

Heat Illness and Hypothermia

A plain-English guide for you and your family

WHAT IS HAPPENING

Your body works hard every second to keep its core temperature right around 37°C (98.6°F)—warm enough for enzymes to work but cool enough that proteins don't cook. The hypothalamus (the thermostat deep in your brain) watches blood temperature and sends signals to sweat when you're hot or shiver when you're cold. Blood vessels in your skin open wide to dump heat or squeeze shut to trap it. When the outside heat is too extreme, when you work so hard your muscles make heat faster than sweat can carry it away, or when medicines or illness break the thermostat, your core temperature can swing dangerously high or low. Above 40°C, heat directly damages brain cells and makes proteins in your organs unfold and stop working—the brain gets confused, muscles break down and spill their guts into the blood, and clotting factors fall apart so you bleed easily. Below 35°C, every chemical reaction in your body slows, the heart beats sluggishly and skips into dangerous rhythms, and blood gets thick and won't clot right. Both extremes trigger a cascade: the body tries to compensate by pushing blood around faster or slower, but those very efforts (sweating out fluids in heat, shivering and burning energy in cold) drain resources and can make things worse. The key is to catch the drift early—cool the overheated person fast and warm the cold person gently—before the dominos tip into organ failure or a lethal heart rhythm.

What you might feel

- Heavy sweating that later stops (in heat stroke)
- Confusion, slurred speech, or acting strange
- Shivering (in mild hypothermia) or no shivering (in severe hypothermia)
- Fast heart rate (tachycardia) or slow heart rate (bradycardia)
- Nausea, vomiting, or loss of appetite
- Muscle cramps or weakness
- Pale, cold, clammy skin (in heat exhaustion) or hot, flushed skin (in heat stroke)
- Dizziness, fainting, or feeling lightheaded
- Rapid, shallow breathing or slow, shallow breathing

- Seizures (in severe cases)

Call the doctor right away if...

- Core temperature above 104°F (40°C) or below 95°F (35°C)
- Confusion, slurred speech, or loss of consciousness
- Hot, dry skin with no sweating in a hot environment (heat stroke)
- Seizures or uncontrollable shivering
- Very slow heart rate (under 50 beats/min) or irregular heartbeat in a cold person

What the care team will do

- Measure core body temperature using a rectal thermometer every 5 to 10 minutes and start immediate cooling if temperature is above 40 degrees Celsius (104 degrees Fahrenheit)
- Remove all clothing and immerse the patient in ice water up to the neck, or apply ice packs to neck, armpits, and groin while pouring cold water over the body until core temperature reaches 38.5 degrees Celsius (101.3 degrees Fahrenheit)
- Start a large-bore IV line and give normal saline bolus at 20 milliliters per kilogram of body weight rapidly, while watching for lung crackles or shortness of breath
- Assess mental status every 5 minutes using simple commands like squeeze my hand and tell me your name; protect airway and prepare suction if patient cannot follow commands
- Place patient on continuous heart monitor and watch for irregular heart rhythms (arrhythmias), checking potassium and calcium levels immediately
- Draw blood to check sodium, potassium, kidney function (creatinine), liver enzymes, and clotting times (PT, PTT, INR), and repeat every 4 to 6 hours
- If seizure occurs, give lorazepam 2 to 4 milligrams IV slowly, protect head from injury, turn patient to side, and prepare intubation equipment at bedside
- Measure urine output every hour with a urinary catheter, targeting at least 0.5 milliliters per kilogram per hour, and watch for dark brown or tea-colored urine

Medicines you may be given — and why

Heat stroke: Cold-water immersion (ice-water bath or evaporative cooling)

Cold water pulls heat out of the body quickly through the skin, like dunking a hot pot into a sink of ice water. The goal is to drop the core body temperature to 102°F (39°C) as fast as possible—usually within 30 minutes—to stop the brain, kidneys, and muscles from cooking. We stop cooling at about 101°F (38.5°C) so the body doesn't overshoot and get too cold. Ice-water immersion (the person sits in a tub of water with ice) is the fastest method. Evaporative

cooling (misting the skin with water and blowing air over it) is the backup if immersion isn't available. This is the single most important step in heat stroke; no drug can replace it.

Heat stroke supportive care: Intravenous (IV) normal saline

Normal saline is salt water that matches the body's fluid. We give it through an IV to refill the blood volume that dropped from sweating and from blood vessels opening wide in the heat. This raises blood pressure, helps kidneys make urine to flush out muscle breakdown products (myoglobin), and keeps organs fed with oxygen. We usually give 1-2 liters fast, then adjust based on urine output and blood pressure. This does NOT cool the body—only cold water does that—but it supports the organs while cooling happens.

Heat stroke seizure control: Benzodiazepine (lorazepam or diazepam)

Heat stroke can cause seizures when the brain overheats. Benzodiazepines boost GABA (the brain's main calming signal) at receptors in the neurons, which slows down the electrical storm causing the seizure. Lorazepam (Ativan) or diazepam (Valium) are given IV to stop the seizure quickly. We also use these if the person is shivering hard during cooling, because shivering makes more heat and fights the ice bath.

Severe hypothermia: Active rewarming (external and internal)

When core temperature drops below 90°F (32°C), the heart can stop (cardiac arrest) and normal CPR doesn't work until the body warms up. We rewarm slowly at first (1-2°F per hour) to avoid shocking the heart with sudden temperature swings. External rewarming uses heated blankets, warm IV fluids, and warm humidified oxygen. For severe cases (temperature below 82°F or cardiac arrest), we use internal rewarming: warmed IV saline, bladder lavage (flushing the bladder with warm fluid), chest-cavity lavage, or ECMO (extracorporeal membrane oxygenation—a machine that pulls blood out, warms it, and pumps it back). The rule is: 'No one is dead until they are warm and dead'—we continue resuscitation until core temperature is at least 90°F.

Hypothermia cardiac-arrest support: Modified ACLS (Advanced Cardiac Life Support)

In severe hypothermia, the heart is so cold that it doesn't respond normally to defibrillation (shocks) or medications like epinephrine. We follow modified ACLS rules: give one shock for ventricular fibrillation or pulseless V-tach, then focus on rewarming. If there's no response, hold further shocks and epinephrine doses until core temperature is above 86°F (30°C). Once the person is warmer than 86°F, resume standard ACLS (shocks and drugs every few minutes). The heart needs to be warm enough for the electrical system and the medications to work.

Where this information comes from

- Wilderness Medical Society Clinical Practice Guidelines for Heat Illness (2019)
- Wilderness Medical Society Clinical Practice Guidelines for Hypothermia (2019)
- CDC Environmental Health – Extreme Heat and Cold
- American College of Emergency Physicians (ACEP) Clinical Policy on Heat-Related Illness

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