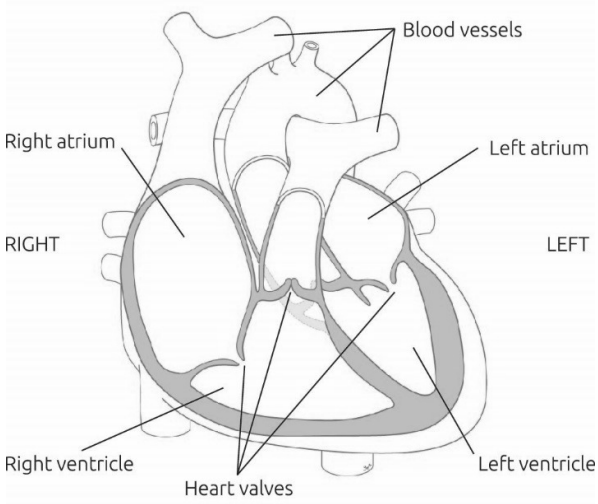
C. HEART, BLOOD CIRCULATION, SHOCK

In this chapter you will learn about:

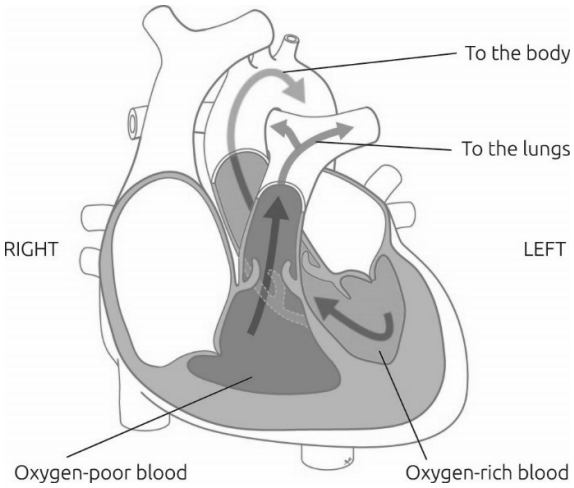
- The heart and the blood circulation.
- The blood.
- Chest discomfort.
- Bleeding.
- Wounds.
- Shock.

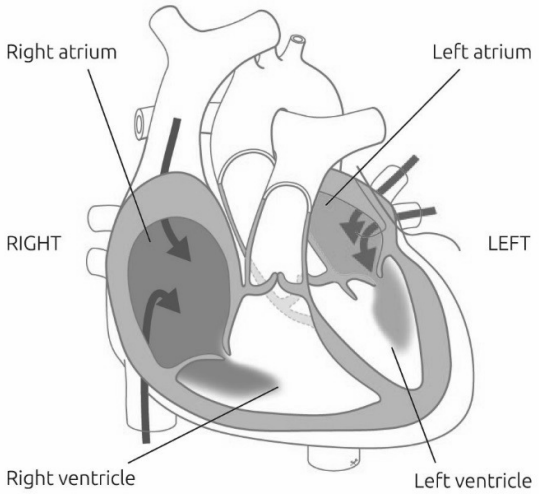
C.1 THE HEART AND THE BLOOD CIRCULATION

C.1.1 HEART AND BLOOD CIRCULATION

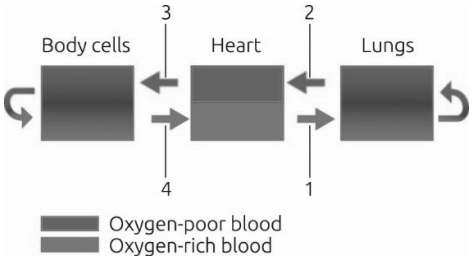


The heart is a muscular organ situated at the centre of the chest cavity. It acts as a pump. It is divided into four chambers. The right upper chamber called the *right atrium* receives impure blood from all parts of the body through blood vessels called veins.

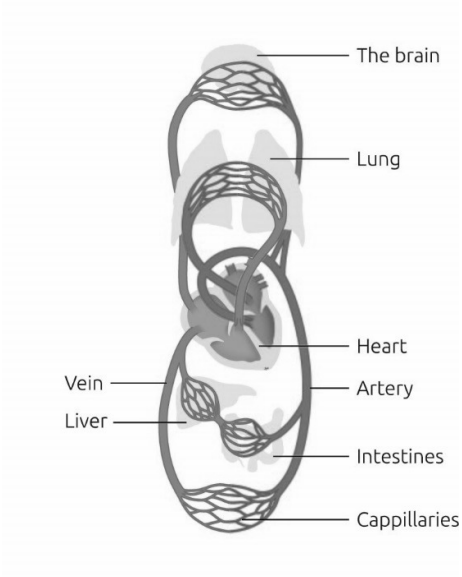




When the heart muscle contracts (the heart beats) this impure blood is passed into the right lower chamber, called *right ventricle*, and finally finds its way to the lungs where it is purified. During the process of purification, it gives up carbon-dioxide and takes a fresh quantity of oxygen.



The purified blood finds its way into the left upper chamber called *left atrium*. It then passes to the left lower chamber, called *left ventricle*, and from there, in the course of the beating of the heart the purified blood is discharged into various blood vessels called *arteries* and *capillaries* which convey this purified blood for the nourishment for the body as a whole including the heart muscles. Thus each heart is in fact two pumps put together.



C.1.2 BLOOD PRESSURE

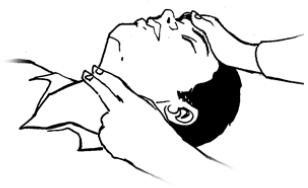
The pressure in the arteries varies with the beating of the heart. When the heart contracts the pressure in the arterial system increases; when the heart relaxes, the pressure in the arteries decreases. The pressure exerted on the main arteries is known as the *blood pressure* and is recorded by a blood pressure measuring instrument.

C.1.3 PULSE

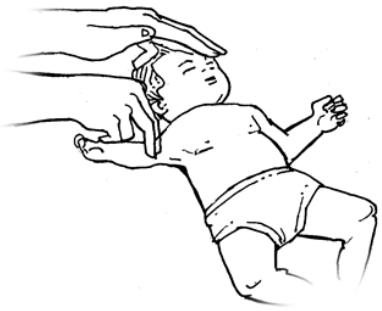
With each heartbeat blood is ejected into the arterial system. Most of the arteries are placed deep in the body except on the wrist, elbow, neck, groin and ankle. So arterial pulse is normally felt over the lateral side of the wrist, in the neck, temples, and groin and near the ankle. You may not be able to feel arteries even at these sites (except carotid artery in the neck which is a major artery near to the heart) when the person is in shock. Nevertheless, feeling the pulse correctly is not always easy and requires training.

Pulse rate in a normal resting adult is between 60 and 100 beats per minute. Tachycardia refers to the heart beating too fast at rest - over 100 beats per minute.

Wrist



Neck



Elbow

Ankle

C.1.4 THE BLOOD

A living human body contains different types of fluids. Blood is one of them. It circulates in a closed system formed by the heart, the arteries, capillaries and the veins. An average adult has a volume of five to six litres blood which constantly circulates.

The blood is a thick viscid liquid of bright red or scarlet colour when it flows from the heart to the arteries and takes a dark red or purple hue when it comes back to the heart via the veins. It has a saline taste.

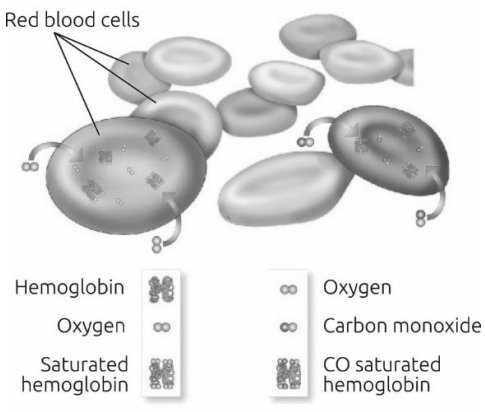


Figure c02 ipv C0 …Blood consists of varieties of cells:

- The blood cells which carry haemoglobin (which enables the cells to carry oxygen) are red in colour and are known as red blood corpuscles (RBC).
- The other cells are white blood corpuscles (WBC) (which play a role in the defence of the body against infections) and platelets (which help the blood to clot). The remainder yellowish liquid portion of the blood is called plasma which contains proteins, enzymes and other important ingredients.
- Whenever blood comes in contact with some external material it tends to solidify, forming a clot to stop further bleeding. When the blood clots inside the arteries, veins or the heart it is referred to as a thrombus.

C.1.5 HOW BLOOD CLOTS

When a blood vessel is severed or damaged, it constricts (narrows) in order to prevent excessive amounts of blood from escaping. At a first stage, specialized blood cells called *platelets* come into contact with the damaged vessel wall, become sticky and start to clump at the site of the injury.

Injured tissue cells at the site of the wound together with the clumped *platelets*, trigger a series of complex chemical reactions that result in the formation of a substance called *fibrin*. Strands (filaments) of fibrin come together to form a mesh, which traps blood cells to make a blood clot. The clot releases a pale-coloured fluid, called *serum*, which contains antibodies and specialised cells. The serum begins the process of repairing the damaged area. At first the blood clot is a jelly-like mass. Later it dries out into a crust (scab) that seals and protects the site of the wound until the healing process is complete.

C.2 CHEST DISCOMFORT

Like all body organs, the heart also needs blood to function properly. If someone complains of chest discomfort, it may be a sign that not enough blood is flowing to the heart muscles. This is very serious and can indicate that the person may suffer from a heart attack.

A heart attack happens when there is a blockage of the blood flow to some parts of the heart muscle. In that case, a part of the heart muscle starts to die as soon as that region does not get any blood supply. It is serious even if the sick person says that nothing is wrong with him.

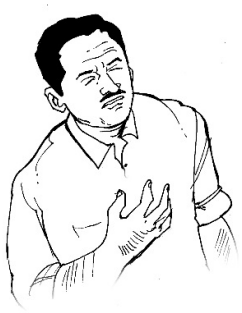
When a person complains of chest pain, always suspect an impending heart attack. However, not every chest discomfort or pain is a heart attack. Several other less problematic health problems present with similar symptoms.

Diagnosing a heart attack may not be easy, even for a trained medical staff!

Extra alarm bells to make you consider a heart-related problem are:

- The pain remains longer than 15 minutes.
- The pain is provoked by effort (exertion pain).
- There is relief when resting.
- The person is known to have cardiac problems or has been prescribed cardiac medicines.

C.2.1 WHAT DO I SEE AND ENQUIRE?



You might observe the following signs and symptoms when a person is having a heart attack:

- discomfort, tightness or pain in the chest;
- pain spreading to the shoulder, neck, jaw, arm or stomach;
- the pain might be described as of a dull, heavy or tight character;
- dizziness and fainting;
- sweating;
- difficulty in normal breathing;
- nausea and vomiting; or
- distress.

C.2.2 WHAT DO I DO?

C.2.2.1 SAFETY FIRST AND CALL FOR HELP

1. Make sure there is no danger to you and the person.
2. The person urgently needs help. Shout or call for help if you are alone but do not leave the person unattended. Ask a bystander to seek help or to arrange urgent transport to the nearest healthcare facility or hospital. Tell him to come back to you to confirm if help has been secured.

C.2.2.2 PROVIDE FIRST AID

3. Make the person lie down in a comfortable position, or propped up position if lying down is not possible. A semi- reclined position is often the most comfortable for such cases.
4. Ask him to rest and not move. He should rest wherever he is at that moment.
5. Loosen tight clothing for more comfort.
6. Reassure the person and tell him what is happening.
7. Ask if the person is taking medication for his heart condition. If so, allow the person to take the prescribed medication.

   If the patient has prescribed nitro-glycerine with him, it is safe for him to take up to three doses.

8. If there is aspirin available, ask the person to chew on an aspirin tablet and swallow it with some water afterwards. Tell him that this will help the blood flow to the heart.
9. Arrange urgent transport to a nearby healthcare facility or hospital.
10. Keep observing the person in case he collapses.

C.2.2.2.1 WHAT DO I DO WHEN THE PERSON BECOMES UNCONSCIOUS, BUT IS STILL BREATHING?

1. Put the person in the recovery position.
2. Do not leave the victim alone and continue to observe him.

C.2.2.2.2 WHAT DO I DO WHEN THE PERSON STOPS BREATHING?

Perform CPR.

Do not interrupt the resuscitation until:

- the victim starts to wake up, moves, opens his eyes and breathes normally;
- help (trained in CPR) arrives and takes over;
- you become too exhausted to continue; or
- the scene becomes unsafe for you to continue.

C.2.2.3 HYGIENE

Always wash your hands after taking care of a person. Use soap and water to wash your hands. If no soap is available, you can use ash to wash your hands. Alcohol-based sanitizers can also be used, if available.

C.2.3 WHEN TO REFER THE PERSON TO A HEALTHCARE FACILITY?

Always urgently seek urgent medical assistance or transport the person to the nearest healthcare facility when you suspect that he is suffering from a heart attack. A heart attack is a life-threatening condition.

C.3 BLEEDING

Blood circulates in blood vessels (arteries, veins, and capillaries). When a blood vessel is damaged, several mechanisms are activated to control blood loss: the vessel constricts, and a series of chemical reactions occur to form a blood clot as a "plug" over the damaged area. If blood vessels are torn or severed, uncontrolled blood loss may occur before clotting can take place, and *shock* may develop.

C.3.1 TYPES OF BLEEDING

A bleeding can be classified by the type of the blood vessel that has been damaged:

- Arterial bleeding.

Arteries carry bright red oxygen rich blood under pressure from the heart. If an artery is damaged, the bleeding may be profuse. The blood will spurt out of it in time with the heartbeat. If a main artery is severed, the blood may jet several feet high. In this case, the volume of the circulating blood will fall rapidly.

- Venous bleeding.

The blood in the veins, having given up its oxygen into the tissues, is dark red. The blood flows under less pressure than arterial blood, but the vein walls can widen greatly and the blood can 'pool' inside them. If a major vein is damaged, the blood may gush from it profusely.

- Capillary bleeding.

Bleeding from the capillaries occurs with any wound. At first the bleeding may be brisk, but blood loss is usually slight. A blow may rupture capillaries under the skin, causing bleeding into the tissues (bruising).

A bleeding can also be classified by its location:

- External bleeding.

  If the bleeding is from the surface of the body, it is called an external bleeding.

- Internal bleeding.

  If the bleeding is within the skull, chest and abdomen or inside the body, it is called an internal bleeding. These bleedings might not been noticed immediately. At a later stage, blood might ooze out of the nose or ears (bleeding inside the head), be coughed up (bleeding inside the lungs), vomited or defecated (bleeding inside the digestive tract) or urinated out (bleeding inside the urinary tract).

C.4 FIRST AID FOR BLEEDING (IN GENERAL)

C.4.1 WHAT DO I SEE AND ENQUIRE?

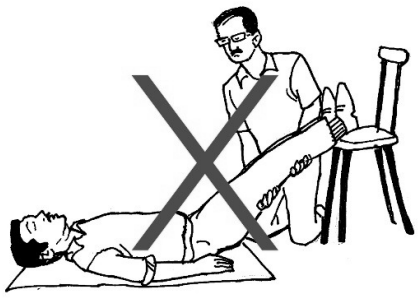
A person who has an injury which is bleeding severely is in a life-threatening situation and needs immediate help. Therefore, stopping the bleeding is a core first aid activity. In addition, bleeding in the face or neck may impede the air flow to the lungs.

There might be an open wound that is bleeding.

- The bleeding might be profuse.
- There might be an object stuck in the wound. Even if you cannot see an object, there might be something stuck in the wound if:
  - the injured feels pain in a specific area;
  - the injured person reveals a painful lump;
  - the injured person feels there is something stuck in the wound;
  - there is a discoloured area where the pain is.

Suspect bleeding inside the body if the injured person:

- is losing blood from body cavities (nose, ear(s), mouth, sex organs, anus);
- is breathing rapidly;
- has a cold and clammy skin that is pale or turns blue;
- has a rapid heartbeat (pulse);
- is behaving in an irritated or unusual way;
- has pain or complains about tenderness; sometimes there is also swelling in the abdomen or chest at the place of the suspected internal bleeding;
- becomes sleepy or falls unconscious.



Do not raise an injured person's legs if you suspect an injury to the legs or moving the legs is painful. The effect of raising the leg is only limited and moving the legs might cause harm.

C.4.2 WHAT DO I DO?

C.4.2.1 SAFETY FIRST AND CALL FOR HELP

1. Make sure there is no danger to you and the person.
2. The person urgently needs help. Shout or call for help if you are alone but do not leave the person unattended. Ask a bystander to seek help or to arrange urgent transport to the nearest healthcare facility. Tell him to come back to you to confirm if help has been secured.

C.4.2.2 HYGIENE

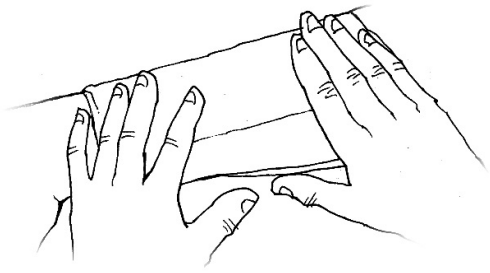
3. Wash your hands before and after taking care of the patient. Use soap and water to wash your hands. If no soap is available, you can use ash to wash your hands. Alcohol-based sanitizers can also be used, if available.
4. Put on gloves if available. You can also use a clean plastic bag. Try not to come in contact with the person's blood.

C.4.2.3 STOP THE BLEEDING

5. Ask the injured to sit or lie down or put him in comfortable position.
6. Comfort the person and explain what is happening to him. Tell the person to relax and rest. He should not try to exert.

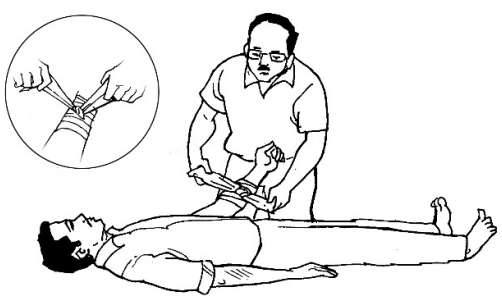
7. Try to stop or slow down the bleeding; press with both hands on the wound with a clean cloth or bandage.

Alternatively, if possible, ask the injured to press on the bleeding wound himself to stop the bleeding.



8. If you have a piece of clean (cotton) cloth, then cover the wound with it.

   If you have no bandages, improvise with other materials.



9. You can also wrap a bandage around the wound to slow down the bleeding, but continue to apply pressure until the bleeding stops.

   Make sure the bandage is firm enough so it stops the bleeding but doesn't cut off all the blood flow.

   If the part of the body below the bandage changes colour or is swelling or the injured person says he is losing any feeling there, loosen the bandage a little but do not remove it. If the blood flow to a limb is stopped an injured person can lose his limb.

10. Do not apply a tourniquet or fix a bandage above the wound, except in special situations (as specified below)!

Only apply a tourniquet:

- if the bleeding of an external limb cannot be stopped by putting direct pressure on the wound, or
- if there are many casualties you have to give help to, and
- the first aider has been well trained on how to apply a tourniquet.

If a tourniquet is applied on a bleeding limb:

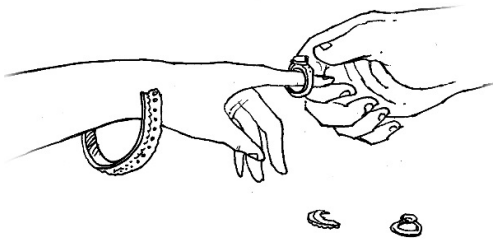
a. apply it above the wound,

b. note down the time when the tourniquet is applied,

c. maximally have a tourniquet applied for 2 hours,

d. transfer the casualty as quickly as possible to a healthcare facility for further treatment.

11. If the bandage becomes soaked in blood, do not remove it, but add another bandage on top of it and continue to apply pressure.



12. Take off jewels or anything else in the area of the wound that may cut off blood flow because of swelling. Keep the jewels and belongings with the owner or in a safe place.

13. Keep the injured person warm by taking off wet clothing, covering him with a blanket or other covering, taking care not to overheat him.
14. Keep checking for the bleeding and also check that the person is conscious and breathing properly.

15. Stay with the person until medical help is available.
16. Do not give the injured person anything to eat or drink.
17. Arrange transport to the nearest healthcare facility.

C.4.2.3.1 WHAT DO I DO IF THE VICTIM LOSES CONSCIOUSNESS, BUT IS STILL BREATHING?

1. If the person is breathing, put him in the recovery position and cover him with a blanket or coat to keep him warm.
2. Continue to put pressure on the wound to stop the bleeding.
3. Do not leave the victim alone and continue to observe the breathing.

C.4.2.3.2 WHAT DO I DO IF THE VICTIM STOPS BREATHING?

Start CPR.

Do not interrupt the resuscitation until:

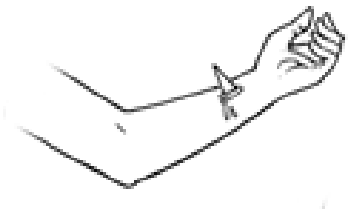
- the victim starts to wake up, moves, opens eyes and breathes normally;
- help (trained in CPR) arrives and takes over;
- you become too exhausted to continue, or
- the scene becomes unsafe for you to continue.

C.4.2.4 HYGIENE

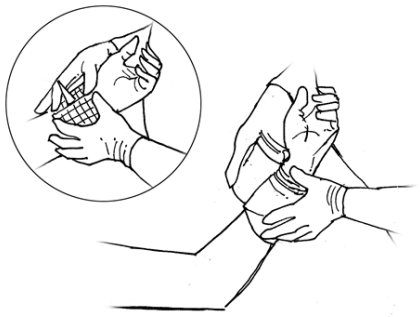
Always wash your hands after taking care of a person. Use soap and water to wash your hands. If no soap is available, you can use ash to wash your hands. Alcohol-based sanitizers can also be used, if available.

C.4.3 WHAT DO I DO IF AN OBJECT IS STUCK IN THE WOUND?

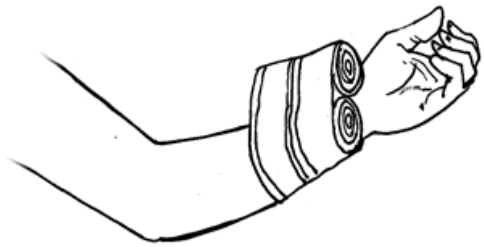
1. Do not remove the object.



2. Check if the object caused an additional exit wound if it passed through; try to stop the protruding object from moving (do not remove the object) with bulky material and bandages.



3. Build up padding around the object until you can bandage over it without pressing down.



4. Bandage the material above and below the object with a piece of clean (cotton) cloth or improvise with other materials.

   Make sure the bandage is firm enough so it stops the bleeding but doesn't cut off all the blood flow.

   If the part of the body below the bandage changes colour or is swelling or the injured person says he is losing any feeling there, loosen the bandage a little but do not remove it. If the blood flow to a limb is stopped an injured person can lose his limb.

5. Do not apply a tourniquet or fix a bandage above the wound, except in special situations (see below)

   Only apply a tourniquet:

   - if the bleeding of an external limb cannot be stopped by putting direct pressure on the wound, or
   - if there are many casualties you have to give help to, and
   - the first aider has been well trained on how to apply a tourniquet.

   If a tourniquet is applied on a bleeding limb:

   a. apply it above the wound,
   b. note down the time when the tourniquet is applied,
   c. maximally have a tourniquet applied for 2 hours,
   d. transfer the casualty as quickly as possible to a healthcare facility for further treatment.

6. If the bandage becomes soaked in blood, do not remove it, but add another bandage on top of it and continue to apply pressure.
7. Take off jewels or anything else in the area of the wound that may cut off blood flow because of swelling. Keep the jewels and belongings with the owner or in a safe place.

C.4.4 WHAT DO I DO WHEN I SUSPECT AN INTERNAL BLEEDING?

1. Ask the injured person to sit or lie down or make him comfortable.
2. Check the airway, breathing and circulation.
3. If there is also external bleeding: try to stop or slow down the external bleeding; press with both hands on the wound with a clean cloth or bandage.

4. Keep the injured person warm by taking off wet clothing, covering him with a blanket or other covering, taking care not to overheat him.
5. Keep checking that the person is conscious and breathing properly.
6. If the person stops breathing, start CPR.
7. Do not apply hot water bottles or ice bags to the chest or the abdomen.
8. The person needs to be transported urgently to the nearest healthcare facility.

C.4.5 WHEN TO REFER TO A HEALTHCARE FACILITY?

Always urgently transport the casualty to the nearest healthcare facility when you suspect he may be suffering an internal bleeding.

After giving first aid, a casualty should always be referred to the healthcare facility for further follow-up or treatment.

However, you also must seek medical help in the following situations:

- the wound is large and/or bleeding profusely;
- you cannot stop the bleeding;
- the injured person lost a lot of blood;
- an object is in the wound;
- the wound has an irregular shape;
- the wound is open;
- the injured person is losing feeling or has problems moving the body part;
- the injured person feels sick, has fainted or lost consciousness;
- the condition of the person worsens;
- the wound is on the face, is on or near the eyes, or in the area of the sex organs;
- the wound has dirt in it and cannot be cleaned properly;
- the colour of the wound or limb changes;
- the person experiences a problem with movement;
- the wound has faeces or urine in it;
- the wound was caused by a bite (from a human or an animal);
- the wound was caused by a stabbing or a bullet;
- the injured person has diabetes or immunity affecting disease;
- the injured person is 65 years old or older; or
- it is more than 10 years since the injured person last had a tetanus toxoid injection or if there is any doubt about when the injured person last had a tetanus toxoid injection. Even small wounds can cause tetanus and it is a very safe injection.