving. The signs and symptoms are the same as a full stroke; however a casualty suffering a TIA will make a full recovery. A TIA should be seen as a warning sign and the casualty viewed as being high risk of having a full stroke and should be fully investigated.

Signs and Symptoms:
- Identical (as above)

It is neither possible nor appropriate to differentiate!

Action:
Exactly as for a major stroke (as above).

Summary:
It is vitally important that the signs and symptoms are picked up early and that urgent and appropriate action to get the Emergencies Service to the casualty is essential. Early medical intervention for example, with clot busting drugs (thrombolytics) can prove to be successful. It is equally important to be aware that death can be almost instantaneous and that there is little a first aider can do in these circumstances.

High Risk Categories
- Irregular heart rhythms
- Previous TIA
- Diet
- Age (over 65 years)
- Gender – Women less likely than men
- Family history – High blood pressure/Diabetes
- Ethnic background – Asians, Africans and Afro/Caribbeans
- Heavy drinking/drugs

8. Poisoning Stings and Bites

8A POISONING

A poison is any substance which on entry to the body can cause temporary or permanent damage or death.

Poisons may be swallowed, inhaled, injected or absorbed. Once in the body the poison may enter the blood stream and from there can be rapidly carried to all tissues.

The effect of the poison will depend on the type, concentration, route of entry, and the time elapsed since the poison was taken. There may be damage to organs, depressed vital signs, unconsciousness, and in some cases vomiting.

Action:
Safety: Avoid contamination from any substance, if it is necessary to give CPR use a face shield or pocket mask.

If dealing with injected poisons / drugs be aware of the danger of needle-stick injuries, if you are injured in this way, report the incident as soon as possible.

With inhaled poisons, if it is safe for you to do so, get the casualty away from the source and into fresh air as quickly as possible.

- Check A-B-C. Recovery position if unconscious. Monitor and record vital signs.
- Do not induce vomiting.
- If a corrosive poison has been swallowed, avoid contamination, give sips of water to protect the airway.
- Seek urgent medical help, give any information that you can about the poison, quantity and time taken.

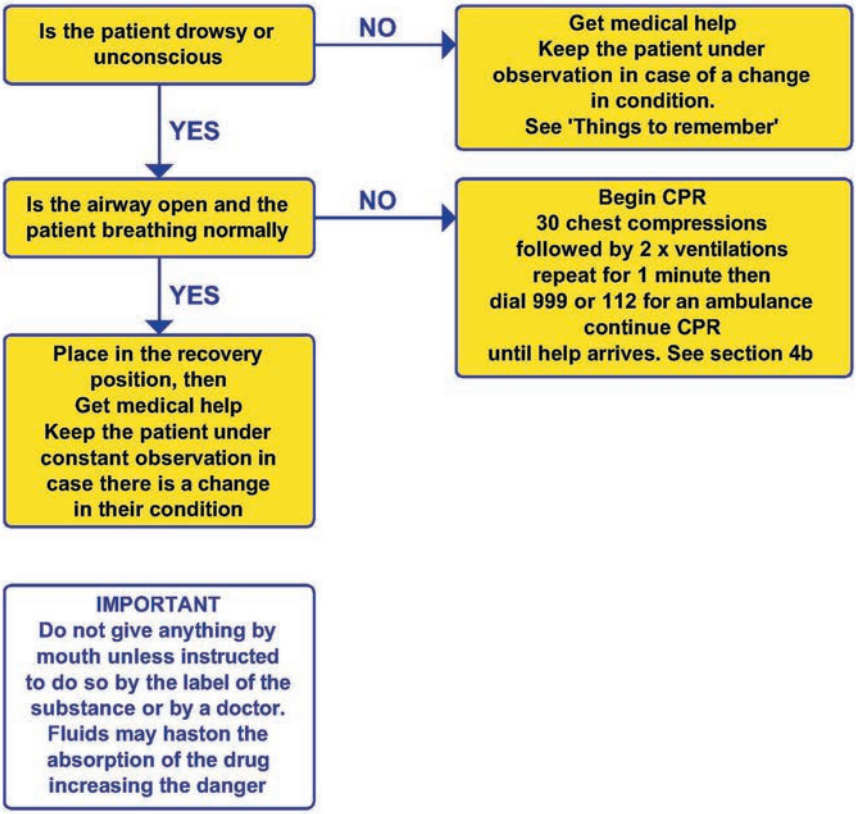
Drug Poisoning: Emergency guide
The following is intended to give practical advice for dealing with a known or suspected drug poisoning emergency.

Emergency action is necessary in any of the following circumstances:
- If a person has taken an overdose of any drug or drugs, and has one or more of the danger symptoms listed.
- If a person has taken, or is suspected of having taken, an overdose of an unknown drug.
- If an infant or child has swallowed, or is suspected of having swallowed any medicines or any drug of abuse.

Danger Symptoms:
- Take emergency action if the person has one or more of the following symptoms:
- Drowsiness or unconsciousness
- Shallow, irregular or stopped breathing
- Vomiting
- Seizures

What to do:
If you are faced with a drug poisoning emergency, it is important that you carry out first-aid and arrange immediate medical help in the correct order. The Priority Action Decision Chart (below) will help you to assess the situation and to determine your priorities. The information should help you to remain calm in an emergency if you ever need to deal with a case of drug poisoning.

Priority Action Decision Chart



Things to remember
Effective treatment of drug poisoning depends on the doctor making a rapid assessment of the type and amount of drug taken. Collecting evidence that will assist the diagnosis will help:

After you have carried out first aid:
- Look for empty or opened medicine (or other) containers.
- Keep any of the drug that is left, together with its container (or syringe), and give these to the medical personnel.
- Save any vomit for analysis by the hospital

8B MARINE ANIMAL BITES AND STINGS

In the seas around UK, there are a number of creatures which can bite or sting and many will also inject venom. The prime purpose of marine animal bites or stings may be defensive, predatory or both. In humans, the effect of marine animal bites or stings can vary from the trivial to life threatening.

Jellyfish
Jelly fish carry stinging cells (nematocysts) in their tentacles. Each nematocyst is venom filled and contains a long, coiled, hollow, thread-like tube which acts as a tiny hypodermic needle. The severity of envenomation on contact with jelly fish tentacles depends on the type of jelly fish (and hence the nature of the venom), the number of nematocysts discharged onto the casualty's skin and the physical condition of the casualty. Sea anemones can also give similar poisonous stings. Cyanea – 'Lions mane jelly fish' Ken Cameron

Cyanea – 'Lions mane jelly fish'
Ken Cameron

Envenomation is most often mild, characterised by stinging, paraesthesia (tingling), itching, and reddishbrown linear wheals on the skin. Systemic symptoms, if they appear, may include nausea, vomiting, abdominal pain, headache, respiratory difficulty due to the muscles around the airway going into spasm, respiratory and cardiac arrest.

First aid treatment is directed at stabilising the casualty and minimising the effects of the venom. It should be noted that the Portuguese Man O'War, which is potentially the most dangerous marine animal in UK waters is not a true jelly fish but a complex colony of polyps and its toxin is very different from that of true jelly fish. The Portuguese Man O'War can most easily be recognised because it does not swim in the water but floats on the surface with no means of self propulsion.

For true jelly fish stings:
Assess safety, ABC, monitor and resuscitate if necessary.

To minimise the effects of the venom, immediately rinse the wound with sea water. Do not rub or use fresh water, alcohol or ammonia as these will encourage the nematocysts to discharge their venom.

Apply copious amounts of vinegar to neutralise the venom in intact nematocysts. A paste of meat tenderiser can also be used. This should not be left on the skin for more than ten minutes.

Remove any visible tentacle fragments carefully.

Apply shaving cream and shave the area gently to remove invisible nematocysts. If shaving material is unavailable, the area should be gently scraped with the edge of a knife or spatula.

Rinse again with sea water.

Seek medical help if necessary.

For Portuguese Man O'War stings:
Assess safety, ABC, monitor and resuscitate if necessary.

To minimise the effects of the venom, immediately rinse the wound with sea water. Do not rub or use vinegar, fresh water, alcohol or ammonia as these will encourage the nematocysts to discharge their venom.

Remove any visible tentacle fragments carefully.

Apply ice packs to the injured area to reduce pain and constrict the blood vessels and so reduce the spread of the toxin.

If ice is not available, apply hot water to the injured area. This destroys the toxin.

Seek medical advice if necessary.

Some studies show that hot water is the best treatment but ice is thought still to be the most commonly used treatment by lifeguards around the world.

Seaurchins And Starfish
These animals have hard thorny spines some of which are venomous. They are particularly dangerous because they are very easily broken off and can penetrate deep into the flesh. Typically, these wounds cause immediate pain, swelling and bleeding but, as with jellyfish stings, systemic symptoms can appear, particularly with multiple puncture wounds.

Treatment involves careful removal of any imbedded spines using tweezers. This may require the attention of a doctor if the spine is large and cannot be easily removed or if there is any risk that a broken piece of spine remains in the wound.

The toxins produced typically by sea urchins and starfish may cause immediate intense pain, swelling, redness and nausea. Later effects may include respiratory distress, paraesthesia of the lips and face and, in severe cases, respiratory failure due to complete loss of muscle tone. Since most marine venoms lose their toxicity when exposed to changes of temperature, the recommended treatment for stings to the feet or hands, which are by far the most common sites, is to immerse the affected part in water which is as hot as can be tolerated. It is generally recommended that both hands or feet should be immersed in case of injury which may go unnoticed because of numbness in the part thought to be unaffected or distracting pain in the part known to be affected.

Poisonous Fish
There are a number of poisonous fish in the waters around UK. The venom is generally injected by means of spines on erectile dorsal fins but is not usually as potentially dangerous as the stings from jelly fish or sea urchins. Anyone who has been injured by a fish should be monitored and treated according to the symptoms which present. The advice of local fishermen will be helpful and, in extreme cases, medical help may be needed.

One significant life threatening problem is associated with envenomation by marine animals as with any other bite or sting and that is the acute allergic reaction known as anaphylaxis. This is always a possible complication and is a genuine medical emergency requiring the most urgent of treatment to prevent death (see Section 5).

Marine Mammal Bites
Although members of the public are rarely exposed to a risk of marine mammal bites the consequences can be serious so an awareness of the danger is relevant. As with all hazards, avoidance is the best protection. Baby seals may look like fluffy toys but they should not be approached because they do bite and can transmit potentially very dangerous infections. Anyone who has been bitten by a seal or who falls ill after touching a seal (or other marine mammal)

should seek medical attention specifically mentioning the contact with a marine mammal. When seeking medical attention, it may be appropriate to mentions that infections resulting from this type of injury respond best to tetracyclic antibiotics (ref BMJ volume 299 page 928 7 October 1989).

8C LAND ANIMAL AND INSECT BITES AND STINGS

Animal Bites
Animal bites are not poisonous but can result in the transmission of infection and in significant tissue damage due to the power of the jaws of the biting animal. Medical help should always be sought for any bite which breaks the surface of the skin. It should be borne in mind that human bites are amongst the dirtiest of all, in terms of the risk of infection and can also cause significant damage by crushing tissue.

Bites should be treated like any other wound. Thorough washing and the application of a dressing will be appropriate. If possible, the animal inflicting the bite should be identified but only if this can be done safely.

Signs and symptoms:
- History
- Pain
- Swelling
- Wound / bleeding

Treatment:
- Reassure
- Wash the wound with soap and water
- Dry and dress the area
- Control bleeding as necessary
- Seek medical attention

Snake bites
The only venomous snake indigenous to UK is the adder and, although fatalities from adder bites are rare, the potential for serious problems following a bite must not be underestimated. Snake venom in injected into the tissues just under the skin and is absorbed and transported by the lymphatic system. The movement of venom away from the bite site is, therefore, relatively slow.

Signs and Symptoms:
- History of a bite
- Puncture marks or parallel scratches on the skin
- Severe pain
- Redness and swelling at the bite site
- Anxiety
- Pale, cold, clammy skin with increasing sweating
- Rapid, weak pulse
- Rapid, shallow breathing; breathing difficulties
- Blurred vision; drooping eyelids
- Difficulty swallowing and speaking
- Abdominal pain; nausea, vomiting

Treatment:
- Reassure
- Arrange for urgent medical attention
- Keep the part of the body that was bitten as still as you can
- Lie in the recovery position if possible
- Take off any jewellery and loosen clothing near the bite, in case it swells

Do NOT :
- Apply a tourniquet
- Do not tie anything around the site of the bite
- Cut or suck the bitten area
- Try to catch the snake

Insect Bites And Stings

Ticks
See Section 11e – Lyme Disease

Bees
A bee sting is normally no more than a temporary irritation but can lead to life threatening anaphylaxis (see Section 5) in susceptible people.

Signs and symptoms:
History. The sting is likely to remain in the skin with the small venom sack
- Pain and itching
- Swelling
- Treatment:
- Reassure

Remove the sting by scraping with a fingernail or credit card. Tweezers can be used but care must be taken to avoid squeezing the venom sack which will simply inject more venom

Apply a cold compress to reduce swelling

Monitor for signs of an anaphylactic reaction

Wasps And Hornets
Unlike bees, wasps and hornets do not leave their stings in place. One consequence of this is that an individual insect can deliver multiple stings. These insects are attracted to sweet, aromatic substances and will enter drinks containers leading to a risk of someone being stung in the throat while taking a drink from the can. Even without the development of an anaphylactic reaction, the subsequent swelling can be life threatening.

Signs and symptoms:
- History
- Severe pain at the site of the sting
- Swelling. This develops particularly rapidly if the sting is in the throat

Treatment:
- Reassure
- Apply a cold compress to reduce swelling
- If someone has been stung in the throat, get urgent medical attention
- Monitor for signs of an anaphylactic reaction

Midges
Although widely detested, midges do not normally feature in first aid manuals. However, we should be aware that anaphylactic reactions to midge bites have been reported and may need very urgent medical treatment.

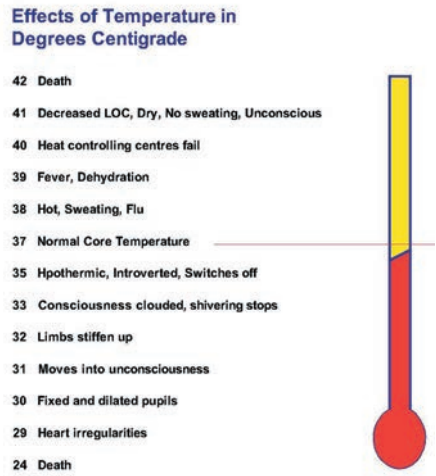
Exotic Pets
Although indigenous animals and insects seldom pose a life-threatening problem, exotic pets, whether they be snakes, arachnids or insects, can be a very different matter. The key to successful treatment of envenomation by an exotic pet is identification of the source of venom and rapid transport to hospital for treatment. It will usually be too dangerous to try to catch the animal concerned but, if possible, a photograph should be obtained and sent to hospital with the casualty.

9. Environmental Injuries

The human body requires a number of things to function properly. In first aid, we talk constantly about the absolute requirement for an adequate supply of oxygen but, of course, the blood also carries sugars which are just as essential to life. Another thing which the body, particularly the brain, requires to function normally is a stable temperature. The normal core temperature of the body is 37°C and any change of more than 2°C in either direction can have serious effect on the way the brain functions.

In this section, we will consider the effects of heat and cold on the body as a whole and also the local effects of cold on tissues. The local effects of heat on tissues (burns) are discussed in Section 6 (See section 6c).

General effects of heat and cold
The normal body temperature is 37°C and any change of more than 2°C in either direction can have serious effect on the way the brain functions. It should be noted that this refers to the core temperature as the peripheral temperature can vary greatly without any serious effect unless freezing or burning occurs.



The body's response to changing temperature Cooling
- Shivering
- Circulation to the skin shuts down
- Reduced Pulse/Resp Rate

Heating up
- Sweating
- Circulation to the skin opens up
- Increased Pulse/Resp Rate

In general, it is not possible for the first aider to measure the core temperature accurately but the dividing line between mild and serious effects of heat or cold can be defined by :
- The cessation of shivering in a cold casualty.
- The cessation of sweating in a hot casualty.

Notes

9A COLD INJURIES

Mild Hypothermia
Hypothermia is defined as a core temperature of 35˚C or less.

As a casualty becomes cold, the casualty will start to shiver, stop sweating and the circulation to the skin will shut down leaving the skin pale and cold to the touch. The brain will very quickly be affected by the reduced temperature resulting in the casualty becoming withdrawn and quiet and giving the classic signs of mild hypothermia:

- Grumbling
- Mumbling
- Fumbling
- Stumbling
- Tumbling

The treatment of mild hypothermia is simple:

- Recognise the problem – Observation is key.
- Get shelter.
- Prevent further heat loss – Insulate and replace wet clothing with dry.
- Do not massage the extremities (hands, arms, legs, feet, etc.) or the trunk.
- Give warm drinks and food.
- Do not place the victim in a warm bath or shower.
- If available, heated, humidified air or oxygen should be administered.
- The victim may be confused and unaware of what is happening and may deny assistance when it is needed.

As noted above, recognition of the onset of hypothermia is key to early treatment and recovery. It is important to realise that when someone begins to get cold, the brain is very quickly affected and they will not be aware that they have a problem. All members of a party should be watching the other members for early signs and be alert to any changes to their normal behaviour.

Once mild hypothermia is reversed, there is no reason why the casualty cannot continue. Unlike severe hyperthermia, when a prolonged period of recovery will be necessary. If mild hypothermia is not recognised and treated it can progress to a more severe condition, indicated by the cessation of shivering, which will become life threatening at a rate depending on whether the casualty is in water with consequent very rapid cooling or in air where the cooling will be much slower. The way a casualty's condition changes with falling temperature is indicated on page 81.

Severe Hypothermia
Hypothermia can be caused by three main circumstances.

Exposure/Immersion hypothermia where the head is above water, this group has the best outcome and should be treated as Mild Hypothermia as above. Submersion Hypothermia where the head is under water and water temperature is <5C, these people have up to 90 mins to rescue, or >6C only have 30 mins for the best outcome.

Avalanche, where cause of death is more likely to be asphyxia or trauma rather than cold. Follow IKAR International guidelines (or updated UK guidelines if available.)

- Look after ABC.
- Get a history – It will be important to assess the likelihood of injury.
- Avoid all unnecessary movement and handle the victim gently.
- Prevent further heat loss by getting the casualty into shelter and insulating.
- Do not attempt to re-warm if casualty is unconscious or suspect cardiac arrest.
- If casualty is conscious, actively rewarm and transfer to hospital.
- Give nil by mouth unless casualty is conscious, and then give warm sweet drinks as long as they can actively swallow. Do not start CPR if the casualty is unconscious, have a blocked airway, significant trauma

or the body is completely frozen.
- Start CPR if the casualty is unconscious, has a clear airway, no significant trauma, body is not frozen or been buried for more than 35 minutes; continue as long as possible.
- Arrange for urgent evacuation to hospital with ECMO facilities.

Non-Freezing Cold Injury
Also known as Trench Foot or Immersion Foot, is a result of prolonged exposure over several days to cold but not freezing temperatures and is usually also associated with damp conditions. NFCI is not common in normal outdoor activities. The foot becomes extremely sensitive with a burning sensation. The skin may be white or mottled greyblue. This injury should be treated by gradual warming. On warming, the foot will remain very sensitive with red, swollen and easily broken skin. Dry dressings, elevation and the complete avoidance of cold, wet conditions for a period of several weeks are required to ensure recovery.

Frost Nip
Frost Nip is a precursor to fully developed frostbite and usually occurs where bare skin is in contact with a cold conducting surface, such as metal, or exposed to the cold and wind. Frost nip is typified by white waxy skin and can be treated simply by removing the affected part from the cold and rewarming gently. Some pain should be expected.

Frostbite
Frostbite is a potentially serious condition in which the tissues are completely frozen and ice crystals form between the cells. Significant tissue destruction can occur and amputation is sometimes necessary. Most of the tissue destruction is caused by the loss of blood supply to the affected part and hence the loss of oxygen and sugars which are essential to fuel cellular life. This loss of blood supply is due to freezing, vasoconstriction due to the cold and, significantly, the formation of clots within the capillary blood vessels. Inadequate or restrictive clothing, hypothermia, exhaustion and smoking (nicotine contracts blood vessels) are predisposing factors. In early, superficial, frostbite, the skin will be yellow-grey, painless, numb and leathery. In deep frostbite, the tissue is hard, white and obviously frozen. Toes and fingers may become reddish purple due to blood sludging before freezing.

Severe frostbite is unlikely in this country and the following is only likely to be of interest to people skiing, walking or climbing in the greater ranges.

The onset of frostbite can be recognised by pain followed by a loss of sensation in the affected part. Extremities will feel wooden and look pale, sometimes purplish, and feel cold. In severe cases, the area will be firm and hard to the touch because of the amount and depth of frozen tissue.
- Once recognised, the management of frostbite is directed at minimising the long term tissue damage and avoiding the need for amputation.
- If it is not possible to stop and find temporary shelter, turn back and stop at the first opportunity.
- Expose the frostbitten part, removing any rings etc. Warm it in a companion's armpit or groin. During rewarming, severe pain should be expected.

If possible, give one 300mg aspirin to minimise the clotting which plays a significant part in the loss of blood supply and subsequent tissue death.

If the frostbitten part has fully recovered in ten minutes, then the frostbite has been superficial and treatment successful. When dressing the frostbitten part which has been exposed for rewarming, dry warm gloves and socks should be used if at all possible. The casualty may continue but should be aware that there is a high risk of recurrence and great care should be taken to avoid refreezing.

If the frostbitten part has not recovered fully in ten minutes, the frostbite must be regarded as more serious.

- No further attempts to rewarm should be made.
- The casualty should be evacuated, without walking on frozen feet if possible, for medical treatment in hospital.
- If it is not possible to evacuate the casualty to hospital, evacuation to a fixed base where warmth and shelter are available is necessary. If the damage is to the casualty's foot, it must be borne in mind that, from this point, the casualty will not be able to walk.

Give one aspirin if this has not already been done.

Expose the frostbitten part and rewarm it as rapidly as possible. The best way to do this is to immerse it in water which is as hot as can be borne (by undamaged tissue). The frostbitten part should be kept immersed, and the water reheated as necessary, until it is warm and colour returns. Excruciating pain will accompany this rewarming and analgesia should be given if available. Rewarming typically takes from twenty to forty minutes but may be up to an hour for a foot.

Infection is a major risk with frostbite and a suitable disinfectant should be added to the water if available.

Dry and elevate the affected part and apply loose non-fluffy dressings.

Watch out for infection. The injury should be bathed in antiseptic solution and redressed daily.

Give 300mg of aspirin daily.

Evacuate to hospital.

Under no circumstances should any frostbite injury be allowed to refreeze or, if the injury is to a foot, should the casualty be allowed to walk. Either will cause massive tissue damage and may necessitate amputation.

Late frost bite, climber in Andes, made full recovery.
John Holmes

Notes

9B HYPERTHERMIA

Heat Syncope
This is a simple faint caused by a person who has been exercising in a hot environment stopping. When the muscle pump in the legs stops, cardiac output suffers a significant dip, blood supply to the brain is reduced and the casualty faints.

Collapsing to the ground will restore the blood supply to the brain and the situation will resolve quickly. Sips of cool water will help.

Heat Exhaustion
The name of this condition is very descriptive of the condition itself in that the sufferer will, in fact, be exhausted due to dehydration caused by sweating in an attempt to keep the body cool in a hot environment. The onset of heat exhaustion will be speeded up by exertion. The signs and symptoms include headache, fatigue and nausea. The heart rate is usually elevated in response to mild shock caused by reduced blood volume due to fluid lost in sweat being replaced from the bloodstream and by the fact that the peripheral blood vessels are dilated to carry blood and heat to the surface so that heat can be lost. This slight relative hypovolaemia also leads to dizziness frequently being experienced when a casualty stands up; this is caused by dips in blood pressure as some of the already reduced blood volume is pooled in the legs leading to a further reduction in the blood, and hence the oxygen, supply to the brain. The temperature may be slightly elevated but will never be above 40°C.

The condition is easy to treat by reducing exertion and providing shade. It may also be necessary to actively cool by fanning or sponging with tepid water. Fluid and salts must be replaced but the amount of fluid lost will be in excess of two litres and cannot be replaced in the short term. Oral Carbohydrate-electrolyte beverages (sports energy-rehydration drinks) are now recommended for exertion related dehydration. Specific sports energy-rehydration drinks have proven to be more effective than water as they also replace lost body salts. Evidence also suggests that semi-skimmed milk and tea can also be as effective as water. If none of the aforementioned are available, drinking sweetened water and eating a couple of packets of crisps will help greatly. Casualties do not recover quickly from heat exhaustion and may need up to two days rest to fully recover. Resumption of any form of exertion should only be undertaken with great caution.

Heat Stroke
Heat stroke is a much more serious condition with a mortality in excess of 25%. Heat stroke is defined clinically as a body temperature of greater than 40°C. At this temperature, the brain begins to be affected with the common symptoms of irrational behaviour, confusion and headache. The significant factor is that, at this temperature, the temperature control mechanism within the brain fails and the temperature can rise very rapidly leading to convulsions, coma and death.

The classic form of heat stroke occurs in high (greater then 37°C) ambient temperatures and usually affects the elderly and frail. Casualties will commonly present with hot, flushed, dry skin.

In this country, heat stroke is brought on by excessive exercise, commonly in young, fit males. Although the skin may be hot, dry and flushed, it is frequently pale, cold and clammy and this can delay diagnosis and treatment unless a core temperature can be measured. In all cases, initial symptoms are irritability, confusion and headache. A rapid pulse is common because the blood pressure may be reduced by sweating and the opening up of the blood supply to the skin. If the condition is not recognised and treated, fits, coma, circulatory collapse and death follow quickly. Treatment is urgent:

- Ensure that it is safe to approach and treat the casualty.

A Make sure the airway is open.

B Assess the breathing.
C Assess the circulation.
D Assess the level of consciousness and treat appropriately
E Measure the core temperature if possible.

- In all cases, active cooling will be life saving. Immersion in cool (not icy cold) water, sponging with tepid water, fanning etc are all appropriate.
- Arrange urgent evacuation to hospital.

10. Paediatric problems

Childhood trauma – Causes:
0-1year: Choking / suffocation, burns, drowning, SIDS (Sudden Infant Death Syndrome).

1-4 years: Occupant in a motor vehicle accident, burns, drowning, falls.

5-15 years: Motor vehicle accident occupant / pedestrian, bicycle injuries, burns, drowning.

Children are not small adults, physiologically they are different, with heart and respiratory rates varying dependant upon the child's age (see section 4 BLS). The way they respond to disease and injury may also differ both physically and psychologically.

Body proportions change with age. At birth the body surface area of the head is 19 %; this falls to 9 % by age 15. Certain specific changes in body proportion also have a bearing on emergency care. One example is that the relatively large head and short neck of the infant tends to cause neck flexion and this, together with the relatively large tongue, makes airway care more difficult. Both upper and lower airways are relatively small and consequently easily obstructed. Seemingly small obstructions can have significant effects on air entry in children.

A child is a relatively small target. If they are struck by, for example a motor vehicle, the same amount of force is transmitted to them as if they were adult. Unfortunately, with the child's smaller mass the force is more concentrated. Put simply, a collision causing a minor injury to an adult is likely to cause a correspondingly greater injury in a child. As a child is a 'smaller package', the major organs are in closer proximity. For this reason, multi-system trauma is more common e.g. a child with chest injury probably has an abdominal injury also.

The skeletal system of a child is far less brittle than that of an adult, and therefore a child's bones will transmit force more easily. An adult struck on the chest or skull will absorb much of the energy by sustaining a fracture. The skeletal structure of a child is more elastic, the bones bend, and do not break so easily and so the force is transmitted directly to the underlying structures. Where an adult may suffer a rib fracture and minor bruising to the lung, a child, in the absence of a fracture, would suffer a more serious lung contusion.

Assessing the sick or injured child:
Initially the assessment is the same as for an adult. Scene safety, followed by the assessment and maintenance of airway and breathing, the treatment of any circulatory problems, and organising further medical assistance as required.

If there appears to be no immediate life-threatening problem, a further assessment can be made. The overall appearance of the child can give a rapid and surprisingly accurate assessment. A previously well 6 month old baby who is laying floppy in the mother's arms, pale, and not interested in their surroundings is more likely to need medical attention than a baby who is pink, and who laughs and reaches out for toys.

Here are some observations which can be made without touching a child:

Airway:
- Noisy breathing
- Weak or strong cry
- Abnormal cry

Breathing:
- Use of accessory muscles
- Recession (as the child tries to breath in an obstruction can cause the sternum (breast bone) and intercostal space (space between the ribs) to be drawn inwards)
- Nasal flaring
- Grunting

Interaction with surroundings:
- Alertness, conscious level
- Readiness to play, interest in surroundings

Activity:
- Limb movement – spontaneous or only when stimulated
- Skin:
- Pallor
- Cyanosis
- Bruising
- Wounds/burns
- Skin rash

Croup / Epiglottitis:
Caused by inflammation of the windpipe and larynx, it presents as a severe breathing difficulty, and can be alarming, but usually passes without lasting harm. An attack will usually occur at night and may recur before the child settles.

Signs / symptoms:
- Respiratory distress
- A short, barking cough
- Stridor, a crowing or whistling noise, particularly when breathing in
- Cyanosis
- In severe cases, the use of accessory muscles in neck and shoulders
- Nasal flaring

Treatment:
- Sit the child up on your knee supporting their back
- The attack may be alarming, remain calm and reassure the child, panic may make the attack worse
- Create a steamy atmosphere, boil a kettle or pans of water, or take the child into a bathroom and run the hot taps or shower. Encourage the child to breath in the steam. This should ease the breathing (keep the child clear of scalding steam and running hot water).
- If an attack of croup is severe, or persists, and is accompanied by a fever, there is a small but serious risk that the child is suffering from epiglottitis, a rare condition in which the epiglottis, the small flap-like structure in the throat which covers the entrance to the larynx while swallowing, becomes infected and swollen and may block the airway completely, this condition requires urgent medical attention.

Suspect epiglottitis if:
- The child is sitting bolt upright and is in respiratory distress
- The child has a high temperature

Seizures in children:
Seizures (fits or convulsions) in children are most often caused by a raised body temperature, and can be associated with an ear, throat or other infectious disease. This type of seizure is known as febrile convulsion and is caused by the brain's reaction to a high body temperature.

Signs / symptoms:
- Violent muscle spasm, clenched fists and arched back
- Signs of fever: hot, flushed skin, perhaps sweating
- Facial twitching, squinting, fixed or upturned eyes
- Holding breath, red, 'puffy' face and neck, drooling
- Loss of consciousness

Another possible cause of seizure is epilepsy. Seizures can be alarming, but are rarely dangerous if dealt with properly (see section 7e), however, to ensure safety the child should be taken to hospital to exclude the possibility of a more serious underlying condition.

See 'Special First Aid Issues 11f for information on meningitis.

11. Special First Aid Issues

11A CASUALTY MOVING AND HANDLING

The general rule when administering first aid is that you should leave casualties in the position you found them until medical help arrives.
A casualty should only be moved if he is in imminent danger, and even then only if it is safe for you to do so, and you have the training, equipment and /or personnel to carry out the move without endangering the casualty.

A simple 'risk assessment' should be made:

- Is it safe to approach the casualty, do you need any personal protective equipment, and is it available?
- Is the task really necessary? Often a casualty can be assessed and treated in the position they are found.
- Can the casualty move himself? Ask the casualty if he feels able to move, consider the patient's injuries, and use your common sense.
- Is the casualty a large, heavy person?
- What injuries does the casualty have? Will moving them make their condition worse?
- What resources do you have? Sufficient trained helpers, physically able to carry out the move?
- Is there any equipment available to assist with moving the patient?
- Is there sufficient space around the casualty to carry out the move?
- Consider the sort of ground you will be crossing with the patient. Select a safe route.

Good practice:
The situation that the casualty is in will usually dictate the method best suited to help them. Always make a plan, and ensure that the casualty and any helpers are prepared for the move.

Take the following steps to ensure safety:

- Assess the situation, and choose a method to suit the casualty's condition, any help and equipment available.
- For the move, one person gives the commands. Ensure your helpers understand the sequence of actions.
- Make sure any equipment is in position, and your helpers are prepared for the task.

Try to ensure the safety and comfort of the casualty, yourself, and any helpers during the move.

Always reassure the casualty and explain what is going to happen, and encourage the casualty to cooperate as much as possible.

For the move:

- Position yourself as close as possible to the casualty's body.
- Get your feet into a stable position so that you remain well balanced.
- Maintain a good posture to avoid causing injury to yourself.
- Use the strongest muscles of your legs, arms and shoulder girdle to give a smooth move. If the situation permits, a 'log roll' is the safest way to get a casualty onto a blanket or carry sheet. A 'lift' should only be undertaken if the casualty is in a position where a 'log roll' would cause more damage e.g. on broken, uneven ground, where a 'roll' could cause spinal distortion.

Your trainer will cover moving a casualty, 'log rolls' and 'lifts' as appropriate to your course.

Note: If you are dealing with an unresponsive casualty, or one whose airway is at risk, regardless of the ground you are on, or the injuries sustained you must move your patient sufficiently to achieve a 'recovery' position, to protect the airway.

Notes

11B CRUSH INJURIES

Crush Injury
Is an injury from a compressive force sufficient to interfere with the normal structure and function of the tissues involved.

In the absence of entrapment, the severity of a crush injury depends on the amount of force involved and the part of the body affected. For example, a massive crush injury to a vital organ may cause immediate death, while crushing caused by slight blunt trauma may be trivial.

Typical signs and symptoms of a crush injury are the five Ps:
- Pain
- Paraesthesia (tingling)
- Pallor
- Pulselessness (a late finding)
- Paresis (weakness / loss of mobility – a late finding)

Unless it is clearly trivial, a casualty with a crush injury should always seek medical attention. The possibility of complications arising from physical damage to muscle fibres or from circulatory compromise at and beyond the injury site could be limb threatening.

The management of any casualty with a crush injury, once safety has been established, depends on the precise nature of the injury and whether or not there is an altered level of consciousness.
- Manage ABC
- Treat underlying fractures as appropriate
- Ensure urgent medical attention

Following crushing, compartment syndromemay develop if there is bleeding into an enclosed muscle mass, it is a limb threatening complication which requires urgent surgical intervention.

Bleeding into an enclosed muscle space causes an increase in pressure in the surrounding tissue. As the pressure increases it compromises the blood supply and nerve fibres.

The signs and symptoms of compartment syndrome are those of a crush injury (the five Ps) with the inclusion of swelling.

Crush syndrome
Is a life threatening condition associated with crushing and entrapment.

When muscle fibres are crushed chemicals are released into the circulation from damaged cells. In the absence of circulation due to entrapment, these pieces of muscle fibre and chemicals are not transported away from the injury site. In addition, because of the lack of an oxygenated blood supply, toxins called anaerobic metabolites build up in the limb distal to the injury. An additional complication is that crushed muscle can behave rather like a sponge which has been squeezed dry. All of these factors produce life threatening responses when a crushed casualty is released from entrapment.

- The sudden refilling of the crushed tissue with blood can cause significant hypovolaemia and shock. In addition, the adverse affect of a sudden dip in the amount of blood being returned to the heart can cause cardiac arrest at the moment of release.
- The risk of cardiac arrest is significantly increased by the return of toxins released from damaged cells into the general circulation.
- Particles of damaged muscle fibre are flushed into the kidneys on the return of circulation and can block their fine filtration system, resulting in acute kidney failure.

The following considerations are relevant when contemplating the release of a trapped, crushed casualty :

- If the entrapment has been for less than ten minutes, release the casualty immediately and treat all injuries as appropriate.
- If the entrapment itself is life threatening, eg by compromising the airway, breathing or circulation, release the casualty immediately. In this case, the provision of urgent medical attention will be vital no matter what the casualty's injuries may be because of the risk to life at the moment of release. Monitor the released casualty and treat as appropriate.
- If the entrapment has been for longer than ten minutes and is not, of itself, life threatening, the casualty should not be released until appropriate medical help is at the scene. It may be of interest to note that the treatment given at the scene to prevent death at the moment of release may vary from giving intra venous fluids to in situ amputation. Monitor the casualty and treat any injuries as appropriate.

11C DIVING EMERGENCIES

Decompression sickness
This occurs when a diver ascends too rapidly following a dive. Nitrogen, which, at depth, is dissolved in the blood in quantities greater than normal, cannot come out of solution in the lungs and be exhaled in the normal way if an ascent is too rapid. It then tends to come out of solution in the form of gas bubbles in the bloodstream or body tissues. Symptoms, which may vary considerably depending on where the gas bubbles lodge, usually start within an hour of surfacing but may be delayed for up to forty eight hours perhaps precipitated by decompression associated with flying. Symptoms include:

- General tiredness and fatigue with loss of appetite.
- Skin rashes and swelling.
- Musculoskeletal pain, particularly around the shoulders and knees, is the most common presenting symptom. This is known as 'The Bends'.
- Paralysis of one side of the body or limbs. Any neurological signs after a dive should be taken as a warning of possible decompression sickness. These include headache, confusion, altered sensations etc.
- Anyone displaying signs of decompression sickness requires urgent and appropriate medical attention in a decompression chamber.

Barotrauma
This is physical damage to tissues resulting from pressure changes as a diver dives or surfaces.

Barotrauma of descent (also known as 'Squeeze') results from compression of gas in enclosed spaces as a diver descends and pressure increases. The most common areas affected are the ear, where the problem is caused by a failure to clear the eustachian tube, and nasal sinuses. Problems can occur at depths of as little as one meter and include sharp pain and bleeding from the nose or ear. Problems can also occur in the lungs, in the gut and in teeth.

Anyone experiencing pain during the descent phase of a dive, should return to the surface gradually and seek medical help.

Barotrauma of ascent (also known as 'Reverse Squeeze') results from the expansion of air in enclosed spaces as a diver surfaces with possible disruption of tissue. The most common cause is breath holding which can result in physical damage to the lungs. It is also possible for air to enter the bloodstream as a result of the lung damage (air embolism). This problem may present in many ways depending on where the air bubbles form but should be suspected if any problem develops at or near the time of surfacing.

The symptoms of air embolism include paralysis, confusion, loss of consciousness, blindness, convulsions, dizziness, abdominal pain and cardiac arrest. Any one exhibiting unexpected symptoms at the moment of surfacing or shortly thereafter should suspect a diving related problem and must receive urgent medical attention and recompression.

Immersion trauma
This is the name given to a specific problem which occurs as a direct result of immersion in water. It is related to blood pressure changes caused by alterations in the amount of blood pooled in the legs. There are two extreme positions when a body is floating in water but both, and any position in between, result in increasing blood pressure. When a body is floating vertically, the water pressure acting on the legs squeezes more blood back to the heart and when a body is floating horizontally, the loss of gravitational pooling also results in more blood being returned to the heart. The increased cardiac output resulting from this significantly increased venous return leads to increasing blood pressure for which the body compensates by shifting fluid out of the circulatory system eg by increasing urine

production to reduce the circulating blood volume and hence the blood pressure. If a casualty is then rescued from immersion vertically, the sudden return of blood to the legs in conjunction with a reduced blood volume results in a significant loss of venous return to the heart which, in turn, results in a catastrophic dip in cardiac output which may be life threatening due to complete cardiovascular collapse.

11D EMERGENCY CHILDBIRTH

Childbirth is a natural and often lengthy process: when a woman goes into labour, there is usually plenty of time to get her to hospital, before her baby arrives. In the rare event of a baby arriving quickly the birth will usually happen naturally, and only in an extreme situation will it be necessary for the first aider to intervene.

Childbirth is open to infection therefore it is imperative that you take all possible precautions for mother and child against contamination from yourself and from the surroundings – wear disposable gloves during the process. If gloves are unavailable scrub your hands thoroughly with soap and warm water. Change your gloves, or scrub your hands each time they come into contact with contaminated material, faeces, blood etc.

The birth process normally begins at about the 40th week of pregnancy. The entire process is called Labour, and there are three distinct stages: in the first, the uterus contracts and the baby gets in position for birth; in the second, the baby is born; and in the third, the afterbirth (placenta and umbilical cord) is expelled.

1st Stage – Onset of labour:
This may last between 2 and 24 hours. It begins with cramp-like pains in the lower abdomen, a 'heavy' feeling near the pubic area, or some may experience back pain. The pains occur regularly every 5 – 20 minutes and last for approximately 30 seconds.

Examination of the patient's vagina may reveal a 'show' (the expelling of a bloodstained mucus plug which protects the uterus from infection), which occurs some time before the contractions of the uterus begin.

The start of the contractions, together with the pressure of the baby's head, causes the cervix (neck of the uterus) to dilate (widen). During this stage, the amniotic sac breaks and the 'waters' (amniotic fluid) leak out of the vagina, depending on the position of the baby this may be a trickle or a rush.

Now that the birth process has begun, you should prepare for it by organising:

- Plastic sheeting (to protect the area beneath the mother to be)
- Towels for warmth, and to absorb body fluids
- Three clean linen or string ties about 25cm long
- Sharp sterile scissors
- Large sterile pads (for the mother)
- A warm towel or blanket (for the baby)
- Towel, flannel and warm water to clean the mother

2nd Stage – Birth of the baby:
Once the cervix is fully dilated, the baby's head presses down on the mother's pelvic floor, triggering an urge to push. The pains change to 'bearing down' pains. These contractions may stimulate the mother to want to pass a bowel motion. Do not let her go to the toilet unaccompanied!

The birth canal (vagina) stretches as the baby passes through it, and there will usually be an increase in bloodstained mucus. Eventually the top of the baby's head will become visible – this is called 'crowning'. Most babies are born head-first, though occasionally a baby will present buttocks-first. This is known as a 'breech birth', and the mother may be unable to give birth without trained medical assistance.

When you observe the 'crowning' process, if possible wash your hands or change your gloves if time allows.

The mother may unavoidably pass a bowel motion. If this occurs, remove the faeces completely with a pad and cover the stained area. The mother will be in some pain and have

an urge to 'push'. Encourage her not to hold her breath. Help her to stay calm and advise her to 'push' when the urge is very strong. As the baby is gradually pushed through the opening of the vagina, gently support its head – Do not pull the baby, as it will be delivered normally in successive contractions.

In most cases the baby turns to face the mother's back as it travels down the vagina, but as the baby is born it will spontaneously rotate to face one side. This is a normal process.

Note: Should the umbilical cord be wound around the baby's neck, slide two fingers underneath it and gently ease it over the baby's head. There is enough slack in the cord to do this easily.

Very occasionally, the baby's head is born but the body delayed, usually by the shoulders, ask the mother to change her position, try a supported squat or on all fours.

If the baby presents as a breech birth, it will be born body-first. The baby is unlikely to be expelled normally, so you must attempt to prevent the cord becoming pinched in the vagina. Gently pull down a loop of cord to relieve the pressure. Get medical help urgently!

Lift the baby away from the vaginal opening. Newborn babies are wet and slippery, handle with care! Pass baby to its mother, laying it on her stomach.

At this point the baby may start to cry, if this does not happen, check airway and breathing; if there is any doubt, begin resuscitation immediately (see section 4e).

Dry the baby with a clean cloth and then wrap carefully in a blanket and give it back to the mother. When laying the baby down, keep it on its side so that any fluid or mucus can drain easily from its nose and mouth.

After 2-3 minutes the cord will stop pulsating. At this point the baby is no longer dependent on the mother's circulatory system, and is ready to go it alone. Use the linen or string ties to tie the cord firmly in three places: 10cm, 15cm and 20 cm from the baby's navel. Secure the ties firmly enough to prevent any flow of blood through the cord, which may allow the baby to bleed.

Note: you do not need to cut the cord if medical help is on the way, but if you are required to do so, cut the cord leaving two ties on the baby's side of the separation.

As soon as possible after the delivery, assess the baby, noting the time it was delivered, its colour at birth (blue? dusky? pale?), any deformities, or skin discolouration, strength of cry (loud and lusty, or weak), and whether the baby moves spontaneously, or just lies still. This is important information for the baby's subsequent medical examination. Repeat the examination after 5-10 minutes and note any changes. Keep the baby under constant observation.

3rd Stage – Delivery of the placenta (afterbirth):
The placenta was the source of the baby's blood supply while in the uterus, and is now redundant. It will be expelled through the vagina by contractions, similar to the birth. This usually occurs 15 – 60 minutes after the birth. During this time it is essential that you do not apply pressure, or any strain on the cord or touch the mothers abdomen.

To encourage delivery of the placenta, ensure that the mother raises and parts her legs slightly. It is normal for the mother to bleed slightly as the placenta is expelled. Put the baby on the mother's breast, this will stimulate the uterus to contract and slow any bleeding. The placenta will be delivered by successive contractions.

After delivery, it is important that the placenta is retained for examination by a medical professional. Care of the mother: Provide the mother with a towel, and water for washing, and give her sanitary pads to use. Monitor her pulse, assess her colour, and check carefully for any further bleeding and what you may consider to excessive blood loss. Provided the mother is conscious and not ill or drowsy, give her a warm, sweet drink and encourage her to rest. Keep her under constant observation. Retain all bloodstained towels and pads for medical examination. If requested by the mother, assist her with cleaning herself up and changing her clothing.

Notes

11E LYME DISEASE

Lyme disease is a bacterial infection carried by ticks. There is very strong evidence of a dramatic increase in the tick population in UK throughout the 1990's with their numbers remaining high to the present day and Lyme disease is becoming a more common phenomenon. It should be remembered that, although the chance of infection is relatively small and the disease is easily treatable if caught early, the consequences however can be very severe if it is not treated properly in its early stages.

Ticks are widespread in moorlands and woods but particularly in grassy pastures. Climbers on sea cliffs are also vulnerable to infection from various species of tick who use birds as the primary host. Ticks can also be brought into the home by family pets, check your dog or cat carefully and treat them regularly with a vet approved insect repellent. A tick bite is painless and the tick will remain attached to a host until it is gorged with blood increasing greatly in size before dropping off. This can take anywhere from a few days to two weeks.

The first signs:
Three to thirty days after being bitten, a small pimple like swelling appears at the bite site with accompanying flu-like symptoms.

- Fever.
- Headache.
- Stiff neck.
- Joint pains.
- Fatigue.

A circular rash, erythema migrans, sometimes called a 'Bull's Eye' rash is a classic sign, however, a rash only occurs in around 50% of cases but if it is observed medical help should be sought as soon as possible; appropriate treatment should begin as soon as possible. The rash may become oval or triangular as it spreads. As infection spreads, rashes can appear at different sites on the body. The rash usually fades, even without treatment, from the centre out after about four weeks.

Risk of Infection:
The risk of infection from the bite of an infected tick increases with time.

- In the first 24 hours, infection is unlikely.
- There is a 50% risk of infection between 24 and 48 hours.
- After 72 hours, infection is certain.

Prevention and treatment:
If symptoms appear, medical advice should be sought and a LD blood test insisted upon. If possible carefully remove the tick with a 'Tick Twister' or other appropriate instrument and place it in a secure container, it may be required later for analysis. Early treatment with antibiotics can be very effective in reducing the short term symptoms and, importantly, can have a significant effect on the development of potentially serious long term complications which include recurrent attacks of arthritis (swollen, painful joints), heart abnormalities and severe neurological problems such as stiff necks, severe headaches, meningitis, facial paralysis (Bell's Palsy), numbness and poor motor coordination. These long term complications can develop months or even years after infection. In an extreme case, Lyme disease can be crippling. If at all possible, stay out of areas of thick vegetation.

- Leave no exposed skin on the legs, ankles or arms.
- During and after a day on the hill, inspect your body thoroughly for signs of ticks.
- Remove ticks using a proprietary tick hook or by grasping the head of the tick with tweezers as close to the skin as possible and pulling gently. It may be helpful to apply a slight anticlockwise twist while removing the tick. This tends to cause the spines which hold the mouthparts in the skin to retract.
- If the ticks mouthparts are left in the skin, either remove as you would a splinter or seek medical advice.
- Treat the bite site with antiseptic and apply a dressing.
- BE TICK AWARE

Notes

11F MENINGITIS

The meninges are the linings that surround and help protect the brain and spinal cord. They can become infected by a variety of viruses or bacteria, and infection can occur at any age.

If not diagnosed and treated promptly meningitis is potentially a very serious illness, the casualty may deteriorate rapidly, and prompt hospital treatment with antibiotic drugs is vital. Meningitis, if not treated promptly, can cause permanent problems such as deafness, brain damage, or can even be fatal.

Signs and symptoms:

- These may include – high fever, vomiting, severe head ache
- Loss of appetite
- Intolerance to light and sound
- Rigidity of muscles (especially those in the neck)
- A distinctive rash of red/purple 'pin prick' spots that may spread to look like fresh bruising, and does not fade if the side of a glass is pressed over the skin).

If there is any doubt, suspect meningitis and seek urgent medical advice. Do not wait for all of the signs listed above to appear.

Notes

11G SPORTS INJURIES

Many injuries, such as fractures, soft tissue injuries, head injury etc, occurring during sporting activities are dealt with elsewhere since they may be found in a wide variety of circumstances. Some other injuries, mainly chronic or overuse injuries, are discussed below. Most can be relieved by 'First Aid' type treatment but, in many cases, it will be necessary to seek medical help.

Tennis elbow.
Symptoms include swelling around the outer edge of the elbow (because the tendon is inflamed), tenderness around the elbow and pain. Movement of the elbow may be pain free, pain tends to occur on gripping. Tennis elbow is due to repetitive movement of the muscles in the lower arm and may be treated with rest and proprietary anti-inflammatory drugs such as ibuprofen.

Golfer's elbow.
This condition has similar symptoms to tennis elbow (above), with the difference that the swelling appears on the inside of the elbow due to the difference in arm movement during sport.

Jogger's nipple.
This term is used to describe dermatitis (itchy, inflamed skin) around the nipples and is due to constant chafing of clothing against the nipple. Spreading petroleum jelly on your skin before running can help prevent it. Hydrocortisone cream may help to reduce symptoms once the condition has developed.

Runner's knee.
This is swelling at the back of the kneecap and can cause a grating sensation in the knee. Runner's knee is due to repeated impact through running on hard surfaces. This problem can often be avoided by the use of good quality trainers or an appropriate sports insole with good heel padding.

Tendonitis.
This is an uncomfortable condition caused by overuse, strain, or a tear in a tendon resulting in inflammation between the tendon and tendon sheath. Symptoms include swelling, redness, and pain at the affected area, and restricted movement of the area.

Shin splints.
This is pain along the shin bone (the bone at the front of the lower leg between the knee and the ankle), caused by inflammation and tiny fractures (microfractures) in the surface of the bone. Shin splints are common in any sport involving running and are usually caused by too much training too soon, although they can be caused by running on a hard surface or by running in shoes that do not have enough support for the foot and ankle.

Groin injuries.
These are commonly encountered in athletes of all ages at all levels of competition and are particularly common in activities such as skating, swimming, and soccer where the hip joint is heavily loaded.

Special consideration should be given to children, adolescents, and females with groin pain, because these conditions may be wrongly attributed to minor trauma when they can, in fact, be serious and require medical or surgical intervention. Any child aged up to fifteen years with groin pain and a limp should be seen by a doctor because there is a risk of serious medical problems.

It is also common in children and adolescents that knee pain is actually referred from an injury to the hip, or vice versa. Complaints of both hip and lower extremity pain in children and adolescents should be referred to a doctor.

Notes

11H TRIAGE

Multiple casualty assessment (Triage): Triage – A French word meaning to select or sort. Triage when applied to medicine is a systematic examination and prioritisation of multiple casualties. It is based on the principle that certain problems are much more likely to kill a patient. Airway – Breathing – Circulation.

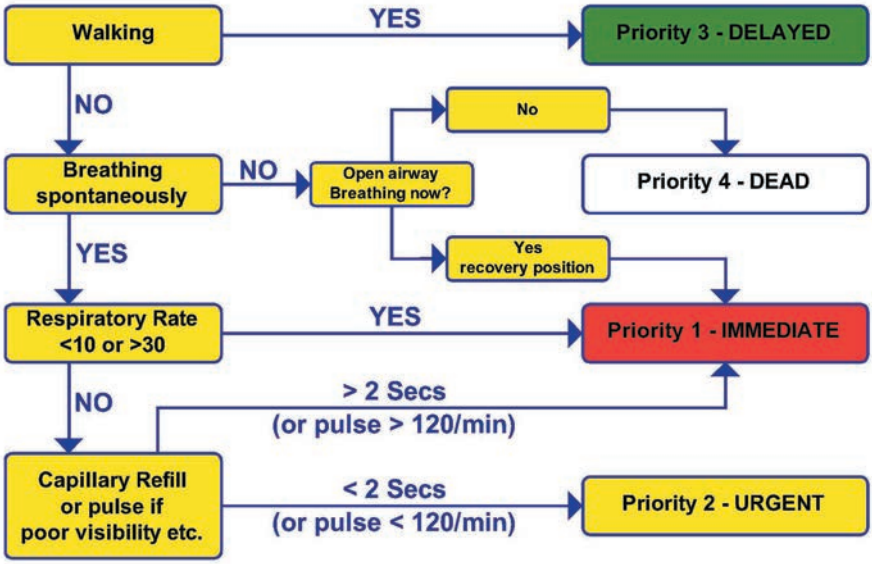
Triage Sieve is a rapid initial triage, which divides patients into colour coded priority groups,

- (Red) P1 immediate,
- (Yellow) P2 urgent and
- (Green) P3 delayed,
- (White) P4 dead, or expectant (expected to die, these people will only receive treatment if or when resources allow).

By following the simple flow chart shown below, triage sieve is a reproducible, objective assessment. Patient intervention should not be started until all victims have been prioritised, intervention before this can cause resources to be diverted from where they are essential. Once the initial triage is complete the First Aider is in a position to reassess and treat the highest priority casualties.

Remember:
Triage is dynamic and will be carried out a number of times on a patient. A P3 delayed patient may deteriorate and become P2 urgent etc.

The objective is to do the best for the most.



Notes

11I WEIL'S DISEASE (LEPTOSPIROSIS)

Weil's disease is a bacterial infection which affects animals and humans. It is not known to spread from human to human but may be caught as a result of exposure to water, food or soil contaminated by the urine of an infected animal. This may happen either by ingesting contaminated material or through direct contact at the eyes, nose, mouth (mucosal surfaces) or an open wound. Many different animals – cattle, pigs, dogs, horses, rodents and wild animals – are known to carry the bacterium which causes Weil's disease. The animals themselves frequently do not become sick but are simply carriers of the disease. Rat urine is probably the most common cause in UK with one in five of wild rats thought to carry the infection. The bacterium only remains viable for no longer than an hour in urine or fresh water. It is killed if it dries out or is exposed to salt water.

The symptoms of Weil's disease include:

- High fever.
- Severe headache.
- Chills.
- Muscle aches.
- Vomiting and diarrhoea.
- Jaundice (yellow skin and eyes) if the kidneys or liver are affected.
- Abdominal pain.

If untreated, the disease can lead to liver and kidney damage, meningitis and respiratory distress. In rare cases, death can occur.

It may take anything from two days to four weeks for symptoms to develop after exposure to a contaminated source. Illness usually begins abruptly with fever and other symptoms. This first phase may be followed by a period when the casualty may recover for a time then become ill again. If the second phase occurs, it is likely to be more serious with kidney and liver damage and meningitis. The illness lasts from a few days to three weeks and, without treatment with antibiotics, recovery may take several months.

Weil's disease is an occupational hazard for people working outdoors or with animals and a recreational hazard for campers and people participating in outdoor sports. Swimming, caving and canoeing in contaminated water have been associated with infection.

High risk areas include:

- Small slow-flowing rivers, ditches and pools.
- All stagnant water.
- Caves, sewers and drains.
- Marshes and permanently wet soil.

In any case of illness following a potential exposure to contaminated water or food, medical help should be sought and the doctor specifically advised that there is a risk of Weil's disease. A blood sample should be sent for analysis and, if this is not done as a matter of routine by the doctor, the patient should insist that it is done.

Notes

12. Human Anatomy

The human body can be considered as being made up of a number of separate but integrated systems which function together to control everything we do. Although the first aider does not require a detailed knowledge of anatomy and physiology, it is helpful in understanding many of the principles of first aid to have a knowledge of how some of the body's systems function.

The Nervous System
The nervous system is split anatomically into the central and peripheral systems.

The Central Nervous System
Controls the functions of all the other systems. The central nervous system is made up of the brain and spinal cord.

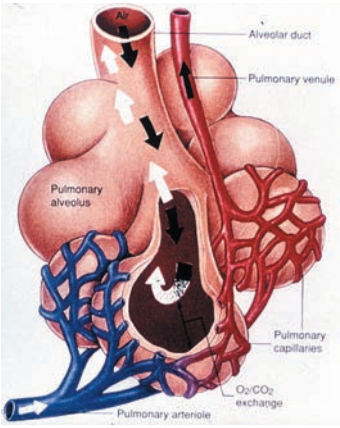
The Peripheral Nervous System
Carries all motor and sensory signals to and from the central nervous system. Most of the peripheral nerves are connected to the spinal cord but there are twelve which emanate directly from the brain. One of these, the vagus nerve, exits the brain stem and descends through organs in the neck into the thorax, and plays an important role in controlling vital functions such as the heart rate.

As well as being split anatomically into central and peripheral, the nervous system is divided by functional considerations. The autonomic systemcontrols all those functions over which we exercise no control eg breathing and heart beat and the somatic system controls such things as movement which we control by conscious thought. The autonomic system is further split into two divisions which provide directly opposing stimuli which act together to produce a balanced response. The stimulus from the sympathetic division of the autonomic system has the effect of accelerating, inhibiting and dilating various vessels and organs, while the parasympathetic system tends to stimulate various secretions and blood flow to skin and viscera, and slow, constrict and contract other vessels and organs. Some important parasympathetic stimuli are carried from the brain via the vagus nerve which, as noted above, does not pass through the spinal cord. Not all of the body's functions are controlled by stimuli from both the sympathetic and parasympathetic divisions of the nervous system. Importantly, the size of the blood vessels and the breathing are controlled by sympathetic stimulus only.

The Digestive System
This system, which includes the oesophagus, stomach and intestines, provides a means of getting fuel, ie sugars from food, into the body and of excreting the solid waste products of digestion. Drink and food are passed, via the oesophagus, to the stomach where they are processed for further digestion. They are then absorbed into the body via the membranes of the intestines. Some organs such as the liver and pancreas are considered as accessories to the digestive system as they assist in the processing of food into various chemical substances used in the body.

The Respiratory System
Provides the means of getting oxygen into the body and also of removing gaseous waste products, eg carbon dioxide.

The respiratory system consists, in simple terms, of a set of tubes which get ever smaller until they terminate in small air sacs called alveoli whose walls are so thin that they allow gas to pass into and out of the blood vessels which surround them.



Alvioli
BASP collection

The tubes (mouth, nose, windpipe etc) are collectively known as the airway and one of the most vital functions in first aid is to ensure that the airway is open and clear.

It is useful to understand that the lungs do not expand and contract of their own volition but that they function inside an intact chest cavity. The main muscles which drive respiration are the intercostal muscles between the ribs and the diaphragm. These are called the primary muscles of respiration. When we breathe in, the rib cage expands and the diaphragm contracts and flattens. These actions make the pressure within the chest fall resulting in a reduction of pressure outside the lungs and, since the pressure inside the lungs always remains the same because the lungs are connected to atmosphere through the airway, air flows into the lungs and they expand. At rest, the contraction of the diaphragm is the main factor in breathing with the intercostal muscles coming into play as the drive to breathe increases, e.g. after exercise. As the drive to breath increases further, e.g. after hard exercise or as a result of a medical problem such as asthma, more muscles, called the secondary muscles of respiration, around the shoulders and neck come into play. When we breath out, the elastic recoil of the lung tissue, together with the increasing pressure within the chest resulting from relaxation of the diaphragm and the intercostals muscles, cause the air, now relatively rich in carbon dioxide, to be forced out. Any damage to the chest can have a serious effect on our ability to breath adequately.

The Circulatory System
Provides the means of circulating the oxygen and nutrients to all parts of the body where they are used to provide energy to each individual living cell. Oxygen and sugars are carried throughout the body by the blood. The heart acts as a pump and the blood vessels are the pipes in which the blood is carried. The right side of the heart pumps blood to the lungs where it picks up oxygen before returning to the left side of the heart which pumps it throughout the body. The blood leaves the heart in vessels called arteries which get smaller and smaller as they branch out to every part of the body until they form the smallest blood vessels called capillaries from which the oxygen and sugars are transferred to the cells to fuel life and into which the main waste product of metabolism (carbon dioxide) passes. From the capillaries, the blood is returned to the right side of the heart through a system of vessels called veins.

The Musculoskeletal System
This system includes bones, cartilage, ligaments, tendons and muscles. The skeleton provides protection to the vital organs and, together with the muscles, facilitates movement as well as giving structure to the body. Very importantly, the bones, thanks to the marrow which they contain, play a significant part in the generation of white blood cells which circulate in the blood to help fight infection and platelets which play a part in clotting to stop blood loss from a damaged blood vessel. Ligaments provide the means of attaching bones at a joint, cartilage acts as a cushion between the moving parts of a joint and tendons provide the attachment between muscles and

bones. While most muscles generate movement by contracting across a joint, some muscles such as the diaphragm, function attached to large masses of tissue and do not generate movement as such. The heart is another vitally important muscle in the human body which does not generate movement.

The Endocrine System
This system provides the hormones which, being circulated in the blood, stimulate and control many of the body's functions. The endocrine system is closely linked to the nervous system with some bodily functions being directly controlled by stimuli from the nervous system while other functions are mediated by hormones released in response to a stimulus.

The Urino-Genital System
The urinary system provides the means of removing soluble waste from the body. It is made up of the kidneys, bladder and urinary tract and its proper functioning is vital in maintaining a healthy body. In simplistic terms, the kidneys act as filters for the blood, removing dissolved impurities and then reabsorbing water. The amount of water reabsorbed is controlled by the release of certain hormones. By regulating urine production, this system also plays a part in maintaining a fluid balance in all body systems.

The reproductive system is linked to the urinary system, sharing the same external anatomy.

The Lymphatic System
This system provides a mechanism for flushing toxins from the body. Lymphatic fluid is produced by the body's tissues and carries toxins and infections from the tissues to be processed in the lymph nodes in the armpits, neck and groin. The lymphatic fluid eventually drains into the blood stream.

The Integumentary System
This system is made up of the skin, hair, nails and various glands. It provides protection against injury, dehydration and bacterial attack. There is a very large network of blood vessels in the skin. In addition to providing oxygen and sugars to fuel the cells of what is the largest organ in the body (the skin), this ensures a strong and rapid clotting response to any wound and also a supply of white blood cells to fight infection. The large network of blood vessels close to the body's surface also provides a very effective mechanism for temperature control. The blood supply to the skin can either open up to carry heat to the surface from where it can be lost or shut down to conserve heat in the core. Within the skin, there is a large number of sensory nerves which allow the brain to recognise and respond to heat, cold, pain and all external stimuli. There are also sweat glands which play a role in temperature control and sebaceous glands which provide moisture to the skin and assist in responding to any bacterial attack.

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