

CASE: A 32 yo previously healthy woman with three days of worsening low back pain and vomiting. She has fevers, severe chills, mildly painful urination, and no vaginal discharge. Her WBC count is 28,000. What is the diagnosis? What will you look for on physical examination and studies?

Pyelonephritis (Pyelo)

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Clinical findings. Pyelonephritis usually presents with acute flank pain plus constitutional symptoms. Nausea and vomiting are hallmarks. Often there is *no* dysuria, urinary hesitancy, or urgency. Flank tenderness (LR 3.6) and fever on physical exam are the most useful signs. Distinguish pyelonephritis from UTI (urinary tract infection), which arises from the same pathophysiologic process, by flank pain and vomiting.

Diagnosis. History and exam should suggest the diagnosis. Check for Pelvic Inflammatory Disease (PID) via pelvic exam. A pregnancy test can help exclude alternate diagnoses and determine antibiotic therapy. Urinalysis typically shows moderate numbers of white blood cells; colony counts may be as low as 100-1000 col/cc in acute pyelo. White cell casts are less common but *pathognomonic*. Obtain urine culture to identify culprit organism and antibiotic sensitivities. Renal ultrasound can rule out urethral obstruction if there is decreased urine output or elevated creatinine. If you suspect kidney stones or genitor-urinary (GU) tract abscess, obtain CT-KUB, which is performed without contrast. CT should show inflammatory findings consistent with pyelonephritis.

▶ **Organisms:** *Escherichia Coli* causes 89%. Less common organisms are *Staphylococcus saprophyticus*, *Proteus mirabilis*, *Klebsiella* spp, Enterococcus, *Ureaplasma urealyticum*, *Mycoplasma hominis*. In *Proteus*, consider ruling out kidney stone.

▶ **Pregnant women:** One-third with asymptomatic bacteruria >100,000 col/cc will develop symptomatic UTI or pyelonephritis so screen in the first trimester.

Management.

● **Hospitalize** patients who are vomiting and cannot tolerate oral treatments, hypotensive, or have urethral obstruction. Treat with IV fluids and levofloxacin, ciprofloxacin, or gatifloxacin – all achieve high urine concentrations and rapid bacteriologic cure. Usual practice is to give IV antibiotics initially, switching to oral antibiotics when clinical improvement. Oral Ciprofloxacin has efficacy equal to IV Ciprofloxacin in patients who can eat. Spar/trova/ moxifloxacin do not attain effective urinary concentrations. If you suspect *Pseudomonas* use piperacillin or tazorbactanar or fluroquinolones or Enterococcus, use IV Ampicillin and an aminoglycoside in penicillin allergic use vancongin. Most experts recommend treating hospitalized patients with pyelonephritis for 14 days. Randomized data for antibiotic therapy in pyelonephritis is sparse.

● **Pregnant women:** Screen in first trimester and treat with amoxicillin, sulfisoxazole, or nitrofurantoin. Avoid trimethoprim. Fluoroquinolones are contraindicated. In pregnant women with recurrent pyelo, prophylax with low-dose nitrofurantoin.

● **Consult urology** about patients with prior catheterization or urologic surgery, known urological abnormalities, kidney stones, ureteral obstruction, or abscess.

● **Maintain an index of suspicion for intrarenal or perinephric abscess.** Clues could be persistent fever or bacteremia, high initial WBC, or severe tenderness on exam or failure to improve after appropriate therapy. CT-KUB will help you establish the diagnosis. Consult urology to help determine if surgical drainage is necessary; consult emergently if you discover emphysematous pyelonephritis.

● **Fevers may persist 48-72 hours** after you initiate antibiotics. Exercise patience when switching antibiotics.

- Antibiotic resistance occurs most often in patients with recent hospitalization or antibiotic use, immunosuppression, kidney stones in women and recurrent pyelo in men.
- Microscopic hematuria is common in UTI and pyelo; check that hematuria has resolved after infection clears. If hematuria persists, rule out kidney stone and contact urology about GU tumor workup.

Discharge criteria. Discharge patients when they defervesce and are tolerating oral intake. Have patients follow up in two to three weeks for repeat urinalysis, to ensure cure was achieved.

Case follow-up. The patient had mild flank tenderness on exam. Pregnancy test was negative. Back pain and vomiting persisted. CT-KUB showed multiple small intrarenal abscesses, which urology felt were too small to warrant intervention and could be treated adequately with antibiotics. Organism was sensitive to levofloxacin. Patient received IV levofloxacin until she could tolerate oral intake and completed 14 days total. She was advised to return for recurrent fevers or vomiting and follow up urine culture in 2 weeks and she recovered fully.

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