Hypothermia occurs when the body's temperature falls below 35 °C. The human body has a number of systems that maintain a constant core temperature of around 37 °C. A person doesn’t have to be in sub zero temperatures to risk hypothermia – it only requires the environmental temperature to be less than the body temperature and a person will “donate” heat to the atmosphere.

If the heat generated by the body – and people are constantly generating heat through metabolic processes and muscle movements – is less than that lost to the environment, then their temperature will begin to fall.

The four ways that the human body loses heat include:

- **conduction** – by direct transfer from the body to an object that is cooler than the body (for example, lying on a cold surface will pass body warmth to the surface away from the body)
- **convection** – air or liquid flow across the skin drawing off heat (for example, wind will increase heat loss, as will water that is cooler than body temperature)
- **radiation** – electromagnetic waves distribute heat into the ambient environment (for example, exposed skin will allow heat to be drawn off if the air temperature is less than the body – the exposed head of a person is a strong source of heat loss, particularly in children)
- **evaporation** – fluid on the skin turns to vapour, drawing off heat (moist skin will lose heat more rapidly, such as in someone who is wet, clammy or has exposed moist skin, such as burns).

Sometimes, medical conditions can lead to hypothermia. For example, someone suffering a stroke or a person with diabetes suffering a hypoglycaemic episode may end up lying immobile for a period of time, unable to protect themselves from hypothermia.

The natural response to becoming cold is two-fold, including:

- **Behavioural** – the person will try and move around to generate heat, and seek shelter from further heat loss.
- **Physiological** – the body shunts blood to the core to keep it warm, hair stands on end to trap a layer of warm air around us (goose bumps), we shiver to make more heat and our body releases hormones to speed up our metabolism to create more heat.

If these measures don’t work, hypothermia will result.

**Symptoms of hypothermia**

Hypothermia can be distinguished into three stages – mild, moderate or severe. The signs and symptoms of hypothermia can be approximately grouped with the temperature ranges of the different stages:

For mild hypothermia (35-32 °C), signs and symptoms include:

- pale and cool to touch as blood vessels constrict in the skin
- numbness in the extremities
- sluggish responses, drowsiness or lethargic
• shivering
• increased heart rate and breathing.

For moderate hypothermia (32-28 °C), signs and symptoms include:
• decreasing conscious state
• may have been incontinent of urine as a result of an increased workload on the kidneys related to blood being shunted to the major organs
• no longer shivering
• slowed heart rate, breathing rate and low blood pressure.

For severe hypothermia (below 28 °C), signs and symptoms include:
• unconscious and no longer responding
• the heart beats more slowly and may become irregular before ultimately stopping if the person gets too cold
• no response to light in the pupil of the eye
• rigid muscles – the person might feel like they are in rigor mortis
• pulses and respiratory effort may be present but hard to detect.

Myth about hypothermia
One hypothermia myth is that you lose more heat through your head than any other part of your body. This is not true. Heat loss occurs through any area of skin exposed to the environment. An adult head is approximately 10 per cent of the surface area of their whole body.

Most of the time, the rest of our bodies are covered, with the possible exception of our hands (which together only make up about four per cent of our surface area), so we feel cold, because our head is cold compared to the rest of our insulated body.

If a person had to expose another part of their body – for example, their abdomen, which also makes up about 10 per cent of an average adult body – then they would lose as much heat through that as their exposed head.

Parents are often advised to keep children’s heads covered to stop them getting cold, but this isn’t to do with any special heat-losing properties of the head. It has more to do with the relative size of the head to the body. At birth, a baby’s head makes up over 20 per cent of their total surface area, so exposing that skin leads to increased heat loss, putting them at risk of hypothermia much quicker than an adult, if they were to both have their heads uncovered.

Risk factors for hypothermia
Factors that may increase a person’s susceptibility to hypothermia include:

• Children – small children are at risk of hypothermia because they are unable to protect themselves in varied environmental conditions. They also have a faster rate of heat loss than adults, generally speaking. Due to their large head relative to their body, they also need their heads covered to prevent significant heat loss.

• Old age – in the elderly, the ability to notice changes in temperature is impaired due to the loss of nerve endings to the skin. They also have less fat, which has an insulating function, and a lower metabolic rate, and so generate less heat themself. Social factors also play a part, as the elderly are more likely to be reluctant to use heating for economic reasons, and they may be socially isolated so can be alone for long periods of time with no one noticing as they deteriorate.

• Dementia or immobilising illness – anybody who is unable to look after themselves independently, either physically or cognitively, is at risk of hypothermia. People with dementia can be particularly at risk if they wander off in cold conditions without having protected themselves with appropriate clothing first.

• Alcohol and other drugs – alcohol makes people feel cosy because it relaxes the blood vessels, allowing more blood to flow near the skin, providing a flushed appearance and a warm sensation. This also puts people who are drunk at significant risk of hypothermia if they are outside in cold weather, as this increases the rate of heat loss. It also slows down the metabolism, so slows down internal heat generation. Alcohol also impairs judgement, so the person is less likely to recognise the environment and their own physical condition, and less likely to take protective measures against heat loss. This is also a concern with any other
mind-altering substance.

- **Water immersion** – people who spend any time immersed in water that is colder than body temperature will suffer significant heat loss. The other person at risk is anyone who may have been in wet clothes for a prolonged period of time, either due to incontinence or sweating.

**Severe hypothermia is life-threatening**

Mild hypothermia (32–35 °C body temperature) is usually easy to treat. However, the risk of death increases as the core body temperature drops below 32 °C.

If core body temperature is lower than 28 °C, the condition is life-threatening without immediate medical attention. Under this temperature, a person will be very cold to touch, unresponsive, rigid, not breathing, have no pulse, and their pupils will be fixed (they will not respond to light changes). They will appear to be dead, but they may not be.

**First aid for severe hypothermia**

First aid steps for severe hypothermia include:

- **In an emergency, call triple zero (000).**
- While waiting for help to arrive, monitor the person’s breathing. If they have severe hypothermia, their breathing may become dangerously slow or shallow, or they may cease breathing.
- Begin cardiopulmonary resuscitation (CPR) immediately if the person shows no signs of life – if they are not breathing normally, are unconscious or unresponsive, or not moving.

Never assume a person is dead. A person with severe hypothermia may only take one breath per minute, with a heart rate of less than 20 beats per minute. Always assume they are alive.

**First aid for all cases of hypothermia**

The first aid tips that apply to all stages of hypothermia include:

- The first step in all cases of hypothermia is to prevent any further heat loss. This is done by removing the four ways that heat loss occurs mentioned earlier, including:
  - Conduction – remove the person from a cold surface if possible. Ideally, place them onto a warm surface, or at least a dry one that will prevent further heat loss.
  - Convection – remove the person from a windy or wet environment. Covering with blankets is good, but the aim must be to get them to shelter.
  - Radiation – Cover as much of the person as possible to avoid radiant heat loss. Particularly cover the head of a younger child.
  - Evaporation – wet and sweaty people will suffer evaporative heat loss. Dry skin where possible and remove wet clothing as soon as practicable.
- Don’t massage or rub the person – and do not allow them to help you. Keep them still because, particularly below 32 °C, they risk a cardiac arrest.
- Move the person out of the cold – if this is not possible, protect them from wind, cover their head and insulate their body from the cold ground. If the person is moderately or severely hypothermic, move them as gently as possible. Below approximately 30 °C the heart is very vulnerable and there are case studies of simple movements like rolling the person over prompting a cardiac arrest.
- Remove wet clothing – replace with a dry covering, preferably warm. Cover the person’s head.
- Try to warm the person – do not use hot water immersion. Make sure that the person is dry. Insulate them from the environment to retain whatever heat they are producing. Use whatever heat source is available – heaters, hot water bottles, heat packs, an electric blanket – to begin slowly warming the person. The heat source should not be too hot or too close to the person. A slow and gradual warming is ideal and whatever heat source is used only has to be warmer than the person to be donating heat. When applying heat close to the skin – such as with hot water bottles or heat packs – be careful not to make them too hot, as the person may have impaired sensation to their skin and is at risk of suffering burns. If using multiple small sources of heat, such as heat packs, preferentially pack them around the torso, into armpits and the groin to focus warming on the central area. Share body heat – to warm the person’s body, remove your clothing and lie next to the person, making skin-to-skin contact. Then cover both bodies with a blanket or get into a sleeping bag if possible.
• Don’t give alcohol – it lowers the body’s ability to retain heat. If the person is alert and is able to swallow, have them drink warm, non-alcoholic beverages. Do not offer liquids if they are vomiting.

• Do not leave the person alone – stay with them at all times.

• Continually monitor breathing – if the person’s breathing stops, start cardiopulmonary resuscitation (CPR) immediately if you are trained. If unsure, dial triple zero (000) – operators will advise you what to do. Continue CPR until the person starts breathing on their own or until medical help arrives.

• Don’t assume the person is dead – CPR can be lifesaving for a person with severe hypothermia who may appear to be dead. They may not be breathing, have no pulse, be cold to touch, have fixed pupils and be rigid – but they may still be alive.

Preventing hypothermia when outdoors

Exposure to cold weather, even for a short time, can be dangerous if you are not prepared. Shivering and feeling cold or numb are warning signs that the body is losing too much heat.

Simple ways to prevent hypothermia include:

• Avoid prolonged exposure to cold weather.

• Be alert to weather conditions that may increase the risk of hypothermia and act accordingly. For example, seek shelter during a snowstorm.

• If driving through a cold weather environment, particularly if there is a risk of ice or snow on the road increasing the chances of a crash, do not rely on the vehicle heater to stay warm while driving. Dress for the weather outside the car and leave the heater turned down so that in the event that you are incapacitated by an accident or snowstorm, you have a better chance of avoiding hypothermia.

• Wear several layers of clothing to trap body heat, rather than just one bulky layer. Natural fibres like wool are better at holding heat.

• Use a weatherproof outer layer to stay dry.

• Use gloves, scarves and socks, with spares to replace when wet.

• Wear insulated boots.

• Wear warm headgear.

• Make sure your clothes and boots aren’t too tight. If your blood circulation is restricted, you are more prone to hypothermia.

• Drink plenty of fluids.

• Eat regularly.

• Take regular breaks to reduce the risk of physical fatigue.

• Keep your eye on exact body temperature by taking a clinical thermometer in your first aid kit.

• Change out of wet clothes straight away.

• Avoid alcohol, cigarettes and caffeine.

• Make sure your kit includes a good supply of waterproof matches.

Use a buddy system

When participating in any outdoor activity that has the potential risk of hypothermia, such as bushwalking or mountaineering, use the ‘buddy system’ and check each other for warning signs. You may not be able to recognise your own symptoms of hypothermia due to mental confusion. First aid training is strongly advised.

Hypothermia at home

Hypothermia can occur in the home. The elderly and some people with medical conditions are more susceptible to hypothermia. The risk can be reduced by:

• making sure there is adequate heat in the home

• seeking assistance from government agencies for help with heating, food and clothing if necessary

• having regular medical check-ups.

Where to get help

betterhealth.vic.gov.au
• In an emergency, call triple zero (000)
• Your doctor
• The emergency department of your nearest hospital

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