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Urinary Tract Infections in Hospitalized Patients

Puerto Rico Chapter Annual Meeting

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March 9, 2019

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Disclosures for speaker:

Date of presentation: 3/9/2019

- No relevant financial disclosures:
  - Daniel C. DeSimone, MD
- *Reference to off-label/investigational use(s) of pharmaceuticals or devices:*
  - None

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Learning Objectives

Upon conclusion of this activity, participants should be able to:

1. Distinguish between asymptomatic and symptomatic bacteriuria.
2. Identify patients appropriately with a UTI
3. Define the diagnostic workup and management of UTI in hospitalized patients

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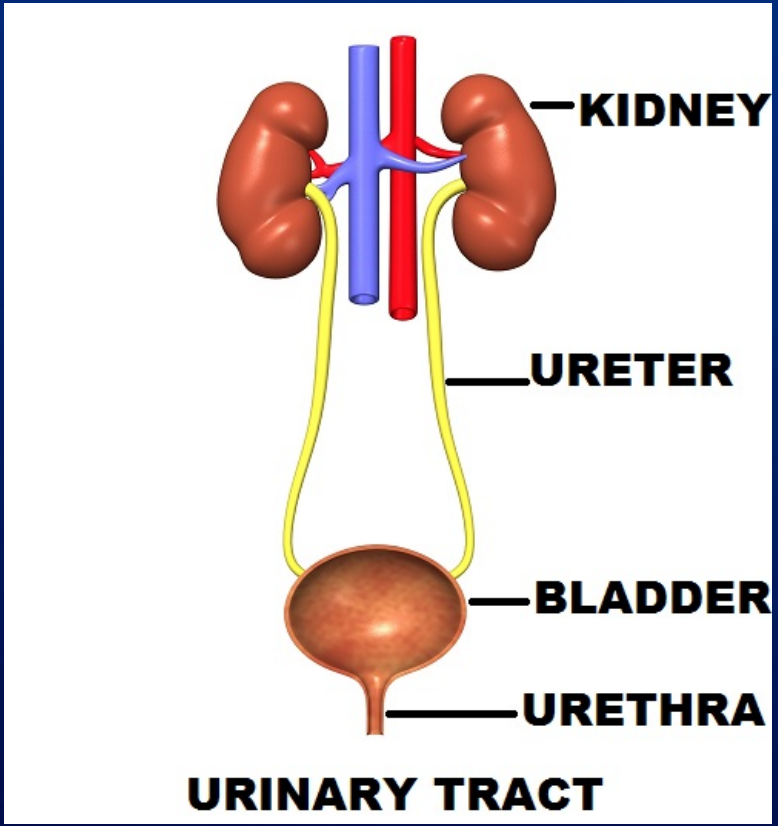
UTI

- Cystitis—bladder infection/lower urinary tract
- Pyelonephritis—kidney infection/upper urinary tract

- Much more common in women than men



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Pathogenesis

- Colonization of the vaginal introitus or urethral meatus by uropathogens from fecal flora, followed by **ascension** via the urethra into the bladder
- Pyelonephritis—pathogens ascend to the kidneys via the ureters
  - Also occurs by seeding of kidneys by **bacteremia** and **lymphatic** pathways

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UTI

- Acute simple cystitis—UTI confined to the **bladder**
- Acute complicated UTI—systemic symptoms:
  - Fever, chills, rigors, fatigue, malaise, flank pain, CVA tenderness, pelvic/perineal pain
  - "**Complicated**"—factors that predispose to relapsing/persistent infection
    - Calculi, catheters, stents, obstruction, immunosuppression, renal failure, renal transplantation, urinary retention from neurologic disease.

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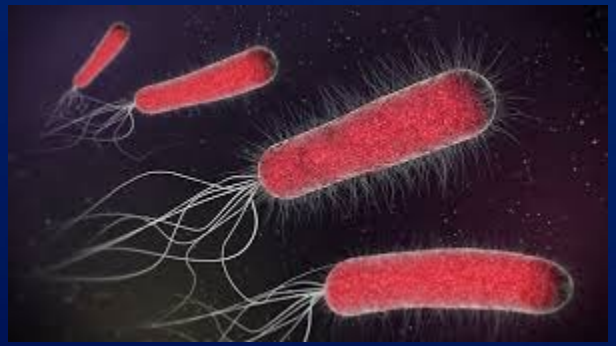
Microbiology

- *E. coli* is the most common
- Enterobacteriaceae—*Klebsiella* and *Proteus* species
- *Pseudomonas*
- Enterococci
- *Staphylococcus aureus*



- Contain virulence factors allowing for evasion of host defenses, attach and invade uroepithelial cells, and establish infection

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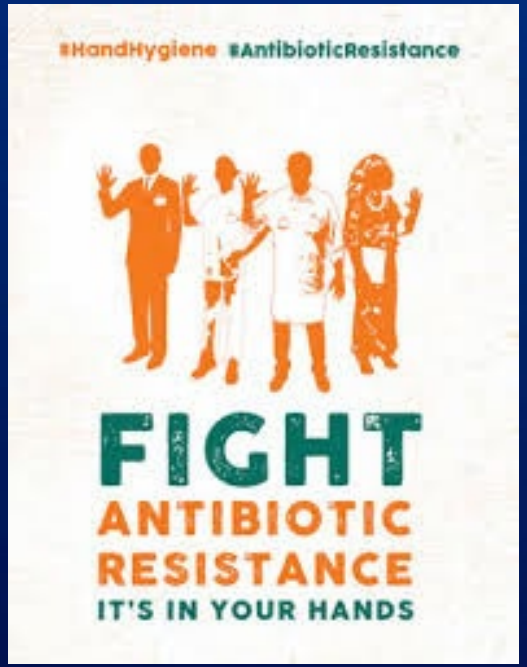
Resistance

- Major and growing issue
- Risk factors—recent broad spectrum ABX, health care exposures, and travel to countries where MDR organisms are prevalent
- Increased rates of fluoroquinolone resistance, ESBL producing Enterobacteriacae, and carbapenem resistance



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Signs and Symptoms of a UTI

- Dysuria, urinary frequency/urgency
- Suprapubic pain
- Hematuria
- Fever, chills, rigors, fatigue, nausea, vomiting, or malaise beyond baseline
- CVA tenderness, flank pain

- Patients with spinal cord injury w/neurogenic bladder—autonomic dysreflexia and increased spasticity

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Diagnostic Approach

- History and physical examination
  - Fevers/chills?
  - CVA/abdominal/suprapubic tenderness
- Urinalysis and culture with susceptibility testing
- Most do not warrant imaging studies
  - Except severely ill, persistent clinical symptoms despite 2-3 days of ABX therapy, suspect obstruction
  - CT abdomen/pelvis or renal ultrasound

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Diagnosis of UTI

- Presence of bacteriuria (>100,000 CFU/mL) of a uropathogen **PLUS** signs or symptoms of a UTI

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Case 1

58 year old female with a history of congestive heart failure, diabetes mellitus type 2, COPD, current smoker, is admitted to the hospital with chest pain, shortness of breath, and cough with sputum production. Chest x-ray reveals patchy opacities bilaterally concerning for pulmonary edema, but cannot rule out pneumonia. She complains of fevers, chills, and mild nausea. She denies abdominal pain, urinary urgency or frequency, hematuria, and diarrhea. The ED physician obtained blood and urine cultures, urinalysis, and started IV Ceftriaxone. Urinalysis showed 4-10 WBC, 0-1 RBC, Gram negative bacilli on Gram stain. This morning, the urine culture is growing E. coli 3+. You are treating her for heart failure and possible COPD exacerbation with diuretics and antibiotics. Does she have a UTI?

1. Yes, continue IV Ceftriaxone and await susceptibilities
2. No, she has asymptomatic bacteriuria—no antibiotics are necessary
3. No, but she has 3+ E. coli on urine culture with fevers—treat with antibiotics
4. Yes, she has fever and positive urine culture for E. coli—treat.
5. Yes, all urine cultures that are positive must be treated.

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Asymptomatic Bacteriuria

- Positive urine culture (>100,000 CFU/mL) from an individual without symptoms or signs of a urinary tract infection
- **DO NOT TREAT** asymptomatic bacteriuria with antibiotics
  - Exceptions—pregnant women, urologic procedures when mucosal bleeding is anticipated, and renal transplant patients in the first 3 months following transplantation

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Case 2

92 year old female with CAD, CHF, COPD, DM type 2, dementia, PAD, hyperlipidemia, stroke, atrial fibrillation on anticoagulation, diffuse large B-cell lymphoma, laryngeal cancer s/p chemoradiation, gastric bypass, GERD, multiple drug/antibiotic allergies, recurrent pneumonia and UTIs, bilateral THA/TKA/TSA, rheumatoid arthritis on low dose prednisone, scleroderma, aortic and mitral valve replacements, and CABG x 4. She is admitted with altered mental status and falls. She has no fevers, chills, chest pain, dyspnea, abdominal pain, CVA tenderness, urinary urgency/frequency. She does have rigors and frequent diarrhea. She was treated 2 weeks ago with Ciprofloxacin and Clindamycin for a polymicrobial UTI. The ED physician obtains a chest x-ray that is unremarkable, as well as blood and urine cultures. Urinalysis shows 10-20 WBCs, 1-3 RBCs, Gram stain positive for many GPC, GPB, GNB. Urine culture grows Enterococcus faecalis >100,000 CFU/mL. Blood cultures remain negative. Does she have a UTI? What's the next best step?

1. Yes, start IV Ampicillin and obtain CT abdomen/pelvis
2. Yes, start IV Vancomycin and obtain renal ultrasound and CT abdomen/pelvis
3. No, stop antibiotics and discharge home.
4. Yes, start IV Piperacillin/tazobactam and repeat urine culture in 3 days to demonstrate cure
5. No, check C. difficile toxin assay.

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Avoid pre-mature closure!

- Premature closure—type of cognitive error in which the physician fails to consider reasonable alternatives after an initial diagnosis is made
- Elderly or debilitated patients may present with more generalized signs/symptoms of infection without clear symptoms localizing to the urinary tract.
- UTI is often suspected in these patients with nonspecific signs/symptoms such as falls or change in mental status/functional status
  - These are not reliable predictors of UTI
  - Infectious disease workup should be performed

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Case 3

82 year female presents to the ED with fevers (102 F), chills, flank pain, dysuria, and increased urinary frequency for the past 3-4 days. She has a history of recurrent UTIs, renal calculi, diabetes mellitus type 2, and hypertension. She has poor oral intake and feels fatigued. She is admitted to your service and has received 3 liters of IV normal saline for hypotension with fair response. Blood and urine cultures are both growing Klebsiella species. She is started on IV Vancomycin and Piperacillin/tazobactam. She recently underwent cystoscopy and lithotripsy of a right 9 mm calculus. Does she have a UTI? What's the next best step?

1. No, she has asymptomatic UTI. Stop antibiotics and discharge home.
2. Yes. Obtain chest x-ray to rule out pneumonia and C. difficile toxin assay.
3. Yes. Obtain CT abdomen/pelvis with and without contrast.
4. No. Transfer to ICU and call Urology.
5. Yes. STAT Urology consult for operative management.

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Case 3

- Complicated UTI—possibly pyelonephritis and/or renal obstruction
- CT imaging would be ideal in this case over renal ultrasound to detect anatomic or physiologic factors.
  - Better at detecting calculi, gas-forming infections, hemorrhage, obstruction, and abscesses

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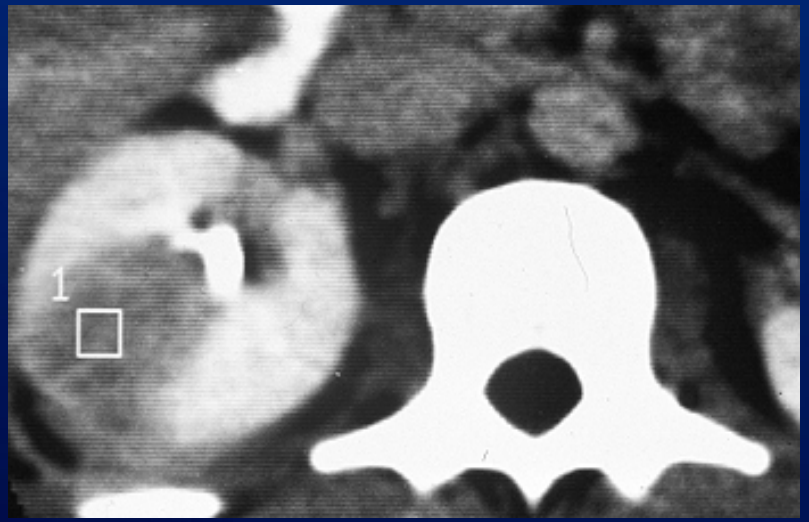
Acute pyelonephritis on CT imaging



Pyelonephritis

- Treatment for 5 to 7 days; 10 to 14 days may be required for immunocompromised patients or those with complex urologic anatomy.
  - Cefepime, Piperacillin/tazobactam, Meropenem
- If susceptible, can use oral step-down therapy:
  - Ciprofloxacin, Levofloxacin, TMP-SMX

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Treatment of UTI

- Symptomatic UTI
- Empiric antibiotic therapy depends on:
  - Severity of illness
  - Risk factors for resistant pathogens
  - Specific host factors (allergies, prior ABX use)

Acute Simple Cystitis

- Nitrofurantoin for 5 days (if Cl_{Cr} >30 mL/min)
- TMP-SMX for 3 days
  - Do not use if local *E. coli* resistance rates exceed 20%
- Cefdinir for 5 days
- Fosfomycin 3 g once
- **Note:** Avoid fluoroquinolones (ciprofloxacin, levofloxacin, ofloxacin) due to increasing resistance (>20% resistance for *E. coli* in many areas) and to preserve fluoroquinolones for susceptible, more serious infections.

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Acute Complicated UTI

- Nitrofurantoin for 7 days
- TMP-SMX for 7 days
- Cefdinir for 7 days

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Acute Complicated UTI

- Critically ill/ICU admission, sepsis, urinary tract obstruction?
  - IV Vancomycin
  - Cefepime/Piperacillin-tazobactam/Meropenem
    - Depending on risk factors for MDR Gram negative organisms
      - Travel
      - Prior fluoroquinolone/trim-sulfa/broad spectrum beta-lactams
      - Inpatient stay at healthcare facility **use Meropenem.

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Follow up & prevention

- No follow-up needed if symptoms resolve.
- If symptoms persist despite adequate treatment, consult a urologist or an infectious diseases specialist.

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Questions & Discussion

- Thank you

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