

The Backward Flow Brief: *VUR, Hydronephrosis & Ureterovesical Reflux*

Everything a pediatric nurse must know — pathophysiology, grading, red flags, management & parent teaching — distilled for the Next Gen NCLEX in one page.

01 Pathophysiology at a Glance

● What's actually happening?

In healthy anatomy, urine flows **one way**: kidney → ureter → bladder → urethra. The **ureterovesical junction (UVJ)** acts as a one-way valve. When that valve fails, urine refluxes **backward** — setting off a cascade of infection, pressure, and potential kidney scarring.

VUR Vesicoureteral Reflux

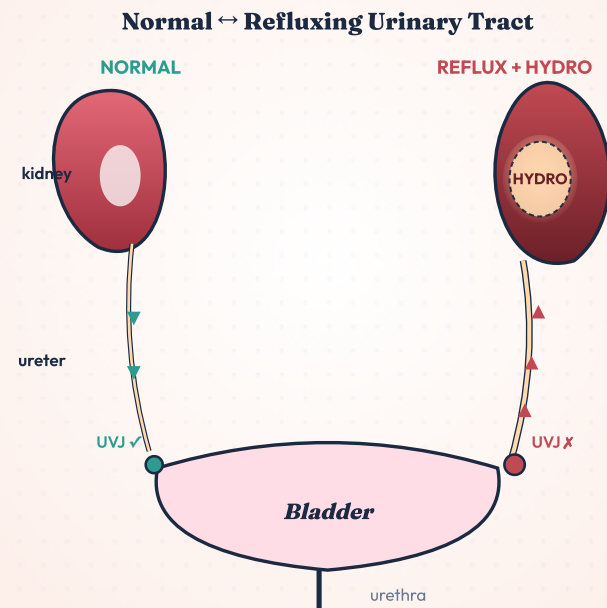
Urine flows **backward** from bladder → ureter → kidney. Most common reason for pediatric UTI recurrence.

UVR Ureterovesical Reflux

Reflux specifically at the **UVJ** — the valve between ureter & bladder. Essentially the mechanism *behind* VUR.

HYDRO Hydronephrosis

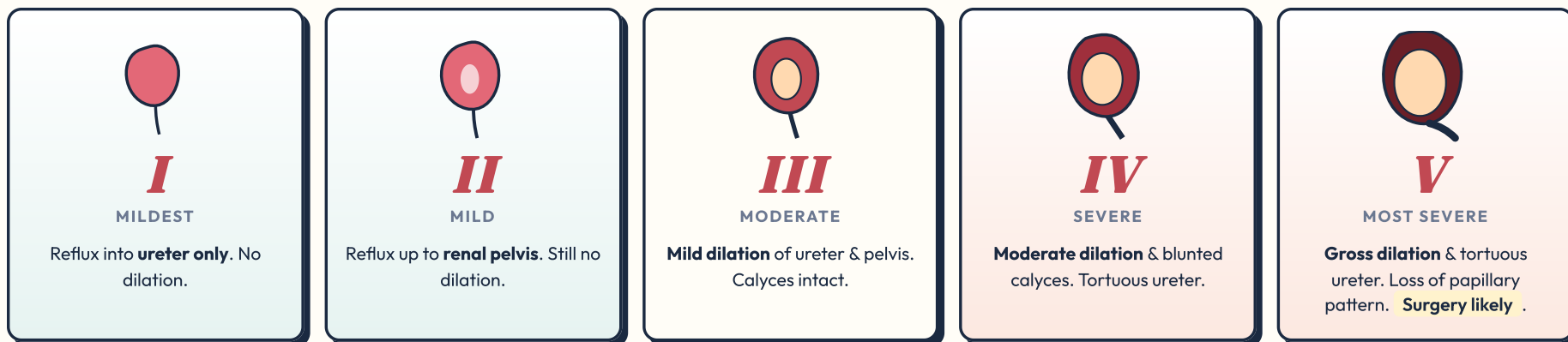
Swelling of the renal pelvis from urine backup or obstruction. It is a **consequence**, not a disease — caused by VUR, UPJ obstruction, posterior urethral valves, or stones.



Left: one-way UVJ valve keeps urine flowing downward. Right: incompetent UVJ → backflow → ureter dilates → renal pelvis swells (hydronephrosis).

⚠ **NCLEX Clue:** Any infant or toddler with **recurrent/febrile UTI**, **failure to thrive**, or a prenatal ultrasound finding of hydronephrosis — **think VUR**. Undiagnosed reflux → pyelonephritis → renal scarring → HTN & CKD.

02 International VUR Grading (I – V)



Grades I–III: often resolve with growth → watch & prophylaxis Grades IV–V: less likely to self-resolve → surgical repair considered

03 Signs, Symptoms & Diagnostics

● Clinical Signs by Age

Kids don't always say "it burns" — know age-based clues.

Infants (<2 yrs):

- Fever **without a source** (▮ classic)
- Poor feeding, vomiting, irritability
- Failure to thrive, foul-smelling urine
- Jaundice in neonates

Toddlers & Preschool:

- Dysuria, urgency, frequency

● Diagnostic Workup

- Urinalysis & urine culture** — first step (clean-catch or cath in non-toilet-trained).
- Renal + bladder ultrasound (RBUS):** screens for hydronephrosis, renal size, scarring. *Non-invasive → often first imaging.*
- ★ **GOLD STANDARD** **Voiding cystourethrogram (VCUG):** confirms & **grades VUR**. Catheter placed → bladder filled with contrast → child voids while fluoroscopy captures reflux.
- DMSA renal scan:** detects **renal scarring** & pyelonephritis. Used when kidney damage is suspected.

- **New-onset enuresis** in a previously toilet-trained child
- Abdominal/flank or suprapubic pain
- Hematuria, cloudy urine

School-age & Adolescent:

- Flank pain, CVA tenderness (pyelonephritis)
- Elevated BP — think **reflux nephropathy**
- Proteinuria on routine screening

- **BUN, creatinine, BP:** baseline renal function & monitoring for nephropathy.
- **Urodynamic studies:** if bladder-bowel dysfunction suspected.

💡 **VCUG prep teaching:** Explain catheter placement in *developmentally appropriate* terms (e.g., “a tiny straw”), allow a comfort item, warn parents about **pink-tinged urine** & mild dysuria for 24 h post-procedure, push fluids, monitor for fever (could indicate post-procedure UTI).

04 Management — Three Tiers of Care

TIER 1 · CONSERVATIVE

Watchful Waiting

Grades I–III, infants, no breakthrough UTIs.

- Annual imaging (US ± VCUG)
- Monitor BP, growth, UA
- **Hydration** + timed voiding
- Treat constipation (huge contributor to reflux & UTI!)
- Perineal hygiene; wipe **front-to-back**
- Spontaneous resolution: ~80% Grade I–II, ~50% Grade III by age 5

TIER 2 · MEDICAL

Antibiotic Prophylaxis

Febrile UTI, breakthrough infections, Grade III+.

- **TMP-SMX (Bactrim)** or **Nitrofurantoin** — single bedtime dose at $\frac{1}{4}$ – $\frac{1}{3}$ treatment dose
- *Avoid nitrofurantoin <1 month of age*
- **Amoxicillin** in neonates
- Monitor for breakthrough UTI, GI upset, rash
- Check CBC periodically (Bactrim → neutropenia risk)
- Stress **adherence** — missed doses = infection risk

TIER 3 · SURGICAL

Ureteral Reimplantation

Grades IV–V, breakthrough febrile UTIs, worsening scarring, non-adherence.

- **Endoscopic injection (Deflux®):** bulking agent at UVJ — outpatient, minimally invasive
- **Open/robotic ureteral reimplantation:** creates a new, longer submucosal tunnel — ~95% success
- Post-op: **bladder spasms**, hematuria (expected 1–3 days), indwelling catheter, stents
- Pain control: **oxybutynin** for spasms
- Continue prophylactic antibiotic until follow-up VCUG clears

05 Parent & Family Teaching

“Keep the plumbing flowing & the infection out.”

Priority teaching points for NGN item writers & real-life parents.

DAILY ROUTINE

- **Push fluids** — aim for pale yellow urine; water is best.
- **Void every 2–3 hours**; use a **double-void** technique (void, wait 1 min, void again).
- Prevent **constipation** — fiber, fluids, squatty-potty position. Constipation worsens reflux.
- Perineal hygiene: wipe **front to back**, cotton underwear, avoid bubble baths & scented soaps.
- No “holding it” — schedule toileting at school.

MEDICATION & MONITORING

- Give prophylactic antibiotic **at bedtime** (longest contact time in bladder).
- **Do not skip doses** — even when child “feels fine.”
- Keep a **UTI symptom log** (fever, dysuria, foul urine).
- Call provider for: fever $\geq 38^{\circ}\text{C}$, back/flank pain, vomiting, decreased urine output.
- Attend **all follow-up imaging** — VCUG is repeated to confirm resolution.
- Monitor blood pressure yearly (kids with VUR are at lifelong HTN/CKD risk).

06 NGN High-Yield Quick Hits

⚡ “If you remember nothing else...”

- 1 **Febrile UTI in a child < 2** → rule out VUR with RBUS + VCUG. This is a *classic* NGN matrix item.
- 2 **VCUG = gold standard** for diagnosing *and grading* VUR. US alone **cannot** grade reflux.
- 3 **Hydronephrosis is a SIGN** (swelling), not a diagnosis — always ask *what’s causing it?*
- 4 **Constipation** is a leading cause of breakthrough UTI in VUR kids — always assess bowel habits.
- 5 **Prophylaxis is given at bedtime**, low dose, *long-term*. Monitor adherence & side effects.
- 6 Post ureteral reimplantation → expect **bladder spasms & hematuria**. Treat with **oxybutynin**; hematuria should clear by day 3.
- 7 Long-term risks of untreated VUR: **renal scarring** → HTN → CKD → ESRD. This is why follow-up matters.
- 8 NGN *bow-tie* tip: link **fever without source** → VUR → prophylactic antibiotics + hydration + follow-up imaging.

07 Quick Compare: VUR vs. Hydronephrosis vs. UVR

FEATURE	VESICoureTERAL REFLUX (VUR)	HYDRONEPHROSIS	URETEROVESICAL REFLUX (UVR)
What it is	Backflow of urine from bladder → ureter → kidney	Swelling of renal pelvis from urine backup/obstruction	Reflux specifically at the UVJ — the mechanism behind VUR
Cause	Incompetent UVJ (primary) or obstruction/neurogenic bladder (secondary)	VUR, UPJ obstruction, posterior urethral valves, stones, tumors	Short submucosal ureteral tunnel, congenital valve defect
Classic finding	Febrile UTI w/o source; diagnosed on VCUG	Prenatal US finding; flank mass in infant	Seen on VCUG as backflow at the UVJ
Gold-standard Dx	VCUG (graded I–V)	Renal/bladder ultrasound (SFU grade 1–4)	VCUG
First-line care	Prophylactic antibiotics + watchful waiting	Treat the underlying cause; relieve obstruction	Treat as VUR — prophylaxis ± surgical reimplant
Priority complication	Pyelonephritis → renal scarring → HTN/CKD	Loss of renal function, infection, pain	Recurrent UTI, ascending infection

◆ *The Backward Flow Brief • Pediatric GU Review*

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