



Nephrolithiasis

Most stones pass and most patients go home · which makes the two exceptions the whole point

Fever + obstruction
= decompress within hours

⚠ THE EMERGENCIES *everything else on this sheet is analgesia and follow-up*

⚠ OBSTRUCTION PLUS INFECTION

Fever, rigors or systemic signs in an obstructed kidney means **pus under pressure**: antibiotics cannot penetrate it, and the patient can progress to sepsis and irreversible renal damage **within hours**. **Urgent decompression -ureteral stent or percutaneous nephrostomy- plus antibiotics and resuscitation**. Definitive stone treatment waits until infection is controlled. **Fever is NOT a feature of uncomplicated renal colic**.

THE OTHER REASONS NOT TO DISCHARGE

Acute kidney injury, a solitary or transplanted kidney, or bilateral obstruction -all of which are functional anuria- plus **intractable pain or vomiting** and high-grade obstruction. Everything else with controlled pain, tolerated oral intake, normal renal function and no infection goes home on expectant management, which is most patients.

⚠ THE MIMIC THAT KILLS

An older patient with "first-time renal colic" may have a **leaking abdominal aortic aneurysm** -a classic fatal misdiagnosis, because the pain and the demographic overlap. Also appendicitis, ovarian torsion, ectopic pregnancy, mesenteric ischemia. **First-time colic in an older patient deserves scepticism, not a reflex diagnosis**.

DIAGNOSIS AND ACUTE MANAGEMENT *two commonly overestimated interventions*

Step	Detail
Imaging	Non-contrast CT is the gold standard -detects all stone types including radiolucent uric acid stones, gives size and location, finds the alternatives. Use low-dose protocols : comparable accuracy at a fraction of the radiation, which matters in a recurrent disease affecting young patients repeatedly. Ultrasound first in pregnancy and children (detects hydronephrosis well, misses mid-ureteral stones)
Labs	Urinalysis (a negative urinalysis does NOT exclude a stone -hematuria is absent in a meaningful minority), culture if infection suspected, CBC, creatinine, electrolytes and calcium (raised calcium points to primary hyperparathyroidism). Urine pH : persistently acidic (< 5.5) suggests uric acid; persistently alkaline (> 7) suggests struvite or distal RTA
Analgesia	NSAIDs are first-line and outperform opioids : they reduce ureteral smooth muscle tone and inflammatory edema as well as treating pain, with less nausea and sedation. Check renal function, volume status and for a solitary kidney first ; use opioids where NSAIDs are unsafe
⚠ What does NOT work	IV fluids do not flush stones out -forced diuresis has no proven expulsion benefit; give fluid for dehydration from vomiting. Tamsulosin's benefit is modest and concentrated in DISTAL stones over about 5 mm , not universal
Size predicts passage	Under ~5 mm passes in the large majority; 5-10 mm in roughly half; over ~10 mm rarely passes and usually needs intervention. Distal stones pass more readily than proximal. Arrange follow-up imaging if passage is not witnessed : silent obstruction damages kidneys, and "the pain stopped" is not proof
Definitive options	Ureterscopy with laser lithotripsy (highest stone-free rates, most locations), shock wave lithotripsy (non-invasive, less effective for lower pole, large or dense stones such as cystine), percutaneous nephrolithotomy for large or staghorn burden

STONE TYPES DRIVE TREATMENT *which is why straining the urine matters*

Type	Features and what changes
Calcium oxalate <i>the majority</i>	Radiopaque. Driven by low urine volume, hypercalciuria, hyperoxaluria, hypocitraturia . Prevention is where the work is
Calcium phosphate	Radiopaque; associated with higher urine pH, distal (type 1) RTA, and primary hyperparathyroidism -so an alkaline urine with these stones should trigger a look for both
Uric acid	RADIOLUCENT on plain film (seen on CT), forms in persistently acidic urine ; associated with gout, diabetes, obesity, chronic diarrhea. These are the stones that can be DISSOLVED medically with alkalinization to pH 6.5-7 using potassium citrate
⚠ Struvite	Form in alkaline urine from urease-producing organisms (Proteus, Klebsiella, Staph saprophyticus - not E. coli), growing into staghorn calculi . The bacteria live inside the stone matrix, so antibiotics cannot sterilize it and any residual fragment reseeds infection: complete surgical clearance is required , usually percutaneous
Cystine	Rare autosomal recessive cystinuria: young patient, recurrent stones, hexagonal crystals, dense stones resistant to shock wave lithotripsy

PREVENTION *recurrence approaches half within a decade, and this conversation is the one most often skipped*

⚠ NEVER RESTRICT DIETARY CALCIUM

Dietary calcium binds oxalate in the gut and prevents its absorption. Restricting it leaves more free oxalate to be absorbed and excreted, so urinary oxalate **RISES** and stone risk **INCREASES** -the exact opposite of the intent, and one of the most common counterproductive instructions in medicine. **Take normal dietary calcium WITH meals** so it binds oxalate where the oxalate is.

WHAT TO ADVISE INSTEAD

Fluid sufficient to produce at least 2-2.5 L of URINE per day -the single most effective measure across every stone type; give the target in urine output, not glasses of water. **Reduce sodium** (it drives calcium excretion). **Moderate animal protein** (acid load raises calcium and uric acid, lowers citrate). **Limit high-oxalate foods** (spinach, rhubarb, nuts, chocolate, tea) in oxalate formers.

Targeted therapy	Indication and mechanism
24-hour urine	Volume, calcium, oxalate, citrate, uric acid, sodium, pH -in recurrent formers, bilateral disease, children, solitary kidney, or family history . Collect after the acute episode settles, on the usual diet
Thiazide diuretic	Hypercalciuria -reduces urinary calcium excretion, and the effect is enhanced by concurrent sodium restriction
Potassium citrate	Hypocitraturia, uric acid stones, distal RTA -citrate binds calcium in urine and inhibits crystallization, and raises urinary pH
Allopurinol	Hyperuricosuric calcium oxalate formers, and uric acid stones where alkalinization alone is insufficient

PEARLS & PITFALLS

- Distal stones masquerade as UTI**: a stone at the ureterovesical junction causes urgency, frequency and dysuria, which is how renal colic gets treated with antibiotics.
- Renal colic patients writhe; peritonitis patients lie still**. The inability to find a comfortable position is a genuinely useful bedside discriminator.
- Strain the urine and send the stone**. Composition is the single most useful preventive information available, and it is routinely lost because nobody hands out a strainer.
- Give the prevention advice at the FIRST stone**, not the third -recurrence approaches half within a decade, and the emergency visit is where the opportunity is usually missed.

