

Hypothermia

Hypothermia means the body is losing heat faster than it can make it. Nobody is dead until warm and dead.

THE ONE-LINE TRUTH

The body's core temperature drops below 35°C (95°F), and the machinery that makes and keeps heat cannot keep up.

The chain — how it unfolds

1. Cold exposure, water immersion, or broken heat control (sepsis, low thyroid, low blood sugar, alcohol, malnutrition, or CNS injury) pulls heat out faster than the body can make it. — why: Heat leaves through conduction (touching cold water or ground), convection (wind blowing warm air away), radiation (your body glowing infrared heat into cold air), and evaporation (wet clothes). If the hypothalamus or fuel supply is broken, thermogenesis fails. Core temperature starts to drop.
2. Core temperature drops to 32–35°C (mild hypothermia). The hypothalamus fires maximum sympathetic drive: violent shivering, a fast heart rate (tachycardia) (fast heart), vasoconstriction (squeezed blood vessels), confusion, and clumsiness. — why: The hypothalamus detects the falling blood temperature and releases norepinephrine to speed the heart and squeeze vessels. Shivering muscles burn glucose and oxygen to make heat. But this costs huge amounts of energy. If cold keeps winning, the body cannot sustain this effort.
3. Core drops to 28–32°C (moderate hypothermia). Shivering stops. Heart rate slows (bradycardia). Consciousness fades into stupor. The ECG shows a J wave (Osborn wave). — why: Muscles run out of ATP and oxygen, so shivering fails. The sympathetic nervous system is exhausted. Cellular metabolism slows. The heart slows to conserve oxygen. The J wave appears because cold delays repolarization of the ventricles. Now the body has no more tools to make heat — it is passively cooling.

4. Core drops below 28°C (severe hypothermia). The patient is unconscious (comatose), pupils fixed and dilated, breathing slow or absent, heart profoundly slow or in ventricular fibrillation or asystole. — why: The brain shuts down because neurons cannot fire below 28°C. The brainstem stops driving respiration. The heart's electrical system becomes wildly unstable — any mechanical bump (moving the patient, starting an IV, intubating) or chemical bump (giving certain drugs) can trigger ventricular fibrillation (the heart quivers uselessly) or asystole (no heartbeat at all). The good news: cold protects the brain and organs from oxygen-starved (hypoxic) damage, like putting them on ice. This is why prolonged CPR and rewarming can bring patients back with full recovery.
5. Every weird finding — shivering then no shivering, fast heart then slow heart, confusion, J waves, arrhythmias — is the body trying to keep blood flow and oxygen going, then failing as cold wins. — why: None of this is random. Shivering and a fast heart rate (tachycardia) are the body fighting. A slow heart rate (Bradycardia) and pauses in breathing (apnea) are the body giving up to save oxygen. J waves are a direct electrical effect of cold on heart cells. Arrhythmias happen because cold makes the heart irritable. Each finding is a marker of how far down the curve the patient has slid.
6. If you trace backwards from each finding to its cause, they all point to one broken step: the body cannot make or keep heat because of cold exposure, water immersion, or broken thermogenesis inside the body (sepsis, hypothyroidism, low blood sugar (hypoglycemia), alcohol, malnutrition, CNS injury). — why: Hypothermia is not a collection of random problems. It is one upstream break (heat out > heat in) that cascades through every system. Fix the upstream cause (get the patient out of the cold, rewarm gently, replace glucose, treat sepsis, give thyroid hormone if needed), and the dominoes reverse. Miss the upstream cause, and rewarming alone may not be enough.
7. The key teaching: nobody is dead until warm and dead. Keep CPR going, rewarm actively, and prepare for full recovery even after hours of resuscitation. — why: Cold protects the brain. Patients have survived hours underwater in icy water or buried in snow and walked out of the hospital neurologically intact. Do not stop resuscitation based on appearance or initial rhythm. Rewarm to at least 32–35°C (guidelines vary) before declaring death. This is one of the few true 'miracles' in medicine, and it is backed by physiology and documented cases.

Spot it — what you see, and why

- Core body temperature below 95°F (35°C): The body loses heat faster than it can make it — from cold air, cold water, wet clothes, or not eating enough fuel to burn. A regular mouth or ear thermometer won't catch it; you need a low-reading rectal or esophageal thermometer that can measure down into the danger zone.

- Shivering at first, then shivering stops: When you first get cold, your muscles shake fast to make heat (shivering). But once your core drops below about 90°F (32°C), your brain and muscles run too cold to keep shaking, so shivering stops — that's a sign things are getting worse, not better.
- Confusion, slurred speech, or acting drunk: The prefrontal cortex (the front part of the brain that thinks and decides) slows down when it gets cold, so thinking gets fuzzy, speech gets sloppy, and judgment goes out the window — people may take off clothes or make dangerous choices without realizing it.
- Heart rate slows down (bradycardia): Cold slows every chemical reaction in the body, including the signals that tell the heart to beat. The SA node (the heart's natural pacemaker) fires more slowly, so the pulse drops — sometimes to 30 or 40 beats per minute or even lower.
- Breathing slows and gets shallow: The brainstem (the part at the base of your brain that controls automatic breathing) slows down in the cold, so breaths come less often and don't pull in as much air. In severe cases, breathing may be so quiet and slow it's hard to notice.
- J waves (Osborn waves) on the ECG: Cold changes the way electricity moves through heart muscle. A small extra hump (called a J wave or Osborn wave) appears at the end of the QRS complex on the heart monitor tracing — it's a classic sign that the heart itself is cold.

Red flags — act now

- Core temperature below 90°F (32°C) — severe hypothermia with high risk of deadly heart rhythms
- Confusion, can't stay awake, or doesn't respond when you shake them — brain is shutting down
- Shivering has stopped but the person is still very cold — body can't fight back anymore
- Heart rhythm is chaotic or very slow (ventricular fibrillation or severe a slow heart rate (bradycardia)) — can stop any second
- Breathing is barely noticeable or has stopped — needs rescue breaths and advanced warming right away

Treat it — in this order

1. Remove all wet clothing and move the person to a warm environment (room temperature 21–24°C or 70–75°F); for mild hypothermia (32–35°C), use passive external rewarming with blankets; for moderate (28–32°C), add forced-air warming blankets (Bair Hugger) at 40–42°C → Stops ongoing heat loss and lets the body's own metabolism (if still working) raise core temperature by 0.5–2°C per hour. Shivering may restart as the hypothalamus warms up.

2. Give warm intravenous fluids (normal saline or lactated Ringer's heated to 40–42°C or 104–108°F) and deliver warm humidified oxygen (42–46°C or 108–115°F) through a mask or endotracheal tube → Delivers heat directly to the core through the bloodstream and prevents heat loss through the lungs. This speeds rewarming in moderate hypothermia and supports blood pressure as cold blood vessels begin to dilate (widen) during warming.
3. Handle the person extremely gently — no rough movement, no vigorous chest compressions unless absolutely needed, and avoid unnecessary procedures like central line insertion until the core is warmer → Prevents mechanical irritation of the cold, electrically unstable myocardium (heart muscle), which can trigger ventricular fibrillation even from a gentle jostle or a bump during transport.
4. For severe hypothermia (core below 28°C or 82°F with cardiac arrest or ventricular fibrillation), initiate extracorporeal life support — either ECMO or cardiopulmonary bypass — as soon as possible → Pumps blood out of the body, warms it with a heat exchanger, and returns it, raising core temperature 1–2°C every 10–15 minutes. This is the only way to restart a cold, fibrillating heart and restore blood flow (perfusion) (blood flow) to the brain and organs.
5. Do NOT give standard ACLS medications (epinephrine, amiodarone, lidocaine) or attempt defibrillation more than once until core temperature is above 30°C (86°F); cold hearts do not respond to these drugs → Avoids stacking toxic doses of medications that will not work until the heart warms up. Once core reaches 30°C, resume standard ACLS dosing and defibrillation attempts.

Your top priorities at the bedside

1. Handle the patient extremely gently and keep them flat; no rough movement, vigorous rubbing, or aggressive position changes — why: The cold heart muscle is very irritable and even small bumps or movements can trigger ventricular fibrillation (deadly chaotic heart rhythm) that is almost impossible to fix until the body warms above 30°C
2. Remove all wet clothing immediately and replace with dry warm blankets; cover the head completely — why: Wet fabric pulls heat away 25 times faster than air and the head loses 30 percent of total body heat so stopping these heat losses is the fastest way to prevent deeper hypothermia
3. Place a continuous heart monitor and watch for J waves (extra bumps after the QRS complex) and dangerous rhythms like atrial fibrillation (an irregular, quivering heartbeat) or ventricular fibrillation — why: J waves appear when core temperature drops below 32°C and signal that the heart is cold enough to develop deadly rhythms; cold hearts often will not respond to defibrillation until rewarmed above 30°C