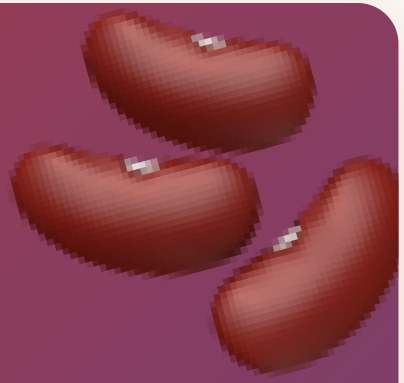
NGN NCLEX 2026 · RENAL/URINARY SYSTEM

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

🔥 Acute Pyelonephritis

- High fever, shaking chills
- Flank pain + CVA tenderness
- Nausea & vomiting
- Dysuria, urinary frequency & urgency
- Cloudy, foul-smelling urine
- Hematuria (possible)
- Malaise, fatigue, headache
- Tachycardia
- Costovertebral angle tenderness on percussion

🕰️ Chronic Pyelonephritis

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

Test	Expected Finding in Pyelonephritis
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
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.

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

3RD-GEN CEPHALOSPORIN

Ceftriaxone (Rocephin)

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

Side effects: Diarrhea, rash, rare anaphylaxis.

⚠ Cross-sensitivity with penicillin allergy — always ask.

SULFONAMIDE

TMP-SMX (Bactrim)

Mechanism: Blocks bacterial folic acid synthesis.

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

⚠ 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).

URINARY ANALGESIC

Phenazopyridine (Pyridium)

Mechanism: Topical anesthetic on bladder mucosa — relieves dysuria.

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

ANTIPYRETIC / ANALGESIC

Acetaminophen

Mechanism: Reduces fever and mild pain centrally.

Side effects: Hepatotoxicity if > 4 g/day.

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

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

⚠ 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**
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
Prevents E. coli from the perineum entering the urethra.

❤️ Void After Intercourse
Flushes bacteria out of the urethra.

🍒 Cranberry Products
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.