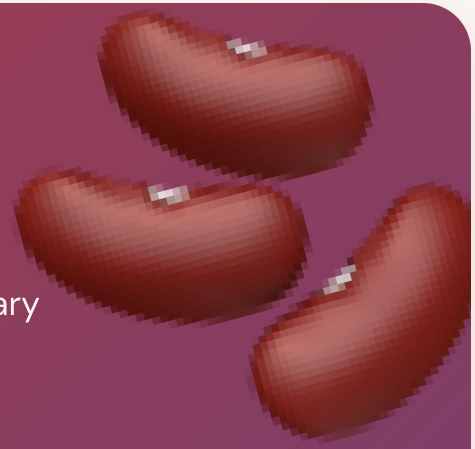
NGN NCLEX 2026 · RENAL/URINARY SYSTEM

Pyelonephritis



Bacterial infection of the kidney parenchyma, renal pelvis & tubules — an upper urinary tract infection that can rapidly escalate to urosepsis if missed. High-yield for NCLEX priority & recognize-cues items.

🫘 Upper UTI | 🦠 E. coli (#1) | 🚨 Sepsis Risk | 💊 IV Antibiotics | 🎯 Priority Care

📖 SECTION 01 Definition & Overview

What It Is

Bacterial infection of the **renal pelvis, tubules, and interstitial tissue** — the kidney itself, not just the bladder.

Upper vs Lower UTI

Pyelonephritis is an **upper UTI** (systemic symptoms). Cystitis is a **lower UTI** (local bladder symptoms only).

Acute vs Chronic

Acute: sudden, severe, treatable.
Chronic: repeated episodes → scarring → CKD → HTN.

Why it matters: Pyelonephritis is the most common cause of **urosepsis** — a life-threatening complication. The NCLEX expects you to differentiate it from simple cystitis and act on systemic red flags (fever, flank pain, hypotension).

SECTION 02

Pathophysiology (Simplified)

1 — Bacterial Entry
E. coli from perineum ascends the urethra

→

2 — Bladder Colonization
Causes cystitis (lower UTI)

→

3 — Ureter Ascent
Bacteria travel upward (worsened by reflux, obstruction)

→

4 — Kidney Invasion
Inflammation of pelvis & parenchyma → pyelonephritis

→

5 — Systemic Spread
Can seed bloodstream → **urosepsis**

⚠ If Untreated (Acute)

Septic shock, acute kidney injury, perinephric abscess, multi-organ failure.

⚠ Long-Term (Chronic)

Renal scarring → chronic kidney disease → hypertension → end-stage renal disease.

Top risk factors: Female anatomy (short urethra), pregnancy, urinary obstruction (stones, BPH), catheterization, diabetes,

vesicoureteral reflux, immunosuppression.

SECTION 03

Signs & Symptoms

👑 The Classic Triad (Memorize This)

If you see all three together, think pyelonephritis first.

1	2	3
Fever & Chills	**Flank Pain**	**CVA Tenderness**
High-grade, often 101–104°F	Unilateral, dull to sharp	Costovertebral angle on percussion

🔥 Acute Pyelonephritis

- High fever, shaking chills
- Flank pain + CVA tenderness
- Nausea & vomiting
- Dysuria, urinary frequency & urgency
- Cloudy, foul-smelling urine

🕰️ Chronic Pyelonephritis

- Often **asymptomatic** early
- Vague fatigue, low-grade fever
- Hypertension (from renal damage)
- Polyuria & nocturia
- Recurrent UTI history

- Hematuria (possible)
- Malaise, fatigue, headache
- Tachycardia
- Costovertebral angle tenderness on percussion

- Gradual rise in BUN/creatinine
- Anemia (late)
- Progression to CKD / ESRD

RED FLAGS — Escalate Immediately

- Hypotension + tachycardia (sepsis)
- Decreased urine output (< 30 mL/hr)
- Elderly: confusion may be the ONLY sign
- Altered mental status / confusion
- Temperature > 103°F unresponsive to antipyretics
- Pregnant patient with any UTI symptom

SECTION 04

Key Diagnostics

Test	Expected Finding in Pyelonephritis
Urinalysis	Bacteria, WBCs (pyuria), nitrites (+), leukocyte esterase (+), RBCs, **WBC casts ← pathognomonic**
Urine Culture & Sensitivity	≥ 100,000 CFU/mL — identifies organism & guides antibiotics. **OBTAIN BEFORE starting antibiotics.**
CBC	Leukocytosis (↑ WBC), left shift (↑ bands)
BUN / Creatinine	Elevated if kidney function impaired

Test	Expected Finding in Pyelonephritis
Blood Cultures	Ordered if sepsis suspected — positive = bacteremia
CT / Renal Ultrasound	Rule out obstruction, abscess, stones (especially if not improving)

SECTION 05

Priority Nursing Interventions

Organized by ABC + safety prioritization. **Airway and perfusion come first** if the patient is septic.

1. A·B·C **Assess vital signs frequently** — watch for hypotension, tachycardia, fever, tachypnea, and altered LOC (sepsis indicators).
2. DX **Obtain urine culture & blood cultures BEFORE antibiotics.** This is a frequent NCLEX priority action — cultures first, then drugs.
3. RX **Administer IV antibiotics** promptly as prescribed (often ceftriaxone, ciprofloxacin, or gentamicin until culture results return).
4. CIRC **Administer IV fluids** to support blood pressure and maintain renal perfusion; monitor response carefully.
5. FLUID **Encourage oral fluids 3–4 L/day** once tolerated (unless contraindicated by HF or renal failure) to flush

bacteria.

6 I&O **Monitor intake & output strictly.** Urine output < 30 mL/hr = report to provider immediately.

7 LAB **Trend BUN, creatinine, WBC** — assess for worsening kidney function or unresolved infection.

8 PAIN **Administer antipyretics & analgesics** (acetaminophen preferred — avoid NSAIDs if kidney injury is present).

9 POS **Position for comfort** — side-lying with knees flexed often relieves flank pain.

10 ED **Teach prevention & completion** of full antibiotic course to prevent recurrence and resistance.

SECTION 06

Pharmacology

FLUOROQUINOLONE

Ciprofloxacin

Mechanism: Inhibits bacterial DNA gyrase → kills gram-negative bacteria (E. coli).

Side effects: Tendon rupture, QT prolongation, photosensitivity.

3RD-GEN CEPHALOSPORIN

Ceftriaxone (Rocephin)

Mechanism: Broad-spectrum bactericidal; first-line IV for inpatient pyelonephritis.

Side effects: Diarrhea, rash, rare anaphylaxis.

SULFONAMIDE

TMP-SMX (Bactrim)

Mechanism: Blocks bacterial folic acid synthesis.

Side effects: Stevens–Johnson, hyperkalemia, rash, crystalluria.

⚠ Avoid with dairy & antacids — chelates drug. Teach sun protection.

⚠ Cross-sensitivity with penicillin allergy — always ask.

⚠ Push fluids to prevent crystal formation in urine.

AMINOGLYCOSIDE

Gentamicin

Mechanism: Inhibits bacterial protein synthesis; reserved for severe cases.

Side effects: Nephrotoxicity & ototoxicity (NCLEX favorite).

⚠ Monitor peak/trough levels, BUN/Cr, and hearing.

URINARY ANALGESIC

Phenazopyridine (Pyridium)

Mechanism: Topical anesthetic on bladder mucosa — relieves dysuria.

Side effects: Orange-red urine (harmless), stains clothing.

⚠ NOT an antibiotic — must be given WITH one. Short-term use (≤ 2 days).

ANTIPYRETIC / ANALGESIC

Acetaminophen

Mechanism: Reduces fever and mild pain centrally.

Side effects: Hepatotoxicity if > 4 g/day.

⚠ Preferred over NSAIDs in kidney infection (NSAIDs worsen renal injury).

SECTION 07

Cystitis vs. Pyelonephritis

NCLEX loves to test this differentiation. The key is **systemic symptoms**.

Feature	Cystitis (Lower UTI)	Pyelonephritis (Upper UTI)
Location	Bladder	Kidney (pelvis & parenchyma)
Fever	Absent or low-grade	**High fever + chills**
Pain	Suprapubic, burning	**Flank + CVA tenderness**

Feature	Cystitis (Lower UTI)	Pyelonephritis (Upper UTI)
N/V	Rare	Common
WBC Casts	Absent	**Present (pathognomonic)**
Sepsis Risk	Low	**High**
Treatment	Oral antibiotics 3–7 days	IV antibiotics → oral, 10–14 days

SECTION 08

NCLEX Test Traps

1. **"Just a UTI" thinking**

   Students confuse cystitis with pyelonephritis. **Systemic symptoms (fever, flank pain, CVA tenderness)** = pyelonephritis, not cystitis. Priority differs.

2. **Antibiotics before cultures**

   If both orders are present, **collect culture FIRST**. Giving antibiotics first ruins the culture and delays targeted therapy.

3. **Missing sepsis in the elderly**

   Older adults may not develop fever. **Confusion, hypotension, or falls** may be the only signs of urosepsis. Don't overlook!

4 **Stopping antibiotics when symptoms resolve**

Incomplete course → recurrence → chronic pyelonephritis → CKD. Always teach patients to **finish the full antibiotic course**.

5 **Pyridium ≠ cure**

Phenazopyridine only relieves pain; it does NOT treat infection. **Orange-red urine is expected**, not an adverse effect.

6 **Using NSAIDs for fever/pain**

NSAIDs (ibuprofen, naproxen) are **nephrotoxic**. Choose acetaminophen when kidneys are inflamed or injured.

7 **Ignoring pregnancy**

A pregnant patient with ANY UTI symptom needs aggressive treatment — untreated pyelonephritis in pregnancy can cause **preterm labor and sepsis**.

SECTION 09

Patient Education

Finish Antibiotics
Complete the entire prescription, even if feeling better — prevents recurrence & resistance.

Hydrate Well
Drink 3–4 L of water daily to flush bacteria (unless restricted).

Void Regularly
Empty bladder every 2–3 hours. Never hold urine.

Wipe Front to Back

Void After Intercourse

Cranberry Products

Prevents E. coli from the perineum entering the urethra.

Flushes bacteria out of the urethra.

May help prevent recurrent UTIs (not for active treatment).

Avoid Irritants

No bubble baths, scented soaps, douches, or tight synthetic underwear.

Report Warning Signs

Return of fever, flank pain, or decreased urine output → call provider.

Follow-Up Culture

Repeat urine culture 1–2 weeks post-treatment to confirm clearance.

SECTION 10

NCJMM Clinical Judgment Framework

Applying the Next-Gen NCLEX Clinical Judgment Measurement Model to pyelonephritis.

01

Recognize Cues

Fever, flank pain, CVA tenderness, cloudy urine, dysuria, N/V, tachycardia.

02

Analyze Cues

Differentiate cystitis from pyelonephritis. WBC casts + systemic symptoms = upper UTI.

03

Prioritize / Act

Cultures → IV antibiotics → IV fluids → monitor for sepsis → pain control.

04

Evaluate

Fever down, pain decreased, urine clearing, labs normalizing, output > 30 mL/hr.

SECTION 11

Memory Boosters & Mnemonics

FACTS

F — Fever & chills

A — Aching flank pain

C — CVA tenderness

T — Tachycardia / tachypnea

S — Sepsis risk (monitor!)

PEE

P — Pain in flank/back

E — Elevated temperature

E — E. coli is #1 cause

FLUSH

F — Fluids 3–4 L/day

L — Labs (BUN, Cr, WBC)

U — Urine culture FIRST

S — Start IV antibiotics

H — Hydration & hygiene teaching

WIPE

W — Water — drink plenty

I — Intercourse → void after

P — Pee every 2–3 hours

E — Enforce front-to-back wiping

🎯 **Quick pattern: Upper UTI = Upstairs symptoms** (fever + systemic) · **Lower UTI = Downstairs symptoms** (dysuria + frequency only). WBC casts always point UPSTAIRS to the kidney.

Structured to the NCJMM · High-Yield Visual Review · Exam-Ready Reference