

Slow heartbeat

A slow heart rate is not always a disease — the key question is whether the slow rate causes symptoms like dizziness, tiredness, or fainting.

THE ONE-LINE TRUTH

The heart beats too slowly to pump enough blood for the body's needs.

The chain — how it unfolds

1. Heart rate drops below 60 bpm (bradycardia) — why: The SA node fires too slowly, or electrical signals are blocked in the AV node or bundle branches, so fewer beats reach the ventricles each minute.
2. Cardiac output falls (amount of blood pumped per minute decreases) — why: Cardiac output equals heart rate times stroke volume — if rate drops and stroke volume cannot rise enough to make up for it, total output falls.
3. Blood pressure drops (hypotension) — why: Lower cardiac output means less blood pushing through the arteries each minute, so pressure falls unless blood vessels tighten enough to hold it up.
4. Brain receives less oxygen (cerebral poor blood flow (hypoperfusion)) — why: The brain needs constant oxygen delivery — when cardiac output and blood pressure drop, less oxygen-rich blood reaches brain cells, causing confusion, dizziness, or fainting (syncope) (fainting).
5. Muscles and organs become tired and weak — why: Skeletal muscles and organs like the kidneys and liver do not get enough oxygen and glucose (fuel), so the patient feels weak, tired, and short of breath even at rest.
6. Kidneys reduce urine output (oliguria) — why: Low blood flow to the kidneys signals them to hold onto water and salt to try to raise blood volume and pressure, so urine output drops.
7. Lactic acid builds up (lactic too much acid in the blood (acidosis)) — why: Cells switch to anaerobic metabolism (making energy without oxygen) when oxygen delivery is too low, producing lactate as a waste product that piles up in the blood.

- 8.** Risk of sudden cardiac arrest (asystole or pulseless electrical activity) — why: If the heart rate drops too low or the electrical system completely fails, the heart may stop pumping altogether (asystole) or show electrical activity on the monitor but no pulse (pulseless electrical activity) — both are life-threatening emergencies.

Spot it — what you see, and why

- Feeling tired and weak: When your heart beats too slowly, it pumps less blood each minute. Your muscles and organs don't get enough oxygen and glucose (the sugar fuel cells burn), so you feel tired even when you haven't done much.
- Feeling dizzy or lightheaded: Your brain needs a steady stream of blood. When your heart beats slowly, less blood reaches your brain (like turning down a faucet), so you feel dizzy or like the room is spinning—especially when you stand up quickly.
- Fainting or feeling like you're about to faint: If your heart rate drops suddenly or stays very low, not enough blood reaches your brain and you can black out. This is a danger sign—it means your brain isn't getting the oxygen it needs to stay awake.
- Shortness of breath: A slow heartbeat can't move blood through your lungs fast enough. Blood backs up in the lungs (like water pooling behind a slow drain), making it harder to breathe. Your body also needs more oxygen than the slow heart can deliver.
- Chest pain or pressure: Your heart muscle itself needs oxygen-rich blood. If the heart beats too slowly—or if the slow beat is caused by blocked coronary arteries (the pipes feeding the heart)—the heart muscle doesn't get enough oxygen (called starved blood flow (ischemia)) and you feel pain or tightness in your chest.
- Confusion or trouble thinking clearly: Brain cells need a constant supply of oxygen to work. When blood flow slows down, not enough oxygen reaches the cerebral cortex (the thinking part of your brain), so you may become confused, slow to answer, or unable to focus. This is a warning that your brain isn't getting enough fuel.

Red flags — act now

- Fainting or nearly fainting—your brain isn't getting enough blood, and you're at risk of dangerous pauses in your heartbeat.
- Chest pain or sudden trouble breathing—may mean a heart attack, heart failure, or fluid backing up into your lungs.
- Confusion or trouble staying awake—means your brain is starved for oxygen and needs emergency care.
- Blood pressure below 90 on the top number, with cold skin, weak pulse, or little urine—your body is going into shock and organs may start failing.

- New complete heart block or advanced second-degree heart block on the ECG (the electrical tracing of your heart)—the electrical signals between your heart's upper and lower chambers are failing, and your heart could stop.

Treat it — in this order

1. Atropine 1 mg IV push, can repeat every 3 to 5 minutes up to a total of 3 mg → Atropine blocks the body's brake system (the vagus nerve's parasympathetic signals, which release acetylcholine, a chemical messenger that slows the heart). By blocking acetylcholine receptors at the SA node (natural pacemaker) and AV node (relay station), atropine speeds up the heart rate within 1 to 2 minutes. This increases the amount of blood pumped every minute (cardiac output), which raises blood pressure and restores blood flow to the brain and body. ACLS (Advanced Cardiovascular Life Support) guidelines recommend atropine as the first drug for symptomatic a slow heart rate (bradycardia).
2. Transcutaneous pacing (TCP) or transvenous temporary pacemaker wire → Transcutaneous pacing uses large sticky electrode pads on the chest and back to deliver electrical shocks (usually 50 to 100 milliamps, about the same power as a strong muscle stimulator) that make the heart's lower chambers (ventricles) squeeze at a set rate, usually 60 to 80 beats per minute. A transvenous pacemaker threads a thin wire through a large vein (usually the internal jugular vein in the neck or subclavian vein below the collarbone) into the right lower chamber to deliver electrical pulses directly to the heart muscle. Both methods force the heart to beat at a safe speed within seconds, immediately increasing cardiac output and restoring blood flow to the brain and body. ACLS says use pacing for symptomatic a slow heart rate (bradycardia) that does not respond to atropine.
3. Stop or reduce beta-blockers, calcium channel blockers (diltiazem, verapamil), digoxin, and antiarrhythmic drugs (amiodarone, sotalol) → Removing or lowering the dose of medicines that slow the heart's pacemaker (SA node) or relay station (AV node) allows the heart's own electrical system to speed back up. Heart rate usually rises within hours to days, depending on how long the drug stays in the body. For example, metoprolol's effect wears off in about 12 to 24 hours, but amiodarone can take weeks to months to clear because it dissolves in fat and tissues and is released back into the blood very slowly.

4. Correct high potassium with calcium gluconate or calcium chloride IV, insulin with dextrose IV, sodium bicarbonate IV if acidotic, and sodium polystyrene sulfonate (Kayexalate) or patiromer by mouth, or hemodialysis; replace low magnesium with magnesium sulfate IV; treat hypothyroidism with levothyroxine by mouth → Calcium gluconate (1 to 2 grams IV over 2 to 3 minutes) or calcium chloride (0.5 to 1 gram IV over 2 to 3 minutes) stabilizes heart cell membranes and protects the heart from the dangerous rhythm effects of high potassium within 1 to 3 minutes, though it does not lower potassium itself. Regular insulin (10 units IV) with dextrose (25 grams, or one amp of D50, IV) pushes potassium from the blood into cells by activating the sodium-potassium pump, lowering blood potassium by 0.5 to 1.2 mEq/L within 15 to 30 minutes. Sodium bicarbonate (50 to 100 mEq IV) also shifts potassium into cells if the blood is acidic (pH below 7.35). Kayexalate or patiromer removes potassium through the gut over hours to days by binding it in the intestine so it comes out in the stool. Hemodialysis (filtering the blood through a machine) removes potassium directly from the blood and is the fastest definitive treatment for severe high potassium (hyperkalemia). Magnesium sulfate (1 to 2 grams IV over 15 minutes) replaces missing magnesium and restores normal heart cell electrical function. Levothyroxine (starting dose 1.6 mcg per kg by mouth once daily, usually 100 to 125 mcg in adults) replaces missing thyroid hormone; heart rate usually improves over 2 to 4 weeks as thyroid levels normalize. Fixing these metabolic and hormonal problems removes the causes of a slow heart rate (bradycardia).
5. Epinephrine infusion 2 to 10 mcg per minute IV or dopamine infusion 5 to 20 mcg per kg per minute IV if atropine fails and pacing is not immediately available → Epinephrine and dopamine are hormones (chemical messengers released by the adrenal glands) that stimulate beta-1 receptors (the gas pedal) on the heart's pacemaker and relay station, speeding up electrical firing and conduction. This raises heart rate and increases the force of each heartbeat (called inotropy), which increases cardiac output and blood pressure. ACLS guidelines say use these infusions as a temporary bridge when atropine does not work and pacing is delayed or not yet ready.

Your top priorities at the bedside

1. Put the patient on a continuous heart monitor and watch the heart rate and rhythm every minute. — why: A slow heartbeat can suddenly stop completely (asystole), and the monitor lets us see when the rhythm gets worse so we can start lifesaving treatment like CPR or pacing in seconds instead of waiting until the patient collapses.
2. Get IV access with at least one large IV line and prepare atropine 1 mg at the bedside, ready to push. — why: Atropine blocks nerve signals that slow the heart down, so it speeds up the heartbeat quickly—we need it ready because if the heart rate drops more or the patient faints, we have only minutes to give the medicine before the heart stops.

3. Attach transcutaneous pacing (TCP) pads to the chest and turn on the pacing machine, but do not pace yet unless the patient gets worse. — why: TCP sends electrical shocks through the chest to force the heart to beat faster—having the pads already stuck on means we can start pacing in 10 seconds if the patient faints or the heart slows even more, instead of wasting 2 to 3 minutes setting up.