Urinary Tract Infection

Medical Student Case-Based Learning
A 64 year old woman presents with a 3 year history of recurrent urinary tract infections (UTIs) treated with multiple antibiotic courses by a walk-in clinic.

What are the clinical symptoms associated with UTI?
UTI clinical symptoms

• May be non-specific for infection
  – Irritative symptoms
    • Urgency
    • Frequency
  – Dysuria
  – Hematuria
  – Foul odor
  – Suprapubic pain
• Upper tract infections (pyelonephritis) also associated with fevers, rigors, flank pain, and often nausea and emesis
The patient reports presumed bladder infections which occur every month or two associated with dysuria, urgency, and frequency. No gross hematuria, flank pain, or fevers.

What is the differential diagnosis?
Many processes and conditions may mimic the symptoms of bacterial urinary tract infection, so it is critical to rule out other causes during the evaluation prior to initiating treatment

- Urologic neoplasm
- Atrophic vaginitis
- Prostatitis
- Overactive bladder
- Trauma
- Congenital abnormalities
- Urethral diverticulum

- Sexually transmitted diseases
  - Herpes, Chlamydia, Trichomonas, Gonorrhea
- Urinary lithiasis
- Interstitial cystitis/painful bladder syndrome
- Sepsis from non-urologic source
How would you diagnose a urinary tract infection?
Diagnosis of UTI

- Clinical symptoms
  - Urgency, frequency, dysuria, hematuria, pain, odor
- Physical exam for atrophic vaginitis, prostatitis, epididymitis, urethral diverticulum, etc.
- Clean-catch midstream urine sample
- Chemical (dipstick) urinalysis
- Quantitative urine culture
  - In general $> 10^5$ colonies/ml diagnostic
Diagnosis of UTI

- Dipstick evaluation
  - Leukocyte esterase 63-90% specific
  - Nitrite very specific for gram negative but only 50% sensitive
- Positive dipstick + symptoms: consider treatment
- Negative dipstick + symptoms: consider culture
When do you need radiologic imagining or further evaluation for diagnosis of UTI?
Indications for further evaluation

• Generally, uncomplicated cystitis or pyelonephritis does not benefit from imaging

• Consider CT, ultrasound, voiding cystourethrogram (VCUG) and further evaluation with cystoscopic or ureteroscopic evaluation for patients with known anatomic abnormality or those who do not respond to treatment
What factors are important for genesis of UTI
Pathogenesis

• Ascending infection from the periurethral area critical
• Hematogenous spread is uncommon
• Risk factors
  – Reduced urine flow
    • Obstruction, stricture, neurogenic bladder
  – Factors that promote colonization
    • Sexual activity, spermicide, estrogen depletion
  – Facilitation of ascent
    • Catheterization, incontinence, residual urine
What bacteria are associated with urinary infections and what pathogenic factors from both bacteria and the host contribute to colonization?
Uropathogens

- **Escherichia coli** (80% of outpatient UTIs)
  - Uropathogenic E. coli (UPEC)
- Klebsiella
- Enterobacter
- Proteus
- Pseudomonas
- Staphylococcus saprophyticus (5-15%)

- Enterococcus
- Candida
- Adenovirus
- Normal perineal flora: Lactobacillus, Corynebacteria, Staphylococcus, Streptococcus, anaerobes
What are some correctable Urologic abnormalities that may provoke bacterial persistence?
Bacterial persistence: complex

- Infected stones
- Chronic bacterial prostatitis
- Fistula disease (colovesical, vesicovaginal)
- Unilateral infected atrophic kidneys
- Ureteral duplication and ectopic ureters
- Foreign bodies (such as retained ureteral stent)
- Urethral diverticula
- Unilateral medullary sponge kidneys
- Infected ureteral stump after nephrectomy
- Infected urachal or renal cyst
- Papillary necrosis
Patient found on exam to have poor water intake, atrophic vaginitis, and urine dipstick consistent with acute bacterial infection.

What are the treatment options for UTI?
Treatment Options

- Encourage hydration and behavioral measures to increase fluid intake
- Treat atrophic vaginitis with topical transvaginal estrogen if appropriate
- Determine if infection represents uncomplicated or complicated infection
Uncomplicated UTI Treatment

- 3 day course of trimethoprim/sulfamethoxazole (TMP/SMX), or nitrofurantion for 5 days, or fosfomycin as a single dose

- For local TMP/SMX resistance pattern > 20%, consider fluoroquinolones

- Full 7 day course in patients with diabetes, long duration of symptoms, pregnancy, > 65 years old, past history of pyelonephritis
Complicated UTI Treatment

- Culture is essential
- Ampicillin + aminoglycoside or Amp/Vancomycin + aminoglycoside or 3rd generation cephalosporin
- Adjust according to culture results
- If good clinical response, switch to oral agents in 48 hours
- Treat for 14 days
Follow-up

- Test for cure by repeat culture in special situations such as pregnancy, pyelonephritis, and complicated or relapsing UTI
- Consider single dose post-coital self-treatment in select cases
- Do not treat asymptomatic bacteruria
- Treatment is generally not indicated for patients on self-catheterization protocols
References and further reading

- Pontari, M. AUA Core Curriculum for Residents: “Urinary Tract Infections”