

Nephrotic Syndrome

Nephrotic syndrome means the kidney filter is leaking protein into the urine. Every weird finding after that—swelling, high cholesterol, clots, infections—comes from the same upstream break.

THE ONE-LINE TRUTH

The kidney's filter broke and now protein leaks out, so the blood loses what it needs to hold fluid inside vessels.

The chain — how it unfolds

1. Podocyte damage opens gaps in the glomerular filter. — why: The podocytes (foot cells on the outside of the glomerular capillary) lose their tight foot-process structure and negative charge. Gaps appear, and the barrier that normally blocks albumin from leaving the blood is gone.
2. Albumin pours into the urine (proteinuria ≥ 3.5 g/day). — why: Albumin is negatively charged and normally repelled by the podocyte charge barrier. Once that barrier breaks, albumin floods through into the urine faster than the liver can replace it.
3. Serum albumin drops below 3 g/dL (hypoalbuminemia). — why: You lose more albumin in the urine every day than your liver can make, so blood albumin level falls. Albumin is the main protein holding fluid inside your vessels (oncotic pressure), so oncotic pressure drops.
4. Fluid leaks out of blood vessels into tissues → swelling (edema). — why: With low oncotic pressure, the balance between hydrostatic pressure (pushing fluid out) and oncotic pressure (pulling fluid in) tips outward. Fluid shifts into the interstitial space, causing puffiness around the eyes (periorbital swelling (edema), worst in the morning), swollen legs and ankles, fluid buildup in the belly (ascites) (fluid in the belly), and sometimes pleural a fluid collection (effusion) (fluid around the lungs).
5. The liver makes more cholesterol and lipoproteins → hyperlipidemia. — why: The liver senses low albumin and tries to help by ramping up synthesis of all proteins, including lipoproteins (VLDL, LDL). Total cholesterol often goes above 300 mg/dL. You may see lipiduria—oval fat bodies and fatty casts in the urine under the microscope.

6. Antithrombin III, protein C, and protein S leak out → hypercoagulable state. — why: These natural anticoagulant proteins are small enough to leak through the damaged filter. At the same time, the liver makes more clotting factors (fibrinogen, factors V, VIII). The balance tips toward clotting. Renal vein clot formation (thrombosis) (sudden flank pain, blood in the urine (hematuria), worsening kidney function) and pulmonary embolism (a clot lodging in a lung artery) (chest pain, shortness of breath) are serious risks.
7. Immunoglobulins (IgG) leak out → increased infection risk. — why: Antibodies that normally coat bacteria (opsonize them) are lost in the urine. Encapsulated bacteria—especially *Streptococcus pneumoniae*—become dangerous. Children with nephrotic syndrome are at high risk for spontaneous bacterial peritonitis and pneumonia.
8. Every symptom you see comes from one upstream break: podocyte injury causing low albumin. — why: Trace it backward: foamy urine, swelling, high cholesterol, clot risk, infection risk—all point to the same source. Fix the filter (treat the underlying cause—steroids for minimal change, control sugar in diabetes, stop the offending drug) and the dominoes reverse. The body was never broken randomly; every sign is the emergency response to losing albumin.

Spot it — what you see, and why

- Swelling around the eyes and in the legs (edema): The kidneys leak huge amounts of albumin (the main protein that keeps water inside blood vessels) into the urine, so water seeps out of the blood and pools in the tissue under the skin, especially in loose areas like the eyelids and ankles where gravity or tissue stretch let fluid collect easily.
- Foamy or frothy urine: Protein spilling into the urine acts like soap — it traps air bubbles when you pee, making the toilet water look foamy or sudsy, just like shaking a bottle of dish soap and water.
- Weight gain (often several pounds in a few days): Fluid is building up in the body's tissues faster than you can pee it out, so the extra water weight shows up on the scale before you even notice visible swelling.
- Fatigue and low energy: Losing albumin drains the fuel your cells need to work well, and carrying extra fluid weight is like hauling around heavy bags all day — it wears you out.
- Loss of appetite or belly fullness: Fluid can leak into the lining of the belly (ascites), pressing on the stomach and intestines so you feel stuffed even when you haven't eaten much.
- High cholesterol and fats in the blood: The liver tries to make up for lost albumin by ramping up all protein production, but it accidentally also churns out extra cholesterol and triglycerides (fats), flooding the bloodstream with them.

Red flags — act now

- Sudden chest pain or trouble breathing (may mean a blood clot traveled to the lungs)
- Fever with chills or a new cough (may mean pneumonia or another serious infection)
- Severe belly pain or swelling that comes on fast (may mean infection of fluid in the belly or a clot in a belly vein)
- Blood in the urine that you can see, or urine that turns cola-colored (may mean the kidneys are inflamed in a dangerous way, not just leaking)
- Swelling so bad you can't breathe well lying flat, or swelling in the face and throat (may mean fluid is backing up into the lungs or airway)

Treat it — in this order

1. ACE inhibitor (e.g., lisinopril) or ARB (e.g., losartan) → Relaxes the blood vessels inside the kidney filter (the glomerulus) and lowers the pressure squeezing protein out through the damaged podocytes (the filter cells). This slows the protein leak and protects the kidney from further damage.
2. Loop diuretic (e.g., furosemide) plus low-sodium diet (under 2 grams of sodium per day) → Pulls extra water out through the kidneys so swelling in the legs, face, and lungs goes down and breathing gets easier. Limiting salt stops the body from holding onto more fluid.
3. Disease-specific therapy: corticosteroids (e.g., prednisone) for minimal change disease, immunosuppressants (e.g., cyclosporine, tacrolimus, rituximab) for FSGS or membranous nephropathy, or tight diabetes and blood pressure control for diabetic nephropathy → Targets the actual cause damaging the podocytes or the immune attack destroying the filter, so protein stops leaking and albumin levels rise back toward normal.
4. Statin (e.g., atorvastatin or simvastatin) → Lowers the high cholesterol that builds up when the liver over-produces it to try to replace lost albumin. This reduces the long-term risk of heart disease and blood clots.
5. Anticoagulation (warfarin or low-molecular-weight heparin such as enoxaparin) if albumin is less than 2.0 to 2.5 g/dL or a clot is found → Prevents new blood clots from forming in veins and arteries because the kidney is losing antithrombin (a protein that stops clots) in the urine, making the blood sticky.

Your top priorities at the bedside

1. Weigh the patient daily at the same time with the same clothing and record strict intake and output every shift — why: Fluid retention from low albumin causes swelling (edema) (swelling); daily weights detect fluid overload before it becomes severe pulmonary edema (fluid flooding the lungs) (fluid in lungs), and tracking helps adjust diuretic (water pill) doses
2. Monitor blood pressure every 4 hours and report systolic over 140 or diastolic over 90 immediately — why: Damaged kidneys activate the renin-angiotensin-aldosterone system (a hormone chain that raises blood pressure), causing high blood pressure (hypertension) (high blood pressure) that worsens kidney damage; ACE inhibitors or ARBs lower pressure and reduce proteinuria
3. Check albumin and protein levels and watch for signs of blood clots like sudden leg swelling, chest pain, or shortness of breath — why: When albumin drops below 2.5 grams per deciliter, the liver overproduces clotting factors and blood becomes hypercoagulable; venous thromboembolism (clots in veins) happens in 25 percent of patients and needs immediate anticoagulation (blood thinners)