

URINARY TRACT INFECTIONS (UTI) IN ADULTS

UNCOMPLICATED UTI

Acute uncomplicated cystitis (AUC)		
<ul style="list-style-type: none"> Acute dysuria, frequency, urgency in a non-pregnant, otherwise healthy premenopausal female 		
Etiology	Preferred regimen	Comments
<p><i>E. coli</i> (75-90%)</p> <p><i>Staphylococcus saprophyticus</i> (5-15%)</p>	<p><u>1st line:</u> Nitrofurantoin macrocrystals 100 mg qid x 5d OR Fosfomycin 3 g single-dose sachet in 3-4 oz (or 90-120 ml) water</p> <p><u>2nd line:</u> Cefuroxime 250 mg bid x 7d OR Cefixime 200 mg bid x 7d OR Amoxicillin-clavulanate 625 mg bid x 7d</p>	<p>Empiric treatment is the most cost-effective approach; urinalysis and urine culture not pre-requisites.</p> <p>Nitrofurantoin monohydrate/macrocrystals (100 mg bid) are not locally available.</p> <p>Amoxicillin/ampicillin and cotrimoxazole are not recommended for empiric treatment given the high prevalence of resistance to these agents.</p> <p>Fluoroquinolones are considered as reserved drugs because of propensity for collateral damage (i.e., selection for drug-resistant bacteria); but are efficacious in 3-day regimens.</p> <p>The treatment is the same for otherwise healthy elderly women with AUC.</p>

Acute uncomplicated pyelonephritis		
<ul style="list-style-type: none"> Fever, flank pain, costovertebral angle tenderness, nausea/vomiting, with or without signs or symptoms of cystitis in an otherwise healthy premenopausal female 		
Etiology	Preferred regimen	Comments

<p>As for AUC, <i>E. coli</i> is predominant, as well as other Enterobacteriaceae</p>	<p>Oral <u>1st line:</u> Ciprofloxacin 500 mg bid x 7-10d OR Levofloxacin 750 mg od x 5d, OR 250 mg od x 7-10d</p> <p><u>2nd line:</u> Cefuroxime 500 mg bid x 14d OR Cefixime 400 mg od x 14d OR Amoxicillin-clavulanate 625 mg tid x 14d (when GS shows Gram+ cocci)</p> <p>Parenteral <u>1st line:</u> Ceftriaxone 1-2 g q24h Ciprofloxacin 400 mg q12h Levofloxacin 250-750 mg q24h Amikacin 15 mg/kg q24h Gentamicin 3-5 mg/kg q24 h +/- ampicillin</p> <p><u>2nd line:</u> Ampicillin-sulbactam (when gs shows g+ cocci) 1.5 g q6h</p> <p>Reserved for multidrug-resistant organisms: Ertapenem (if ESBL rate >10%) 1 g q24h Piperacillin-tazobactam 2.25 - 4.5g q6-8h</p>	<p>Urine analysis, Gram stain, culture and susceptibility tests should be done. Blood cultures are not routinely done unless septic.</p> <p>Consider giving initial IV/IM dose of antibiotic followed by oral regimen in patients not requiring hospitalization.</p> <p>Indications for hospitalization/parenteral regimen:</p> <ol style="list-style-type: none"> 1. signs of sepsis 2. inability to take oral medications/hydration 3. concern re compliance 4. presence of possible complicating conditions <p>Switch to oral regimen once afebrile for 24-48 hr and able to take oral medicines.</p> <p>Tailor antibiotic regimen once culture result available.</p> <p>Routine urologic evaluation and imaging not recommended unless still febrile after 72 hr. Post-treatment urine culture not recommended if clinically responding to treatment.</p>
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<p>Asymptomatic bacteriuria (ASB) - presence of bacteria in the urine without signs and symptoms of UTI</p>		
<p>Diagnosis:</p>		
<ul style="list-style-type: none"> • In women: 2 consecutive voided urine specimens with the same organism in quantitative counts $\geq 100,000$ cfu/mL • In men: single, clean-catch voided urine with one bacterial species in a quantitative count $\geq 100,000$ cfu/mL • In both men and women: a single catheterized urine specimen with one bacterial species in a quantitative count ≥ 100 cfu/mL; pyuria, odor and color of urine not relevant to decision to treat 		
<p>Etiology</p>	<p>Preferred regimen</p>	<p>Comments</p>

<p>Similar to acute uncomplicated cystitis</p>	<p>No screening and treatment recommended <u>except</u> in:</p> <ul style="list-style-type: none"> • pregnant women • persons undergoing invasive genitourinary tract procedures (likely to cause mucosal bleeding) <p>DO NOT TREAT ASB in:</p> <ul style="list-style-type: none"> • healthy adults • non-pregnant women • patients with diabetes mellitus • elderly patients • persons with spinal cord injury • persons with indwelling urinary catheter • persons with HIV • persons with urologic abnormalities 	<p>Antibiotics do not decrease asymptomatic bacteriuria or prevent subsequent development of UTI .</p> <p>The optimal screening test is a urine culture.</p> <p>If urine culture not possible, significant pyuria (>10 wbc/hpf) or a positive gram stain of unspun urine (>2 microorganisms/oif) in two consecutive midstream urine samples may be used to screen for ASB.</p> <p>When indicated, treatment should be culture-guided. A 7-day regimen is recommended.</p>
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RECURRENT UTI IN WOMEN

- ≥3 episodes of acute uncomplicated cystitis documented by urine culture in 1 year or ≥ 2 episodes in a 6-mo. period

Etiology	Preferred regimen	Comments
<p>Similar to cystitis</p>	<p>Treat as acute episode for uncomplicated UTI</p> <p>Prophylaxis: TMP-SMX 40/200 mg or nitrofurantoin 50-100 mg at bedtime for 6-12 mo. OR TMP-SMX 80/400 mg single dose (post-coital) OR TMP-SMX 320/1600 mg as single dose at symptom onset</p> <p>Other: Lactobacilli not recommended.</p> <p>Cranberry juice and products can be used.</p> <p>For post-menopausal women, intra-vaginal estriol nightly x2 weeks then twice-weekly for at least 8 months.</p>	<p>Radiologic or imaging studies not routinely indicated.</p> <p>Screen for urologic abnormalities in the ff:</p> <ul style="list-style-type: none"> • No response to treatment • Gross hematuria/persistent microscopic hematuria • Obstructive symptoms • History of acute pyelonephritis • History of or symptoms suggestive of urolithiasis • History of childhood UTI • Elevated serum creatinine • Infection with urea-splitting bacteria (<i>Proteus</i>, <i>Morganella</i>, <i>Providencia</i>)

UTI IN PREGNANCY

Acute uncomplicated cystitis in pregnancy		
Etiology	Preferred regimen	Comments

<p><i>E. coli</i> (70%) Other enterobacteriaceae Group B <i>Streptococcus</i></p>	<p>Cefalexin 500 mg qid x 7d</p> <p>Cefuroxime 500 mg bid x 7d</p> <p>Cefixime 200 mg bid x 7d</p> <p>Nitrofurantoin macrocrystals 100 mg qid x 7d</p> <p>Fosfomycin 3 g single-dose sachet</p> <p>Amoxicillin-clavulanate 625 mg bid x 7d</p>	<p>Start empiric antibiotic immediately, but pre- treatment urine must be submitted for culture and susceptibility; adjust treatment accordingly.</p> <p>Document clearance of bacteriuria with a repeat urine culture 1-2 wks post-treatment.</p> <p>Avoid amoxicillin-clavulanate in those at risk of pre-term labor because of potential for neonatal necrotizing enterocolitis.</p> <p>Use nitrofurantoin from the 2nd trimester to 32 wks only, if possible, because of potential for birth defects and hemolytic anemia.</p> <p>Avoid cotrimoxazole esp during the first and third trimesters because of risk of teratogenicity and kernicterus.</p> <p>Fluoroquinolones are contraindicated.</p>
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Acute pyelonephritis in pregnancy		
Etiology	Preferred regimen	Comments
<p>Similar to acute cystitis in pregnancy</p>	<p>Parenteral: <i>1st line:</i> Ceftriaxone 1-2 g q24 h</p> <p>Ceftazidime 2 g q8 h</p> <p><i>2nd line:</i> Ampicillin-sulbactam (when gs shows gram+cocci) 1.5 g q6 h</p> <p>Oral: Cefalexin 500 mg to complete 14d</p> <p>Cefuroxime 500 mg bid to complete 14d</p> <p>Cefixime 200 mg bid to complete 14d</p> <p>Amoxicillin-clavulanate 625 mg bid to complete 14d</p>	<p>Urinalysis, gs and culture/susceptibility tests should be done. Blood culture not routine unless septic. Ultrasound of KUB reserved for failure to respond to treatment</p> <p>Indications for admission: pre-term labor and other indications as listed above for acute uncomplicated pyelonephritis.</p> <p>Switch to oral regimen when afebrile x 48 hrs and based on culture/susceptibility result.</p> <p>Recommended duration of treatment is 14d.</p> <p>Test of cure with a urine culture post-treatment is essential.</p> <p>Follow up with monthly urine culture until delivery.</p>

Asymptomatic bacteriuria (ASB) in pregnancy		
Etiology	Preferred regimen	Comments
<p><i>Similar to acute cystitis in pregnancy</i></p>	<p>Cefalexin 500 mg qid x 7d</p> <p>Cefuroxime 500 mg bid x 7d</p> <p>Nitrofurantoin macrocrystals 100 mg qid x 7d</p> <p>Fosfomycin 3 g single-dose sachet</p> <p>Amoxicillin-clavulanate 625 mg bid x 7d</p>	<p>Treat ASB to reduce the risks of symptomatic UTI and low birth weight neonates and preterm infants.</p> <p>Choice of regimen is based on culture/susceptibility test result. Note caveats for use of nitrofurantoin and amoxicillin-clavulanate.</p> <p>Screen all pregnant women for ASB once between the 9th and 17th week, preferably during the 16th week. The standard urine culture/susceptibility is the test of choice. Urinalysis is inadequate for ASB screening.</p> <p>Do follow-up urine culture 1 week post-treatment and monitor every trimester till delivery.</p>

COMPLICATED UTI (CUTI)

- Significant bacteriuria plus clinical symptoms occurring in the setting of:
 - functional or anatomic abnormalities of the urinary tract,
 - presence of an underlying disease that interferes with host defense mechanisms
 - any condition that increases the risk of acquiring [persistent] infection and/or treatment failure.
- Cut-off for significant bacteriuria in cUTI is 100,000 cfu/mL; may be lower in certain clinical situations, such as in catheterized patients.

Etiology	Preferred regimen	Comments
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<p>Etiologic agents more varied and may include drug – resistant organisms (eg., ESBL-producing <i>E. coli</i>), <i>Pseudomonas aeruginosa</i> and enterococci</p>	<p>Parenteral Amikacin 15 mg/kg q24h Gentamicin 3-5 mg/kg q24h Piperacillin-tazobactam 2.25-4.5g q6-8h Ertapenem 1g q24h Meropenem 1 g q8h Oral Ciprofloxacin 500-750 mg bid Levofloxacin 500-750 mg OD Amoxicillin-clavulanate 625 mg tid or 1 g bid</p>	<p>Always obtain urine for gram stain, culture and susceptibility prior to start of treatment, and adjust regimen as needed based on culture result.</p> <p>Ancillary diagnostic tests such as imaging of the urinary tract (CT or ultrasound) are often warranted.</p> <p>Start with parenteral broad-spectrum antibiotic for severely ill patients, and then switch to an oral regimen/de-escalate when there is clinical improvement.</p> <p>treatment duration: 7-14 days</p> <p>Repeat urine culture 1-2 weeks post -treatment.</p> <p>Referral to a specialist often warranted</p>
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CATHETER-ASSOCIATED UTI (CAUTI)

Diagnosed when

- Signs or symptoms compatible with UTI are present with no other identified source of infection, AND $\geq 10^3$ colony forming units (CFU)/ml of ≥ 1 bacterial species are present in a single catheterized urine or in a midstream voided urine within 48 hr after catheter (urethral, suprapubic or condom) removal
- Often a healthcare-associated infection

	Preferred regimen	Comments
<p>Etiologic agents more varied and may include drug – resistant organisms (eg., ESBL-producing <i>E. coli</i>), <i>P. aeruginosa</i> and enterococci</p>	<p>Amikacin 15 mg/kg iv q24h Ertapenem 1 g iv q24h Meropenem 1 g iv q24h Cefepime 1-2 g iv q8-12h Ceftazidime 1-2 g iv q8h Piperacillin-tazobactam 4.5 g iv q8h Ampicillin 1-2 g iv q6h (for susceptible enterococcal infections) Levofloxacin 750 mg po or iv q24h (for mild infections with no previous 3rd gen. cephalosporin or fluoroquinolone use)</p>	<p>Pyuria, odorous or cloudy urine alone is not an indication for initiating antibiotics</p> <p>Whenever possible, remove indwelling catheter; if still needed, replace with a new catheter and obtain urine for gram stain and culture/susceptibility test prior to initiating treatment.</p> <p>DO NOT obtain urine for culture if asymptomatic.</p> <p>Choice of empiric antibiotics is institution-specific depending on the local susceptibility patterns and severity of illness.</p> <p>Duration: 7 days w/ prompt resolution of signs and symptoms; 10-14 days of antibiotic treatment for patients with delayed response</p>

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CANDIDURIA

Asymptomatic candiduria		
	Preferred regimen	Comments
<i>Candida</i> sp. in urine almost always represents colonization; more often in the elderly, female, diabetic, w/ indwelling urinary device, w/ prior surgical procedure, and taking antibiotics; colony count and presence of pyuria not helpful in differentiating colonization from infection.	No treatment indicated <u>Exceptions:</u> When undergoing urologic procedure, treat with oral fluconazole 400 mg (6 mg/kg) pre- and post-procedure. Treat also those at risk for dissemination (eg., neutropenic patients).	Elimination of risk factors (ex. indwelling urinary catheter) usually adequate to clear candiduria.
Symptomatic cystitis		
Etiology	Preferred regimen	Comments
Most common etiologic agent: <i>C. albicans</i>	Fluconazole 200-400mg po od x 2 wks <u>For fluconazole-resistant <i>Candida</i> (<i>C. krusei</i> or <i>glabrata</i>):</u> AmB deoxycholate 0.3-0.6 mg/kg x 1-7days	Do ultrasound or CT of kidneys if candiduria persists in immunocompromised patients.
Pyelonephritis		
Etiology	Preferred regimen	Comments
Most common etiologic agent: <i>C. albicans</i>	Fluconazole 200 mg po od x 2 wks <u>For fluconazole-resistant <i>Candida</i> (<i>C. krusei</i> or <i>C. glabrata</i>):</u> AmB deoxycholate 0.3-0.6 mg/kg x 2 wks	Consider surgical intervention to relieve obstruction if any (e.g., fungus ball). If disseminated disease suspected, treat as if bloodstream infection is present.

BACTERIAL PROSTATITIS

- Most cases of bacterial prostatitis are preceded by a urinary tract infection.
- Risk factors: urinary tract instrumentation, urethral stricture, or urethritis (usually due to sexually transmitted pathogens)

Acute bacterial prostatitis (ABP) without risk of STD

Etiology	Preferred regimen	Comments
Enterobacteriaceae, enterococcus, <i>Pseudomonas aeruginosa</i>	<p>1st line: Ciprofloxacin 500 mg po or 400 mg iv bid OR Levofloxacin 500-750 mg iv/po OD</p> <p>If enterococcus is suspected/documented: Ampicillin 1-2 g iv q4h; vancomycin 15 mg/kg q12 h</p> <p>Alternative: TMP-SMX DS bid Piperacillin-tazobactam 4.5 g IV q6-8h</p>	<p>Do CBC, blood cultures, urinalysis and urine culture.</p> <p>Treatment duration: 2 weeks; extend to 4 weeks if patient still symptomatic.</p> <p>Caveat: <i>E. coli</i> resistance to TMP-SMX is high so TMP-SMX cannot be 1st line empiric treatment despite its high prostatic concentration.</p>

ABP with risk of STD

Etiology	Preferred regimen	Comments
<i>Neisseria gonorrhoeae</i> and <i>Chlamydia trachomatis</i>	<p>Ceftriaxone 250 mg IM x 1 dose PLUS Doxycycline 100 mg bid or azithromycin 500 mg po od</p>	Fluoroquinolones not recommended for gonococcal infection. Treat for 2 weeks.

ABP with risk of antibiotic-resistant pathogens

Etiology	Preferred regimen	Comments
Fluoroquinolone-resistant Enterobacteriaceae and <i>Pseudomonas</i> ESBL or AmpC beta lactamase-producing Enterobacteriaceae	<p>Ertapenem 1g IV od OR Meropenem 1 g IV q8h (for <i>Pseudomonas</i>)</p> <p>Alternative: Cefepime 2g IV q12h</p>	Consider a 4-week regimen.

Complicated ABP

- Eg., bacteremia or suspected prostatic abscess

Etiology	Preferred regimen	Comments
Enterobacteriaceae, enterococcus, <i>Pseudomonas aeruginosa</i>	<p>Ciprofloxacin 400 mg iv q12h OR Levofloxacin 750 mg iv q24h</p>	<p>Obtain blood cultures.</p> <p>Treat for 4 weeks.</p>

	<u>Alternative:</u> Ceftriaxone 1-2 g iv q24h PLUS Levofloxacin 750 mg IV q24h OR Ertapenem 1 g IV q24h OR Piperacillin-tazobactam 4.5 g IV q8 h	Consider genitourinary imaging. Drain abscess. Switch to oral regimen once bacteremia has cleared and abscess is drained.
Chronic bacterial prostatitis (CBP) <ul style="list-style-type: none"> • Prolonged urogenital symptoms (ie., >3 mos.) • Hallmark: relapsing UTI 		
Etiology	Preferred regimen	Comments
Enterobacteriaceae, enterococci, <i>P. aeruginosa</i>	Ciprofloxacin 400 mg iv q12h OR Levofloxacin 750 mg iv q24h <u>Alternative:</u> TMP-SMX DS bid	Treat for 4-6 weeks. If refractory, options are: 1. treat intermittently for symptomatic episodes; 2. suppressive treatment; or 3. prostatectomy if all other options have failed.