

# Water Awareness and Charge Certificate Manual

## Module 21: First Aid and Waterborne Diseases

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## Revision History

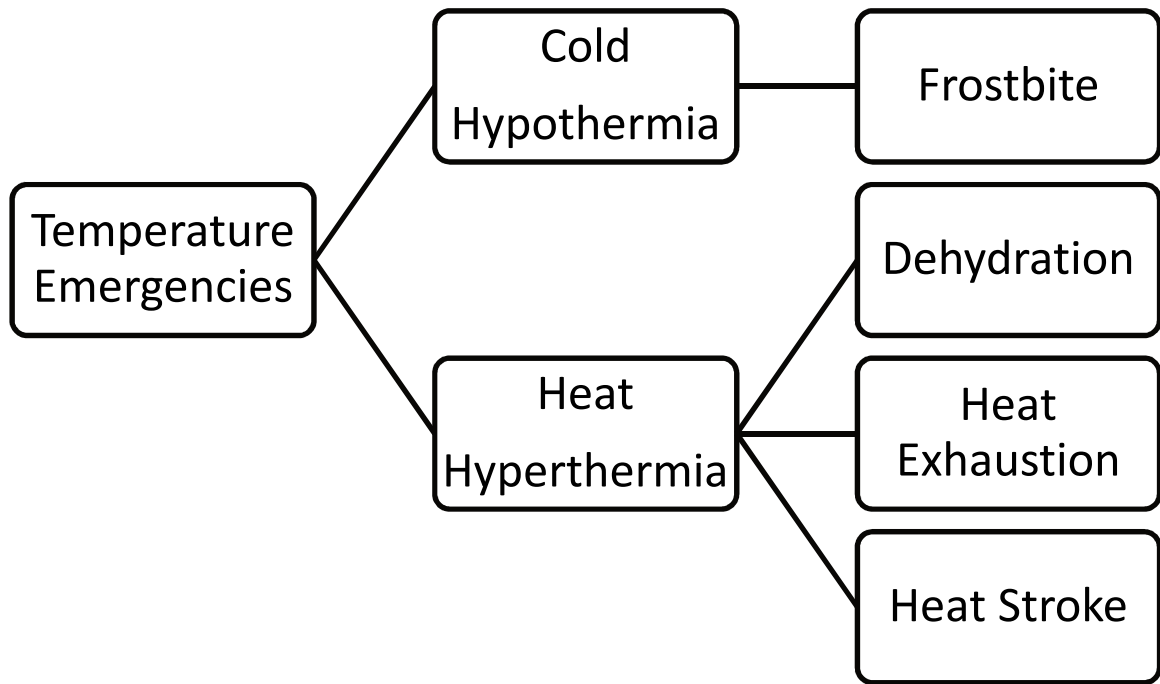
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## Outcomes

After completing this module, the certificate holder will be able to:

- Identify and treat hypothermia, hyperthermia and heatstroke.
- Perform cardio pulmonary resuscitation
- List several diseases that are of concern when conducting water activities

# 1 FIRST AID



## 1.1 Hypothermia - First aid

Hypothermia is the condition where by the body's core temperature drops below that required for normal metabolism and bodily functions. Normal body core temperature is maintained at 37°C.

Hypothermia can be divided in three stages of severity.

1. Body temperature drops by 1-2°C below normal temperature. Mild to strong shivering occurs. The casualty is unable to perform complex tasks with the hands; the hands become numb. Blood vessels in the outer extremities constrict, lessening heat loss to the outside air. Breathing becomes quick and shallow. Goose bumps form. Often, a person will experience a warm sensation, as if they have recovered, but they are in fact heading into Stage 2. Another test to see if the person is entering stage 2 is if they are unable to touch their thumb with their little finger; this is the first stage of muscles not working.
2. Body temperature drops by 2-4°C. Shivering becomes more violent. Movements are slow and laboured, accompanied by a stumbling pace and mild confusion, although the casualty may appear alert. Surface blood vessels contract further as the body focuses its remaining resources on keeping the vital organs warm. The casualty becomes pale. Lips, ears, fingers and toes may become blue.
3. Body temperature drops below approximately 32 °C. Shivering usually stops. Difficulty speaking, sluggish thinking, and amnesia starts to appear; inability to use hands and stumbling is also usually present. Cellular metabolic processes shut down. Below 30 °C, the exposed skin becomes blue and puffy, muscle coordination becomes very poor, walking becomes almost impossible, and the casualty exhibits incoherent/irrational behaviour including terminal burrowing (paradoxical undressing) or even a stupor. Pulse and respiration rates decrease significantly but fast heart rates (ventricular tachycardia,

arterial fibrillation) can occur. Major organs fail. Clinical death occurs. Because of decreased cellular activity in stage 3 hypothermia, the body will actually take longer to undergo brain death.

Treatment for hypothermia involves gradually raising the core body temperature of the casualty. If it took 24 hours to get his cold, then warming must be gradual over 24 hours. The first aid response to someone experiencing hypothermia, however, must be made with caution.

- Do not rub or massage the casualty
- Do not give alcohol
- Do not treat any frostbite
- Do not allow the body to become vertical

Any of these actions will divert warm blood from the critical internal organs and will worsen the situation. Rubbing of the body to warm the casualty up can cause unnecessary circulation of the cold blood on the body's surface to the core. This can cause Secondary Hyperthermia.

#### **What you should do:**

- Call the emergency services
- Get the casualty to shelter
- Remove wet clothing and dry the casualty. Use towels to gently pat the water from their skin and hair – NEVER rub them dry
- Place warm hot-water bottles (wrapped in a cotton sock) in the casualty's armpits and between their legs
- Cover them with blankets or sleeping bags
- Use body heat to warm them up
- Monitor the casualty and be prepared to give Cardio-Pulmonary Resuscitation.

If the hypothermia has become severe, notably if the person is incoherent or unconscious, re-warming *must* only be done under strictly controlled circumstances in a hospital. Bystanders should only remove the casualty from the cold environment, insulate them as much as possible and get the person to advanced medical care as quickly as possible.

In hypothermia, the heart becomes extremely "irritable", and sudden re-warming can provoke cardiac arrhythmia, irregular beating of the heart in which blood isn't pumped adequately or may not be pumped at all. Common first aid wisdom in helping someone suspected of suffering from hypothermia is to treat them as if they were fragile, or made of glass — do nothing to over-stimulate the heart.

An important tenet of treatment is that ***a person is not dead until they are warm and dead*** - remarkable stories of recovery after prolonged cardiac arrest have been reported in casualties with hypothermia. This is presumably because the low temperature prevents some of the cellular damage that occurs when blood flow and oxygen are lost for an extended period of time.

## **1.2 Frost Bite – First Aid**

This occurs when part of the body freezes due to the cold. When this happens, all circulation to the affected part stops.

Numbness, tingling and pain on movement are felt at the site. The affected area also becomes very pale and waxy-white due to the lack of circulation.

**What you should do:**

- Call the emergency services
- Warm affected area slowly using tepid water at first
- Do not rub the affected area as this may damage blood vessels
- Protect the affected area using padding
- Remove to hospital as soon as possible

### **1.3 Hyperthermia - First aid**

Hyperthermia is overheating of the body. There are a variety of heat-related illnesses, including heat stroke and heat exhaustion. Hyperthermia is a medical emergency requiring hospitalization, and the local emergency system should be activated as soon as possible

People suffer heat-related illness when the body's temperature control system is overloaded. The body normally cools itself by sweating. But under some conditions, sweating just isn't enough. In such cases, a person's body temperature rises rapidly. Very high body temperatures can damage the brain or other vital organs. High humidity, old age, obesity, fever, dehydration, heart disease, poor circulation, sunburn, and drug/alcohol use can all affect the body's ability to cool itself.

The body temperature must be lowered immediately. The casualty should be moved to a cool area (indoors, or at least in the shade) and clothing removed to promote heat loss (passive cooling). Active cooling methods may be used: The person is bathed in cool water, or wrapped in a cool wet towel. Cold compresses to the head, neck, and groin will help cool the casualty. A fan may be used to aid in evaporation of the water (evaporative method). Ice and very cold water can produce hypothermia; they should preferably not be used to cool down the casualty. The sudden shock in temperature can cause the heart to stop.

Immersing a casualty into a bathtub of cold water (immersion method) is a recognised method of cooling. This method requires the effort of 4-5 persons and the casualty should be monitored carefully during the treatment process. This should be avoided for an unconscious casualty; if there is no alternative, the casualty's head must be held above water.

Hydration is of paramount importance in cooling the casualty. This is achieved by drinking water (Oral rehydration). Commercial isotonic drinks may be used as a substitute. Alcohol and caffeine should be avoided, because of their diuretic properties. If the casualty is confused, unconscious or unable to tolerate oral fluids, intravenous hydration (via a drip) is necessary.

Alcohol rubs will cause further dehydration and impairment of consciousness and should therefore be avoided. The casualty's condition should be reassessed and stabilized by trained medical personnel. The casualty's heart rate and breathing should be monitored, and CPR may be necessary if the casualty goes into cardiac arrest.

The casualty should be placed into the recovery position to ensure that their airway remains open.

## 1.4 Dehydration

Dehydration can be a serious heat-related disease, as well as being a dangerous side-effect of diarrhoea, vomiting and fever. Children and persons over the age of 60 are particularly susceptible to dehydration.

Take precautionary measures to avoid the harmful effects of dehydration, including:

- Drink plenty of fluids, especially when working or playing in the sun.
- Make sure you are taking in more fluid than you are losing.
- Try to schedule physical outdoor activities for the cooler parts of the day.
- Drink appropriate sports drinks to help maintain electrolyte balance.

### **Treatment for dehydration:**

In cases of mild dehydration, simple rehydration is recommended by drinking fluids. Many sports drinks on the market effectively restore body fluids, electrolytes, and salt balance.

For moderate dehydration, intravenous fluids may be required, although if caught early enough, simple rehydration may be effective. Cases of serious dehydration should be treated as a medical emergency, and hospitalization, along with intravenous fluids, is necessary. Immediate action should be taken.

## 1.5 Heat Exhaustion

Heat exhaustion is a heat-related illness that can occur after you've been exposed to high temperatures, and it often is accompanied by dehydration.

### **There are two types of Heat Exhaustion:**

- Water depletion. Signs include excessive thirst, weakness, headache, and loss of consciousness.
- Salt depletion. Signs include nausea and vomiting, muscle cramps, and dizziness.

Although heat exhaustion isn't as serious as heat stroke, it isn't something to be taken lightly. Without proper intervention, heat exhaustion can progress to heat stroke, which can damage the brain and other vital organs, and even cause death.

## **Symptoms of Heat Exhaustion**

The most common signs and symptoms of heat exhaustion include:

- Confusion
- Dark-colored urine (a sign of dehydration)
- Dizziness
- Fainting
- Fatigue
- Headache
- Muscle or abdominal cramps
- Nausea, vomiting, or diarrhoea
- Pale skin
- Profuse sweating
- Rapid heartbeat

## **Treatment for Heat Exhaustion**

- If you, or anyone else, have symptoms of heat exhaustion, it's essential to immediately get out of the heat and rest, preferably in an air-conditioned room. If you can't get inside, try to find the nearest cool and shady place.
- Drink plenty of fluid (avoid caffeine and alcohol).
- Remove any tight or unnecessary clothing.
- Take a cool shower, bath, or sponge bath.
- Apply other cooling measures such as fans or ice towels.

If such measures fail to provide relief within 15 minutes, seek emergency medical help, because untreated heat exhaustion can progress to heat stroke.

After you've recovered from heat exhaustion, you'll probably be more sensitive to high temperatures during the following week. So it's best to avoid hot weather and heavy exercise until your doctor tells you that it's safe to resume your normal activities.

## **1.6 Heat Stroke (Sun Stroke)**

Heat stroke is the most severe form of heat illness and is a life-threatening emergency. It is the result of long, extreme exposure to the sun, in which a person does not sweat enough to lower body temperature. The elderly, infants, persons who work outdoors and those on certain types of medications are most susceptible to heat stroke. It is a condition that develops rapidly and requires immediate medical treatment.

Our bodies produce a tremendous amount of internal heat and we normally cool ourselves by sweating and radiating heat through the skin. However, in certain circumstances, such as extreme heat, high humidity or vigorous activity in the hot sun, this cooling system may begin to fail, allowing heat to build up to dangerous levels.

If a person becomes dehydrated and cannot sweat enough to cool their body, their internal temperature may rise to dangerously high levels, causing heat stroke.

There are precautions that can help protect you against the adverse effects of heat stroke. These include:

- Drink plenty of fluids during outdoor activities (minimum 1.5 litres per day), especially on hot days. Water and sports drinks are the drinks of choice; avoid tea, coffee, soda and alcohol as these can lead to dehydration.
- Wear lightweight, tightly woven, loose-fitting clothing in light colours.
- Schedule vigorous activity and sports for cooler times of the day.
- Protect yourself from the sun by wearing a hat, sunglasses and using an umbrella.
- During outdoor activities, take frequent drink-breaks and mist yourself with a spray bottle to avoid becoming overheated.
- Try to spend as much time indoors as possible on very hot and humid days.

### Treatment for Heat Stroke:

It is important for the person to be treated immediately as heat stroke can cause permanent damage or death. There are some immediate first aid measures you can take while waiting for help to arrive.

- Call for immediate medical attention
- Get the person indoors.
- Remove clothing and gently apply cool water to the skin followed by fanning to stimulate sweating.
- Apply ice packs to the groin and armpits.
- Have the person lie down in a cool area with their feet slightly elevated

Intravenous fluids are often necessary to compensate for fluid or electrolyte loss. Bed rest is generally advised and body temperature may fluctuate abnormally for weeks after heat stroke.

	Frostbite	Hypothermia	Heat Cramps	Heat Exhaustion	Heat Stroke
Causes	Skin is exposed to temperature below 0°C	Body core temperature drops by more than 2°C (below 35°C)	Loss of water + Minerals through sweating	Increased loss of water + Minerals through sweating	Complete loss of fluid and minerals through sweating
Signs and Symptoms	Firm skin White waxy looking skin Cold, hard and numb	Shivering Bluish skin May lead to unconsciousness Temp <35°C	Cramps Excessive sweating	Excessive sweating Dilated pupils Dizzy, blurred vision, headache	Restless, headache, fatigue, dizziness NO SWEATING



<b>Treatment</b>	No not rub	Cover exposed	Cold place	Lots of	Lower body
	Warm and	skin	Give lots	water!	temperature
	comfortable	Keep off wind	of water!	Get medical	Cover with wet
	Re-warm	Out of cold	See a	help	sheet
slowly	Remove wet	doctor	Cold place	Shock	Seek medical
	clothing				care

## 1.7 Cardio-Pulmonary Resuscitation

**Cardio-Pulmonary Resuscitation (CPR)** is an emergency first aid protocol for an unresponsive casualty that has no signs of breathing and circulation.

The medical term for a casualty whose heart has stopped is cardiac arrest (also referred to as *cardio respiratory arrest*), in which case CPR is used. For Water Emergencies, where the casualty still has a pulse, but is not breathing, this is called respiratory arrest and Rescue breathing is used. This can be done in the water while rescuing the casualty (see Rescue Breaths below). In many first aid certifications, the CPR protocol is also used for an unconscious choking casualty.

The most common treatable cause of cardiac arrest outside of a hospital is a heart attack leading to a heart rhythm disturbance. Cardiac arrest may be caused by a number of events, including drowning, drug overdoses, poisoning, electrocution and many other conditions.

CPR is a practical skill and needs to be regularly practiced (on a resuscitation manikin) to ensure full competency.

Certified CPR training is available through many commercial, volunteer and governmental organizations worldwide, and can be arranged through Scouts SA. CPR training is not confined to just the medical professionals. Anyone is able to perform CPR: early CPR is essential in preventing brain damage during a cardiac arrest until an Automated External Defibrillator (AED) or other medical help arrives.

## 1.8 Cardiopulmonary Resuscitation - Importance

Heart action and respiratory effort are absolute requirements in transporting oxygen to the tissues. The main organ to suffer from oxygen starvation is the brain, which may sustain damage after four minutes and irreversible damage after about six minutes. The heart also rapidly loses the ability to maintain a normal rhythm. Following cardiac arrest, effective CPR enables enough oxygen to reach the brain to delay brain death, and allows the heart to remain responsive to defibrillation attempts.

CPR is commonly taught to ordinary people who may be the only ones present in the crucial few minutes before emergency personnel are available.

## **1.9 Rescue Breaths**

If a casualty has fallen into the water and breathing has stopped, it is more important to give this casualty rescue breaths instead of CPR. As the heart has stopped beating due to hypoxia, compressions are simply pumping unoxygenated blood around the body. You should begin giving rescue breaths in the water by turning the casualty on their back, open the airway, blocking the nose and giving a breath every 5-6 seconds. This needs to be done until the casualty can be lifted into a boat or reaches the shore where full CPR can be started if necessary.

### **American Heart Association (AHA) 2010**

*CPR for drowning victims should use the traditional A-B-C approach in view of the hypoxic nature of the arrest*

*The first and most important treatment of the drowning victim is the immediate provision of ventilation.*

## **1.10 Cardiopulmonary Resuscitation - Effectiveness**

If started early, CPR is very effective in on drowning victims with studies showing successful resuscitation in more than 80% of cases. Bystander rescue and resuscitation play a critical role in the survival of drowning.

CPR is almost never effective if started more than 4-6 minutes after collapse because permanent brain damage has probably already occurred. A notable exception is cardiac arrest occurring with exposure to very cold temperatures. A casualty cannot be pronounced dead before they has been brought back to a normal temperature by appropriate means: Hypothermia seems to protect the casualty somewhat. There are cases where CPR, defibrillation, and advanced warming techniques have revived hypothermia casualties after over 30 minutes or longer.

# Basic Life Support for

H



Check for **Hazards**

Make sure it is safe for you, then the casualty then the bystanders

H



Check for a response, say **Hello**

Use a talk and touch technique to check for response

H



Call 082-911 or 112 / 10177 and get

**Help**

Shout for help or send someone to call for an ambulance

A



Open the **Airway**

Use the head-tilt chin-lift technique to open the airway

B



Check for **Breathing**

Look, listen and feel for normal breathing

C



Check for **Circulation**

If no signs of circulation, start CPR  
Give **30 compressions** followed by **2 rescue breaths**

Continue CPR until the casualty responds or normal breathing returns

# CPR GUIDELINES



1



Call 082-911 for the unresponsive casualty

2



Observe the casualty for signs of responsiveness – breathing, skin colour, movement, coughing

3



Place the heel of one hand in the middle of the chest. Put your other hand on top of the first. Lock elbows, looking down at your hands, push hard and fast 30 times.

4



5



Tilt the head back, pinch the nose closed and breath 2 normal breaths into the casualty's mouth.

6



Repeat 30 Compressions and 2 breaths till help arrives.

## 2 WATER BORNE DISEASES

The most common routes for micro-organisms to enter the human organism are through the food we eat, the water we drink, or the air we breathe. Thus the importance of:

- good food hygiene,
- clean drinking water, and
- fresh air

There are three categories of diseases relating to water; these are:

- Waterborne diseases
- Water-based diseases
- Water-vectored diseases

### 2.1 Waterborne Diseases

These are diseases that are transmitted through drinking water, and interruption of transmission is achieved by proper treatment of drinking water.

Examples:

- Cholera
- Gastroenteritis
- Typhoid

### 2.2 Water-Based Diseases

These are diseases transmitted by contact with water, e.g., recreational swimming, where the causative microorganism lives in water bodies, typically in a secondary host such as a snail.

Examples:

- bilharzia
- swimmer's itch = non-human bilharzia

### 2.3 Water-Vectored Diseases

These are diseases that are transmitted by an arthropod vector, such as a mosquito, which needs water or moisture in order to breed.

Example:

- Malaria

### 2.4 Description of Selected Waterborne Diseases

**Amoebic dysentery** is a diarrhoeal disease caused by the **parasite** *Entamoeba histolytica*. As much as 90% of infections with this parasite are without symptoms. Where symptoms occur, these appear between three days to three months after infection. The diarrhoea, when it occurs, is often bloody, and associated with tenderness in the abdomen, nausea and weight loss. Life-threatening complications can occur, such as intestinal perforation, or spread of the disease to the liver or other organs.

**Bilharzia** is an infection by a blood-fluke (parasitic flatworm). There are two blood-flukes of importance in South Africa, i.e., *Schistosoma haematobium*, which causes urinary, or bladder bilharzia; and *Schistosoma mansoni*, which causes intestinal (bowel) bilharzia. The adult flukes can live, and deposit eggs, for many years in the small blood vessels lining the bladder or the large intestine. The eggs are subsequently either trapped in the tissues, where they eventually calcify, or they are passed out with the urine or stool. Infections are sometimes without any symptoms other than a feeling of slight weakness or fatigue. Where heavy infestations are present, blood may be noticed in the last few drops of urine passed.

**Cholera** is a diarrhoeal disease that is very sudden in onset. It is characterized by a massive loss of body fluids, through profuse diarrhoea and vomiting, leading to severe dehydration, which can be fatal. Stools have the appearance of "rice water". Infants and small children show the most rapid advance of the illness. Untreated cases of cholera can lead to death within 6 hours, depending on the degree of dehydration.

**Gastroenteritis** is a disease where there is sudden onset of vomiting and watery diarrhoea often accompanied by moderate fever and sometimes stomach cramps. The incubation period is generally short (8 to 48 hours). The disease is colloquially referred to as "gastric flu", "gyppo guts", or "a stomach bug". Gastroenteritis can be caused by a wide variety of micro-organisms, both bacterial and, especially, viral. Examples of bacterial causes of gastroenteritis are *Salmonella enteritis* and *E. coli* O157, while viral causes are for example rotaviruses, enteroviruses or adenoviruses.

**Hepatitis A** is a virus that causes inflammation of the liver. After an incubation period of two to Six weeks the casualty experiences fatigue, loss of appetite, especially for fatty foods, tender liver, with sometimes diarrhoea, chalk white stools and jaundice (yellow discolouration of the skin and whites of the eyes). Casualties recover in the majority of cases, and chronic infection is rare.

**Swimmer's itch** is an intensely irritating dermatitis caused by the free swimming stages of blood flukes (parasitic flatworms), whose primary hosts are normally ducks, geese, gulls or other animals, and where the cercariae inadvertently penetrate human skin, causing an allergic reaction or local irritation of the skin. In the differential diagnosis, swimmer's itch should be distinguished from the itchy dermatitis which has commonly been reported where recreational bathers swim in water containing algal scums, and come into contact with the toxins secreted by blue-green bacteria. The dermatitis caused by the toxin of algal scums is often associated with transient gastroenteritis-like symptoms, which do not appear with schistosomal dermatitis.

NOTE: Additional information can be obtained from the document titled: "Management of Water-related Microbial Diseases", published by the Department of Water Affairs and Forestry at:  
(<http://www.dwaf.gov.za/iwqs/AssessmentGuides/DiseaseGuide/DiseaseGuide.pdf>)