

I01: Hypothermia

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Introduction

Hypothermia is defined as a drop in body core temperature below 35°C. Peripheral thermometers are of limited utility in hypothermia – they can be inaccurate and vary by as much as 2°C – but their readings can provide paramedics and EMRs with valuable data in respect to trends. Because core temperature probes (either rectal or esophageal) are generally unavailable in a out-of-hospital setting, recognition of the different stages of hypothermia is more important than an understanding of the exact boundaries.

General hypothermia management consists of removing the patient from the cold environment, ensuring the patient is dry, and to prevent further heat loss. Paramedics and EMRs/FRs should handle patients gently and attempt to keep them supine whenever possible.

Essentials

Although patient presentations can vary widely, the signs and symptoms of hypothermia can be divided into three categories:

- Mild hypothermia is defined as a core temperature between 32°C and 35°C. These patients have a normal mental status with shivering, tachypnea, tachycardia, initial hyperventilation, ataxia, jumbled speech, impaired judgment, and "cold diuresis."
- Moderate hypothermia features a core temperature between 28°C and 32°C. Patients present with an altered mental status and are no longer shivering. Lower heart rates, and an attendant reduction in cardiac output are common. Atrial fibrillation, junctional bradycardias, or other dysrhythmias can develop. Respiratory rates decrease and hyporeflexia can occur as a result of central nervous system depression. The altered mental status may cause patients to remove clothing.
- Severe hypothermia features a core temperature between 24°C and 28°C. Unconsciousness, hypotension, and bradycardia are common. Pulmonary edema can develop, as can ventricular dysrhythmias or asystole.

Additional Treatment Information

WARNING: HYPOTHERMIA IS A SIGNIFICANT CONTRIBUTOR TO MORTALITY IN TRAUMA

In general, patients should be treated in a step-wise manner, beginning with less aggressive rewarming techniques. "Passive rewarming," through the use of blankets around the body and the head, coupled with "active rewarming" using heated IV solutions, offers an effective initial strategy for most patients who are perfusing effectively.

While environmental exposure may trigger an assessment for hypothermia, paramedics and EMRs/FRs are cautioned that other groups of patients may be at risk for developing hypothermia in atypical environments. Clinical problems that produce an altered level of consciousness can eventually result in hypothermia, including (but not limited to) behavioural or psychiatric problems, prolonged seizures, alcohol or drug intoxication, strokes and cerebrovascular accidents, and diabetic or other metabolic emergencies. Elderly or frail individuals who are "found down" in their homes are at significant risk for developing hypothermia. Paramedics and EMRs/FRs must perform comprehensive assessments, and treat identified conditions concurrently with the hypothermia.

Depending on the degree of thermogenesis from shivering, the rewarming rate for patients may be anywhere from 0.5°C to 2°C per hour. The addition of active rewarming measures, using insulated or wrapped heat packs applied to the torso (groin, sides of chest, back of neck, small of back, and axillae) will significantly improve comfort and may lessen thermal stress.

Do not attempt to rewarm frozen or frostbitten limbs.

Hypotension can result from decreased cardiac output. Fluid shifts into the extracellular space are common, producing dehydration. Vascular access is indicated in hypothermia with warmed saline (between 37°C and 42°C) as the fluid of choice, if available. In the out-of-hospital environment, it can be difficult to warm or measure the temperature of fluids; paramedics are cautioned that "room temperature" fluids will significantly worsen

hypothermia.

General Information

Hypothermic patients have significantly reduced metabolic demands and have dramatic reductions in heart and respiratory rates. A range of 30 to 45 seconds should be taken to accurately assess spontaneous respiration and pulse rates. Afterdrop, a phenomenon where cold blood from the extremities returns to the core, can occur producing an additional drop in core temperature.

Electrocardiogram findings in hypothermia can include J or Osborn waves (positive deflections following the QRS complex), most prominently in V₂ through V₅. The height of the wave is roughly proportional to the degree of hypothermia, though these are non-specific and may be due to other clinical phenomena.

Interventions

First Responder

- At all times: handle patients gently
- Remove from cold environment, remove wet clothes, and prevent further heat loss
- Initiate passive rewarming with blankets
- Assess for concurrent injuries or conditions and treat as required
- Conduct ongoing assessment and gather collateral information, such as medications and identification documents
- Establish ingress and egress routes from the patient's location
- Communicate patient deterioration to follow-on responders
- In cardiac arrest:
 - Begin and maintain chest compressions.
 - Attach AED and analyze as indicated
 - Defibrillate up to 3 times as indicated; after 3 defibrillation deliveries, do not pause compressions to analyze rhythm or attempt additional defibrillations

Emergency Medical Responder – All FR interventions, plus:

- Obtain baseline vital signs, including temperature where possible
- Consider active rewarming measures (e.g., wrapped hot packs) for moderate hypothermia
- In cardiac arrest:
 - Begin and maintain chest compressions
 - Consider conveyance to a hospital capable of extracorporeal blood rewarming if within 90 minutes; these facilities are available in Vancouver, Victoria, and Kelowna
 - [CliniCall consultation recommended](#) if clinical pathway options are unclear and to discuss care planning options

Primary Care Paramedic – All FR and EMR interventions, plus:

- Establish vascular access
 - [→ D03: Vascular Access and Fluid Administration](#)
 - If available, consider warmed saline (37°C-42°C) for hypotension (30 ml/kg, maximum 2 L)
- Obtain capillary blood glucose and treat as required
 - [→ E01: Hypoglycemia and Hyperglycemia](#)

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Obtain and interpret 12-lead electrocardiogram
 - [→ PR16: 12-Lead ECG](#)
- Consider transcutaneous pacing for persistent bradycardia if core temperature is between 32°C and 35°C
 - [→ PR19: Transcutaneous Pacing](#)
- In cardiac arrest:

- May administer up to 3 doses of [EPINEPHrine](#)

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Vasopressors may be necessary to support blood pressure
- Rhabdomyolysis and multi-organ system failure can develop during rewarming process
- Consider Buddy warmer
- Consider conveyance to centre capable of extracorporeal blood rewarming (ECMO) in cases of severe hypothermia refractory to treatment
 - Review [BC Accidental Hypothermia Treatment Guideline](#)

Evidence Based Practice

Hypothermia

Supportive

- [AER \(Active External Rewarming\)](#)

Neutral

- [Temperature Monitoring](#)
- [Warmed IV Fluids](#)

Against

- [Inhalation Rewarming](#)

