

Post Cardiac Arrest Care

After the heart stops and is restarted, the brain and heart are injured from losing oxygen, so we cool the body to protect the brain, fix what caused the arrest, support the heart and blood pressure, and watch closely to see if the brain will recover.

THE ONE-LINE TRUTH

The heart has been restarted after stopping, but the brain and heart are now hurt and fragile, and the next hours decide whether the person wakes up and lives.

The chain — how it unfolds

1. The heart stops (ventricular fibrillation, pulseless ventricular a fast heart rate (tachycardia), asystole, or pulseless electrical activity), so blood flow stops instantly. — why: Without blood flow, oxygen delivery stops, and within 10 seconds the brain runs out of the oxygen it has stored; within 4 to 6 minutes, brain cells begin to die because they cannot make ATP (energy) without oxygen.
2. Brain cells swell, leak toxic chemicals (glutamate, an excitatory neurotransmitter, and calcium), and trigger inflammation; the longer the arrest, the more cells die. — why: When cells cannot make energy, their pumps fail, sodium and calcium flood in, the cell swells like a water balloon, and it leaks glutamate that poisons neighboring cells and spreads the damage like a wildfire.
3. The heart muscle itself is starved of oxygen (because the coronary arteries also lost flow), so even after it restarts, it is stunned, weak, and cannot pump well for hours to days. — why: Heart muscle cells that went without oxygen are damaged and cannot contract strongly, so cardiac output (the amount of blood pumped per minute) drops, blood pressure falls, and organs do not get enough blood—this is called myocardial stunning.
4. When blood flow returns (after CPR or defibrillation restarts the heart), the sudden flood of oxygen triggers a burst of free radicals (unstable oxygen molecules) and inflammatory chemicals that damage blood vessels throughout the body. — why: This is starved blood flow (ischemia)-reperfusion injury: the very act of restoring blood flow paradoxically causes more damage because oxygen reacts with damaged cell parts to make toxic molecules, vessel walls become leaky, and organs swell and fail (especially lungs, kidneys, and liver).

5. The brain loses control of breathing, heart rhythm, blood pressure, and temperature, so the patient stays unconscious (comatose), breathes irregularly or not at all, and cannot maintain stable vital signs without machines. — why: The brainstem (the part that controls automatic functions like breathing and heart rate) and the cerebral cortex (the outer layer of the brain that controls waking and thinking) are both injured, so the patient cannot wake up, breathe on their own, or regulate their body.
6. Over the next 24 to 72 hours, brain swelling peaks, and the team watches for signs of recovery (pupil reactions, movement, waking) or signs of irreversible injury (no pupil response, no movement, flat EEG). — why: Brain injury after cardiac arrest evolves slowly; some cells that were hurt but not dead may recover if protected (by cooling, good blood pressure, normal oxygen and sugar), but others will die no matter what, and it takes days to know which path the patient is on.
7. Meanwhile, the team hunts for and fixes the cause of the arrest: emergency cardiac catheterization (threading a tube into the heart arteries) if it was a heart attack, antiarrhythmic drugs (medicines that steady heart rhythm) or ablation (burning the spot causing the bad rhythm) if it was a deadly rhythm, antibiotics if it was sepsis (severe infection), surgery if it was bleeding. — why: If the root cause is not fixed, the patient will arrest again; for example, if a coronary artery is blocked, reopening it with a stent (a tiny metal tube) restores blood flow to the heart and prevents another arrest.
8. The final outcome is decided by two things: how long the heart was stopped (down time) and how well the brain and organs are supported afterward; some patients wake up fully, some stay in a persistent vegetative state, and some die from brain death or multi-organ failure. — why: Every minute without blood flow kills more brain cells; even perfect post-arrest care cannot bring dead cells back, so the length of the arrest and the quality of CPR are the biggest predictors of whether the person will survive with a working brain.

Spot it — what you see, and why

- No response to voice or touch: During the arrest the brain got almost no oxygen, and neurons (the nerve cells that send all signals) were starved. Many are still stunned or damaged, so the circuits that wake a person up—running from the brainstem through the thalamus (the brain's relay station) up to the cortex (the outer thinking layer)—cannot fire properly yet.
- Weak or absent breathing: The medulla (the lowest part of the brainstem that runs automatic breathing) may have been injured by lack of oxygen. Without steady signals from the medulla, the diaphragm (the big breathing muscle under the lungs) and chest muscles do not contract regularly, so breaths are shallow, slow, or stop completely.

- Very low or very high blood pressure: The heart muscle itself is often weak and stunned after an arrest—called post-cardiac-arrest myocardial dysfunction—so it cannot squeeze hard enough to push blood out. At the same time, the autonomic nervous system (the autopilot that tightens or relaxes blood vessels) is unstable: vessels may clamp down too tight (raising pressure) or relax too much (dropping pressure).
- Fast or irregular heart rhythm: The heart's electrical wiring may still be irritated or scarred from the original problem that caused the arrest (such as starved blood flow (ischemia)—not enough blood feeding the heart muscle—or scar tissue from an old heart attack). Injured heart cells can fire extra beats or chaotic signals, creating a fast or jumpy rhythm.
- Seizures (shaking fits or stiffening): Parts of the cortex (the brain's outer layer that controls movement and thought) were damaged by lack of oxygen. Injured neurons become hyperexcitable—they fire in wild, synchronized bursts instead of orderly patterns—and that uncontrolled electrical storm spreads across the brain, causing the muscles to shake or lock up.
- Cool, pale, or bluish skin: The heart is pumping weakly, so less blood reaches the skin. The body also redirects whatever blood it has away from the skin and toward vital organs—the brain, heart, and kidneys—leaving the skin cold, pale, or even blue (cyanotic) from low oxygen.

Red flags — act now

- No breathing or very weak breathing after the heart starts beating again
- Seizures that keep happening or do not stop (status epilepticus)
- Pupils stay wide open and do not shrink when a light is shined in the eyes, lasting more than 72 hours
- Blood pressure drops very low despite medicines and fluids to raise it (refractory shock)
- Body temperature rises above 102°F (38.9°C) or drops below 93°F (34°C) without targeted temperature management

Treat it — in this order

1. Targeted Temperature Management (TTM): cool the body to 32–36°C for 24 hours, then rewarm slowly at 0.25–0.5°C per hour over 8–12 hours, then prevent fever >37.5°C for at least 72 hours after arrest → Cooling the brain slows down its need for oxygen and energy, like turning down a furnace. It also turns down inflammation (the immune system's repair response that can overshoot and cause more swelling and cell death). This gives injured-but-still-alive brain cells time to heal instead of swelling up and dying in the hours after blood flow comes back. Studies show TTM improves the chance of waking up with a working brain, especially after shockable rhythms (VF, pulseless VT).

2. Restore and maintain blood flow (perfusion) pressure: keep mean arterial pressure (MAP) ≥ 65 mmHg with IV fluids first, then norepinephrine or epinephrine infusion if fluids are not enough; keep oxygen saturation 94–98% and PaCO₂ 35–45 mmHg on the ventilator → The brain and heart need oxygen and fuel (glucose) delivered by blood flow. Keeping blood pressure up (MAP ≥ 65 mmHg) pushes blood into the tiny vessels in the brain and heart muscle so the injured cells can try to recover instead of dying from a second round of starvation. Keeping oxygen and CO₂ in the normal range stops the brain blood vessels from clamping down (which happens when CO₂ is too low) or swelling (which happens when CO₂ or oxygen is abnormal).
3. Emergency coronary angiography (heart catheterization) if the ECG shows STEMI or if the arrest rhythm was shockable (VF or pulseless VT) and a heart cause is likely, even if the person is still unconscious → If a blocked coronary artery (the vessel that feeds the heart muscle) caused the arrest, threading a catheter up to the blockage and opening it with a balloon and metal stent restores blood flow to the dying heart muscle, stops ongoing damage, and prevents the heart from arresting again. Current guidelines (AHA 2020) say do not wait for the person to wake up—go to the cath lab right away if STEMI is on the ECG or if a heart attack is the likely cause.
4. Sedation (propofol or midazolam continuous infusion) and analgesia (fentanyl) during TTM; add neuromuscular blockade (paralytic like rocuronium or cisatracurium) if shivering despite sedation → Shivering is the body trying to warm itself up by shaking the muscles, which makes heat and burns oxygen and glucose. Sedation and paralysis stop shivering so the cooling can work. This also keeps the person comfortable (they cannot feel the breathing tube in the throat or the cold) and prevents muscle breakdown (rhabdomyolysis, where muscle breaks down and clogs the kidneys) from constant shaking.
5. Neuroprognostication (figuring out if the brain can recover) using a multimodal approach at ≥ 72 hours after rewarming: clinical exam (pupil and corneal reflexes, motor response to pain), continuous EEG (looking for seizures and background brain activity), brain imaging (MRI preferred, or CT), and serum biomarkers (neuron-specific enolase) → By 72 hours after rewarming, the sedation is cleared and the true extent of brain damage is visible. Combining physical exam, EEG, imaging, and blood tests gives families and the medical team an honest, evidence-based answer: will this person wake up, and if so, will they be able to think, talk, and live independently? This guides shared decisions about continuing life support or transitioning to comfort-focused care. No single test is perfect; you must use all of them together.

Your top priorities at the bedside

1. Keep mean arterial pressure at 65 mmHg or higher using IV fluids first, then add vasopressors like norepinephrine if needed — why: The brain and heart just survived being starved of oxygen and need strong blood flow now to recover and prevent more cell death

2. Start Targeted Temperature Management by cooling the patient to 32 to 36 degrees Celsius using cooling blankets or ice packs and check core temperature every hour — why: Cooling slows down the chemical reactions that cause brain cells to die after they have been without oxygen, giving the brain time to heal
3. Adjust the ventilator to keep oxygen saturation between 94 and 98 percent and carbon dioxide between 40 and 45 mmHg, checking blood gases every 4 hours — why: Too much oxygen creates harmful free radicals that damage recovering brain cells, and wrong carbon dioxide levels change blood flow to the injured brain