Chapter 6

Safety, first aid and sports injury management

Elite sportspersons run a high risk of injury.

Learning focus

After completing this chapter, you should be able to:

• demonstrate basic first-aid skills, including cardiopulmonary resuscitation (CPR), asthma management and sports injury management
• examine the concept of adventure in outdoor activities as well as perceived and actual risk
• engage in a variety of recreational and outdoor adventure activities, and develop skills, knowledge and behaviours for enhancing safe participation in these activities
• examine perceptions of challenge, risk and safety in a variety of settings such as in the home, school, the workplace and the community
• discuss ways to balance risk and safety, and refine and evaluate harm-minimisation strategies
• work in diverse teams within and beyond school, including the workplace, to complete tasks with several interrelated components (Interpersonal development, Level 6)
• reflect on the success of team management and learning in achieving agreed goals (Interpersonal development, Level 6)
• use role-play or simulation games to practise and reflect on the usefulness of assertiveness and resilience strategies.

Standards

After completing this chapter, you should be able to demonstrate that you can:

• compare and evaluate perceptions of challenge, risk and safety
• work independently to implement a range of strategies, as appropriate, to maximise your learning (Personal learning, Level 6)
• work collaboratively, negotiate roles and delegate tasks to complete complex tasks in teams (Interpersonal development, Level 6)
• describe how you respect and build on the ideas and opinions of team members and clearly articulate or record your reflections on the effectiveness of learning in a team (Interpersonal development, Level 6)
• develop and implement strategies for improving their contributions to achieving team goals (Interpersonal development, Level 6).
**Introduction**

It is a sad fact that four out of every ten accidents occur in the home — mainly burns, scalds, poisoning, falls, cuts and electrocutions. Would you know what to do if you were confronted by such an emergency? Some of the accidents are life threatening. It is estimated that accidents and injuries cost Australia approximately $20 billion each year. It is therefore everybody’s duty to have a sound knowledge of safety procedures and first aid — safety procedures in the first instance to prevent accidents and then first aid to treat those injured if an accident occurs.

This chapter explores common first-aid practices for dealing with incidents that may arise at school, around the home, at work, in the sporting arena, or in everyday life. First, there is an introduction to basic first aid and procedures for life-threatening situations. Then the section on the great outdoors will deal with safe water practices and emergency procedures that may arise from outdoor recreational pursuits. Sports injuries most common to young athletes are explained and also the role of the coach in helping to prevent them.

**What is first aid?**

First aid is, as the term suggests, the initial or first help that is given to an injured or ill person. First aid can be confused with medical aid, which is treatment by a doctor or other qualified person such as a nurse or ambulance officer.

First aid begins when a person arrives at the scene of an accident and continues until the casualty recovers or medical aid arrives. The most obvious objective of first aid is to save lives. This objective can be simplified into the five Ps. First aid can:

- preserve life
- protect the unconscious
- prevent injury or illness becoming worse
- promote recovery
- procure medical aid.

**Preserve life:** If a life-threatening situation does exist, the first aider should have knowledge of procedures to keep the casualty alive. (This will be discussed later in the chapter.)

**Protect the unconscious:** A casualty should be isolated from all further dangers and placed in a position where their injury or illness will not become worse.

Prevent injury or illness becoming worse: The casualty's injuries or illness should be attended to in order to prevent complications arising from his or her injury or illness (i.e. broken bones should be immobilised, bleeding should be controlled).

**Promote recovery:** A first aider can speed recovery of the casualty by reassuring them, keeping them comfortable and arranging for emergency care (that is, ringing an ambulance). This point is very important. Even though first aid delivered by a skilled person can save lives, it cannot indefinitely keep the casualty alive if the injury or illness is serious.

**Procure medical aid:** In most cases, there will be a need for qualified medical assistance; therefore, this must be a major priority. If there are bystanders, they should be sent to seek urgent medical advice. If you are alone, you must attend to the casualty first and then seek medical help as soon as possible. Whoever is sent to seek medical advice must be aware of the correct procedure for calling any emergency service or assistance. The message should be brief yet contain all essential information about the accident or incident. This information may seem obvious now, but under pressure or panic many calls are useless because callers fail to give all relevant information.

The following checklist contains details needed when seeking medical aid:

- **Location**
  - Name of district or suburb
  - Name of street, road, highway
  - Nearest corner or cross street
  - Distance from major town or landmark

![Figure 6.1 When seeking an emergency service, make sure you get the details right.](image)
**Prevention and safety**

Before we go into any detail on how to administer first aid, we should be reminded of one very important point. *Most accidents are preventable.* The golden rule of first aid is to be safety conscious. Commonsense safety rules can prevent many accidents. Your home is where most accidents occur, therefore you can be responsible for keeping your living environment safe by checking the level of safety and identifying any changes that can be made in your home. Let us try to identify some general rules that may be followed.

**Safety in the home**
- Store poisonous substances and medicines out of the reach of children.
- Provide guards for fires and radiators.
- Do not leave toys around the house, as people can slip on them.
- Store firearms and explosives in safe areas, locked away from children.
- Turn handles on saucepans and other cooking containers away from the edges of the stove.
- Unplug electric cords when not in use.
- Always run cold water into the bath before the hot.
- Do not leave cigarette lighters or matches within reach of children (see figure 6.2).

**Safety in the backyard**
- Have a childproof fence around swimming pools — keep the gate locked.
- Store pool chemicals safely away.
- Lock away all sharp or dangerous tools when not in use.
- Have dangerous or flammable liquids clearly marked.
- Do not leave ladders standing against walls.

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**Figure 6.2** The home, where most accidents occur, can be made a safer environment.
Safety in the car and boat

- Ensure the car is roadworthy.
- Don’t drive too far without taking a break.
- Make sure all passengers have seatbelts correctly fitted, and that babies and small children are correctly secured.
- Carry approved life jackets for all on board.
- Inform someone responsible of where you are going and when you intend to return.
- Check the weather forecast.
- Carry sufficient fuel and water.

This is certainly not an exhaustive list of safety rules. There will be an opportunity to include more in one of the Inside and Out Workbook activities. (We will also discuss some more specific rules and commonsense ideas when we look at sports injuries, camping and water safety later in the chapter.)

You should be very aware of this rule:

Every person has a responsibility to be alert to possible dangers and to do all in their power to prevent accidents to their own family and to other people.

Plan of action

Practical Activity 6.1

**Hypothetical accident**

You are walking home from school when you hear a screech of tyres and a loud bang coming from around the corner. Your heart skips a beat and starts thumping in your chest like a drum. You quickly rush around the corner to be confronted by a horrific sight. There is a motorcyclist lying still on the road, his motorbike mangled beside him. A car has veered across the road. The driver is getting out, and appears uninjured (see figure 6.4).

Would you know what to do?

**Questions**

1. Write a list of the actions you would take.
2. Read the advice on pages 151–5 and then compare it with your list. In what ways do your list and the advice differ?
We must realise that the above hypothetical accident is a life-threatening situation — not all accidents we will come across will be this serious or dramatic. However, in order to administer first aid successfully we must have a plan of action that will work for all types of situations, from a serious car accident to a sprained ankle.

In an emergency situation, we have to have a set of priorities in our ‘plan of action’; that is, we must attend to a person’s breathing before we attend to broken bones. (A person cannot usually die from a broken bone.) The most widely used plan of action is the DRABCD plan, in which each letter stands for something a first aider should do, and in the correct order.

**Danger**
Check for and remove any danger to:
- yourself
- the casualty
- the bystander.

**Response**
Gently shake and loudly shout. If the casualty:
- responds, check and control serious bleeding
- does not respond, proceed with ABCD.

**Airway**
Open the mouth and clear if needed.
Clear and open the airway (tilt the head and support the jaw).

**Breathing**
Look for signs of life — is the lower chest or abdomen rising and falling?
Listen — can you hear breathing sounds?
Feel — can you feel breathing?
- If the casualty is breathing but not responding, an ambulance must be called immediately (dial 000). Continue to monitor the breathing.
- When checking the airway, the unconscious casualty should only be rolled onto his or her side (lateral position) if foreign material is present in the mouth, see figure 6.5 on page 152.
- If the person is not breathing, an ambulance must be called (dial 000), then CPR should be commenced immediately.

New guidelines for Cardio Pulmonary Resuscitation (CPR) and resuscitation have been adopted by the Australian Resuscitation Council (ARC). These guidelines were first published in 2005 and are designed to streamline CPR for the first aider. A major change in the updated guidelines is that they increase the number of chest compressions to 30, after giving two rescue breaths. This change applies for victims of all ages (except newborn infants). The full details are provided on pages 152–3 of this chapter.

**Compressions (CPR)**
If the casualty is not breathing and is unconscious, CPR must be commenced immediately. The presence of a pulse is no longer checked prior to commencement of, or during, CPR.

**Defibrillator**
Defibrillators can be used by qualified rescue personnel such as paramedics if the casualty is still not breathing and is unconscious. Some first-aid courses also now teach how to use a defibrillator as part of their CPR training, as many public places will soon have them available for use in case of emergency.

**Danger**

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Practical Activity 6.2

**Danger**
What dangers exist for the victims, for ourselves, for bystanders? Make a list on the board and discuss how we may overcome the dangers. For example, we are no use to anyone if we get injured trying to help casualties — we must keep ourselves safe.

**Response (shake and shout)**
Which casualty is likely to be more seriously injured in the hypothetical accident described in Practical activity 6.1? The motorcyclist, most
probably. We are trying to establish whether the casualty is conscious or not. If he is, this will make our job easier. We would approach the motorcyclist, gently shake him and ask ‘Can you hear me?’. If the casualty responds, check for bleeding and other injuries (broken bones etc.). In this case, the casualty has not responded, so what do we do now?

**Airway**

If the casualty is unconscious (a condition in which the brain fails to respond to the messages sent to it), we must check that the airway is clear and send for an ambulance immediately. The airway is the passage that leads from the mouth, nose and throat to the windpipe. If this is blocked, oxygen cannot reach the lungs. If there is no oxygen for 3–4 minutes, the person will start to die. Some common causes of a blocked airway are:

- the tongue
- vomit
- false teeth
- chewing gum.

If any of these objects is blocking the airway, we must place the casualty in a position that will enable us to clear the object. This position is called the lateral position and is shown in figure 6.5.

1. Kneel beside the casualty.
2. Place the arm of the casualty that is furthest away from you straight out.
3. Place the casualty’s nearest arm across his chest.
4. Bend the nearer knee up.
5. Roll the casualty away from you so he is lying on his side.

![Figure 6.5: Rolling a casualty into the lateral recovery position to remove foreign substances](image)

If our motorcyclist casualty may have vomited from the shock of his fall. If he is lying on his back, the contents would block his airway. We therefore place him in a lateral position to clear his airway.

**Clearing the airway**

1. With the casualty in the lateral position, tilt the head back slightly.
2. Open the mouth. With two fingers, remove any objects that may be blocking the airway using a scooping action (see figure 6.5).

If the airway is clear, then the casualty can be positioned on his or her back.

**Opening the airway**

1. Whether the person is on his or her back or in the lateral position, tilt the head right back with one hand on the forehead and, using a pistol grip, hold the chin and jawline (see figure 6.6).
2. Lift the jaw forward and open the casualty’s mouth slightly.

![Figure 6.6: Clearing the airway](image)

**Breathing**

We may have done a good job clearing the casualty’s airway; however, he may still be having trouble breathing. We are not doctors, so how do we check if he is breathing?

1. Place your cheek alongside the casualty’s mouth.
2. Feel and listen for breath.
3. Look along the chest to see whether it is rising and falling.

If our motorcyclist casualty is breathing, we continue to monitor him until the ambulance arrives. If there is no breathing, we must not waste time.
Rescue breathing and CPR

1. Position the casualty on his back.
2. Kneel beside the casualty.
3. Place one hand on the casualty’s forehead.
4. Tilt the casualty’s head back.
5. Pinch the casualty’s nostrils with your fingers or close off the nostrils with your cheek.
6. Place your mouth firmly over the casualty’s mouth, making an airtight seal (see figure 6.7).
7. Breathe into the casualty’s mouth to give two rescue breaths.
8. If there are still no signs of life, begin chest compression.

![Figure 6.7 Sealing the nose with the fingers, give two rescue breaths](image)

CPR for adults (one operator)

1. Visualise the centre of the chest. Place your interlaced hands on the breastbone; keep your arms straight (see figure 6.8).
2. Lean forward so that you compress the breastbone about 1/3 of the depth of the chest (see figure 6.8).
3. Release the pressure, then repeat.
4. Continue 30 times.
5. Pause after each 30 compressions to give two rescue breaths performing a ratio of 30 compressions to two breaths at a rate of 100 compressions per minute.
6. Continue with chest compressions until signs of life are obvious.

![Figure 6.8 Press the breastbone down about 1/3 of the depth of the chest.](image)

Variations on CPR

Two operators

- Each person should kneel on opposite sides of casualty’s body.
- The more experienced person should perform rescue breaths.
- Give 30 compressions and two rescue breaths at a rate of 100 compressions per minute.
- Change operators of chest compressions every two minutes.

CPR for small children

For children under 8 years, but over 12 months old, use the following procedure.

- Apply slight, not full, head tilt.
- Locate the lower half of the breastbone.
- Apply compressions with the heel of one hand placed over the lower half of the breastbone.
- Depress the breastbone 2.5 cm.
- Keep the same ratios as for adults.
- Cover the child’s nose and mouth if required with your mouth and breathe with less force, as children’s lungs are smaller.

CPR for infants

For infants below the age of 12 months, use the following procedure.

- Do not apply head tilt for infants. The head remains horizontal.
- Apply compressions with the tips of your index and middle fingers over the lower half of the breastbone.
- Compress to a depth of 1.5 cm using two fingers.
- Rates of ventilation and compression are the same as for small children.
Practical Activity 6.3

Role-play and teamwork for an accident scenario

Role-play is a positive way to learn about working collaboratively as part of a team. Role-play requires investigation, rehearsal and presentation of the subject or topic matter, and promotes deeper understanding of the issue. Role-play scenarios such as first aid at the scene of an accident require students to work collaboratively as a team.

Characteristics of an effective team include:
- specified role for each team member
- well developed communication within the team
- a desire on the part of each team member to achieve agreed team goals rather than individual goals
- effective leadership.

Strategies for developing teamwork:
- plan together, devise strategies and ideas together
- understand the task
- review performance, reflect and evaluate after each rehearsal or practice
- peer coaching, assist each other to achieve
- flexibility, a change of role within the team may assist achievement of goals
- agree on a timeline for the project
- agree on the form of final presentation.

Role-play — emergency situation

To complete this task, you will need to use information from page 148 of this chapter ‘What is first aid?’ and pages 150 and 151 ‘Plan of action’.

1. Form a team of five and rehearse the scenario set out on page 150. The following roles are required: victim, car driver, first aider, bystander 1 and bystander 2. Remember to include the five Ps and DRABCD into your role-play.

2. On completion of this task, complete the self-assessment rubric for this chapter (see the Inside and Out Workbook, 4E). Teachers may find the corresponding teacher rubric, also in the Inside and Out Workbook, 4E, useful for assessment.

Let’s return to the scene of our accident. The motorcyclist has had life-threatening injuries attended to. We have checked his airway and breathing. We have placed him in a lateral recovery position. This position keeps his airway open; any regurgitation can drain out without causing blockage. The casualty is also prevented from rolling over and causing further injury. What next? Well, we have sent for urgent medical help. The next step is to find out if there are any other life-threatening injuries. What about bleeding?

Bleeding

Adults have approximately 6 litres of blood in their body, children about 2.5 litres and babies about 750 mL. Severe bleeding must be controlled, as losing a large quantity of blood could lead to a casualty collapsing or dying. Once an adult loses more than 1 litre of blood, serious damage can result.

Management of external bleeding

To reduce the risk of disease transmission when controlling bleeding, you must form an effective barrier (e.g. by using latex gloves or a clean, folded cloth) between your skin and the victim’s blood. Immediately after providing care, wash your hands thoroughly with soap and water. Do not eat, drink or touch your mouth, nose or eyes until you have washed your hands.

Bleeding may be controlled by using pressure and elevation as follows.

1. Lay the casualty down.
2. Apply direct pressure to the site of the bleeding. Pressure can be applied in a number of ways:
   - using your hand
   - tying a piece of clothing around the wound
   - making a pad and using a bandage to hold it in place.

By pressing firmly on the wound, the blood vessels beneath the skin are flattened and the blood flow is reduced. This gives time for blood clots to start forming, sealing off damaged blood vessels.

3. Apply pressure for five to ten minutes.
4. Raise the injured area to reduce blood flow.

Once bleeding has been controlled, commence an orderly assessment of the casualty, checking for injuries, burns or fractures as you investigate the casualty’s body. Look for
anything out of the ordinary, such as tenderness, swelling, blood and deformity.

Examine in the following order:
- head and neck
- shoulders, chest
- abdomen, hips
- arms, elbow, shoulder, wrist, hands
- legs, hip, knee, ankle, feet
- back.

Once you have completed your ‘plan of action’, wait for medical help to arrive and take responsibility. You should remain at the scene in order to assist the medical people or give any information relevant to the accident.

Substance abuse

Any form of substance abuse, including alcohol abuse, poisons the body. Alcohol is a common and popular drug in Australian culture. Consuming a large amount of alcohol has an unhealthy effect on the body (see figure 8.5 on page 217).

When treating a person suffering from substance abuse, follow your emergency plan.
- Make sure the person is in a safe environment.
- Lay the person on his or her side to make sure the mouth is empty. Check for breathing.
- If you can’t wake the person, call an ambulance immediately.
- If there is no breathing, commence CPR.
- Protect the person from extremes of hot and cold.
- Treat bruises and sprains with ice packs as soon as possible.
- Clean minor cuts and abrasions.
- Shock may result from excessive vomiting or heavy bleeding.

**Do not:**
- ignore someone who is vomiting continuously
- try to prevent vomiting
- give the person drugs
- leave an unconscious person unattended.

Asthma

Asthma is a condition that causes breathing difficulty because of sudden or progressive narrowing of the airways caused by spasms in the muscles of the bronchial walls, swelling and inflammation of the lining of the airways, and excessive production of mucus. (Bronchioles are tubes that are located in the lungs and which transport oxygen.) Major factors that can bring on asthma attacks are exposure to house dust, pollens, animal fur and moulds, respiratory infections and exercise. Additional causes of asthma are cold air, anxiety or emotional stress and cigarette smoke.

Many children experience attacks during exercise; however, increased physical fitness can reduce the chance of having an attack. A high level of physical fitness can strengthen the breathing muscles and, in turn, this can improve breathing. So, there lies the problem — the sufferer needs to improve the level of fitness, but exercise may bring on an attack. With an asthma management plan, people with asthma can participate in sporting activities and, in fact, many of our leading athletes have asthma.

Premedication with an inhaled ‘reliever’ medication a few minutes before exercise can prevent exercise-induced symptoms. ‘Reliever’ medications, such as Bricanyl, Respolin, Ventolin and Asmol, are called bronchodilators. They relieve symptoms, but usually for only a short time. The main medication for keeping asthma as steady as possible is the inhaled ‘preventer’. Preventer medications, such as Becotide, Pulmicort or Intal, will work only if you use them regularly and should not be used to treat an asthma attack.

Warm-up exercises are helpful to reduce bronchial constriction that occurs during exercise.

The best types of fitness activities are swimming, walking and cycling. If you suffer from exercise-induced asthma, you can work out a suitable asthma management plan with your doctor and enjoy the benefits of regular exercise. With your doctor, you need to work out a plan that enables you to recognise when your asthma is getting worse, know how to treat it quickly, and know how and where to get the right medical assistance.

**Management of an asthma attack**

1. Sit the patient down and remain calm to reassure him or her. Do not leave the patient alone.
2. Without delay, shake the blue reliever puffer (names include Ventolin, Airomir, Asmol or Epaq) and give four separate puffs through a spacer (spacer technique — one puff/take four breaths from spacer, repeat until four puffs have been given).
3. Wait four minutes. If there is no improvement, give another four separate puffs, as per step 2.
4. Wait four minutes. If there is no improvement, call an ambulance (dial 000) immediately and state that ‘a patient is having an asthma attack’.
5. Continuously repeat steps 2 and 3 while waiting for the ambulance to arrive.
   If at any time the patient’s condition suddenly worsens, call the ambulance again.
6. If breathing stops, commence CPR, as described on pages 152–3 of this chapter, immediately.
   Visit the website for this book and click on the Asthma Victoria weblink for this chapter (see ‘Weblinks’, p 311) for more information.

Most exposure to the elements (sun, wind, rain, snow, water) can, with adequate preparation and forethought, be avoided.

Precautions
- Pack appropriate clothes for the conditions that you will be experiencing. If you do not know what weather conditions you will experience, find out all you can from teachers and camp leaders before you go.
- Make sure you keep yourself dry by having good quality waterproof clothing.
- Wear inner clothing made from natural fibres (some artificial fibres may be appropriate).
- Wear a hat:
  — in the sun, to protect from sunburn
  — in the cold, to protect from heat loss from the head.
- Travel in groups.
- Take equipment to start a fire.
- Ensure you eat a balanced diet.
- Take food and water with you.
- Check the weather forecast before you leave.
- Take a change of clothes in case you get wet.
- Take shelter in extreme weather.
- Take a ground sheet.
- Can you think of other precautions?

The symptoms of overexposure are:
- feeling cold and shivering
- excessive tiredness
- uncoordinated movements
- slow mental and physical response
- blurred vision, feeling dizzy, nausea
- cramps
- the person lagging behind the rest of the group.

Death by overexposure is not an accident.

Management
- Take the casualty and yourself out of the wind, rain and cold, and away from wet ground.
- Remove any wet clothing and put the casualty in dry clothes. Wrap the person in a blanket or sleeping bag (see figure 6.10).
- If conscious, give warm drinks.
- Place a companion in the sleeping bag with the casualty. This will warm the casualty slowly through the warmth given off by the other person’s body.
- Do not warm the casualty in front of a fire, as this will rewarm them too quickly and force blood to the extremities.
Figure 6.10 After being rescued from a sailing accident, this sailor, Tony Bullimore, was wrapped in a space blanket.

**Hypothermia**

Hypothermia is a more dangerous consequence of overexposure. Overexposure is a cooling of the body’s outer surface (i.e. fingers, hands, feet, legs). After several hours of exposure, hypothermia develops as the body's internal organs and tissues start to cool down. This condition can lead to death. **Important:** Heat loss from the head accounts for one-third of the body’s total heat loss.

The symptoms of hypothermia are:
- casualty is cold to touch
- slow pulse
- slow and shallow breathing
- babies become quiet and refuse food
- unconsciousness, especially in the elderly.

**Management**

- Remove to a warm, dry place.
- Place the casualty between blankets so that the temperature can rise gradually.
- If conscious, give a warm drink.
- A companion stripped to underclothes and sharing the sleeping bag will help to warm the casualty.
- Seek medical aid.

Do not attempt to speed up the warming process by:
- placing casualty in a hot bath
- applying hot water bottles
- massaging
- applying direct heat
- giving alcohol.

**Frostbite**

Frostbite is the local freezing of a particular body tissue. The body parts that are prone to frostbite are usually those that are exposed to the cold for a long time (e.g. nose, ears, face, fingers and toes). As the body cools, the blood vessels in the particular body tissue constrict. This usually cuts off circulation to the area. In extreme cases, a person can lose the body part that has frostbite.

The symptoms of frostbite are:
- numbness and tingling in exposed areas
- white, waxy skin
- skin is firm and cold to touch
- possible blistering and discoloured skin.

There may be little or no pain associated with frostbite.

**Management**

- Place the casualty in a warm, dry place.
- Rewarm the area by body heat.
- Never rub or massage the frostbitten area.
- Never rewarm with direct heat.
- Cover any blisters with dry, sterile dressings.
- Seek medical aid.

**Heat injuries**

**Dehydration, heat exhaustion**

Heat injuries occur in hot and humid climates, where people lose excessive amounts of fluid through sweating. They are often associated with hard physical exercise. The fluid in your body regulates your body temperature. When your body becomes hot, it produces sweat to cool itself down. If this fluid is not replaced, the body will continue to heat up. Therefore, the importance of taking in plenty of fluids before, during and after exercise cannot be stressed enough.

Children are likely to suffer from heat exhaustion more quickly than adults due to their smaller body size.

Dehydration and **heat exhaustion** can be prevented by:
- drinking before exercise (even if you are not thirsty)
- drinking during exercise — thirst is a late indicator of dehydration
- avoiding exercise during the hottest part of the day (11 a.m. – 3 p.m.)
- wearing loose-fitting clothes.

The signs of dehydration and heat exhaustion are:
- feeling hot, exhausted and weak
- headache, which may persist for hours
• thirst
• fatigue
• nausea
• giddiness and fainting
• lack of coordination
• rapid breathing and pulse
• muscle cramps
• sweating.

Management
• Remove the casualty to a cool place with fresh air.
• Lay the casualty down.
• Loosen any tight clothing.
• Sponge the casualty with a damp cloth or towel.
• Give plenty of fluids (cool water, add sugar or glucose at 1/2 teaspoon per litre).
• If the casualty does not recover and starts to vomit, seek medical aid.

Heatstroke
Heatstroke is a more serious form of heat exhaustion, and can be very dangerous. It is a complete breakdown of the body’s heat regulating mechanism. At this stage, the body stops sweating and, as a result, the body’s temperature continues to rise. There are cases where a person may become unconscious. This condition is especially dangerous to infants and the elderly. Likely victims of heatstroke are infants left in closed cars on hot days, athletes running long distances in hot weather, elderly people and unfit workers not used to the heat.

A person suffering from heatstroke has:
• a strong, pounding pulse
• a headache
• nausea, dizziness, irritability
• visual disturbance and an altered mental state.

Management
• Undress the casualty. Douse with cold water or rub cold ice over the body.
• Apply a cold pack or ice to the neck, groin and armpits. Cover the casualty with a wet sheet and fan the body to increase air circulation.
• Seek medical aid. (The body’s fluid and salt levels will be low, so the casualty will need medical attention to increase the fluid levels.)
• Check the body temperature every 5 minutes.
• When the casualty is cool to touch and temperature is lowered to 38 degrees, stop cooling procedures.
• When the casualty is fully conscious give fluids, such as water or lemonade, to which glucose and 1/2 teaspoon salt per litre have been added.

Water safety
Research suggests that about six million Australians participate in water activities. Aquatic recreation is one of the fastest growing forms of recreation. On the other hand, 265 Australians drowned in 2005–2006. Of these, four times more males drowned than females. People aged between 25 and 34 were at greatest risk of drowning, with those above 65 at next greatest risk.

It is interesting to note that, with Australia’s extensive coastline and love of the ocean, 164 of the 265 drownings occurred inland in rivers, lakes, dams, homes and swimming pools. As figure 6.13 shows, many people who drown do not intend to enter the water.

Many drownings could have been prevented if people had known how to manage emergencies in the water. We must be aware of all possible dangers and safety rules in order to eliminate dangerous situations.
Figure 6.12 Australia is seen as a nation of water enthusiasts.

Swimming pools 8%
Bath 6%
Other 20%
Ocean, bay and beach 38%
Rivers, lakes, lagoons and dams 28%
Fishing 12%
Boating 10%
Fell in 21%
Playing near or in water (includes swimming) 26%
Attempts rescue 1%
Diving 4%

Figure 6.13 Accidental drownings in Australia in 2005–2006 — location (above) and activity (below)

Source: The Royal Life Saving Society — Australia.

**Dangers in the waterways**

**Rivers**
- Currents can be faster than they seem.
- Submerged obstacles (e.g. trees, branches, rocks, discarded rubbish) are dangerous when diving and swimming.
- Crumbling banks can cause a person to accidentally fall into the water.
- Uneven and unsafe river beds can cause difficulty for those wading and swimming.
- The strong current can sweep unprepared people into dangerous situations.

**Lakes**
- Where a river enters a lake there can be strong currents, in contrast to the lake.
- Cold water can cause distress and shock if a person accidentally enters a lake.

**Sea**
- Waves can cause difficulty for weak swimmers and non-swimmers.
- Rips are fast-flowing currents that move out to sea (figure 6.14). They can be identified by: discoloured water; foam on the surface beyond the breaking waves; a ripple appearance when the water around is generally calm; larger waves breaking on either side and further out. Rips can carry a swimmer far out to sea quickly.

**Water safety rules**

The Royal Life Saving Society of Australia has developed some commonsense rules for water users. If these rules are followed, the chance of dangerous situations occurring is greatly reduced.
Rivers and lakes
• Be careful not to stand on an overhanging bank.
• Before entering the water, check for the strength of the current.
• Check the depth of the water. Are there any snags, rocks, sandbanks, weeds, and so on?
• Enter cold water slowly.
• Beware of boats using the waterway.
• Do not try to stand up in quicksand or deep mud.
• If caught in weeds, avoid sudden movement, swim very gently with a long, slow breaststroke or sidestroke, with minimum leg movement.

At the beach
• Swim between the red and yellow flags. This part of the beach is safe to swim in and is patrolled by lifesavers.
• Never swim alone.
• Swimmers using surf beaches should have a sound knowledge of waves, currents and rips.
• Keep a watch on a reference point on the beach to avoid drifting too far away from the selected swimming area.
• Swim across the current to safety, as swimming directly against a current can be exhausting.
• If unable to escape from a rip, float and signal for help.
• When swimming long distances, swim parallel to, not away from, the shore.
• Avoid swimming at the beach after dark. No one can see you if you get into trouble.
• If cramping occurs, adopt a floating position and signal for help by raising or waving one arm above the head. Stretch the cramped muscle.
• When using a surfboard or surfmat, always use a leg rope and be careful of other people in the water.

Public pools
• Read and obey notices giving advice to swimmers.
• Obey pool attendants.
• Check depth markings on the side of the pool.
• Stay clear of deep water unless you are a good swimmer.
• Do not push others into the water.
• Do not duck others under the water.

• Do not jump into an area where people are swimming.

Fishing
• Always wear suitable clothing and footwear.
• Always fish in the company of other people.
• Avoid standing on sloping, slippery rocks.
• Check for changes in weather and tides.
• Never turn away from the sea. If a large wave is evident, move safely away.
• If boat fishing, do not overload the boat with people or fishing gear.
• Do not stand in the boat when landing a fish.
• Always wear a life jacket.

Boating
• Never go out in a boat alone.
• Do not overload the boat.
• Check weather conditions before you leave.
• Always leave word of where you are going and when you expect to be back.
• Everyone should wear a life jacket.
• When entering or leaving a small boat, keep the weight low and centred.
• Keep a lookout for warning signs of bad weather, such as clouds building up, wind rising quickly, waves becoming bigger.
• If bad weather threatens, make for shore.

Rescue techniques
It is a fact that most drownings occur at inland places such as rivers, dams and home swimming pools. These areas usually do not have lifeguards patrolling them. Therefore, it is up to bystanders to render assistance to people who are in trouble. We must be aware of basic rescue principles in order to deal with water emergencies.

Following are the steps in an emergency situation:
1. Recognise an emergency situation
2. Accept responsibility
3. Assess the situation
4. Implement plan of action
5. Provide emergency care.

1. Recognise an emergency situation
This simply means that a person must recognise that there is something suspicious or dangerous occurring; for example, an overturned boat, a surfboard drifting away, a swimmer not making any headway swimming back to shore, a person splashing violently in the water.
2. Accept responsibility
A bystander must take the responsibility of helping a person in danger. At a crowded emergency scene, individuals may assume that someone else will save the person in trouble. This is usually because people are unsure of what to do.

3. Assess the situation
The rescuer must correctly assess the situation and decide on appropriate action. Factors to consider are:
- the number of people involved
- the condition of the drowning person (e.g. weak swimmer, non-swimmer, injured swimmer)
- help available (e.g. rescue aids, other people)
- distance from safety
- strength of wind and currents
- depth of water
- possible entry points.

4. Implement a plan of action
The golden rule of lifesaving is self-preservation. The plan of action should first ensure that the rescuer is safe at all times. If the rescuer experiences difficulty, there are two potential deaths. A rescue that is performed without getting wet is the safest. The following sequence outlines the order in which the methods should be considered.

Reach
This method involves the rescuer lying down and reaching for the victim, using a stick, towel, clothing or similar, in order to increase the reach.

Throw
The rescuer stays on land and throws in an object if the victim is too far away to reach (e.g. rope, kickboard, plastic container).

Wade
If a person cannot be reached by reaching or throwing, the rescuer may enter the water. This technique brings the rescuer closer to the victim. When wading, the rescuer must be careful to test the depth of the water.

Row
If the water is too deep to wade, a suitable rescue craft can be used to get closer to the victim (e.g. surfboard, canoe, boat).

Swim
Swimming to the casualty is the second least-safe method of rescue.

Tow
If all the techniques described fail or are unsuitable, physically towing a victim is the last option. A rescuer is most vulnerable to danger. There are a number of safety tows that can be adopted to rescue victims. If you want to find out more about these tows and other rescue...
techniques, you may like to enrol in a Royal Life Saving Society certificate course. There is a wide range of certificates, ranging from beginners’ to advanced.

When there is a drowning emergency, the lifesaver should:

- check for dangers (currents, rips etc.)
- effect the rescue as quickly as possible
- perform CPR in the water if possible
- return the victim back to shore quickly
- follow DRABCD plan (refer to page 151).

**Spinal injuries**

Most spinal injuries or neck injuries are sustained due to diving accidents. Swimmers dive into shallow water and hit their head on the bottom.

The symptoms of spinal injury are:

- pain
- swelling
- lack of feeling in limbs below the injured area
- inability to move.

Before taking action and effecting the rescue, we must take into account:

- the person’s size in relation to the rescuer
- whether the casualty is conscious or unconscious
- the availability of additional help.

**Management**

- Immobilisation: This refers to placing the casualty in a position that will prevent the spine from moving in any direction. This usually means keeping the casualty as still as possible. The casualty, if face down, should be rolled over as soon as possible.

---

**Figure 6.19 A tow rescue**

**5. Provide emergency care**

Drowning is death caused by asphyxia (insufficient oxygen reaching the tissues of the body). Although the final cause of death is failure to get air into the lungs, there are other factors that can contribute to this (such as heart attack, stroke, hypothermia).

When a person drowns, there is usually a relatively small amount of water that gets into the lungs. Generally, this amount of water is not enough to interfere with the normal transfer of oxygen. Water in the lungs can cause irritation and result in fluid collecting in the alveoli. This further reduces the transfer of oxygen to the blood and may result in a condition called secondary drowning. This may occur up to 72 hours after the emergency. As a result, the victim must be kept under observation.

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**Spreading the news on spinal safety**

**By JODIE VAN DE WETERING**

Mark Farrell is a photographer specialising in whales, a man who loves the sea, his pets and his family.

He also devotes countless hours to educating people on the dangers of spinal injuries — an issue close to his heart after a diving accident as a teenager left him confined to a wheelchair.

‘I had my accident when I was 14. I’d just left school, started my dream job three weeks ago,’ Mark recalls.

‘I came home from work late in the afternoon, and jumped into the swimming pool feet first.

‘My head hit my shoulders, and my neck snapped in two places. I can’t remember the next three weeks after the accident.’

These days, Mark divides his time between teaching about spinal injuries in schools, volunteer community work and wildlife photography.

He says it can be hard to get the message across to certain age groups.

‘Young people think they’re invincible,’ he says.

‘I always thought I was invincible, too.

‘Most kids are good, the younger kids are fine but the older kids are hard to get through to. By doing [school talks], if I can save one life a year, I’d be happy.’

**Mark’s guide to preventing spinal injury**

Wear seatbelts
Wear helmets when riding bikes or playing sport
Abide by the rules when playing sport — don’t play rough
Take care when diving
Take care of your body.

---

**Source:** ABC Online (www.abc.net.au/widebay/stores/1695084.htm), 2007.
• Clear and check airway: as for DRABCD
  (page 151). Maintain breathing. If breathing is
  absent, commence CPR (pages 153).
• Recruit assistants: other people can be
  recruited to assist.
• Stabilisation: The assistants can help to keep
  the casualty steady and still until medical
  help arrives or they can assist to remove the
  person from the water.
  Rescuer 1: keeps head and neck steady.
  Rescuer 2: keeps hips steady and at water
  level.
  Rescuer 3: keeps legs and ankles steady.
  If a stretcher or board is available, a casualty
  may be placed on it.
• Removal from the water: removal should be
  attempted only if the casualty cannot be kept
  comfortable in the water until medical help
  arrives. When removal is necessary, it should
  be attempted only if the casualty is on a board.
  If we do not exercise care we could make the
  injury much worse than it already is.

Other conditions
Sudden entry into cold water
The human body has a temperature of
37 degrees Celsius. If we enter cold water (at
15 degrees), our breathing rate increases. This
increased rate is greater than the body needs.
As a result, the levels of carbon dioxide in the
blood drop, leading to dizziness or even uncon-
sicness. In older people this can result in
heart attack or stroke (see figure 6.21.)

The survival times for immersion in cold
water are:

<table>
<thead>
<tr>
<th>Degrees</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°C</td>
<td>15–30 minutes</td>
</tr>
<tr>
<td>5°C</td>
<td>30 minutes</td>
</tr>
<tr>
<td>10°C</td>
<td>1 1/2 hours</td>
</tr>
<tr>
<td>15°C</td>
<td>2 hours</td>
</tr>
<tr>
<td>20°C</td>
<td>5 1/2 hours</td>
</tr>
</tbody>
</table>

Children and thin adults lose body heat more
rapidly. If a person is immersed in cold water
for a prolonged period of time, hypothermia
will develop (see page 157).

Figure 6.20 Procedure of
rescue of a spine-injury victim
Normal body core temperature

Shivering

Mental confusion

Onset of hypothermia

Impaired awareness

Shivering stops

Muscles stiff

Heartbeat may be irregular

Unconscious

Heartbeat stops

**Figure 6.21** Effects on the human body of cold water immersion

*Source:* The Royal Life Saving Society — Australia.

**Survival techniques in cold water**

The key to surviving in cold water is to conserve heat and energy. In order to do this the person must:

- retain clothing
- keep the head and as much of the body as possible out of the water
- adopt **HELP (heat escape lessening posture)** to minimise heat loss (see figure 6.22). This position delays heat loss by protecting areas which lose heat most quickly — the head, sides of the chest and groin.
- adopt a **huddle position** if in a group (see figure 6.23). This minimises heat loss by the group pressing the sides of their chests, groins and lower body areas together.
- float on the back if there is no **flotation device**. Movement increases body heat loss, so therefore minimise movement.

- swim only if close to shore or upturned boat, as swimming ability will be affected adversely due to cold weather. The casualty should swim only one-tenth of normal swimming ability. Figure 6.24 shows survival times in cold water, adopting various strategies. Swimming does not come high on the list.
Practical Activity 6.4

Safety and survival in the water

You are the leader of an upcoming canoeing trip on a river. You must supply all students with a set of guidelines, which they must follow while in the canoes. Include guidelines in case of accident.

1. List your guidelines in dot-point form.
2. Share your guidelines with a partner and agree on one common set of guidelines.
3. Share your common set with those of two other groups. Once again, agree on a common set of guidelines.
4. Report your group’s guidelines to the whole class.

<table>
<thead>
<tr>
<th>With flotation aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wearing a thermal protection jacket</td>
</tr>
<tr>
<td>Huddle</td>
</tr>
<tr>
<td>HELP</td>
</tr>
<tr>
<td>Holding still</td>
</tr>
<tr>
<td>Swimming</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With no flotation aid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treading water</td>
</tr>
<tr>
<td>Slow survival swimming</td>
</tr>
</tbody>
</table>

Figure 6.24 Relative survival times in cold water (10°C) adopting various strategies

Source: The Royal Life Saving Society — Australia.

**Sports injuries**

Australia has earned the reputation of being a sports-mad country. Many people are obsessed with either playing or watching sport. With our vigorous, enthusiastic participation in sport comes the drawback of sustaining injuries.

Some of us have suffered disappointment at missing important events or matches due to injury. We can prevent or reduce the effects of injuries if we have a sound knowledge of safety rules and treatment techniques.

Injury can be defined as any condition which causes a player or athlete to miss a game or training, leave the field of play, or seek medical or first aid.

**Going for broke**

Camplin’s list of injuries

- Two right knee reconstructions due to severed ACL
- Broken hand
- Nine cracked ribs
- Broken collarbone
- Pelvic problems
- Separated shoulder
- Nine concussions
- Extensive bone bruising to both ankles, ripped Achilles tendon
- Three separate moderate medial ligament injuries
- Nine concussions

Figure 6.25 The injuries sustained by Alisa Camplin, world aerials champion
1. **Hamstring tear.** Ice treatment and rest are followed by stretching and straining exercises. The player can be away for up to 21 days.

2. **Facial lacerations.** A bad cut may need to be stitched. Players aren’t allowed on the field if they are bleeding. Most players will be back by the next game.

3. **Groin injury.** Muscles in the groin are usually strained by stretching the legs too far. The player may need two to three weeks’ rest.

4. **Thigh haematoma.** Mild to severe internal bruising. Ice treatment and stretching exercises are used to treat this injury. The player will probably be back by the next game.

5. **Sprained ankle.** Depending on the severity of the sprain, treatment ranges from strapping the ankle to reconstructive surgery. This may mean 1 to 12 weeks away from the game.

6. **Concussion.** Concussed players are taken from the field and tested for confusion and amnesia. If they pass the test, they may recommence the game in the next half. Players may miss one to two games; however, serious head injuries are rare.

7. **Rib fracturing/bruising.** The chest may be trapped and the player must rest. Fractures take two to four weeks to heal.

8. **Shoulder injuries.** Treatment ranges from strapping and rest to reconstructive surgery, depending on the type and severity of the injury (such as a strain or a dislocated shoulder). The player may be away for 2 to 16 weeks.

9. **Torn knee ligaments.** This is a severe injury which requires surgery and physiotherapy. The player may be absent for 17 weeks to more than one season.

10. **Lower back strain.** This includes injuries to discs which may require surgery. The player will be away for at least six weeks.

**Figure 6.26** The top 10 most frequent injuries in AFL football, how they are treated and the length of time the player may be away from the game (Matthew Lloyd kicks for goal during the Essendon v West Coast Eagles game on 8 June 2007).
On average, one in 17 Australians suffers from a sporting injury each year — nearly 1 million people. Of these, about 40 000 require hospitalisation or surgery. The direct cost of treating these injuries is between $333–400 million each year. Minimising injuries by concentrating on safety is therefore vital. Prevention is the key to reducing the incidence of sports injury.

Table 6.1 is an estimate of the number of injuries per year in Australia for the major sports.

### Table 6.1 Estimated injuries per year — major Australian sports

<table>
<thead>
<tr>
<th>Sport</th>
<th>No. of players</th>
<th>No. of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Football</td>
<td>492 000</td>
<td>246 000</td>
</tr>
<tr>
<td>Soccer</td>
<td>488 000</td>
<td>146 250</td>
</tr>
<tr>
<td>Cricket</td>
<td>560 226</td>
<td>89 600</td>
</tr>
<tr>
<td>Rugby League</td>
<td>160 000</td>
<td>80 000</td>
</tr>
<tr>
<td>Rugby Union</td>
<td>104 000</td>
<td>52 000</td>
</tr>
<tr>
<td>Netball</td>
<td>374 643</td>
<td>37 464</td>
</tr>
<tr>
<td>Hockey</td>
<td>193 000</td>
<td>28 950</td>
</tr>
<tr>
<td>Indoor cricket</td>
<td>400 000</td>
<td>28 000</td>
</tr>
<tr>
<td>Basketball</td>
<td>142 955</td>
<td>21 300</td>
</tr>
</tbody>
</table>

### Types of sports injuries and treatment

#### Acute sporting injuries

An athlete can expect to suffer from a number of different sports injuries during his or her career. The severity of each injury will vary greatly in terms of injury damage, recovery and rehabilitation. Some sports lend themselves to specific types of injuries. Figure 6.25 shows the most common sports injuries sustained in Australian Football.

Acute sports injuries mostly occur spontaneously and are usually very painful. The injury may occur due to an action within an event, a type of contact as part of a game, or an exercise within an intense training session. All areas of the body are at risk of suffering an acute sporting injury. If not treated correctly, such injuries may deteriorate to a form of overuse or chronic injury.

Table 6.2 outlines a wide range of acute injuries, their symptoms and suggested treatment.

### Table 6.2 Acute sports injuries

<table>
<thead>
<tr>
<th>Area of body</th>
<th>Cause of injury</th>
<th>Signs of injury</th>
<th>Assessment and treatment of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concussion</td>
<td>Blow to the head or heavy fall</td>
<td>Loss of consciousness; vomiting; loss of memory; headache or drowsiness</td>
<td>Use emergency action plan. Remove athlete from the field of play. Consult a medical practitioner.</td>
</tr>
<tr>
<td>Chest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winded</td>
<td>Heavy blow to the chest or abdomen</td>
<td>Gasping for breath; pain; nausea</td>
<td>Use SALTAPS. Have the athlete rest. Allow athlete to regain their normal breathing rhythm.</td>
</tr>
<tr>
<td>Shoulder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dislocation</td>
<td>Falling on an outstretched arm</td>
<td>Shoulder and arm in abnormal frontal position; resultant damage to ligaments and joint capsule; severe pain at point of injury; swelling</td>
<td>Use SALTAPS. Immobilise and support the shoulder and arm. Remove the athlete from the playing field immediately. Use RICERS (see pages 174–5). Hospitalise athlete.</td>
</tr>
<tr>
<td>Broken clavicle (collarbone)</td>
<td>Falling on an outstretched arm</td>
<td>Need to support the elbow of the broken side</td>
<td>Use SALTAPS. Initially place a rolled-up pair of socks under the armpit, then gently tie a jumper around the upper chest and secure between the shoulder blades. This takes the weight off the broken scapula. Remove the athlete from the playing field immediately. Use RICERS. Hospitalise athlete.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Area of body</th>
<th>Cause of injury</th>
<th>Signs of injury</th>
<th>Assessment and treatment of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elbow</td>
<td>Falling on an outstretched hand</td>
<td>Deformity at elbow causing loss of movement; swelling; extreme pain</td>
<td>Use SALTAPS. Immobilise and support the elbow. Remove the athlete from the playing field. Use RICERS. Hospitalise athlete.</td>
</tr>
<tr>
<td>Abdomen</td>
<td>Possible causes: • air bubbles in the duodenum • spasm of the diaphragm</td>
<td>Pain in the side of the abdomen</td>
<td>Use SALTAPS. Encourage athlete to relax their diaphragm and breathing. Stretch the intercostal muscles and reduce exercise intensity.</td>
</tr>
<tr>
<td>Hand/finger</td>
<td>Direct blow to the hand/finger, usually caused by an object such as a ball or stick</td>
<td>Deformity; swelling; localised pain</td>
<td>Use SALTAPS. Use RICERS. Tape the injured finger using the other finger as a splint. Consult a medical practitioner.</td>
</tr>
<tr>
<td>Thigh</td>
<td>Direct contact with an object or body</td>
<td>Weakness in strength and power of the muscle; reduced range of motion; localised pain and swelling</td>
<td>Use SALTAPS. Use RICERS. (Apply the ice and compression to the muscle while the athlete is lying prone with their leg bent and heel against their buttocks.) Consult a physiotherapist for rehabilitation.</td>
</tr>
<tr>
<td>Knee</td>
<td>Forceful twist of knee while bearing weight</td>
<td>Deformity and loss of function of knee; extreme pain; swelling</td>
<td>Keep athlete motionless. Immobilise and support the knee if possible. Remove the athlete from the playing field. Use RICERS. Hospitalise athlete.</td>
</tr>
<tr>
<td></td>
<td>Falling awkwardly and twisting knee</td>
<td>Sound of ‘pop’ or ‘crack’ in the knee</td>
<td>Immediate pain in knee, which is sore to touch; some restricted movement. Use SALTAPS. Use RICERS. Depending on the severity of the injury, consult a physiotherapist for further assessment, treatment and rehabilitation.</td>
</tr>
<tr>
<td></td>
<td>As for sprain</td>
<td>Swelling may be evident or occur later; other signs as for sprain</td>
<td>As for sprain.</td>
</tr>
</tbody>
</table>

**TABLE 6.2 (continued)**

<table>
<thead>
<tr>
<th>Area of body</th>
<th>Cause of injury</th>
<th>Signs of injury</th>
<th>Assessment and treatment of injury</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Inside & Out**

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Practical Activity 6.5

Smartplay website

Smartplay is an Australian sport safety and injury prevention program that operates in several Australian states. To find out about this program, visit the website for this book and click on the Smartplay weblink for this chapter (see ‘Weblinks’, on page 311). Click on Resources/Links and then find the Injury Fact Sheets list. Complete the following tasks:

1. Select one acute injury and read through the fact sheet.
2. Summarise the important information and record any interesting aspects of the injury.
3. Report to the class or your partner.

Delayed onset of muscle soreness (DOMS)

DOMS is a condition that occurs after strenuous, unfamiliar exercise and affects the muscle fibres, resulting in localised pain and discomfort. DOMS is commonly associated with extended endurance exercise and explosive types of exercise requiring forceful, eccentric muscular contractions; for examplebounding, downhill running or bench press.

This condition has three main phases:
- 0–24 hours, where the pain begins to appear;
- 24–72 hours, where the pain peaks in intensity;
- and 72+ hours, when the pain subsides. This explains why a social cricketer may feel more sore two days after the annual cricket match or why a person feels more pain in the pectorals two days after their first weight-training session.

To lessen the severity of DOMS, the athlete can try some of the following measures. Limited research is available, but athletes have reported positive results. Successful strategies include:

- stretching — can be incorporated as part of the cool-down phase by doing gentle stretches for at least 30 seconds.
- cryotherapy — use cold to reduce inflammation (e.g. with an ice bath or ice massage)
- ultrasound — a technique that is reported to reduce the amount of soreness experienced
- exercise — low-impact, non-weight-bearing activities like pool running and swimming that can provide relief and help to regain strength
- training — specific, eccentric work can be introduced gradually to protect athlete against muscle damage and soreness
- in extreme cases, anti-inflammatory drugs may be used.

Knee injuries

The knee is a complex joint, composed of the lower end of the femur (thigh bone) and the upper flattened end of the tibia. This would be an unstable joint without the very strong ligaments that support it (refer to figure 4.10, page 69):

- the medial ligament is on the inside of the knee and is a broad, flat, strong structure. It cannot be felt through the skin.
- the lateral ligament is a cord-like structure on the outside of the knee and it can be felt. Both these ligaments prevent sideways movement of the knee joint.
- the cruciate ligaments are internal ligaments that cross over in the middle of the knee to give it stability. They are called anterior and posterior cruciate ligaments. These ligaments prevent forward or backward movement of the joint.

A direct blow to either side of the knee can cause a sprain to the ligament on the opposite side to the one which received the blow. Also, the ligament can be sprained if there is abnormal movement of the joint either side to side or rotational. Knee injuries are graded from I through to III.

Grade I injuries are painful initially, though athletes may be able to play on.

Grade II injuries are more painful and the athlete usually cannot continue competing. There may be instability or wobbling on attempting to twist or turn.

Grade III injuries are severely painful at first, but afterwards there may be little or no pain. There may be significant instability or wobbling at the joint. A grade III injury is the most dangerous because the ligament is completely torn. This type of injury requires knee reconstruction to mend the ligament together or more seriously graft ligaments back onto bones. Players with grade II or III type injuries can miss between 3 to 12 months of sport.
Who’s at risk?
The anterior cruciate ligament (ACL) injury occurs commonly in Australian Rules football, netball, hockey and soccer — or any sport in which you change direction suddenly, jump and land or stop at speed. If you slip, pivot or twist the knee at home or at work, you can also rupture the ACL.

Once the ACL ruptures, it dies, and a knee reconstruction will use tendon tissue to replace the ‘lost’ ligament.

From 1996 to mid 2002, there were around 85 ACL reconstruction injuries in AFL senior-list players, including training and practice-match injuries.

There is no avoiding the 9- to 12-month recovery period, because the body needs enough time to strengthen the new tissue.

Players are five to seven times more likely to injure the other knee once they have had one knee reconstruction.

What’s the damage?

TABLE 6.3  Estimated number of knee injuries as a percentage of total injuries in a given year

<table>
<thead>
<tr>
<th>Sport</th>
<th>% of injury rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Rules</td>
<td>11</td>
</tr>
<tr>
<td>Soccer</td>
<td>15</td>
</tr>
<tr>
<td>Rugby</td>
<td>13</td>
</tr>
<tr>
<td>Netball</td>
<td>20</td>
</tr>
<tr>
<td>Hockey</td>
<td>15</td>
</tr>
<tr>
<td>Basketball</td>
<td>20</td>
</tr>
<tr>
<td>Indoor cricket</td>
<td>13</td>
</tr>
<tr>
<td>Cricket</td>
<td>2</td>
</tr>
</tbody>
</table>

Overuse or chronic injuries

When managing sports injuries, sometimes a difficult task for the coach is to convince the athlete to rest, to modify workloads and/or take time away from a sport. These steps may be the only way to prevent overuse or chronic sports injuries from occurring. The majority of sports and overuse injuries begin as minor trauma involving soft-tissue injuries — injuries that affect the bone, muscles, ligaments or tendons. Around 80 per cent of all overuse injuries are related to the lower body, and intrinsic causes generally relate to muscle imbalance and anatomical problems like poor posture. Extrinsic causes include training errors, incorrect technique or problematic surfaces such as uneven ovals or hard running tracks.

If high workloads and low levels of rest are programmed, the athlete can develop an overuse injury. This is particularly relevant to younger athletes who are going through puberty and growth spurts. Managing the pain cycle is a strategy for reducing the impact of injuries on an athlete’s function (see figure 6.28). The main examples of overuse injuries seen in athletes are:

- shin splints
- osteitis pubis
- tennis elbow

So, which sportspeople are at greatest risk of receiving knee injuries? It might surprise many people to know that, although Australian Rules has the highest number of knee injuries, netball and basketball have the highest proportion of total injuries occurring to the knee (20 per cent). With the stop and start nature of these games and the very hard surface that they are played on, it is not hard to see why netball and basketball have the highest proportion of knee injuries.
Figure 6.28 Incorrect overload leads to tissue injury; continued activity leads to pain, which leads to inflammation. The only way out of the cycle is rest and healing.

- jumper’s knee or patella tendonitis
- stress fractures of the foot
- Achilles tendinitis.

**Shin splints**

Shin splints are one of the most common overuse sporting injuries. The condition has a number of possible causes, including:

- poor posture
- excessive training during an adolescent growth spurt or beginning of training program
- fallen arches in the feet
- biomechanically incorrect gait
- muscle fatigue in the lower limbs
- a strength imbalance between anterior and posterior muscles in the lower leg.

In some cases, shin splints can be incapacitating to the athlete. Initial pain may be caused by slight inflammation in the muscles but, over time, pain can become constant and extremely uncomfortable. Immediate treatment should include SALTAPS and RICERS. A referral to a sports medicine specialist is needed for long-term treatment and rehabilitation.

**Osteitis pubis**

Osteitis pubis is an overuse injury caused by a combination of high running-loads, frequent changing of direction at pace, and the kicking action. Kicking when running creates significant angular force, which places substantial loads on the pubic symphysis. These factors can lead to irritation and/or overuse of this joint between the pubic bones of the pelvis.

**Osteitis pubis** is the second most common cause of AFL, rugby and soccer players missing games. Hamstring strains cause the largest number of missed games. Symptoms of osteitis pubis are:

- gradual onset of groin pain with an increasing level of discomfort
- pain when kicking, running, twisting or completing turning movements
- pain when contracting abdominal muscles
- significant loss of kicking strength or length
- reduction in maximum running speeds.

The condition is mainly found in young men between the ages of 16 and 30 who are training and competing in sports like AFL, rugby and soccer. Though found rarely in female athletes, osteitis pubis is suffered by a small number of female soccer players.

If an athlete complains of groin pain that has occurred recently, then it is possibly caused by a muscle tear. For an athlete to be suffering osteitis pubis he or she must have experienced a gradual build-up of unmanageable pain. This indicates a stress reaction in the bone, which leads to joint degeneration and constant pain.

Once referred to a sports medicine specialist, the athlete will undergo scans to determine the seriousness of the injury. This can take the form of an x-ray, a bone scan or an MRI. MRI pictures are very clear and are regarded by many as the most specific scans; and they enable all levels of bone structure loss to be identified. The structure and shape of the pubic bones and the cartilage of the symphysis are both affected in this chronic overuse injury.

Treatment of osteitis pubis includes physiotherapy, modified rest, massage, joint manipulation and the strengthening of pelvic muscles. Medication other than anti-inflammatory drugs is not part of an effective treatment as it treats the symptoms and not the cause of the injury. Therefore the athlete will not recover in the long term.

The article in figure 6.29 on the following page reports on some of the latest treatments of osteitis pubis.

**Patellar tendonitis or jumper’s knee**

This is the most common form of tendonitis around the knee. Patellar tendonitis is indicated by inflammation in the tendon that
Osteitis pubis — curse of many AFL stars

By DR PETER LARKINS

The condition we call osteitis pubis (OP) has become the most trendy diagnosis in modern Aussie Rules football. It is an injury that occurs at all levels of football and has now become a term well known in the football world. All ages, shapes and sizes of players are affected, although there is a soft trend towards younger players.

Osteitis pubis literally means ‘inflamed pubic bone’ and is a stress-related overuse injury to the central pubic joint of the pelvis (pubic symphysis). In the past, any sports-related pain between the naval and mid thigh would be labelled a ‘groin strain’ and treated with a huge variety of therapies, usually with limited success.

Now, the club doctor must decide if a groin pain is a muscle tear, hernia, hip inflammation, referred from the back, or a stress overload in and around the pubic bone and central joint. Sometimes it is a combination of all of these!

The task has been made easier as experience increases and new imaging techniques (Ultrasound, MRI, CT) have evolved that show the exact type of tissue which is inflamed.

There is no single cause for osteitis pubis but I have no doubt the increased speed of the game and increased running in both training and games, together with kicking across the body, have contributed to increased stress loads at the pubic joint. The combination of shear stresses in the joint, muscle traction in and around the pubic bones and repeated jarring of the pelvis in collisions and falls ultimately causes pain deep in the central pelvis, fibrocartilage of the symphysis joint and surrounding soft tissues.

Initially, there might only be stiffness and ache in the groin but, later, severe pain can occur when running, walking or trying to get out of bed or a car.

The key to treatment is rapid detection and reduction in workloads. Rest from training is essential. Medication and specific exercises for the pelvic area are also critical. Injections are sometimes used to clarify the diagnosis and reduce any inflammation in the soft tissues. Occasionally, surgery is required to clean out the damaged joint cartilage and release tight muscles.

AFL-funded research is under way to help understand this notorious condition which has affected so many of our current stars.

Source: Dr Peter Larkins, 2007

Figure 6.29 Sports physician and media commentator, Dr Peter Larkins, reports on the condition and treatments of osteitis pubis.

attaches the patella to the tibia. It is generally found in athletes who compete in basketball, volleyball, long and high jump, distance running, figure skating or high-impact aerobics.

The patellar tendon becomes inflamed and tender due to overuse, usually from running, jumping or high-impact activities. Pain is often felt at the end of a session or when the athlete has cooled down. However, it is not uncommon for the pain to disappear following a warm-up in the early stage of the injury. If an athlete continues to train through the pain, it is quite possible that permanent damage will be done to the tendon and it will take many months for performances to improve again.

**Tennis or golfer’s elbow**

The main symptom of tennis or golfer’s elbow (figure 6.30) is recurring pain on the outside of the upper forearm just below the bend of the elbow; occasionally, pain radiates down the arm toward the wrist.

Sufferers may experience the following:

- pain caused by lifting or bending the arm, or grasping even light objects such as a coffee cup
• difficulty extending the forearm fully because of inflamed muscles, tendons and ligaments
• pain that typically lasts for 6–12 weeks; the discomfort can continue for as little as 3 weeks or as long as several years.

Bursitis
Tennis elbow
Golfer’s elbow

Figure 6.30 This acute sporting injury can take different forms, all of which are painful and detrimental to performance.


The body’s response to injury
In a contact injury (direct injury), such as a corked thigh, the tissue that has been damaged will usually bleed. With a corked thigh, there will be pain and bleeding under the skin in the soft tissue of the thigh muscle. A lump may appear where contact has been made. Often, the bruise does not appear until the next day or even later. The bruise is the bleeding trapped inside the skin. The aim of first aid is to:
• stop the bleeding
• reduce the bruising and restore normal movement to the thigh.

If a ligament suffers more than normal stress (e.g. if a running person steps into a pothole) it will usually sprain or tear. This will cause bleeding and swelling and pain under the surface of the skin (examples are sprained ankles and muscle tears).

Injuries resulting from overuse can also occur. Although there is no loss of blood under the surface of the skin, there is still swelling and irritation. There may be inflammation, heat, redness, stiffness and pain, as with tennis elbow, swimmer’s shoulder and Achilles tendon.

Managing sports injuries
When managing sports injuries it is important to have a basic checklist to follow. The checklist lists four questions that we should consider:
1. What is this injury? (Diagnosis)
2. What should I do for it? (Treatment)
3. How did it happen? (Cause)
4. How do I stop a recurrence? (Prevention)

When people approach an injured person, there is the possibility that they may make the injury worse. There must be an assessment made of the extent of the injury and whether the player can continue or whether he or she needs treatment.

Here is a simple checklist that can be used to assess most injuries: SALTAPS. These letters represent the procedure to be followed, when diagnosing a sports injury.

Stop play immediately an injury occurs. The player should be examined on the field or, if practical, removed from the field or court.

Ask the player what happened and how, when and why. Questions may be:
• How did it happen?
• Were you hit or not?
• From which direction were you hit?
• Could you move afterwards?
• Where does it hurt?
• Did you play on?

Look at the injury carefully before you touch it. Compare it to the other limb, looking for any change in:
• colour
• shape
• size.

A pale look may indicate damage to the artery; a blue colour may indicate obstruction to the veins; redness can indicate inflammation. If there is an obvious change in shape, compared to the other limb, this usually indicates a fracture, dislocation or both. An increase in size will indicate bleeding under the surface of the skin.

Touch the injured player to further assess the injury only when you have thoroughly looked at the injured area and its opposite limb.

Begin by feeling the opposite side of the body, paying particular attention to bone shapes, contours and bumps. Next, feel the injured area for any differences in tissue thickness, lumps, bumps or fluid under the surface. If there is a difference in temperature, this may indicate infection.

Active movement: ask the person if he or she can move the injured area. If not, do not try to move it yourself. Note the range and directions of movement, and any clicking, grating and creaking around the limb.
**Passive movement:** when you have established the degree and extent to which active movement is possible, gently move the part through its range of movements without using force.

**Stand up, play on:** check to see if the person can put weight on the injury. Can he or she walk, run? Is the person fit to play on?

It is important to note that the decision to play on should not be made by the player or the coach. The decision should be made by a qualified trainer. This is important, because a player can play on with a serious injury in the heat of the moment, when he or she is warmed up and is caught up in the excitement of the game. For example, world boxing champion Jeff Fenech has boxed through title fights with broken hands; former AFL Essendon champion, Paul Van Der Har, kicked a 60-metre goal with a broken bone in his leg.

To continue playing with an injury can be very serious. The result may be that a minor injury could become a major injury; for example, a slight ankle strain could, if the player continues to play, become torn ankle ligaments.

**Head injuries**

The most important question regarding players who suffer head injuries or blows to the head is: should they leave the field? Can they be allowed to play on? These are ‘tricky’ questions. Basically, common sense and caution should prevail with head injuries.

A player with a head injury showing any of the following characteristics should stop play and be seen by a doctor:

- observable loss of consciousness
- vomiting
- persistent drowsiness
- loss of memory
- confusion or disturbed behaviour
- persistent headache
- any bleeding or clear discharge from the ears or nose.

Again, the player should not decide whether he or she plays on or not. The major reason is that the player may lose the ability to think and react logically, and the chance of further and more serious injury is greatly increased. This is why boxing referees have the power to stop a boxing match if they suspect that a boxer may have concussion.

If a player has a head injury and has suffered from the symptoms listed, he or she should not train for at least seven days. It is the policy of most AFL clubs that if a player suffers a head injury, he will miss at least one match (that is, usually seven days lay-off). This is because there could be delayed symptoms from head injuries, such as cerebral haemorrhage (bleeding inside the head) or brain injury.

**Signs and symptoms of soft tissue injuries**

The signs and symptoms of a soft-tissue injury are:

- pain
- swelling
- loss of movement.

The aim of first aid is to limit the amount of blood loss and to decrease swelling and pain. The management plan to achieve this aim is **RICERS** — Rest, Ice, Compression, Elevation, Referral and Stretch.

**Rest:** sit the person down away from the action.

**Ice** should be applied continuously for 20 minutes. This can be crushed ice placed in the middle of a damp towel, or an ice pack that is kept in first aid kits or in the fridge. Ice constricts the blood vessels around the injury and therefore lets less blood escape. This reduces blood loss and swelling. Ice should be applied at least once every hour for mild injuries for 24 hours (slight ankle sprain) and up to 72 hours for severe injury (hamstring tear). Ice should not be applied directly to the skin. Wrap in a wet cloth (see figure 6.31).

![Figure 6.31 Applying ice treatment](image)
**Compression** is achieved by the use of an elastic bandage. The elastic bandage applied around the injured area restricts internal bleeding and reduces swelling (see figure 6.32).

**Elevation** is achieved by raising the injured part so it is above the level of the heart. This reduces blood flow to the injured area, therefore again reducing blood loss and swelling.

**Referral:** refer the athlete to a qualified sports medicine practitioner for a complete appraisal of the injury. This will ensure correct treatment and speedy rehabilitation.

**Stretch:** keep the injured muscle in a stretched position during treatment. If the management plan is well executed and the goals are achieved, then recovery will be enhanced and the sportsperson will return to training more quickly. The repair of the injured area will also be more successful, that is, the person is more likely to regain the same movement and strength in the injured area.

In general, the RICERS method is continued for the first 48 hours after the injury has occurred. The reason why it is approximately 48 hours is that this is how long a soft-tissue injury will bleed. If you are certain that internal bleeding has stopped after 48 hours, you can commence with the recovery phase of the treatment.

After 48 hours the objective is to:
- heal
- stretch
- strengthen.

**Heal** — the body will begin the healing process naturally. It will try to remove the swelling and bruising. You can assist this process by applying heat to the area; for example, a ray lamp or very light massage of the area. Do not be too rough — you may start the bleeding again.

**Stretch** — this is basically just moving the injured area, increasing activity within the limits of pain. In other words, move the injured area until pain tells you to stop. Early stretching will help the area regain full flexibility and minimise scarring under the surface.

**Prevention of injury**

The old statement that prevention is better than cure is still true today. As a coach or a player you have a responsibility to reduce your chances of injury. The coach sets the standard for what he or she expects at training and at competition.

There are a number of ways in which injuries can be prevented. (Refer to question 20, *Inside and Out Workbook, 4E* page 75 and the article ‘Keeping it safe’) These include ensuring an adequate warm-up and cool-down is completed prior to and at the end of every training session and competition. This topic was discussed in detail in chapter 5, and it is extremely important that correct warm-up and cool-down activities are used. Please refer to chapter 5 if preparing warm-up and cool-down activities.

Developing correct skills and techniques are also important and you as a coach can monitor this. Studies have shown that the higher the level of skill the lower the chance of injury. Appropriate skill progressions, rule modifications and equipment modifications are all important when developing skill and therefore the prevention of injury.
Figure 6.34 A summary of injury prevention
Injuries can occur at any time in a training session or during competition. However, studies have shown that they are more common when a player is fatigued. This would indicate that developing a good level of fitness for a particular sport or activity is very important. After injury, a gradual progression to full training is very important to reduce a recurrence of the injury.

Many rules in sport are designed to create a safe environment for performers in a game or activity. Players should be encouraged to abide by the rules set. Coaches may like to set clear written rules for training and playing. Most schools and sporting associations have adopted codes of conduct for players, coaches and spectators. These should be made available to all concerned and reinforced by the clubs involved.

Poor design or faulty equipment and poor playing surfaces also may lead to injuries that could have been prevented. It is important that equipment is checked and maintained regularly and that playing areas are level and firm, sprinklers are not left uncovered, and that permanent features such as goal posts are padded and highly visible. It is also important that spectators are kept well away from the players.

Many protective devices have been designed to reduce injury. Players in World Series Cricket were the first ones to wear helmets in cricket. Helmets have since been modified and are at a cost that have made them almost compulsory in most standards of cricket. There are many other protective devices that have been designed to reduce injuries in sport. Some of these are mouthguards, pads, eye goggles, gloves, shin-guards, life jackets and wetsuits.

Another way to reduce injuries is fluid replacement. Remember to drink before, during and after training and competition, and not just on hot days or when thirsty.

Sunburn and sunstroke are major concerns in Australia’s harsh summers. In conditions that expose players to outdoor conditions, reinforce ‘Slip! Slop! Slap! Seek and Slide’. Cold can also have life-threatening consequences. When not participating, or if on long walks, ensure players wear adequate warm clothing during breaks or when on the bench. Ensure another warm-up is carried out after long breaks. When planning training avoid talking to players for long periods of time on the training track. Talk to them before or after training.

Some players may wish to return to their sport or activity as soon as possible after sustaining an injury. The coach should ensure that the player has a full medical clearance before returning to full training or competition.

Illness and medical conditions can have an effect on injury and participation. When athletes are ill, the body is vulnerable and the risk of damage to organs and tissues is high. Athletes in this situation should not participate. Some athletes may have other, more permanent problems. Again, medical screening and clearance should be obtained before allowing further participation. The Australian Sports Medicine Federation has put out a pamphlet ‘Guidelines for Safety in Children’s Sport — Medical Conditions’. Coaches should consult this if unsure of what to do.

Balanced competitions also can reduce injuries. During adolescence, players in contact sports can be at risk because of the inequality in size and strength due to the wide range of physical maturity in underage teams. Consideration needs to be given to grading teams on more than just chronological age.

Remember that prevention is common sense. By following the guidelines set out in this chapter, players, coaches and parents can help reduce the risk of injuries occurring.
Chapter summary

The key ideas presented in this chapter are:

• The concept of community safety is an important one: it means that individuals and groups within the community all play a role in ensuring safety.

• First aid is the initial or first help that is given to an injured or ill person by people at the scene of an accident. The objectives of first aid are known as the five Ps: preserve life; protect the unconscious; prevent injury or illness from becoming worse; promote recovery and procure medical aid.

• Most accidents are preventable and it is important to take preventive measures to ensure safety at home and when engaging in outdoor activities.

• In the event of an accident, it is important to have a plan of action. A useful plan is the DRABCD plan. This involves checking for danger; seeking a response from the patient; and checking the airway and breathing of the patient.

• Cardio-pulmonary resuscitation (CPR) is a technique that combines rescue breaths with external cardiac compression. It is used when a casualty is unconscious and is not breathing.

• It is important to learn the first aid techniques and treatment for the following situations so that you may be prepared in the event of an accident:
  — unconsciousness
  — heart attack
  — bleeding
  — substance abuse
  — asthma
  — hypothermia and frostbite
  — dehydration, heat exhaustion and heatstroke
  — spinal injuries.

• Following commonsense water safety rules can save lives. Always check water for hazards before entering rivers, lakes or beaches; be aware of local conditions; swim between the flags at beaches and never swim alone. Be aware of survival techniques and rescue procedures.

• Sports injuries are a major cause of injury, with nearly a million people suffering sports injury in Australia each year.

• Sports injuries can be caused spontaneously during training or during the game.

• These are called ‘acute injuries’ and include concussion, lacerations, bruising, bone fractures, and sprains and dislocations.

• Overuse or chronic injuries may be caused by muscle imbalance or poor techniques, and include shin splints, osteitis pubis, tendonitis.

• All sports injuries must be treated according to the guidelines summarised by RICERS.

• Diagnosis of sports injuries is summarised by SALTAPS.

• The coach plays a major role in the prevention of sports injuries and must set up protocols within the club for the prevention and management of sports injuries.

Extension and research activities

1. Investigate one of the following programs or groups and evaluate the range of programs and strategies it provides to encourage people to participate safely in physical activity (see ‘Weblinks’ on page 311):
   • The Royal Life Saving Society — Australia
   • AUSTSWIM
   • St John Ambulance.

2. Design a pamphlet or poster aimed at adolescents to promote an aspect of personal safety or the safety of those around them.

3. Make a contents list for a first-aid kit you might take on a five-day bushwalk.

4. Visit the website for this book and click on the Cancer Council Victoria weblink for this chapter (see ‘Weblinks’ on page 311) and compile a fact sheet that focuses on sun smart strategies to share with a friend.

5. Research each of the following fields of medical practice:
   • physiotherapy
   • osteopathy
   • chiropractory.

   In each case, provide information on:
   a the theory behind the practice — what makes each one of them different?
   b the role they play in injury prevention, injury management and injury rehabilitation.
   c the qualifications required to practice in each field.