

Bradycardia

A slow heart rate (Bradycardia) means first decide: is the patient feeling symptoms or not? If yes, act fast. Then figure out which part of the heart's electrical system is slow or blocked — the pacemaker, the relay station, or the wires below — because that tells you how to fix it and how urgent it is.

THE ONE-LINE TRUTH

A heart rate below 60 beats per minute is called a slow heart rate (bradycardia). It becomes an emergency when the slow rate causes symptoms — dizziness, fainting, chest pain, or confusion — because those symptoms mean the body is not getting enough blood. An electrocardiogram (ECG; a tracing of the heart's electrical signals) shows whether the slow rate is coming from the heart's natural pacemaker, from a traffic jam in the heart's wiring, or from a complete electrical block.

The chain — how it unfolds

1. The heart's natural pacemaker (SA node) fires too slowly, or the relay station (AV node) blocks signals, or the wires below are damaged — so fewer than 60 electrical sparks per minute reach the ventricles. — why: Medicines (beta-blockers, calcium-channel blockers, digoxin) put the brakes on the heart's electrical system. A heart attack (especially on the bottom wall) cuts off blood to the SA or AV node, starving the pacemaker cells. The vagus nerve (the body's natural brake) can slam on too hard during vomiting, straining, or even coughing. The SA node can just wear out with age. Or the AV node starts blocking signals — first some, then all. Any of these causes means fewer beats per minute leave the starting gate.
2. Cardiac output (the amount of blood pumped every minute) drops because cardiac output equals heart rate times stroke volume — if the rate is cut in half, output is cut in half, even if each beat pumps a normal amount. — why: Imagine a factory that ships 70 boxes per minute. If it slows to 35 boxes per minute, it does not matter if each box is bigger — total product delivered still falls. The body needs about 5 liters of blood pumped every minute to keep organs fed. When the heart rate drops below 40 or 50, that delivery system fails.

3. Blood pressure falls because blood pressure depends on cardiac output and how tight the blood vessels are squeezed — when cardiac output drops, pressure drops unless the body can squeeze vessels tight enough to compensate. — why: At first, adrenaline and vessel constriction keep the pressure up. But if the heart rate stays very slow or keeps dropping, compensation maxes out and blood pressure crashes. You see systolic pressure (the top number) fall below 90, sometimes below 70. The patient feels dizzy and weak.
4. The brain runs out of oxygen and blood flow, so consciousness fades — the patient feels lightheaded, their vision goes gray or black, and they faint (syncope) or collapse. — why: The brain uses 20% of the body's oxygen even though it is only 2% of body weight. It has almost no backup fuel stored, so it depends on a constant flow of oxygen-rich blood every second. When blood pressure drops and cardiac output falls, the brain is the first organ to fail. Fainting (Syncope) is not a separate disease — it is the brain's alarm bell that the delivery system is broken.
5. Other organs start to suffer: the kidneys make less urine or stop completely (acute kidney injury), the skin turns pale and cold and clammy, the patient becomes confused or unresponsive (altered mental status), and the heart itself does not get enough blood (angina — chest pain — even if the coronary arteries were fine before). — why: Every organ is downstream from the pump. When cardiac output is low, blood flow is rationed to the brain and heart first; everything else is starved. The kidneys sense low pressure and think the body is dehydrated, so they shut down to save water — but really the problem is the pump is too slow. The heart muscle itself needs oxygen delivered by the coronary arteries; if the heart is beating slowly and blood pressure is low, coronary blood flow drops and the heart starves itself — this can cause more damage and make the a slow heart rate (bradycardia) worse (a vicious cycle).
6. The body releases a flood of adrenaline and squeezes blood vessels tight, trying to force blood pressure back up and speed the heart rate — but if the electrical system is broken (like in complete heart block), adrenaline cannot fix the wiring, so the patient stays slow and unstable. — why: Compensation is the body buying time, not fixing the root problem. You will see pale, sweaty skin (from blood vessels constricting), anxiety or agitation (from adrenaline), and sometimes extra heartbeats or pauses on the monitor (as backup pacemakers try to take over). This is a red flag: the body is in crisis mode and the system is about to fail.
7. If untreated, the patient can go into cardiac arrest — the slow rhythm stops completely (asystole — a flat line), or it degenerates into a chaotic rhythm like ventricular fibrillation (the heart just quivers and pumps nothing). — why: A heart that beats 30 times per minute is barely keeping the body alive. The backup pacemaker cells in the ventricles are not designed to run the whole heart — they are fragile and unreliable. Any stress (low oxygen, high potassium, another blocked signal) can make them stop. Once the heart stops, you have minutes to restart it with CPR, pacing, or defibrillation before brain damage or death.

8. Every symptom — the dizziness, the fainting, the confusion, the chest pain, the low blood pressure — is not a separate problem. They are all one chain caused by one broken thing upstream: the heart is not beating fast enough to deliver blood. Fix the heart rate, and the whole chain reverses. — why: This is why the first question is always: does the patient have symptoms? If yes, the a slow heart rate (bradycardia) is dangerous and you must act — give atropine (if the block is at the AV node level or above), place a temporary pacemaker wire, or use external pacing pads to shock the heart into beating faster from the outside. If the patient has no symptoms and the rate is only mildly slow, you can watch and find the cause without rushing. But never assume slow and stable means safe — check the trend, check the ECG to see where the block is, and be ready to pace before the patient crashes.

Spot it — what you see, and why

- Slow heart rate (below 60 beats per minute at rest): The heart's electrical system is sending signals more slowly than normal, or signals are being blocked on their way through the heart. This means fewer heartbeats happen each minute.
- Feeling dizzy or lightheaded: When the heart beats too slowly, it may not pump enough blood up to the brain. The brain needs a steady stream of oxygen-rich blood to work well, so when it runs low, you feel woozy or unsteady.
- Extreme tiredness or weakness: Muscles and organs throughout the body need oxygen from blood to make energy. A slow heart rate means less blood is delivered each minute, so your body feels drained and weak—like trying to run a house on a battery that's running low.
- Shortness of breath, especially with activity: When you move, your muscles need more oxygen. A slow heart can't speed up enough to meet that demand, so blood backs up in the lungs and you feel short of breath—like a traffic jam where cars (blood cells) can't move forward fast enough.
- Chest discomfort or pressure: The heart muscle itself needs oxygen. If the heart beats too slowly, the blood flow through the heart's own arteries may drop, starving the heart tissue and causing a squeezing or heavy feeling in the chest.
- Fainting or near-fainting spells: If the heart rate suddenly drops very low or pauses for a few seconds, blood pressure plummets and the brain shuts down briefly to protect itself. You lose consciousness for a moment and may fall.

Red flags — act now

- Fainting or blackout spells
- Chest pain or pressure
- Severe shortness of breath at rest
- Sudden confusion or slurred speech

- Heart rate below 40 beats per minute with symptoms

Treat it — in this order

1. Atropine 1 mg IV push, repeat every 3 to 5 minutes up to a total dose of 3 mg → Atropine blocks the vagus nerve (the nerve that acts like the body's brake pedal on the heart). Blocking the vagus nerve removes the brake and lets the SA node and AV node fire faster. Heart rate increases within 1 to 2 minutes, which immediately increases blood flow to the brain and organs.
2. Transcutaneous pacing—large adhesive pads placed on the chest and back deliver electrical pulses that force the heart to beat at a set rate → The pacing pulses bypass the heart's broken electrical system entirely and directly stimulate the ventricles to contract. Heart rate is immediately controlled (usually set to 60 to 80 beats per minute), restoring blood pressure and organ blood flow (perfusion) within seconds.
3. Stop the drug causing a slow heart rate (bradycardia)—immediately hold beta-blockers (e.g., metoprolol, atenolol), non-dihydropyridine calcium channel blockers (e.g., diltiazem, verapamil), or digoxin → Removing the drug removes the chemical signal that was slowing the heart. As the drug level in the blood drops over hours to days (depending on kidney and liver function), the heart's natural pacemaker speeds back up on its own. In many cases, this is the only intervention needed if the patient is otherwise stable.
4. Glucagon 3 to 5 mg IV bolus followed by infusion of 3 to 5 mg/hour for beta-blocker overdose; calcium chloride 1 g IV (10 mL of 10% solution) or calcium gluconate 3 g IV (30 mL of 10% solution) for calcium channel blocker overdose → Glucagon works through a pathway that does not depend on beta receptors, so it can increase heart rate and force of contraction even when beta-blockers are blocking the usual pathway. Calcium directly competes with calcium channel blockers at the cell membrane, restoring the flow of calcium into heart cells and allowing the heart to speed up and contract more strongly.
5. Epinephrine infusion (2 to 10 micrograms per minute) or dopamine infusion (5 to 20 micrograms per kilogram per minute) if atropine and pacing do not restore adequate blood pressure → Epinephrine and dopamine act like adrenaline. They speed up the heart rate by directly stimulating receptors in the SA node and also squeeze blood vessels to raise blood pressure. This buys time by keeping blood flowing to the brain and heart while you figure out and fix the root cause.

Your top priorities at the bedside

1. Place patient on continuous cardiac monitor and pulse oximetry, and obtain a 12-lead ECG immediately. — why: The ECG shows whether the slow rate comes from the SA node (natural pacemaker), an AV block (traffic jam between upper and lower heart chambers), or another rhythm problem. Each type needs different treatment. Continuous monitoring catches sudden pauses or further slowing.
2. Establish large-bore IV access in at least one arm and draw blood for troponin and electrolytes. — why: IV access allows immediate delivery of atropine (a drug that speeds up the heart) or other emergency medications. Troponin (a heart enzyme) reveals if a heart attack is causing the a slow heart rate (bradycardia). Low potassium or high potassium can worsen electrical conduction.
3. Assess mental status, skin color, and capillary refill every 5 minutes and document findings. — why: Confusion, pale or gray skin, and slow capillary refill (longer than 2 seconds) mean the brain and tissues are not getting enough oxygen. These signs tell us the a slow heart rate (bradycardia) is unstable and the patient needs atropine or pacing now.