

HYPOTHERMIA

Hypothermia is defined as a core body temperature below 35°C

The severity of hypothermia can be defined as:

Type	Core temperature
mild hypothermia	32-35°C
moderate hypothermia	30-32°C
severe hypothermia	<30°C

There are three main classifications of hypothermia depending on the speed at which a person loses heat:

- 1. Acute hypothermia (immersion hypothermia).**
This occurs when a person loses heat very rapidly e.g. by falling into cold water. It is often associated with near-drowning. Inquiry should be made as to why the person is in the water as an injury or illness may have caused them to fall. Acute hypothermia may also occur in a snow avalanche when it may be associated with asphyxia.
- 2. Subacute hypothermia (exhaustion hypothermia).**
This typically occurs in a hill walker who is exercising in moderate cold who becomes exhausted and is unable to generate any heat. Heat loss will occur more rapidly in windy conditions or if the patient is wet or inadequately clothed. It may be associated with injury or frostbite. Do not forget that if one person in a group of walkers is hypothermic, others in the party who are similarly dressed and who have been exposed to identical conditions may also be hypothermic.
- 3. Chronic hypothermia.** In chronic hypothermia heat loss occurs slowly, often over days or longer. It most commonly occurs in the elderly person living in an inadequately heated house or the person who is sleeping rough. It can be associated with injury or illness e.g. the patient who falls or has a stroke and who is on the floor overnight.

It is important to make an assessment of the reasons why the patient has become hypothermic, and be aware of concurrent injuries or illness which may have precipitated the hypothermia.

Hypothermia is more common in the very old and the very young where thermoregulation may be impaired. It is associated with some medical conditions (e.g. hypothyroidism) and also with alcohol.

ASSESSMENT

Assess **ABCD's**

Measurement of the core temperature usually relies on determining the rectal or oesophageal temperature which is usually not practical in the pre-hospital situation. The accuracy of tympanic thermometry in the pre-hospital arena is unproven.

As temperature measurement in the field is difficult, it is important to suspect and treat hypothermia from the history and the circumstances of the situation.

Shivering occurs early but will cease when the temperature falls further. The patient will feel cold to the touch.

Early symptoms are non-specific including:

- ataxia
- slurred speech
- apathy
- irrational behaviour.

As the temperature falls, there may be:

- a progressive decrease in the level of consciousness (**refer to decreased level of consciousness guideline**)
- a slowing of the heart
- a slowing of respiratory rates
- cardiac arrhythmias (atrial fibrillation, ventricular fibrillation) may occur and can be provoked by rough handling (**refer to cardiac rhythm disturbance guideline**)
- with profound hypothermia the patient may be asystolic
- hypothermia may mimic death (very slow and weak or undetectable pulse, very slow and shallow respiration, fixed dilated pupils). Even if cardiac arrest does occur, the hypothermia is protective and good outcomes have resulted from prolonged resuscitation of hypothermic patients. **DO NOT STOP CARDIAC RESUSCITATION IN THE FIELD** (**refer to cardiac arrest guidelines**).

MANAGEMENT¹⁻⁵

Ensure careful patient handling to minimise the risk of cardiac arrhythmias due to the hypothermia.

Airway: (with cervical spine protection if indicated)

- be gentle, intubate only if necessary as airway manoeuvres may induce ventricular fibrillation.

Breathing:

- respiratory rate may be very slow, so check respiration for 10 seconds
- administer high concentration oxygen (O₂) via a non-re-breathing mask, using the stoma in laryngectomy and other neck breathing patients, to ensure an oxygen saturation (SpO₂) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (**refer to COPD guideline**).

Circulation:

- IV cannulation
- measure blood sugar, and treat for hypoglycaemia if required
- IV fluids are only needed in cases of trauma and fluid loss (**see below**). If IV fluids are given, warm the fluids, if possible.⁶

For management of cardiac arrest (**see below and refer to cardiac arrest guidelines**).

Disability

Exposure/environment:

- obtain shelter from the wind, protect from the elements
- prevent further heat loss. **DO NOT** remove wet clothing; wrap the patient appropriately (in the mildly hypothermic patient, if one prevents further heat loss, they will be able to warm up spontaneously by their own metabolism)
- if the patient is conscious, give them a hot drink and food if available and appropriate
- when in ambulance or in shelter, gently remove wet clothes and dry the patient before covering them with blankets
- **DO NOT** rub the patient's skin as this causes vasodilatation and may increase heat loss
- **DO NOT** give the patient alcohol as this causes vasodilatation and may increase heat loss.

Manage co-existing trauma or medical condition as per relevant guidelines.

Cardiac arrest in hypothermia

Cardiac arrest in hypothermia is treated with the same principles as in the normothermic patient except:

- defibrillation is unlikely to be effective if the patient's body temperature is below 30°C
- drugs are less likely to be effective at low temperatures. In addition they will not be metabolised at low temperature and so if repeated doses are given they will build up and will suddenly have an effect when the patient is re-warmed.

So:

- attempt one loop of defibrillation/drugs and continue ventilations/compressions but no further defibrillation/drugs. Defibrillation can be attempted again when the core temperature has risen
- hypothermia causes stiffness of the chest wall so more resistance will be felt with ventilation and chest compression
- hypothermia is protective and good outcomes have resulted from prolonged resuscitation of hypothermic patients. **DO NOT STOP CARDIAC RESUSCITATION IN THE FIELD**
- when cardiac arrest occurs in remote locations (e.g. in the mountains), it is recommended that chest compressions should not be started unless it is possible to continue it throughout the rescue period. It is better to wait to commence initial chest compressions rather than to have to stop and then start again.

Key Points – Hypothermia

- Hypothermia is defined as a core body temperature below 35°C.
- There are three main classifications depending on the speed at which a person loses heat: acute, subacute, and chronic hypothermia.
- Prevent further heat loss; wrap the patient appropriately but **DO NOT** remove wet clothing, rub the skin or give alcohol.
- Rough handling can invoke cardiac arrhythmias so handle patients carefully.
- Cardiac arrest is treated in the usual way, bearing in mind that drugs/ defibrillation are less likely to be effective at low temperatures.

REFERENCES

- ¹ Giesbrecht GG. Prehospital treatment of hypothermia. *Wilderness and environmental medicine* 2001;12(1):24-31.
- ² Bernardo LM, Gardner MJ, Lucke J. The effects of core and peripheral warming methods on temperature and physiologic variables in injured children. *Pediatric Emergency Care* 2001;17(2): 138-42.
- ³ Grief R, Rajek A, Laciny S. Resistive heating is more effective than metallic-foil insulation in an experimental model of accidental hypothermia: a randomized controlled trial. *Annals of Emergency Medicine* 2000;35(4):337-45.
- ⁴ Snadden D. The field management of hypothermic casualties arising from Scottish mountain accidents. *Scott med J* 1993;38:99-103.
- ⁵ Handley AJ, Goldern FS, Keatinge WR. Report of the Working Party on Out of hospital management of hypothermia. *J Br Assoc Immed Care* 1993;16(2): 34-35.
- ⁶ Cassidy ES, Adkins CR, Rayl RH. Evaluation of warmed intravenous fluids in the pre-hospital setting. *Air Medical Journal* 2001;20(5):25-6.
- ⁷ Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.
- ⁸ Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).

SELECT BIBLIOGRAPHY

Larach MG. Accidental hypothermia. *Lancet* 1995;345(8948):493-8.

Keatinge WR. Hypothermia: dead or alive? *BMJ* 1991;302(6767):3-4.

Lloyd EL. ABC of Sports Medicine: Temperature and Performance I: Cold. *BMJ* 1994;309(6953):531-534.

Lloyd EL. Accidental hypothermia. *J Br Assoc Immed Care* 1995;18(2):26-8.

METHODOLOGY

Refer to methodology section.