

Cardiac Tamponade

Fluid builds up in the sac around the heart. The sac cannot stretch. It squeezes the heart so the chambers cannot fill. A needle drains the fluid and saves the pump.

THE ONE-LINE TRUTH

Fluid fills the sac around the heart and squeezes it so hard the heart cannot fill with blood.

The chain — how it unfolds

1. Fluid pours into the pericardial sac faster than it can stretch. — why: Blood from a torn coronary artery or aorta, pus from bacterial or viral pericarditis (infection of the sac), serous fluid from severe waste buildup in the blood (uremia) (kidney failure toxins), malignant a fluid collection (effusion) from cancer spread, or fluid from autoimmune disease builds up in the pericardial space. The fibrous pericardium (the tough outer layer of the sac) cannot expand quickly, so pressure inside climbs.
2. Rising pressure in the sac squeezes all four heart chambers from the outside. — why: The pericardium wraps around the whole heart. When pressure inside the sac goes up, it presses on the right atrium, right ventricle, left atrium, and left ventricle at once, like a hand squeezing a soft bag.
3. The heart chambers cannot open wide during the relaxation phase (diastole). — why: Normally the ventricles spring open and suck blood in. Now outside pressure fights that, so less blood flows in. The amount of blood the heart can pump with each beat — called stroke volume — drops.
4. Pressures inside all four chambers become equal (equalization of diastolic pressures). — why: The outside squeeze overpowers the normal pressure differences between chambers, so right atrial pressure, right ventricular diastolic pressure, pulmonary artery diastolic pressure, and left ventricular diastolic pressure all rise to match the pericardial pressure — usually 15 to 30 millimeters of mercury (mmHg) or higher.
5. Blood backs up into the veins; neck veins swell and stay full (jugular venous distention). — why: The right atrium cannot accept the blood returning from the superior and inferior vena cavae (the body's main draining veins), so pressure rises in those veins and spills backward into the internal jugular veins. You can see the veins in the neck bulge, even when the person sits up.

6. When the person breathes in, blood pressure drops more than 10 mmHg (pulsus paradoxus). — why: Breathing in drops pressure in the chest (intrathoracic pressure falls), so more blood flows into the right heart. The stiff pericardium cannot let the right ventricle expand, so the interventricular septum (the wall between right and left ventricles) bows toward the left. That makes the left ventricle even smaller, so it pumps less blood and systolic pressure falls.
7. Heart sounds become quiet and distant. — why: The layer of fluid in the pericardial sac muffles the sound of the heart valves closing, like listening to a drum wrapped in a thick blanket.
8. Blood pressure drops (hypotension) and the pulse becomes fast and weak. — why: With less blood filling the left ventricle, less blood leaves with each beat. The sinoatrial node (the heart's natural pacemaker) speeds up the heart rate in response to signals from the sympathetic nervous system, but each beat stays weak, so blood pressure falls and organs do not get enough oxygen.

Spot it — what you see, and why

- Blood pressure drops, especially when breathing in (pulsus paradoxus): Fluid squeezes the heart from the outside so the chambers can't fill properly. When you breathe in, pressure inside your chest changes and even less blood gets back to the heart. The squeeze becomes tighter, so blood pressure drops more than 10 points—doctors call that pulsus paradoxus, a hallmark sign that the heart is trapped.
- Neck veins bulge and stay swollen (jugular venous distention): Blood is trying to return to the right side of the heart, but the squeezed heart can't accept it. The blood backs up into the jugular veins (the big veins running up your neck), making them bulge out like garden hoses under pressure. The bulge gets bigger when you lie flat because gravity stops helping.
- Heart sounds turn quiet and muffled: Normally a stethoscope picks up crisp heart sounds through the chest wall. But when fluid fills the pericardial sac (the thin bag wrapped around the heart), it acts like a pillow, blocking and softening the sound waves before they reach the stethoscope.
- Trouble breathing or feeling short of breath (dyspnea): The squeezed heart can't pump enough blood forward to the lungs and body, so oxygen delivery drops. Your brain senses low oxygen and makes you breathe faster and harder to try to catch up, leaving you gasping for air even at rest.
- Heart beats fast (tachycardia, often over 100 beats per minute): Because each squeeze of the heart moves only a tiny amount of blood, the heart tries to make up for it by beating faster—like pedaling harder when your bike chain slips. The sinoatrial node (the heart's natural pacemaker) speeds up to keep oxygen delivery going.

- Chest pain or pressure: The pericardium (the sac around the heart) is stretched tight by the building fluid, which pulls on pain-sensing nerves in the sac's lining. The pain can feel sharp or pressing, and it often gets worse when you lie down or take a deep breath.

Red flags — act now

- Blood pressure dropping below 90 systolic or falling fast despite fluids
- Confusion, loss of consciousness, or not responding normally
- Pulsus paradoxus greater than 10 mmHg (big drop in systolic pressure when breathing in)
- Oxygen levels dropping below 90% or severe trouble breathing
- Signs of shock: cold clammy skin, fast weak pulse, pale or blue color, and altered mental state

Treat it — in this order

1. Pericardiocentesis (inserting a needle or thin catheter into the pericardial sac under ultrasound or fluoroscopy guidance to drain fluid) → Removes fluid from the sac so pressure around the heart drops immediately. The heart chambers can expand and fill with blood again. Cardiac output — the amount of blood the heart pumps out per minute — jumps back up, and blood pressure rises within seconds to minutes. Even removing 50–100 mL can make a huge difference if the fluid built up fast. This is the only treatment that fixes the squeeze itself and saves the patient's life in an emergency.
2. Intravenous fluid bolus (0.9% normal saline, 500–1,000 milliliters given quickly over 15–30 minutes) → Increases the volume of blood in the veins so more blood tries to push into the heart. Even though the heart is being squeezed from outside and cannot fill well, a higher pressure pushing blood in from the veins can help a small amount more get through and keep blood pressure from crashing completely. This buys time — usually minutes to an hour — while you prepare to drain the fluid. It can temporarily stabilize the patient and prevent cardiac arrest.
3. Avoid positive-pressure ventilation (intubation and putting the patient on a mechanical breathing machine) unless absolutely necessary; if the patient needs breathing support, use high-flow nasal oxygen or non-invasive ventilation (like BiPAP) very carefully and prepare to drain the fluid immediately → Positive pressure — forcing air into the lungs with a machine — raises pressure inside the chest, which squeezes the outside of the heart even more and can make the already-low blood pressure drop further or cause the heart to stop. Keeping the patient breathing on their own, or using gentle support that does not raise chest pressure too much, protects the heart from extra crushing force.

4. Vasopressors — norepinephrine preferred, starting at 0.05–0.1 micrograms per kilogram per minute, or dopamine 5–10 micrograms per kilogram per minute — if blood pressure stays dangerously low (systolic under 90 mmHg or mean arterial pressure under 65 mmHg) despite intravenous fluids → Tightens blood vessels all over the body so blood pressure stays high enough to push blood to the brain, kidneys, heart, and other vital organs even though the heart is pumping weakly. Protects organs from dying while you prepare to drain the pericardial fluid. Norepinephrine is preferred because it raises blood pressure without making the heart beat too fast or work too hard. This is only used when the patient is in shock and time is running out.
5. Treat the underlying cause: antibiotics (e.g., vancomycin 15 milligrams per kilogram IV every 12 hours plus ceftriaxone 2 grams IV daily, or anti-TB drugs if tuberculosis is suspected) for bacterial pericarditis; antifungals or antivirals for fungal or viral infections; urgent dialysis for uremic pericarditis from kidney failure; chemotherapy, radiation, or both for cancer causing malignant a fluid collection (effusion); NSAIDs like ibuprofen 600–800 milligrams three times daily or indomethacin 25–50 milligrams three times daily, plus colchicine 0.6 milligrams once or twice daily, and sometimes corticosteroids for autoimmune or with no known cause (idiopathic) (unknown cause) inflammatory pericarditis → Stops the process that is making fluid leak into the pericardial sac. Prevents fluid from coming back after you drain it. If the cause is inflammation or infection, treating it helps the body reabsorb leftover fluid and heal the lining of the sac. For cancer, shrinking the tumor stops malignant fluid from refilling the sac. For kidney failure, dialysis removes the waste that is irritating the pericardium. This is the only way to prevent tamponade from happening again.

Your top priorities at the bedside

1. Place the patient on continuous cardiac monitoring and pulse oximetry, and measure blood pressure every 5 to 15 minutes. — why: Tamponade causes the heart to fail quickly; close monitoring catches dangerous drops in blood pressure, rising heart rate above 100, and falling oxygen levels before the patient crashes into cardiac arrest.
2. Start two large-bore intravenous lines (18-gauge or larger) and give a rapid bolus of 500 to 1,000 mL of 0.9% normal saline over 10 to 20 minutes if blood pressure is dropping. — why: Increasing the blood volume inside the vessels raises pressure and helps the right side of the heart fill despite the squeeze from outside; this buys time until the fluid can be drained.
3. Keep the patient sitting upright at 45 degrees or higher, and avoid laying them flat. — why: An upright position uses gravity to reduce pressure on the heart and makes breathing easier; lying flat increases venous return (blood coming back to the heart) and can worsen the squeeze and cause sudden decompensation (rapid decline).