

ESRD & Dialysis Complications

A plain-English guide for you and your family

WHAT IS HAPPENING

Your kidneys are two bean-shaped organs that sit in your lower back, one on each side of your spine. Every minute, they filter your entire blood supply, pulling out waste (like urea and creatinine, which are leftovers from breaking down protein and muscle), balancing minerals (sodium, potassium, calcium, phosphorus), removing extra fluid, controlling acid levels in your blood, and making hormones that keep your blood pressure steady, build red blood cells, and keep your bones strong. When kidneys fail—meaning they work less than 15% of normal—this is called end-stage renal disease or ESRD. Without working kidneys, waste and fluid pile up in your blood, potassium climbs to dangerous levels (which can stop your heart), acid builds up (making you feel weak and confused), your blood pressure swings, you become anemic (low red blood cells, so you feel exhausted), and your bones weaken. To survive, you need either dialysis (a machine that does some of the kidney's cleaning work) or a kidney transplant. Hemodialysis is done in a center 3 times a week for about 4 hours each time; blood flows out through a special vascular access (usually an arteriovenous fistula, a surgically joined vein and artery in your arm that creates a strong vessel you can stick needles into), gets cleaned by the dialysis machine, and flows back in. Between sessions, though, waste, potassium, and fluid slowly build back up—so you have to watch your diet (low potassium, low phosphorus, limited fluid) and protect your access from infection and clots. Common problems include: feeling wiped out or nauseous after dialysis (from rapid fluid and chemical shifts), low blood pressure during treatment (because fluid is pulled off fast), access infections (the entry site can let bacteria in), access clots (the fistula or graft can clog), high potassium between sessions (which can cause dangerous heart rhythms), fluid overload (swelling, trouble breathing), bone disease (from high phosphorus and low activated vitamin D), and heart disease (the leading cause of death in dialysis patients). None of this is random—each symptom traces back to the fact that your body is trying to survive without kidneys, and dialysis can only do part of the job, not all of it.

What you might feel

- Swelling in the legs, ankles, or face

- Shortness of breath
- Feeling very tired and weak all the time (fatigue)
- Itching all over (uremic itching (pruritus))
- Nausea, vomiting, or loss of appetite
- Trouble thinking clearly or concentrating (brain fog)
- Muscle cramps, especially during or after dialysis
- Chest pain or irregular heartbeat (arrhythmia)
- Fever, redness, warmth, or pus at the dialysis access site (catheter or fistula)
- Very high blood pressure that does not come down with medicine

Call the doctor right away if...

- Sudden severe shortness of breath or chest pain — may mean fluid in the lungs or a heart problem and needs emergency care right away.
- Fever with chills, especially with redness, warmth, or drainage at the dialysis catheter or fistula site — may be a blood infection (sepsis) and needs antibiotics and urgent evaluation.
- New confusion, severe headache, seizure, or trouble staying awake — may mean toxins are affecting the brain (uremic encephalopathy) or there is bleeding in the brain and needs immediate attention.
- Irregular heartbeat, palpitations, or feeling like the heart is racing or skipping beats — may be dangerously high potassium and needs an ECG and emergency treatment to protect the heart.

What the care team will do

- Assess dialysis access site for thrill, a whooshing sound over a vessel (bruit) (whooshing sound with stethoscope), redness, swelling, warmth, and drainage every 4 hours
- Weigh patient on same scale at same time daily and compare to dry weight (goal weight after dialysis removes extra fluid)
- Monitor vital signs and assess for fluid overload: listen to lung sounds for crackles, check jugular venous distension (bulging neck veins), and examine ankles for pitting swelling (edema) (indents when pressed)
- Protect the dialysis access arm: no blood pressure cuffs, no needle sticks, no tight clothing or jewelry, and post signs at bedside
- Monitor potassium levels and assess for high potassium (hyperkalemia) signs: muscle weakness, irregular heartbeat, or ECG changes (tall peaked T waves, wide QRS)
- Administer phosphate binders with meals and monitor calcium and phosphorus lab values

- Teach and reinforce fluid restriction based on urine output plus 500 to 750 milliliters per day, and provide strategies like ice chips or frozen lemon wedges for thirst
- Assess for anemia symptoms (fatigue, shortness of breath, pale skin) and ensure ESA and iron supplementation are given as prescribed

Medicines you may be given — and why

Phosphate binders (sevelamer, calcium acetate, lanthanum)

When your kidneys fail, they can't clear phosphorus from food, so it builds up in your blood and pulls calcium out of your bones and into your arteries, making them stiff like rock. Phosphate binders stick to phosphorus in your stomach and gut so it leaves in your stool instead of entering your blood.

Active vitamin D (calcitriol, paricalcitol)

Healthy kidneys turn regular vitamin D into its active form, which tells your gut to absorb calcium and tells your parathyroid glands (four tiny glands in your neck that control calcium and bone) to calm down. In ESRD your kidneys can't do that conversion, so your parathyroid glands overproduce parathyroid hormone (PTH), which eats away at your bones. Active vitamin D replaces what your kidneys can no longer make.

Calcimimetics (cinacalcet, etelcalcetide)

Your parathyroid glands have a sensor that detects how much calcium is in your blood. In ESRD, low active vitamin D and high phosphorus make the glands think calcium is too low, so they pour out PTH, which pulls calcium from your bones. Calcimimetics trick the sensor into thinking blood calcium is higher than it really is, so the glands make less PTH.

Erythropoiesis-stimulating agents (epoetin alfa, darbepoetin alfa)

Healthy kidneys make erythropoietin (EPO), a hormone that tells your bone marrow to build red blood cells. In ESRD your kidneys make almost none, so your marrow slows down and you become anemic (not enough red cells to carry oxygen). ESAs are lab-made versions of EPO that restart red-cell production.

Iron supplementation (oral ferrous sulfate or IV iron sucrose, ferric gluconate, iron dextran)

Red blood cells need iron to make hemoglobin, the protein that carries oxygen. Dialysis patients lose iron through blood left in the dialysis tubing, frequent blood tests, and poor gut absorption. Without enough iron, even ESAs can't build red cells effectively. Iron supplements refill your body's iron stores.

Antihypertensives (ACE inhibitors, ARBs, beta-blockers, calcium-channel blockers, diuretics in early ESRD)

ESRD patients often have high blood pressure because damaged kidneys can't shed salt and water, and they release too much renin (a hormone that tightens blood vessels). High BP over time damages the heart and speeds up dialysis-access clotting. Blood-pressure medicines work in different ways—some relax vessels, some slow the heart, some block the kidney's renin system, and some (early on) help remove extra fluid.

Potassium binders (sodium polystyrene sulfonate, patiromer, sodium zirconium cyclosilicate)

Healthy kidneys clear potassium from your blood into urine. In ESRD, potassium builds up between dialysis sessions, and high levels (hyperkalemia) can stop your heart. Potassium binders work in your gut: they grab potassium from food and digestive juices and trap it so it leaves in your stool instead of entering your blood.

Immunizations (inactivated influenza, pneumococcal [PCV13 + PPSV23], hepatitis B, COVID-19, Tdap)

ESRD and dialysis weaken your immune system (dialysis filters and severe waste buildup in the blood (uremia) both blunt white-cell function), making infections more dangerous. Vaccines train your immune system by showing it a harmless piece or weakened form of a germ, so your body builds antibodies and memory cells that recognize and fight the real infection quickly if you encounter it. Dialysis patients often need higher or extra doses because their immune response is weaker.

Where this information comes from

- KDIGO Clinical Practice Guideline for CKD and Dialysis 2012 (updated 2020)
- National Kidney Foundation KDOQI Guidelines
- American Journal of Kidney Diseases (AJKD)
- UpToDate Nephrology

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