URINARY TRACT INFECTIONS
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Types:
- **Cystitis**: Suprapubic pain and LUTS
- **Pyelonephritis**: Same as cystitis +/− systemic sx ranging from fevers, malaise, and costovertebral angle pain/tpp to sepsis
- Note that **elderly patients usually present w/ atypical sx**: According to a British 265-patient cohort study, 2/3 of patients >= 75 yo present w/ atypical sx including delirium, increased falling, and increased urinary retention and/or incontinence
- **Complicated UTI** = Cystitis/pyelonephritis in a patient w/ an anatomic or functional abnormality of the urinary tract, or a urinary tract catheter or stent
- Additional conditions that increase the probability of failing Rx: Pregnancy, DM1,2, CRI, immunosupression, transplantation, urologic procedures, and a h/o a prior UTI w/ a resistant pathogen

Diagnosis:
- **Always get a urinalysis w/ microscopy!**
  - The only group of patients in which you can rely solely on a urinalysis w/out microscopy to diagnose a UTI are healthy pre-menopausal, non-pregnant women
  - + LE or + nitrite = Pos LR 4.2 = Okay to treat empirically
  - A – LE and a – nitrite r/o a UTI only in asymptomatic women

<table>
<thead>
<tr>
<th>Urinalysis w/ microscopy</th>
<th>Sn</th>
<th>Sp</th>
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<tbody>
<tr>
<td>+ Leukocyte esterase</td>
<td>74-96%</td>
<td>94-98%</td>
</tr>
<tr>
<td>+ Nitrite</td>
<td>35-85%</td>
<td>92-100%</td>
</tr>
<tr>
<td>+LE or +Nitrite</td>
<td>75-84%</td>
<td>82-98%</td>
</tr>
<tr>
<td>&gt; 5 leukocytes/HPF</td>
<td>72-95%</td>
<td>48-82%</td>
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<tr>
<td>&gt;10 leukocytes/HPF</td>
<td>58-82%</td>
<td>65-86%</td>
</tr>
<tr>
<td>&gt;1 bacterium/HPF</td>
<td>93%</td>
<td>95%</td>
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- Add a **urine culture** in male and postmenopausal patients, patients w/ suspected pyelonephritis or a complicating condition – **basically everyone at the VA!** – in patients whose sx do not improve after 72 hours of Rx and in patients w/ recurrent UTIs
  - + urine culture = >= 10⁵ CFU/mL and pyuria
  - In some studies, a + urine culture = 10² – 10⁵ CFU/mL and pyuria in a symptomatic patient
  - Additional settings in which a + urine culture may have less than 10⁵ CFU/mL: Male patients, urine obtained through a suprapubic catheter or an I/O catheter, urine w/ pure cultures of anything other than E. coli or Proteus spp.
- Add **blood cultures** in patients w/ fevers and/or other SIRS sx
- Add a **CT-KUB w/out contrast** or a renal U/S in patients w/:
S/o nephrolithiasis
- Suspected post-renal acute renal insufficiency
- No response after 48-72 hours of Rx
- Additionally, you may consider it in patients w/ sepsis, immunosuppressed patients, and patients w/ DM1, 2 or a h/o nephrolithiasis or urologic procedures

**Treatment:**
1. If the patient has a Foley catheter, change it
2. Start w/ empiric A/B:

<table>
<thead>
<tr>
<th>Type</th>
<th>Oral</th>
<th>Parenteral</th>
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<tbody>
<tr>
<td><strong>Uncomplicated cystitis</strong></td>
<td>Nitrofurantoin, TMP-SMX <em>(Okay if E. coli resistance</em>&lt;10-20%) &gt; quinolones², Augmentin, cephalosporins <em>(cefpodoxime, cefdinir, cefaclor)</em> &gt; cephalexin if no other appropriate options</td>
<td>Duration: 3-7 days (7 days in patients aged &gt;=65 years, DM1,2)</td>
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<tr>
<td><strong>Uncomplicated pyelonephritis</strong></td>
<td>Quinolone &gt; TMP-SMX + 1 day dose of ceftriaxone or an aminoglycoside &gt; Augmentin or cephalosporins + 1 day dose of an aminoglycoside or ceftriaxone</td>
<td>Quinolone, an aminoglycoside +/- amoxicillin, beta-lactam +/- beta-lactamase³ <em>(ceftriaxone, ceftazidime, cefepime, Unasyn, Zosyn, aztreonam, carbapenems⁴)</em></td>
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<td></td>
<td>Duration: 7-10 days depending on severity, response; some recommend 14 days if you’re using Augmentin or cephalosporins</td>
<td><strong>Plus</strong> Vancomycin, linezolid &gt; ampicillin if Enterococcus spp suspected per prior history, GS</td>
</tr>
<tr>
<td></td>
<td>Duration: Same as oral Rx</td>
<td>Duration: Same as uncomplicated pyelonephritis</td>
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<table>
<thead>
<tr>
<th>Complicated UTI</th>
<th>Quinolones</th>
<th>Same as uncomplicated pyelonephritis</th>
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<tr>
<td></td>
<td>Duration: 10-14 days</td>
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¹ Hospitalization and parenteral A/B is absolutely necessary in patients w/ SIRS physiology, an inability to tolerate oral antibiotics, or patients w/ a h/o pathogens resistant to available oral options; reasonable in patients w/ a complicated UTI

² Except moxi – poor urinary concentration; Avoid quinolones in pregnant patients

³ **Activity against PsAg:** Quinolones, gentamicin, tobramycin, ceftazidime, cefepime, Zosyn, aztreonam, imipenem, meropenem; No activity against PsAg: Ceftriaxone, Unasyn, ertapenem

⁴ Activity against ESBL
3) Await C&S results and treat the specific pathogen
   - Avoid oral cephalosporins for the treatment of pyelonephritis requiring hospitalization and complicated UTI (oral cephalosporins may be acceptable only if the pathogen is susceptible and ID is okay w/ it)
4) Contact the Urologist in patients w/:
   - Concurrent nephrolithiasis
   - Concurrent post-renal AKI
   - Indwelling Foley or suprapubic catheters
   - Ureteral stents
   - Hydronephrosis

Special settings:
- **Asymptomatic bacteriuria**
  - Urine w/ >=10^5 CFU/mL (voided), >= 10^2 CFU/mL (SPC, I/O)
  - If the patient has a Foley catheter, change it
  - Treat only if the patient is pregnant or is about to undergo a urologic procedure
  - Additionally, treat children, neutropenic patients, and patients s/p kidney transplant
- **Candiduria**
  - Candida found along w/ several other bacteria suggests colonization
  - Pure Candida may be colonization or UTI
  - Fungal cast = UTI
  - If the patient has a Foley catheter, change it and get another urine culture, and if the candiduria persists, consider a CT-KUB w/out contrast or a renal U/S to r/o pyelonephritis, perinephric abscess, etc
  - It’s okay to treat symptomatic patients