

Heat and Cold Injuries

Cold Weather Injuries

Hypothermia is when a person's core temperature drops below 35°C. Smaller children have larger surface-area-to-mass ratios and are more susceptible to hypothermia than adults (ie, the smaller the body, the greater the susceptibility to hypothermia). Heat is lost through four mechanisms: (1) radiation, which accounts for approximately 60% of heat loss; (2) conduction, which is more of a concern with cold-water immersion or in the presence of wet clothing (clothes should be removed and the patient dried quickly); (3) convection, which increases with exposure to wind chill (eg, in the desert at night); and (4) evaporation, which accounts for 20%–25% of heat loss, usually from sweating and respiration.

- Effects on the body
 - Cardiovascular: tachycardia is the initial heat-generating protective measure, but heart rate and mean arterial pressure decrease as core temperature decreases. Atrial, then ventricular, dysrhythmias occur as the temperature decreases below 32°C
 - Neurological: neuronal enzyme activity declines with hypothermia, but cerebral perfusion pressure is maintained until temperature reaches 25°C
 - Respiratory: initial tachypnea diminishes with a steady decline in minute ventilation and eventual cold bronchorrhea, which mimics pulmonary edema
 - Renal: as peripheral vasoconstriction creates total body fluid overload, there is rapid diuresis of dilute fluid; effects are enhanced by alcohol and cold-water immersion
 - Gastrointestinal: motility is decreased, leading to constipation and ileus
- Treatment
 - Check airway, breathing, and circulation (ABCs); treat aggressively

- Hypothermia associated with icy water immersion can lead to the diving reflex, with good neurological outcomes even after prolonged cardiopulmonary resuscitation (CPR) and rewarming
- The cold myocardium is resistant to defibrillation; continue CPR
- Some patients convert spontaneously when their temperature reaches above 32°C
- Actively rewarm
 - ▶ Remove all wet clothing, dry the patient, and wrap with warm blankets (warming lights work best on exposed skin)
 - ▶ Administer warmed IV fluids and consider warm nasogastric fluids and warm rectal lavage
- Frostbite: cold damage to the skin that causes vasoconstriction and eventual tissue freezing
 - Use the same degree system as burns for classification
 - Treat by immediate immersion in warm water; however, rewarmed tissue is more susceptible to refreezing. If refreezing is likely, consider not rewarming until the patient has reached a warmer environment

Warm Weather Injuries

Heat injuries are common in soldiers deployed to Iraq and Afghanistan. Infants are predisposed to these injuries because of their high body-surface-area-to-mass ratio. Adolescents who compete in summer sporting events are also at risk. There are three types of heat illness (same as adults):

- Heat cramps
 - Muscle cramps from dilutional hyponatremia
 - No central nervous system signs
 - Treat by repleting fluids and sodium
- Heat exhaustion
 - Manifests with dizziness, nausea, vomiting, and weakness without significant change to mental status
 - Skin is moist from excessive sweating
 - Occurs with mild elevation to 39°C–40°C
 - Treat by replacing fluids and sodium
- Heatstroke

- This is a true medical emergency with a high rate of mortality; it needs to be recognized and treated promptly
- Presents as a combination of altered mental status, dry skin, and hyperpyrexia
- Complications include rhabdomyolysis, renal insufficiency, and hepatic failure
- Treatment: immediate active cooling (eg, ice to the neck and groin, fanning the skin after spraying with water, etc), administering IV fluids and diazepam to prevent shivering (which raises body heat)
- Look for and treat complications

