

Heat Stroke

A plain-English guide for you and your family

WHAT IS HAPPENING

Your body has a built-in thermostat — a tiny spot deep in the brain called the hypothalamus (the brain's temperature control center). Normally, when you get hot, the hypothalamus sends signals to make you sweat and to widen the blood vessels just under your skin so heat escapes into the air. You also feel thirsty and look for shade. This keeps your core temperature steady around 98.6°F, even on a hot day. But in heat stroke, that thermostat breaks or gets overwhelmed. There are two main ways this happens. Classic heat stroke happens when someone is stuck in extreme heat — often an elderly person in a hot apartment with no air conditioning, or a young child left in a closed car. Their body cannot get rid of heat fast enough, and certain medications (like water pills or allergy medicines) or not drinking enough water make it even harder. Exertional heat stroke happens when someone exercises so hard — like a soldier on a long march or an athlete in two-a-day practices — that their muscles make more heat than the body can dump, even if the air is not that hot. Either way, once core temperature crosses 104°F and the person becomes confused or passes out, you have heat stroke. The brain swells. The liver starts to fail. Muscle cells burst open and clog the kidneys. The blood's clotting system goes haywire, making tiny clots everywhere and then causing bleeding. The lungs fill with fluid. The heart rhythm goes wild. Without ice-cold water or ice packs within minutes, multiple organs shut down and the person can die. Everything weird you see — confusion, seizures, vomit, fast breathing, low blood pressure — traces back to that one upstream break: the hypothalamus lost control of temperature, and now every cell in the body is cooking. Cool the person immediately, then figure out why it happened.

What you might feel

- Core body temperature over 104°F (40°C)
- Confusion, strange behavior, or trouble thinking clearly
- Seizures (sudden jerking or stiffening of the body)
- Loss of consciousness or coma
- Hot, dry skin (classic form) or hot, sweaty skin (exertional form)
- Fast, pounding heartbeat

- Fast, shallow breathing
- Severe headache
- Nausea and vomiting
- Muscle cramps or weakness

Call the doctor right away if...

- Core body temperature above 104°F (40°C)
- Confusion, bizarre behavior, or not making sense
- Seizures or loss of consciousness
- Stopped sweating in a very hot person (classic heat stroke)
- Rapid deterioration—getting worse by the minute

What the care team will do

- Start immediate whole-body cooling with ice water immersion up to neck level or evaporative cooling using water mist spray and high-powered fans while taking rectal or esophageal temperature every 5 to 10 minutes
- Stop all cooling measures when core temperature reaches 38.5°C to 39°C and watch for temperature rebound every 15 minutes for the next 2 hours
- Insert two large-bore IV lines (18-gauge or bigger) and give cold normal saline bolus 1 to 2 liters fast while monitoring lung sounds and checking for leg swelling
- Give benzodiazepine medicine (lorazepam 2 to 4 mg IV or midazolam 5 mg IV) immediately if patient has seizures or severe muscle shaking and tremors
- Draw blood for complete metabolic panel checking potassium, creatinine, liver enzymes (ALT and AST), and creatine kinase (CK) levels; send urine to check for myoglobin; repeat these labs every 4 to 6 hours
- Place urinary catheter to measure urine output hourly with goal of 200 to 300 mL per hour; if urine is dark brown give IV sodium bicarbonate to make urine pH above 6.5
- Monitor heart rhythm continuously on telemetry and check ECG for peaked T waves, wide QRS, or arrhythmias; keep patient on supplemental oxygen with pulse oximetry goal above 94%
- Perform neurologic checks every 15 minutes using Glasgow Coma Scale and assess pupil reactions; report any worsening confusion, decreased responsiveness, or unequal pupils immediately

Medicines you may be given — and why

Ice-water immersion or evaporative cooling (cold mist + fans)

Heat stroke is too much heat inside the body that the brain's temperature control center (the hypothalamus) can no longer fix. The fastest way to save the person is to cool the body from the outside. Ice-water immersion (putting the person in a tub of ice water up to the neck) is the gold standard and can drop core temperature by 0.15–0.2°C every minute. If a tub is not available, spray the skin with cool water and blow air with fans so the water evaporates and pulls heat away (evaporative cooling). Pack ice packs around the neck, armpits, and groin where big blood vessels run close to the skin. The goal is to bring core temperature down to 38.5–39°C within 30 minutes. Stop active cooling at 38.5°C to avoid overcooling (hypothermia). This is the single most important treatment and must start immediately, even before the ambulance arrives.

0.9% Normal Saline (IV fluids)

Heat stroke makes people lose huge amounts of water and salt through sweat, and the heart and blood vessels dilate (open wide) to try to dump heat, which drops blood pressure. IV normal saline replaces the lost fluid volume in the bloodstream so blood pressure stays high enough to push blood to the brain, kidneys, and other organs. It also helps the kidneys flush out myoglobin (a muscle protein released when heat breaks down muscle cells) to prevent kidney failure. Start IV fluids as soon as possible; many patients need 1–2 liters in the first hour, but the exact amount depends on blood pressure, urine output, and heart function.

Benzodiazepines (e.g., lorazepam, diazepam)

Heat stroke often causes shivering (the body's automatic attempt to warm itself, even though it is already dangerously hot) and sometimes seizures (the overheated brain misfires). Both shivering and seizures make the muscles contract hard, which generates even more heat and worsens the stroke. Benzodiazepines boost the effect of GABA (the brain's main calming neurotransmitter) at GABA-A receptors in the brain and spinal cord. This calms overactive nerve cells, stops shivering, and stops seizures. Lorazepam 1–2 mg IV or diazepam 5–10 mg IV are common first choices. Do NOT use other anti-shivering drugs (like meperidine) that can raise body temperature or harm the heart in heat stroke.

Where this information comes from

- CDC Heat Stress Guidelines
- American College of Sports Medicine (ACSM) Position Stand on Exertional Heat Illness
- Wilderness Medical Society Practice Guidelines for Heat Illness
- Annals of Internal Medicine / NEJM reviews on heat-related illness

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