

Severe Hyperkalemia with ECG Changes

A plain-English guide for you and your family

WHAT IS HAPPENING

Your heart's muscle cells need the right amount of potassium (symbol K^+ , a mineral salt) both inside and outside to fire in a steady, orderly rhythm. Think of potassium like the spark that lets each heart cell charge up, fire, and then reset for the next beat. When potassium in the blood climbs way too high — above 6.5 — that spark becomes a wildfire: heart cells can't reset properly, and the rhythm turns chaotic. The ECG (the heart-tracing machine) shows the chaos step by step: first the T wave (the reset part of each heartbeat) becomes tall and pointy like a tent peak, then the spaces between beats stretch out, then the whole tracing gets wide and wobbly, and finally it turns into a wavy sine wave that leads straight to cardiac arrest (the heart stops pumping). Meanwhile, skeletal muscles (the muscles you use to move your arms and legs) weaken and can even stop working because they rely on the same potassium balance to fire. What pushes potassium so high? Usually the kidneys are broken (acute kidney injury or chronic kidney disease) and can't dump potassium into urine, or certain blood-pressure medicines (ACE inhibitors like lisinopril, ARBs like losartan, or MRAs like spironolactone) or diuretics (water pills) that spare potassium block the kidneys from letting it go. Sometimes a flood of potassium spills into the blood when muscle breaks down (rhabdomyolysis), cancer cells die in a rush (tumor lysis syndrome), or red blood cells burst (hemolysis). Rarely, a blood draw itself squeezes cells and fakes a high number (pseudohyperkalemia). None of these findings are random — they all trace back to one upstream break: too much potassium sitting outside the cells, poisoning the heart's electrical system. The body has no built-in way to push potassium out when the kidneys or drugs fail, so the heart and muscles stay poisoned until we protect the heart membrane with calcium, shift potassium back into cells with insulin and other agents, and then physically remove it with dialysis or potassium-binding medicines. Every second counts, because the ECG changes are the heart's warning that arrest is close.

What you might feel

- Peaked T waves on ECG (tall, narrow, triangle-shaped T waves)
- Widened QRS complex on ECG (the tall spike stretches out wider than normal)

- Flattened or absent P waves on ECG
- Muscle weakness (feels heavy or hard to move arms and legs)
- Nausea or vomiting
- Tingling or numbness (prickling feeling, usually in fingers, toes, or around the mouth)
- Slow or irregular heartbeat (bradycardia or arrhythmia)
- Lab confirmation: serum potassium ≥ 6.5 mEq/L (often ≥ 7.0 mEq/L) with ECG changes
- Pseudohyperkalemia ruled out (sample was not hemolyzed or clotted)

Call the doctor right away if...

- Peaked T waves, widened QRS, or absent P waves on ECG—the heart's electrical system is breaking down and cardiac arrest can happen within minutes.
- New muscle paralysis or inability to move legs—very high potassium can shut down skeletal muscles completely, and the same process threatens the diaphragm (the breathing muscle).
- Sudden slow heart rate (bradycardia) or irregular rhythm—the heart may stop or fall into ventricular fibrillation (a deadly quivering that cannot pump blood) at any moment.
- Patient on dialysis missed a session, or has acute kidney injury with rising creatinine—the main escape route for potassium is blocked, so levels can skyrocket quickly.
- Watch for rebound high potassium (hyperkalemia) after initial treatment—insulin and albuterol only push potassium temporarily into cells; it drifts back out over hours, so potassium must be removed from the body with dialysis or binding resins to prevent a second spike.

What the care team will do

- Place patient on continuous cardiac monitor and get a 12-lead electrocardiogram immediately, then repeat ECG every 30 to 60 minutes until potassium is safe.
- Give intravenous calcium gluconate 1 gram over 2 to 5 minutes through a large vein, and prepare a second dose to give in 5 minutes if the ECG does not improve.
- Verify the potassium result is real by checking if the blood sample was hemolyzed (red blood cells broke open in the tube) and redraw if needed, but do NOT wait for the new result to treat if the ECG shows changes.
- Administer intravenous regular insulin 10 units plus 50 grams of dextrose (one ampule of D50) over 15 to 30 minutes, but skip the dextrose if fingerstick glucose is above 250 mg/dL.
- Give nebulized albuterol 10 to 20 milligrams (use 4 to 8 times the asthma dose, which is 2.5 mg) by continuous nebulizer over 30 minutes.

- Check arterial blood gas or venous pH, and if pH is below 7.2 (acidemia, meaning the blood is too acidic), give intravenous sodium bicarbonate 50 to 100 milliequivalents over 5 to 10 minutes.
- Eliminate potassium from the body by giving intravenous furosemide (Lasix) 40 to 80 milligrams if the patient makes urine, OR give potassium binders like patiromer (Veltassa) or sodium zirconium cyclosilicate (Lokelma) by mouth or rectum if kidneys do not work.
- Notify the physician immediately if potassium stays above 6.5 after one hour of treatment, if ECG keeps getting worse, if urine output is under 30 mL per hour for 2 hours, or if the patient has chest pain, severe weakness, or confusion—because emergency hemodialysis (dialysis machine) may be needed.

Medicines you may be given — and why

Calcium gluconate (or calcium chloride if a central IV line is in place)

Calcium does not lower the potassium number at all. Instead, it wraps a protective shield around the heart muscle cells so they can still squeeze and relax normally even while potassium is dangerously high. Think of it like putting rubber bumpers on a sensitive switch so it doesn't fire by accident. This buys time—usually 30 to 60 minutes—for the next medicines to actually move potassium out of the blood.

Regular insulin (10 units IV) plus dextrose 50% (one ampule, 25 grams, unless blood sugar is already above 250 mg/dL)

Insulin opens tiny doors (called sodium-potassium pumps) on the surface of muscle and liver cells, pushing potassium from the blood back inside the cells where it belongs. Think of it like turning on a vacuum that sucks potassium out of the bloodstream and tucks it away safely in storage. The dextrose (sugar) keeps blood sugar from dropping dangerously low while insulin does its job. This lowers blood potassium by about 0.5 to 1.2 mEq/L within 15 to 30 minutes, and the effect lasts 4 to 6 hours.

Albuterol (10 to 20 mg by nebulizer, inhaled over 10 minutes)

Albuterol flips on the same cellular pumps that insulin activates—the sodium-potassium pumps—but through a different switch (beta-2 receptors instead of insulin receptors). It pushes potassium from the blood into muscle cells. Think of it like a second vacuum running alongside the insulin vacuum, pulling even more potassium out of the bloodstream. It lowers potassium by about 0.5 to 1.0 mEq/L within 30 minutes, and the effect lasts 2 to 4 hours. It works faster when given in high doses through a nebulizer (the mist machine used for asthma).

Sodium bicarbonate (50 to 100 mEq IV over 5 minutes, or as an infusion)

When the blood is too acidic (low pH, high acid load), cells trade hydrogen ions (acid) for potassium to keep the blood pH from dropping dangerously. This pushes extra potassium out of cells and into the blood. Sodium bicarbonate is a base (the opposite of acid) that neutralizes the extra acid in the blood. Once the blood pH rises, cells stop dumping potassium and may even pull some back in. Think of it like turning off a faucet that was flooding potassium into the bloodstream. This only works when too much acid in the blood (acidosis) (too much acid) is part of the problem—if the blood pH is normal or high, bicarbonate will not help and may be harmful.

Furosemide (40 to 80 mg IV, or higher doses if needed)

Furosemide is a water pill that forces the kidneys to flush extra water, sodium, and potassium out of the body through urine. It works on a part of the kidney's plumbing (the loop of Henle) that normally reabsorbs these chemicals back into the blood. By blocking that reabsorption, furosemide makes the kidneys dump potassium into the urine and out of the body. Think of it like opening a drain valve to let the flood out. This only works if the kidneys are still making urine—if they have shut down (acute kidney injury or end-stage kidney disease), furosemide will not help.

Patiromer or sodium zirconium cyclosilicate (SZC)

These are powders that you swallow (or give through a rectal tube in an emergency). They act like tiny sponges in the gut, soaking up potassium from food, digestive juices, and blood that seeps into the intestines, then carrying it out in the stool. Think of it like a magnet that grabs potassium and won't let go until it leaves the body. They lower potassium by about 0.5 to 1.0 mEq/L over 4 to 7 hours (SZC is faster, patiromer slower). Because they work slowly, they are NOT the first choice in a true emergency with dangerous heart rhythms—they are used alongside or after the faster treatments.

Hemodialysis

Hemodialysis is an artificial kidney machine. It pulls blood out of the body, runs it through a filter (dialyzer) with tiny pores, and washes potassium, acid, and other waste products out of the blood into a cleansing fluid (dialysate), then returns the clean blood. Think of it like running dirty water through a coffee filter that traps the grit. Dialysis removes potassium faster and more completely than any medication—it can drop potassium by 1.0 to 1.5 mEq/L per hour. It is the definitive treatment when kidneys have failed, when medications are not working, or when potassium is so high that waiting is too dangerous.

Where this information comes from

- American Heart Association (AHA) ACLS guidelines

- National Kidney Foundation KDOQI guidelines
- UpToDate clinical reference (Nephrology)
- Journal of the American Society of Nephrology (JASN)

Last reviewed: 2026-07-07