

## **Summary of the Wilderness Medical Society Practice Guidelines for the Out-of-Hospital Evaluation and Treatment of Accidental Hypothermia**

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Accidental hypothermia, a drop in core temperature below 35 degrees C (95 degrees F), can occur in any climate and any season. Any condition promoting net heat loss via conduction, convection, radiation, or evaporation can precipitate hypothermia. In 2014, the Wilderness Medical Society issued Practice Guidelines for out of hospital evaluation and treatment of accidental hypothermia.

A decrease in core temperature leads to depressed central and peripheral neurologic function and decreased tissue metabolism. Shivering is the main response of the body to cold exposure, until core temperature decreases to about 30 degrees C (86 degrees F), when shivering ceases.

Various classification systems have been designed to describe hypothermia. The standard system stages hypothermia based on core temperature measurement:

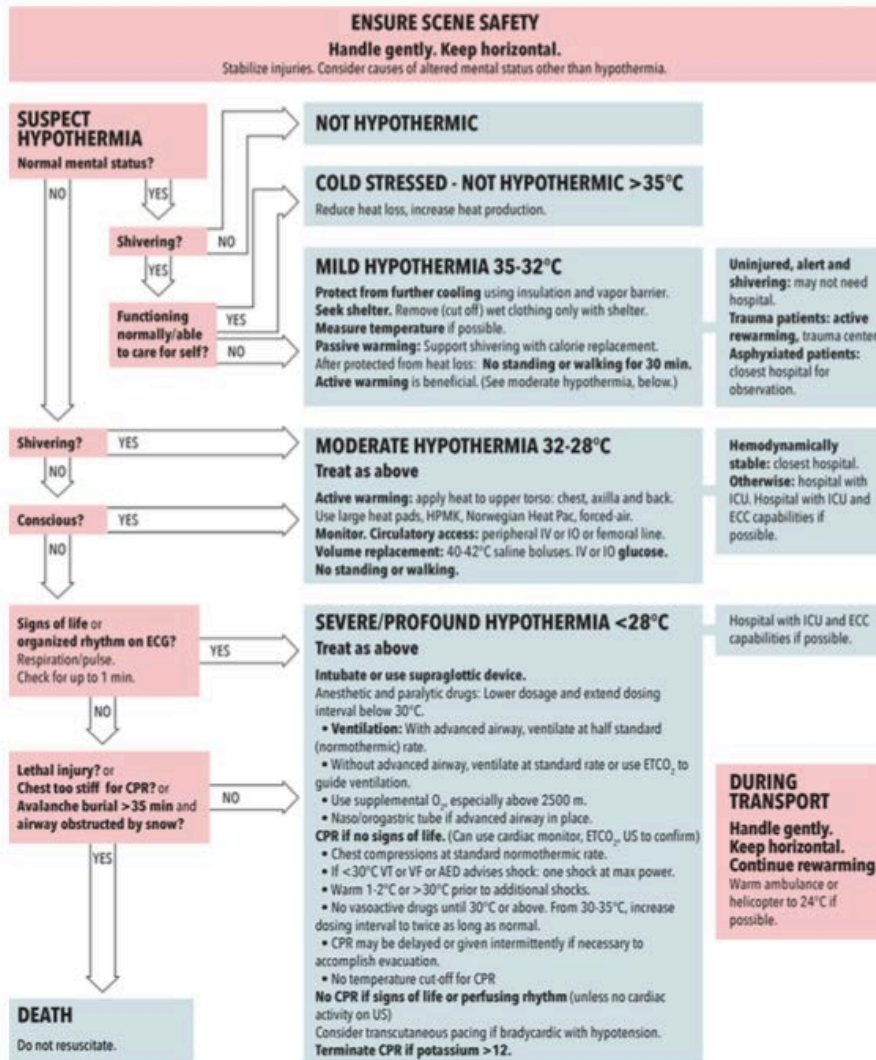
Mild: 32-35 degrees C (90-95 degrees F)

Moderate: 28-32 degrees C (82-90 degrees F)

Severe: less than 28 degrees C (82 degrees F)

Equipment and rescue limitations can make it difficult to obtain a core temperature. Clinical staging, though useful, is limited due to individual differences in physiologic responses to hypothermia. Level of consciousness, cardiovascular stability, presence of shivering, and core temperature are important variables in evaluation and treatment of hypothermia in the field.

The 2014 WMS Practice Guidelines provide evidence-based answers to questions related to field assessment, prehospital treatment, and transport of hypothermic individuals. The guidelines are summarized in a flowchart.



**Figure 2.** Recommendations for out-of-hospital evaluation and treatment of accidental hypothermia. ECG indicates electrocardiogram; CPR, cardiopulmonary resuscitation; HPMK, Hypothermia Prevention Management Kit; IV, intravenous; IO, intraosseous; ETCO<sub>2</sub>, end-tidal carbon dioxide; VT, ventricular tachycardia; VF, ventricular fibrillation; AED, automatic external defibrillator; US, ultrasound; ICU, intensive care unit; ECC, extracorporeal circulation.

*NOTE: Figure 1 above is Figure 2 from the WMS hypothermia guidelines.*

In the rescue of a hypothermia victim, rescuer safety is of primary importance. Once this is assured, the initial approach focuses on airway, breathing, circulation, and consideration of traumatic injury. Someone who is shivering but able to independently care for him or herself is not likely hypothermic. A person who is incapacitated or unconscious in a cold setting may be hypothermic. A core temperature should be obtained if possible. Otherwise, clinical staging should be used.

The most accurate measurement is obtained with an esophageal probe in the lower third of the esophagus. This is most practical in a patient who has an advanced airway in place. An tympanic temperature (NOT the same as infrared tympanic

or so-called temporal artery temperature) is useful but is less accurate in low cardiac output states, and requires the use of an isolating “cap” to protect the ear canal from cold outside air. Rectal and bladder temperatures lag behind true core temperature during core temperature changes, but can be used if esophageal and epitympanic measurement are unavailable.

Hypothermia victims should be moved carefully to minimize core temperature afterdrop and to prevent ventricular fibrillation due to return of cold blood to the heart. Afterdrop is a continued drop in core temperature after removal from the cold environment due to the return of cooler blood from extremities to core. The victim should be kept horizontal and movement of the extremities should be minimized. If the patient is conscious, rescuers should encourage the victim to remain mentally vigilant to prevent a drop in circulating catecholamines.

Protection from further heat loss can be accomplished in many ways. The initial step is usually placement of insulation (blankets, sleeping bags, etc.) surrounded by a vapor barrier (e.g. bubble wrap or tarp) to prevent evaporation and exposure to cold or wet ground. Once the victim is sheltered, wet clothes should be cut off rather than removed, and the victim re-insulated or actively rewarmed.

Shivering while well insulated and in a recumbent position is an effective method of rewarming in mild hypothermia. Active external rewarming with large heat pads and similar devices complements insulation with a vapor barrier. If available, forced air warming is very effective and may replace initial heat pads and insulation methods during transport. When possible, the ambient temperature in a rescue vehicle should be between 24-28 degrees C (75-82 degrees F).

Rescuers may have difficulty determining if a victim of hypothermia is alive or dead. Fixed pupils and apparent rigor mortis are not reliable indicators of death. Resuscitation should not be attempted in cases of obvious lethal injuries:

- Decapitation
- Open head injury with loss of brain matter
- Truncal transection
- Incineration
- Chest wall too stiff to be compressed with CPR

Initial pulse and breathing check should occur for one minute. Peripheral pulses are very difficult to detect in hypothermic patients. Delay or interruption of CPR (due to extrication/transport) does not necessarily have detrimental effects on survival or neurologic outcome in severely hypothermic patients. CPR can be delayed or applied intermittently if necessary for the safety of the rescuers, and during movement of the victim from one location to another. Electrical activity on a cardiac monitor without palpable pulses could signify PEA or could simply mean blood pressure is too low to palpate a pulse. CPR in a patient with a perfusing rhythm can induce ventricular fibrillation (VF).

If a defibrillator is available and advises shock, one shock should be given at maximum power. No further shocks should be given until core temperature is above 30 degrees C (86 degrees F). When available, end tidal CO2 monitoring and ultrasound can aid in determining presence of a perfusing rhythm.

Airway management and ventilation in the hypothermic patient are controversial. Gentle attempts at endotracheal intubation after preoxygenation are low risk and should not induce VF. Care should be taken not to hyperventilate the patient. End tidal CO2 can assist in this process.

Most hypothermic patients require IV fluid replacement (with warm fluids) as systemic vascular resistance decreases with rewarming. The fastest vascular access is often via intraosseous (IO) line. IV placement is usually difficult. Vasoactive and anti-arrhythmic drugs have unpredictable effects in hypothermia and should not be used at core temperature below 30 degrees C (86 degrees F). Although ventricular arrhythmias are life threatening, atrial arrhythmias are common and resolve spontaneously with rewarming.

Triage of hypothermia victims to an appropriate center is crucial to enhance chances of survival. Victims with stable vital signs in mild to moderate hypothermia can be transported to the nearest hospital. Those with a temperature below 28 degrees C (82 degrees F), or cardiovascular instability or arrest may benefit from transfer to a center capable of extracorporeal rewarming.

Hypothermia victims who have been buried in an avalanche present different considerations. The best chance of survival in an avalanche occurs when the victim has an air pocket to prevent asphyxiation. Survival decreases during the first 35 minutes of avalanche burial.

The evaluation and treatment of hypothermia victims in the field depends greatly on equipment and rescue resources. Our intent is to disseminate accurate knowledge to all those who may be involved in these admirable rescue efforts. Timely, careful removal of these victims with active rewarming efforts en route to an appropriate level of medical care will ensure the best chance of survival and neurologic recovery.

Reference:

Zafren, K., et al., [\*Wilderness Medical Society practice guidelines for the out-of-hospital evaluation and treatment of accidental hypothermia: 2014 update\*](#). Wilderness Environ Med, 2014. 25(4 Suppl): p. S66-85.