

Risk Factors for Hypothermia in New Zealand

- Geography.
- Climate.
- Increased transit time for emergency services.
- High risk recreational activities.

Why is recognition important?

- It is a potentially reversible condition.
- It complicates the management of trauma.
- It exacerbates the effects of shock.

Definitions

- Mild Hypothermia - A core temperature **between** 35 & 30°C.
- Severe Hypothermia - A core temperature **below** 30°C.

Patho-physiology

- Decreased heat production.
- An inadequate adaption to shock from the cardiovascular and respiratory systems.
- Increased bleeding tendency.

Deranged Physiology

- Decreased heart rate.
- Decreased blood pressure.
- Cardiac arrhythmia's.
- Decreased oxygenation
- Decreased metabolism.
- Depletion of reserves
- Decreased response to drugs.

Causes

- Decreased Heat Production.
- Inadequate response to shock.
- Increased bleeding tendency.
- Decreased level of consciousness.

Any Benefits?

- Drowning in the case of infants ($T^{\circ}\text{C} < 33$) (iggart & Bohn) J Paediatrics 1990).
- Head injury and cerebral anoxia – moderate hypothermia only.
- 18-50 % increased survival (Shiozaki, Sugimoto et al J Neurosug 1993) Rousseau, Marsigny et al Ann Fr Anesth. Réanim. 1997.
- 114 cases 1988-1996.
- 40% < 32°C.
- 78% associated with trauma.
- 83% males.
- Age range 33 ± 12 years.
- 28% mortality.

Signs and Symptoms in severe hypothermia

- Cyanotic, mottled or livid skin.
- Bradycardia (slow pulse).
- Slow and shallow breathing.
- Absence of shivering below about 31°C.
- Confusion progressing to unconsciousness.
- Absent reflexes and dilate pupils.

Apparent Death

Staging of Hypothermia

- Stage 1 Clear consciousness with shivering 35 – 32 C°.
- Stage 2 Impaired consciousness without shivering 32 – 28 C°.
- Stage 3 Unconsciousness 28 – 24 C°.
- Stage 4 Apparent death 24 – 15 C°?
- Stage 5 Death due to irreversible hypothermia <15 C°? (< 9 C°?).

Assessment in the field - ABCD & E

- Check airway, pulse and respirations.
- Cardiac monitoring and pulse oximetry desirable.
- Assess tympanic or oesophageal temperature.

Temperature Monitoring

- Epitympanic.
- Oesophageal.
- Rectal unreliable especially in the case of peritoneal lavage.
- Core temperature continues to drop after removal from cold environment.

Pre-hospital treatment - features specific to mountain rescue

- Stabilise before moving if possible.
- Remove wet clothing.
- Shield from wind.
- Transport in horizontal position by preference.

Hospital treatment – resuscitation + surgery + re-warming

- Specialised retrieval to major hospital.
- Forced - air re-warming.
- Warmed humidified air.
- Oesophageal or peritoneal re-warming.
- Extra-corporeal re-warming of blood.
- Intensive care and definitive surgery for possible injuries.

Extra-corporeal Re-warming

Resuscitation From accidental hypothermia Of 13.7 C° Pre-hospital treatment with circulatory arrest Gilbert, Bosund et al. *Lancet* 2000

In a victim of very deep accidental hypothermia, 9 hours of resuscitation and stabilisation led to good physical and mental recovery. 1820 hrs, May 20, 1999.

29 year old female skier trapped behind ice:

- T + 49 min: extracted from water.
- T + 69 min: advanced life support.
- T + 3 hrs: arrive base hospital.
- T + 3.5 hrs: on bypass.
- T + 9 hrs: transferred ICU.
- Transferred to own hospital day 28.
- Ventilated total of 35 days.
- Commenced rehabilitation day 60.
- Resumed work, skiing and hiking at 5 months.

Nobody recovered hypothermic from the field is dead, until they are warm and dead.