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
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- 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