CASE: 70 year old man with diabetes and hypertension recently discharged from the hospital for gastrointestinal bleeding. Urinary catheter was placed during the hospitalization. He was found after collapsing at home. He had decreased oral intake and strength over two days. He denied any recent dysuria, hematuria, or flank pain. Physical exam notable for a temperature of 101 F and suprapubic tenderness. Blood pressure was normal.

Urinary Tract Infection (UTI)

Erin Sutcliffe, MD
Harborview Medical Center

SCOPE OF THE PROBLEM: UTIs account for >100,000 hospital admissions per year in the U.S., most for pyelonephritis. The majority of infections are in women, though UTi numbers for men increase after age 65.

UTI can occur anywhere in the urinary tract including the kidneys (pyelonephritis), ureters, bladder (cystitis), and urethra (urethritis).

A complicated infection is defined as one in which the likelihood of persistent or recurrent infection or treatment failure is high. Complicated infections occur in patients with abnormal urinary tract anatomy such as prostate gland enlargement; abnormal bladder function such as neurogenic bladder; abnormal metabolism as in diabetes; and any UTI in men, the elderly, or pregnant women. A multi-drug-resistant organism is also considered complicated. Other infections are considered uncomplicated.

Risk factors include immunosuppression, diabetes, anatomic abnormality within genitourinary (GU) tract or recent GU instrumentation, bladder catheters, frequent sexual intercourse, diaphragm use, spermicide use, failure to urinate after intercourse, and a history of recurrent infections.

Common organisms

- Normal urine in the bladder is sterile. Infection occurs when microorganisms, typically from the gastrointestinal (GI) tract cling to the opening of the urethra and multiply. **E. coli is the most common organism,** Staphylococcus saprophyticus (women more than men), Enterococci, Proteus, Klebsiella, Pseudomonas, and Staphylococci are all culprits.
- Chlamydia and Mycoplasma cause urethritis and can be sexually transmitted; these infections tend to remain localized to the GU tract.

Clinical Findings: Dysuria, frequency, urgency, back or lower abdominal pain, and fevers and chills. Urine may become dark, bloody, or cloudy.

Signs: Patient may have fever, abdominal or suprapubic pain. Consider pelvic exam if suspicion for urethritis or vaginitis; herpes infection can be ruled out on pelvic exam. Consider prostate exam.

Diagnosis

Urinalysis (UA) DIPSTICK

- -The leukocyte esterase test (reflective of pyuria) is 80% to 90% sensitive, whereas the nitrite test (reflective of bacteruria) is only ~50% sensitive compared with quantitative culture. Combining both tests improves the sensitivity into the 85% to 90% range. Both tests have high specificity, at ~95%.
- False-negative nitrite test results may occur with: low levels of bacteruria, patients taking diuretics, patients on a low-nitrate diet, and in infections with bacteria that do not reduce nitrates such as saprophyticus.

UA. MICROSCOPIC

- More costly and time-consuming than dipstick but microscopic examination can detect significant pyuria or hematuria to aid in diagnosis. If screening results are not conclusive or the clinical picture is unclear, a quantitative urine culture should be done.
- ***If a symptomatic patient does not have significant pyuria (at least 1-2 WBC's per high power field = 5-10 WBC/mm^3 urine is upper limit of normal), UTI as cause much less likely (but not impossible) and another cause should be investigated.***
- If at least 1 bacterium is seen per HPF, this is consistent with 10^5 CFU and is considered significant bacteruria. However, this should still only be treated if a patient is symptomatic.

Urine Culture (Cx). Original thought was that only bacteria in the quantity of $>10^5$ CFU/ml of urine were diagnostic of UTI. More recent observations have found clinically significant UTI's at levels even as low as 10^2 CFU/ml. Chlamydia and Mycoplasma species, can be diagnosed with urine ligase chain reaction (LCR). This should be suspected when a person has symptoms of a UTI and pyuria, but negative pelvic exam, negative gram stain, negative Gonorrhea culture, and no hematuria. Onset of pain is gradual compared with sudden onset UTI symptoms.

Management Principles:

- Uncomplicated cystitis 3 days same effectiveness as longer, trimethoprim alone or in combo with sulfa first. Fluoroquinolones OK, but cost more (reserve for complicated UTI's, prostatitis, or if resistance of E. coli to tmp-smx is as high as 20%). Cystitis in older women or caused by S. saprophyticus – consider a 7 day course.
- Men treat at least 7 days with ceftriaxone or fluoroquinolone. Patient may have perineal/rectal pain associated with prostate as well. Amoxocillin or an aminoglycoside are also acceptable.
- Pregnant women avoid fluoroquinolones, tetracycline, and trimethoprim (TMP avoid during 1st trimester). Treat with cephalexin, erythromycin, nitrofurantoin, or augmentin for 7-10 days.
- Complicated UTI/catheters ceftriaxone, or fluoroquinolone good 1st choices. Ampicillin, Gentanicin, Piperacillin, Tazobactan, Imipenem, Treat for 2-3 wks. Continue IV until patient defervesces. Consider evaluating a source of obstruction if unknown.
- Risk factors for STD/Chlamydia Use doxycycline or azithromycin.
- Follow-up cx's are only recommended in: pregnant women (1-2 wks after treatment completed); patients about to go to GU surgery/procedure, or if symptoms after finishing treatment (may have recurrent/relapsing infection). If no longer symptomatic after finishing course of antibiotics, no need for follow up cultures.

Catheter-Associated Infections

- *Duration of catheterization is the biggest risk factor for developing a UTI.*
- *Most catheter-associated UTIs are asymptomatic, rarely causing bacteremia.* General recommendations are to not treat asymptomatic bacteruria, unless patient is pregnant, about to undergo a surgery or instrumentation, neutropenic, or had solid organ transplant. If a patient is symptomatic, first rule out obstruction, including evaluation of catheter and for stones. Treat for 10-14 days after checking urine (from catheter) and blood cultures.
- Minimize duration of catheterization and keep the system closed decrease the incidence of catheter-associated UTIs in the hospital. Condom caths are better, but still a reservoir for bacteria. No good data for intermittent straight cath or suprapubic catheter but may be better. No good data to support changing the catheter.

Candiduria: *Risk factors for candiduria:* recent urinary tract instrumentation, recent antibiotics, advanced age.

In most patients, candida is a simple colonizer. The concern with candiduria is that it may be a source for subsequent dissemination or a marker for hematogenous dissemination especially in neutropenic patients or patients without recent GU instrumentation.

- ***When to treat?*** Treatment of the asymptomatic, non-neutropenic patient with candiduria is of no value. The following should be treated to avoid or treat disseminated candidiasis: symptomatic patients, neutropenic patients, renal allograft patients, and patients who will undergo urologic manipulations. Treat for 7-14 days.
- ***Treatment choices*** *for albicans* Fluconazole (oral or iv) or amphotericin bladder washes for non-albicans
- *Do I change the catheter?* Removal of any GU instrumentation, including catheter is helpful. Changing the catheter may be of benefit but little data exists to support this.

Case Follow-up*: WBC was 14. UA: + nitrite, + leukocyte esterase, + bacteria, + RBC's. The patient was started on a 14 day course of levofloxacin. He was admitted to the hospital since he was bedridden and confused from his UTI, but catheter could not be placed. Urology was consulted and found uretheral stricture causing urinary retention. This was dilated by urology. Uretheral stricture is a known complication pf catheter placement. UCx grew out pan-sensitive proteus mirabilis, at* $> 10^5$ *CFU/mL. There was clinical improvement after dilation and antibiotics.*

Clinical Pearls

- If no pyuria, rethink your diagnosis of UTI
- Only treat candiduria without candidema if you can find no other source of infection, if the patient is neutropenic, has a renal allograft, and those undergoing urologic procedures or instrumentation.
- Catheters often cause bacteruria, but rarely cause bacteremia and are usually asymptomatic. Do not treat unless they meet exception criteria above, or are symptomatic. Minimize duration of catheter use!

References

1. Guidelines for antimicrobial treatment of uncomplicated acute bacterial cystitis and acute pyelonephritis in women. Infectious Diseases Society of America (IDSA). Warren JW - Clin Infect Dis - 01-OCT-1999; 29(4): 745-58
2. Urinary Tract Infections, Clinical Topic Tours, MDConsult, 2003.
3. Urinary tract infections. Bass PF 3rd - Prim Care - 01-MAR-2003; 30(1): 41-61, v-vi
4. Mandell: Principles and Practice of Infectious Diseases, 5th ed., Copyright © 2000 Churchill Livingstone, Inc.
5. Practice Guidelines for the Treatment of Candidiasis; Clnical Infectious Diseases, Vol. 30, No. 4, April, 2000.
6. Pappas, Peter, "Laboratory in the Diagnosis and Management of Urinary Tract Infections", Medical Clinics of North America, Vol. 75, No. 2, 1991.
7. The Sanford Guide to Antimicrobial Therapy 2004.

Last updated: November 1, 2006/ECS