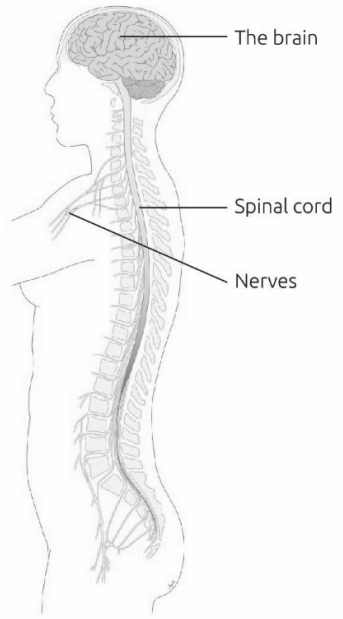
F. NERVOUS SYSTEM AND UNCONSCIOUSNESS

In this chapter you will learn about:

- The nervous system.
- Unconsciousness.
- Head injuries.
- Stroke.
- Fits – convulsions – seizures.
- Epilepsy.

F.1 THE NERVOUS SYSTEM



The nervous system consists of:

- the brain,
- the spinal cord, and
- the nerves.

Anatomically the nervous system is divided in a *central* and a *peripheral* nervous system.

F.1.1 THE CENTRAL NERVOUS SYSTEM

The central nervous system (CNS) comprises of the brain and the spinal cord.

F.1.1.1 THE BRAIN

The brain is an extremely delicate structure made up of a mass of nerve cells. It is here that sensations are analysed and orders are given to the muscles.

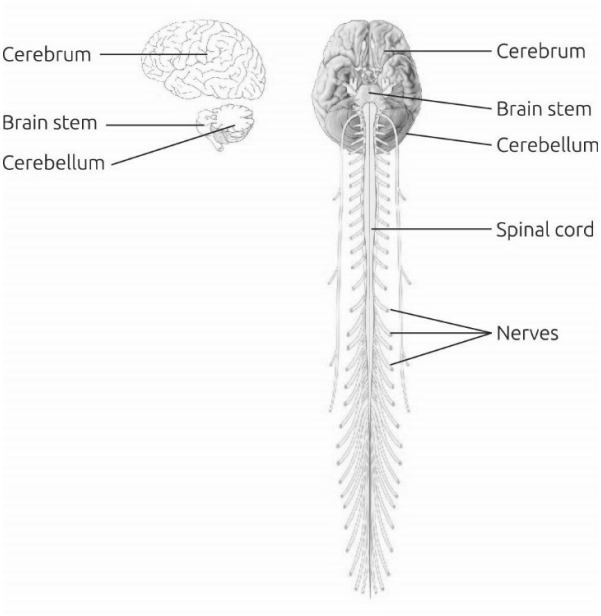
The brain is encased in the skull and suspended in a clear fluid, called the *cerebrospinal fluid (CSF)*, which acts as a partial shock absorber. Nonetheless, since the brain is free to move within the skull the brain is sensitive to violent movements or pressure.

The brain has three main structures:

- *the cerebrum*, which is concerned with thought, sensation, and conscious movement;
- *the cerebellum*, which coordinates movement, balance, and posture; and
- *the brain stem*, which controls basic functions such as breathing.

F.1.1.2 THE SPINAL CORD

The spinal cord is a mass of nerve fibres extending from the brain through an opening in the base of the skull. The cord runs through the spinal column.



The main function of the spinal cord is to convey signals between the brain and the peripheral nervous system.

F.1.2 THE PERIPHERAL NERVOUS SYSTEM (*PNS*)

The peripheral nerves emerge in pairs, each containing motor and sensory nerves, from the brain and spinal cord. Sensory nerves transmit impressions received by the senses (sight, hearing, touch etc.) to the brain and motor nerves then transmit the 'orders' given by the brain to the voluntary muscles. When a nerve is cut there is a loss of feeling, power and movement in that part of the body which is controlled by that nerve.

The peripheral nervous system can be divided in voluntary or *somatic nervous system* and an *autonomic nervous system*.

F.1.2.1 THE SOMATIC NERVOUS SYSTEM

The somatic system is the part of the peripheral nervous system that is responsible for carrying motor and sensory information both to and from the central nervous system. This system is made up of nerves that connect to the skin, sensory organs and all skeletal muscles. The system is responsible for nearly all voluntary muscle movements as well as for processing sensory information that arrives via external stimuli including hearing, touch and sight.

F.1.2.2 THE AUTONOMIC NERVOUS SYSTEM

The *autonomic nervous* system is the part of the peripheral nervous system that regulates key involuntary functions of the body. This system is not controlled by the will and acts continuously whether a person is awake or asleep. It controls different body functions including the activity of the heart muscle; the smooth muscles, including the muscles of the intestinal tract; and the glands. The autonomic nervous system has two divisions: the sympathetic nervous system, which accelerates the heart rate, constricts blood vessels, and raises blood pressure, and

the parasympathetic nervous system, which slows the heart rate, increases intestinal and gland activity, and relaxes sphincter muscles.

F.2 UNCONSCIOUSNESS

Unconsciousness is a state in which the casualty becomes insensible to commands because of an interruption to the normal functioning of the brain. A person has perhaps lost consciousness if he does not react to your action by opening his eyes or answering your questions.

There is no absolute dividing line between consciousness and un- consciousness. People can be fully conscious (aware and awake) or fully unconscious (no reaction to any stimulus) or at any level between these two extremes.

> Loss of consciousness causes the muscles to relax. During the period of unconsciousness the tongue might fall backwards and block the breathing passage.

In fainting, the unconscious state is usually brief as in *vasovagal syncope*. Fainting can occur due to various reasons such as emotional distress, tiredness, hunger, standing up for long period, a sudden change in body position, being a long time in a hot environment, or specific medical conditions. Pregnant women, children and the elderly can be more vulnerable to these causes.

Longer periods of unconsciousness are more serious. Causes include head injuries, cardiac arrest, stroke or poisoning.

In an unconscious state, the person will be unresponsive to your activities (touching, sounds or other stimulation).

Check the following:

- Whether the person opens his eyes and responds to simple questions:
  - "What is your name?"
  - "Where do you live?"
  - "How old are you?"
- Whether the person responds to simple commands:
  - "Squeeze my hand."
  - "Move your arm/leg/foot/hand."
- If there is no response, pinch the person and see if he opens his eyes or moves.

If the person does not react to any of these stimuli, he is in an unconscious state.

> Note that a person might only partially respond to the stimuli you provide (sound, touch, pain); he might be in an in-between state.

When the person becomes conscious again after a period of unconsciousness, he might suffer from:

- confusion,
- drowsiness,
- light-headedness,
- headache,
- loss of bowel and bladder control (incontinence),

- fits, and
- difficulty speaking.

ⓘ The first aider can measure and record a patient's responsiveness and level of consciousness using the AVPU scale (see chapter on basic first aid techniques).

F.2.1 CAUSES OF UNCONSCIOUSNESS

There are many causes of unconsciousness and it can occur as a result of a:

- head injury resulting in a concussion of the brain or a compression of the brain due to swelling or bleeding;
- disturbance of the blood supply to the brain, as in fainting, shock or stroke;
- disturbance in the chemical composition of the blood, e.g. lack of oxygen as in asphyxia, abnormal blood sugar levels in diabetes or presence of poisonous substances in the blood; or
- disturbance in the electrical activity of the brain, e.g. as in epilepsy.

F.2.2 WHAT DO I DO?

F.2.2.1 SAFETY FIRST AND CALL FOR HELP

1. Make sure there is no danger to you, the person or bystanders.

F.2.2.2 PROVIDE FIRST AID

2. Talk loudly to the casualty. Tap him on the shoulders and ask if he is ok. Do not shake the person too roughly.
3. Check if the casualty is conscious or unconscious and act accordingly.

To do so:

a. Talk loudly to person, shake him gently

b. Check if the person opens his eyes and responds to simple questions:
   - 'What is your name?'
   - 'Where do you live?'
   - 'How old are you?'

c. Check if the injured person responds to simple commands:
   - "Squeeze my hand?"

- "Move your arm/leg/foot/hand"

d. If there is no response, pinch the person and check if he opens his eyes or moves.

The first aider can measure and record a patient's responsiveness and level of consciousness using the AVPU scale (see chapter on basic first aid techniques).

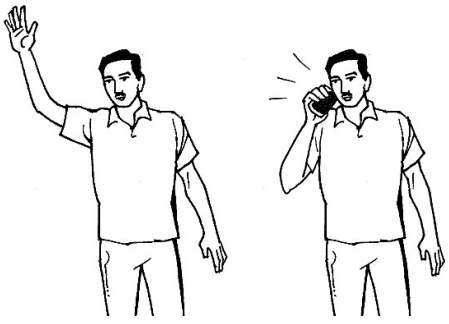
F.2.2.2.1 WHAT DO I DO WHEN THE CASUALTY RESPONDS?

1. Try not to change the position of the person if there has been a head, neck, back, leg or arm injury.
2. Try to find out what happened to the person.
3. Tell the person to stay calm and not to move (if at all possible).

4. Look and feel for breathing
5. Keep checking the casualty to make sure he is not getting worse.
6. Verify regularly the level of consciousness and breathing.
7. Find medical help for the person if needed.

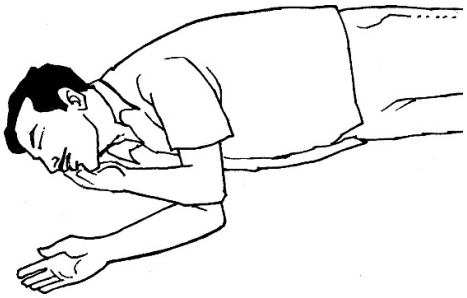
F.2.2.2.2 WHAT DO I DO WHEN THE CASUALTY DOES NOT RESPOND?

1. Try not to change the position of the person if there has been a head, neck, back, leg or arm injury.



2. The injured 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.
3. If you have gloves, put them on. Do not search for gloves if not available and continue with the next step.

4. You must unblock the breathing passage:
    a. Gently roll the person over on to his back.
    b. Carefully tilt his head back and lift the chin up with your hand on the bony part of the chin. This simple action lifts the tongue from the back of the throat.
    c. Do not put your hand on the soft part under the chin to do this!



5. If the person is breathing, put him in the recovery position.
    a. Be careful when moving and turning the victim. It is better to ask assistance by bystanders.
    b. Do not leave the person alone and keep checking his breathing.
    c. Keep the injured person warm by taking off wet clothing, covering him with a blanket or other covering, taking care not to overheat him.
6. If not done yet, arrange transport to a healthcare facility.

F.2.2.2.3 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.

F.2.2.2.4 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.

F.2.3 WHEN TO REFER TO A HEALTHCARE FACILITY?

Always urgently transport an unconscious person to the nearest healthcare facility.

Anyone who has become unconscious or who is feeling sick, has pain after fainting (e.g. in the head or heart region, or from trauma resulting from the fall), is on medication or is being treated for a medical condition, should always seek medical help.

F.3 HEAD INJURIES

Head injuries can be a concussion, a cerebral compression, or fracture of the skull. All head injuries are potentially serious and require a proper assessment because they can impair consciousness.

Head injuries can be associated with damage to the brain tissue itself, damage to blood vessels inside the skull, skull fractures, brain concussions, and compression of brain tissue because of built up pressure due to swelling or bleeding.

Assume always that casualty suffering from head injury might also be having a neck or spinal injury.

F.3.1 CONCUSSION

A *concussion* is a 'shake-up' of the brain inside the skull. It can be caused by a blow on the head or a fall. There is a brief period of impaired consciousness following the blow to the head. The casualty might complain of dizziness, headache, blurred vision or nausea. Typically there is a brief loss of memory of any events that occurred at the time of, or immediately preceding, the injury.

F.3.2 CEREBRAL COMPRESSION

Some head injuries may produce a compression of brain tissue. The pressure inside the skull builds up by swelling or bleeding inside the skull. This condition is life threatening.

Casualties show a deteriorating level of consciousness that may progress to unconsciousness. Therefore, it is important to observe continuously the conscious level of a casualty that experienced a head trauma.

Other signs and symptoms you may observe are:

- The person complains of an intense headache.
- The person complains of dizziness.
- The person complains of drowsiness.
- The person complains of blurred or double vision
- The breathing gets noisy and becomes slow.
- A slow but strong pulse (can be felt if the first aider is experienced in the technique of taking the pulse).
- Unequal pupil size.
- Weakness and/or paralysis on one side of the face and/or body.
- A change in the behaviour or the personality of the casualty.

F.3.3 SKULL FRACTURES

If the casualty has a head wound or bruise, be alert for a possible skull fracture also. A skull fracture is a serious condition because of the underlying risk of brain damage and bleeding.

You might observe following signs and symptoms:

- There is a soft area or a depression on the scalp.

- Asymmetry of the head or skull.
- There is bruising or swelling behind the ear(s).
- Clear watery fluid (CSF) or blood is leaking from the casualty's ear or nose.
- The casualty has a deteriorating level of response which may progress to unconsciousness.

F.3.4 WHAT DO I DO?

1. Approach a casualty who experienced a period of impaired consciousness as described in the chapter on unconsciousness.

2. If there is a risk of fractures of the skull, neck or spine: treat the casualty accordingly as described in the chapter on injuries and fractures to the head, neck and spine.

If there is a risk of fractures of the skull, neck or spine, treat the casualty accordingly (see chapter on Injuries and fractures to the head, neck and spine).

F.3.5 WHEN TO REFER TO A HEALTHCARE FACILITY?

Always urgently transport an unconscious casualty to the nearest healthcare facility. Injured people suspected of having head, neck or spinal injuries should always be examined urgently in the nearest healthcare facility.

Anyone who has become unconscious or who is feeling sick, has pain after fainting (e.g. in the head or heart region, or from trauma resulting from the fall), is on medication or is being treated for a medical condition, should always visit the healthcare facility for medical check.

F.4 STROKE

'Stroke' is a rapid loss of brain function due to a disturbance in the blood supply to the brain. It can be the result of bleeding or when a blood clot leads to a blockage in a blood vessel to the brain, blocking the blood flow. As a result the affected brain part can't function normally and this might result in difficulty in moving, speaking, understanding, etc. Symptoms occur suddenly and depend on the area of the brain affected.

Strokes occur commonly in later life and in patients that suffer high blood pressure or other circulatory disorder

F.4.1 WHAT DO I SEE AND ENQUIRE?

You might observe following signs and symptoms:

- The person complains of numbness;
- The person complains of blurred vision;
- The person talks with a slurred speech;
- The person complains of severe headache;
- The person seems confused;
- You may observe:
  - weakness or paralysis of the limbs,
  - weakness or paralysis in the face.
- Sometimes the person might even have loss of consciousness.

The possibility of stroke should always be considered when there is:

- a sudden weakness or numbness of the face, arm or leg, especially on one side of the body; and/or
- a sudden trouble in speaking, seeing or understanding.

F.4.2 WHAT DO I DO?

1. If you think someone is suffering from a stroke, you can ask the person to perform three simple actions to check.

   You can easily remember this via the mnemonic **'FAST'**: Face – Arm – Speech and Transport.

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2. Ask the person to smile or to show his teeth.

   Check whether the mouth is crooked or drooping at one corner.

   There might be saliva dribbling out of the mouth.

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3. Ask the person to lift both arms.

   Check whether he can do this without one arm dropping or drifting. Can he do this? Is one arm lower than the other?

   A stroke often causes one side of the body to become weak or even paralyzed.

   The person might also have lost his balance.

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4. Ask the person to repeat a simple sentence after you. Check whether he can speak clearly or if he has problems in saying the words.

A stroke is very likely if the person has difficulties with any of the above actions.

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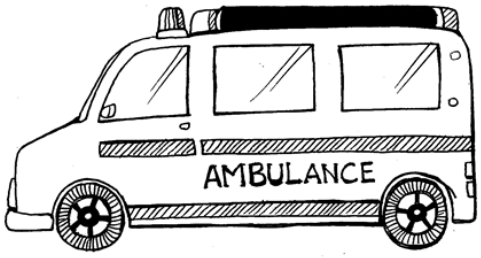


5. Arrange transport quickly. The earlier the person is treated, the better is the outcome. Try to find out when the problem started, note it down and report it.
6. If you think the person suffers from a stroke, the person urgently needs help. Shout or call for help if you are alone but do not leave 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.
7. If the person can sit up, make him to sit upright. This helps the person to breathe.

   If the person cannot sit up, place him in the recovery position.
8. Comfort the person and explain what is happening. Tell the person to relax and rest.
9. He should not try to do anything.
10. Do not give food or drink to the person having a stroke. There is an increased risk of choking or vomiting.
11. Keep checking that the person is awake and breathing properly.
12. Arrange urgent transport to a healthcare facility.
13. 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.

F.4.2.1 WHAT DO I DO IF THE PERSON IS UNCONSCIOUS, BUT IS STILL BREATHING?

a. Put the person in the recovery position.

b. Continue to observe the victim and check his breathing

F.4.3 WHAT DO I DO WHEN THE PERSON STOPS BREATHING?

Start CPR.

Do not interrupt the resuscitation until:

- the person starts to wake up, moves, opens his eyes and breathes normally;
- help (trained on CPR) arrives and takes over;
- you become tooexhausted to continue; or
- the area becomes unsafe for you to continue.

F.4.4 WHEN TO REFER TO A HEALTHCARE FACILITY?

Always arrange urgent transport to the nearest healthcare facility. This should be done even if the symptoms improve.

F.5 FITS – CONVULSIONS - SEIZURES

A person has a fit (a seizure or convulsions) if he suddenly shakes uncontrollably. It is different from normal shivering and trembling. It may manifest in all limbs or just be limited to a single limb.

The person having the fit may urinate and defecate without control. A fit can be caused by high fever, diseases (e.g. malaria, epilepsy…), poisoning (e.g. alcohol, drugs…) or a trauma (e.g. brain injury).

Epilepsy is a central nervous system disorder (neurological disorder) in which nerve cell activity in the brain becomes disrupted, causing seizures or periods of unusual behaviour, sensations and sometimes loss of consciousness. Epilepsy is usually a disease of the young. In the beginning the frequency of convulsions is usually less, but they become more and more frequent later. Epilepsy seizures may be of a 'minor' or 'major' kind. In minor epilepsy seizures, the casualty becomes pale, his eyes become fixed and staring and he becomes unconscious for a few seconds. He resumes his work soon as though nothing had happened. A major epilepsy seizure (also known as '*grand mal* seizures') is serious. The attack follows a headache, restlessness or a feeling of dullness. The casualty is usually aware that he is going to get an attack of an epileptic fit.

Children under the age of four often develop fits as a result of high temperature (fever) caused by infectious diseases. A child having a fit should be brought to a nearby healthcare facility for urgent examination by a doctor.

F.5.1 WHAT DO I SEE AND ENQUIRE?

You may observe following signs and symptoms:

- sudden uncontrollable shaking;
- falling down on the floor;
- loss of consciousness;
- foaming at the mouth; or
- the person might have earlier mentioned that he smelled, felt, tasted, heard or saw things differently.

If the fit is due to high temperature (fever):

- the skin might then feel hot and look reddish.

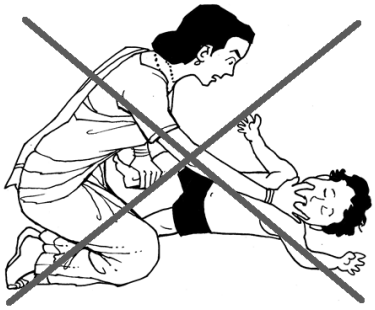
F.5.2 WHAT DO I DO?

F.5.2.1 SAFETY FIRST

1. Make sure there is no danger to you, the person or bystanders.

F.5.2.2 PROVIDE FIRST AID

2. Remove objects that could hurt the person.



3. Do not hold the person down (do not restrain the person).

4. If possible, put something soft (cushion, clothing) under the head if the person is lying on the floor.

5. Make sure the person can breathe freely by loosening tight clothing around the neck (collar, tie).

6. Do not put anything into the person's mouth.

7. Do not put your fingers in the person's mouth.

   A person cannot swallow his saliva during a convulsion. A person might bite his own tongue, but this normally heals in a few days.

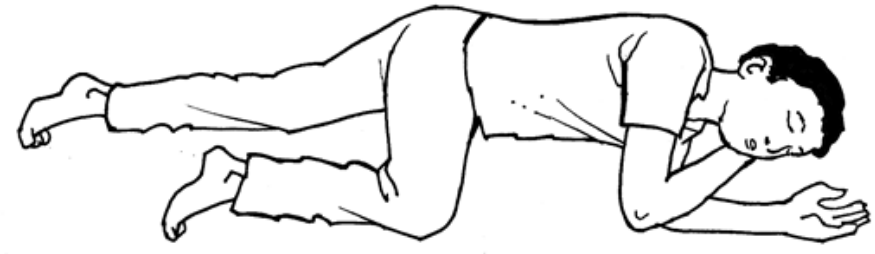
   An object or a hand placed in the mouth of someone having a convulsion is dangerous for the victim and yourself.

8. For a child with high fever:

   a. Remove clothing and blankets and ensure there is enough fresh air.

   b. Do not make the child too cold.

   c. Put pillows and soft padding around the child so that he cannot hurt himself.



   d. If possible, put the child in the recovery position.

   e. Sponge the child with water at room temperature.

9. When the fit stops: put the person in the recovery position if he is not yet in this position.

   This will keep the breathing passage open and prevent vomit from entering the lungs.

10. Stay with the person till he gets better.
11. Reassure the person, parents and bystanders.
12. Do not give food or drinks to a child or person that has just had a fit.
13. Arrange urgent transport to the nearest healthcare facility if:
    a. The person has high fever.
    b. The person did not wake up between fits.
    c. The person stopped breathing, or the situation worsens.
    d. This was the person's first fit (and he has no fever).
    e. The person is under influence of drugs or alcohol.

F.5.2.3 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.

F.5.3 WHEN TO REFER TO A HEALTHCARE FACILITY?

Always arrange urgent transport to the nearest healthcare facility if the person has more than one fit and he did not wake up in between; the person has high fever, or the person's condition deteriorates further.

Always refer the person who has suffered a fit to a healthcare facility for further treatment.