

Kidney Stone (Ureterolithiasis)

A pebble in the drainpipe. Everything upstream is under pressure until it moves.

THE ONE-LINE TRUTH

A tiny rock slides down the drain from kidney to bladder and gets wedged in the pipe, so the kidney backs up and the body screams.

The chain — how it unfolds

1. A stone forms in the kidney over weeks to months. — why: When pee gets too concentrated, minerals like calcium and oxalate stick together and crystalize into a hard pebble.
2. The stone slips out of the kidney and enters the ureter. — why: Gravity and the flow of pee push the stone down the drain.
3. The stone gets stuck at one of the three natural narrow spots in the ureter. — why: The ureter is only about 2 to 3 millimeters wide at its narrowest — barely wider than a pencil lead — so even a small stone can wedge tight.
4. The ureter cramps hard trying to squeeze the stone along. — why: Smooth muscle in the ureter wall reacts to the blockage by spasming in waves, which is what causes the intense, cramping pain of renal colic.
5. Pressure backs up into the kidney, swelling the renal pelvis (hydronephrosis). — why: Pee keeps being made but has nowhere to go, so it pools and stretches the kidney.
6. Pain, blood in the pee, and nausea hit hard and fast. — why: The cramping ureter and the stretched kidney capsule both send pain signals, and the pain is so severe it triggers a reflex that makes you throw up.
7. If untreated, the kidney can get injured, infected pee can pool above the block, or sepsis can set in. — why: Backpressure damages the kidney's filters over time, and stagnant infected pee is a setup for bacteria to spill into the bloodstream.

Spot it — what you see, and why

- Sudden, severe pain in the side (flank) that shoots down to the groin: The stone is stuck in the ureter (the thin tube that carries pee from the kidney to the bladder), causing it to squeeze hard in waves—like trying to push a pebble through a straw. At the same time, the kidney's outer shell (the capsule) stretches from backed-up urine. These squeezing waves (called colic) come and go every 20 to 60 minutes.
- Restlessness—constantly shifting position, can't sit still or get comfortable: Belly pain from organs inside a bag (the peritoneum)—like from the appendix—makes you lie still because movement hurts more. But kidney-stone pain comes from the ureter, which squeezes in waves, so your body instinctively moves around trying to find relief.
- Blood in the urine (pink, red, or brown pee, or only visible under a microscope): The sharp edges of the stone scrape the inside lining of the ureter as it moves, tearing tiny blood vessels and letting red blood cells leak into the urine.
- Nausea and vomiting: The nerves that sense pain from the ureter share wiring in the spinal cord with nerves that trigger the brain's vomiting center (the area postrema in the brainstem). When the ureter sends a pain signal, the vomiting center gets switched on as well.
- Needing to pee often and urgently, especially when the stone is almost in the bladder: When the stone reaches the ureterovesical junction (UVJ—the spot where the ureter empties into the bladder), it rubs and irritates the bladder wall, making the bladder feel full and triggering the urge to pee even when little urine is inside.
- Fever and shaking chills: If bacteria are trapped behind the stone, they multiply in the backed-up urine and release toxins into the bloodstream (sepsis). The hypothalamus (the brain's thermostat) raises body temperature to fight infection, causing fever and chills.

Red flags — act now

- Fever in a patient who has a swollen, backed-up kidney (hydronephrosis) on imaging → Start IV antibiotics immediately and call urology within hours to drain the kidney, either by placing a thin tube through the bladder up past the stone (ureteral stent) or through the skin into the kidney (nephrostomy tube).
- No urine output (anuria) and creatinine rising in the blood → Emergency CT scan to confirm obstruction and urgent urology consultation to restore urine flow, usually with stents or drainage tubes.
- Stone larger than 10 millimeters (about the width of a small pea) → Refer to urology for removal, typically with shock waves that break the stone from outside the body (extracorporeal shock wave lithotripsy, ESWL) or a thin camera and tools passed through the bladder (ureteroscopy).

- Severe pain that does not get better even with strong IV pain medicines (like ketorolac or morphine) → Admit to the hospital for continuous pain control and urology evaluation, often leading to urgent intervention to relieve the blockage.

Treat it — in this order

1. Intravenous (IV) fluids plus IV ketorolac (an NSAID pain medicine), with opioid rescue if needed → Fluids rehydrate the person and help flush the urinary system. Ketorolac lowers prostaglandins (chemicals that make the ureter spasm and swell), which eases the waves of pain. Opioids (like morphine) can be added if ketorolac alone is not enough.
2. IV ondansetron (an anti-nausea medicine) → Blocks serotonin (a brain messenger that triggers vomiting) in the gut and brain, stopping nausea and vomiting caused by ureteral irritation and pain signals.
3. Tamsulosin (an alpha-blocker) for medical expulsive therapy → Relaxes the smooth muscle in the ureter wall, widening the tube so stones (especially distal stones between 5 and 10 mm) can pass more easily and faster. Typically taken once daily for up to 4 weeks.
4. Ureteral stent or percutaneous nephrostomy tube (a drainage tube through the skin into the kidney) → Restores drainage of urine past or around the stone, relieving pressure on the kidney. This is life-saving in an infected, obstructed kidney (obstructive pyelonephritis) because it stops bacteria from backing up into the bloodstream.
5. Extracorporeal shock wave lithotripsy (ESWL) or ureteroscopy with laser lithotripsy → ESWL uses sound waves from outside the body to break the stone into small pieces that can pass. Ureteroscopy threads a tiny camera and laser up through the urethra and bladder to the ureter, then breaks up or plucks out the stone. Both remove the stone and clear the blockage.

Your top priorities at the bedside

1. Give scheduled + PRN analgesia early — why: Colic pain is severe. Waiting causes suffering and prolongs vomiting.
2. Strain all urine and save any stone passed — why: Chemistry guides prevention strategy.
3. Monitor for fever and vital-sign trends — why: Sepsis in an obstructed infected system develops fast.