

Urinary Tract Infections

Most Common Pathogens:¹

Acute Cystitis: E.coli, S. saprophyticus

Pyelonephritis: E.coli, Klebsiella, Enterobacter, Proteus mirabilis

Complicated UTI: E.coli, Enterococci, Klebsiella, Proteus, P.aeruginosa

Prostatitis: E.coli, gram negative bacilli, Staph, Enterococcus

Treatment Recommendations

Always use culture & sensitivity (C&S) testing to guide therapy. Only in acute cystitis C&S may not be necessary.

If you must begin empiric therapy immediately, be certain to tailor therapy to C&S results as soon as the results are known.¹

	Drug of Choice¹	Second Line Therapy¹	Third Line Therapy¹	Comments
Cystitis				
Acute Uncomplicated Cystitis (AUC)	TMP/SMX (x3d) TMP (x3d) Nitrofurantoin (x7d)	Fosfomycin Amoxicillin (x7d) Cephalexin (x7d) Ciprofloxacin (x3d) Norfloxacin (x3d)	Gatifloxacin (x3d) Levofloxacin (x3d)	- use longer courses in diabetes and if symptomatic >7day (and in older women?) ¹ - due to increasing E.coli resistance, amoxi may not be suitable for empiric therapy; reserved for UTIs caused by strep or enterococci or if organism is known to be susceptible ¹
	Fluoroquinolones are not 1 st line in cystitis because of the threat of increasing fluoroquinolone resistance			
Recurrent (<1mt) Treat: 10-14d	TMP/SMX TMP Nitrofurantoin	Amox/Clav Norfloxacin Ciprofloxacin	Gatifloxacin Levofloxacin	- some references classify infections as <i>recurrent</i> if it is within 2 weeks of stopping antibiotic and as a <i>reinfection</i> if >2 weeks since antibiotic is stopped ^{4,8}
Complicated Treat: 10-14 days	TMP/SMX TMP Nitrofurantoin Gentamycin +/- Ampicillin (IV) Tobramycin + Ampicillin (IV)	Amox/Clav Ceftriaxone Cefotaxime Norfloxacin Ciprofloxacin (IV/po) Tobramycin(IV)	Imipenem (IV) Ceftazidime (IV) Piperacillin/ tazobactam (IV)	-definition of "complicated UTI" varies but usually includes urinary tract structural abnormalities (ie. catheters) and specific populations (men, pregnant women, patients with diabetes, patients taking immunosuppressants, and patients who have received a renal transplant) ⁴ - IV antibiotics used in severe UTIs should be switch to oral as soon as possible
Pyelonephritis				
Pyelonephritis (out patient)	TMP/SMX TMP Norfloxacin Ciprofloxacin	Amox/Clav	Gatifloxacin Levofloxacin Ceftriaxone (IV) Cefotaxime (IV) Gentamycin +/- Ampicillin (IV)	- symptoms of pyelonephritis typically includes frequency, urgency, dysuria, fever and flank pain ⁴ - effective antibiotic therapy should stabilize patients in 24 hours, significantly reduce urinary bacteria within 48 hours and within 72 hours, most patients should be afebrile and experiencing fewer symptoms ⁴
Pyelonephritis (in patient)	Ampicillin + Tobramycin (IV) Gentamycin +/- Ampicillin (IV)	Ceftriaxone Cefotaxime	Imipenem Norfloxacin Ciprofloxacin	
Prostatitis				
Prostatitis¹ Acute: treat 2-4 weeks	TMP/SMX Ciprofloxacin Norfloxacin Ampicillin + Tobramycin(IV) Gentamycin +/- Ampicillin (IV)	Tobramycin (IV)	Ciprofloxacin Gatifloxacin Levofloxacin	- chronic prostatitis may need longer treatment ¹ - chronic may not caused by bacteria, so if patient has not responded to antibiotic in 4-6 weeks, refer or try another option (ie. alpha-blocker) ¹

References: ¹ Rx files: Drugs for Urinary Tract Infections. Feb 2005. www.rxfiles.ca ² Rx files: Fluoroquinolones "Too Valuable to Overuse" Feb 2005. www.rxfiles.ca ³ Rx files: Drug Comparison Chart. Sept 2004. www.rxfiles.ca ⁴ O'Donnell J, Gelone S, Abrutyn E. Selecting Drug Regimens for Urinary Tract Infections: Current Recommendations. Infect Med. 2002. www.medscape.com/viewarticle/423482_print
⁵ Gomolin I, McCue J. Urinary Tract Infections in the Elderly Patient. Infect Urol . 2000. www.medscape.com/viewarticle/412692_print
⁶ Managing Acute Uncomplicated Cystitis in the Era of Antibiotic Resistance. September 2003. www.medscape.com/viewprogram/2634_pnt
⁷ Gray J. Therapeutic Choices. 4th ed. Canadian Pharmacists Association. 2003. ⁸ Fitzgerald M. Urinary Tract Infection: Providing the Best Care. (article for CE credit). June 2002. www.medscape.com/viewarticle/436592_5 ⁹ Chilton, L. Infections and Antimicrobial Resistance in the Elderly Living in Long-Term Care Settings (conference coverage). Nov 2004. www.medscape.com/veiwarticle/493678?src=search

Prophylaxis

- If >2 episodes in 6 months or 3 episodes in 12 months, consider prophylaxis⁷
- Consider short course *self therapy* where patient begins 3 day treatment of antibiotics as soon as symptoms develop^{1,7}
- Treatment Options:¹
 - First Line Therapy:
 - TMP/SMX or TMP 1 tab at bedtime or post coital
 - Nitrofurantoin 50mg at bedtime or post coital
 - Second Line Therapy:
 - Cephalexin 250mg at bedtime or post coital
 - Low dose fluoroquinolone (cipro 250mg or norfloxacin 200mg) daily or every other day
- Vaginal estrogens may be an option for some post-menopausal women¹

Asymptomatic Bacteriuria

- 50% of elderly women and 30% of elderly men have asymptomatic bacteriuria⁹
- Only screen and treat asymptomatic patients before genitourinary procedures or pre-op prosthetics, patients who are immunosuppressed, and pregnant women¹
- No indication for screening and **no benefit to treating** elderly, patients with chronic catheters or spinal cord injuries¹
- If patient is asymptomatic, treating the patient does not provide benefit and may contribute to resistance. Therefore, **DO NOT CULTURE ASYMPTOMATIC RESIDENTS.**¹

Treatment in Special Populations

* Always obtain C&S tests

Elderly

- Elderly who are otherwise healthy and living in the community often have classic UTI symptoms such as dysuria, frequency, urgency, suprapubic discomfort, and new or increased incontinence⁵
- Usually treat UTIs in elderly for 7-14 days⁶

Long Term Care

- Elderly who are more frail and in long term care (LTC) facilities, often exhibit atypical UTI symptoms such as mental changes; therefore with bacteriuria so common in elderly it is often hard to distinguish between symptomatic UTI and comorbid conditions^{5,8}
 - In LTC facilities organisms are usually more resistant
 - Catheter induced UTIs often involve many organisms and may involve P.aeruginosa and other gram negative rods. Try to avoid using catheters, if possible⁴
 - If using empiric treatment, use an agent to covers pseudomonas; ciprofloxacin is the fluoroquinolone most active against P.aeruginosa⁴
 - Fluoroquinolones are appropriate empiric therapy for catheter related UTI and are generally used for 14 days in elderly men and 7 days for elderly women⁵
 - Ceftazadine, cefepime, piperacillin, piperacillin/tazobactam, and aztreonam can also be used in empiric therapy until C&S results are known. All of these antibiotics have good activity against gram negative rods, including P.aeruginosa⁴
- **If possible, wait for C&S results before initiating therapy*

Pregnancy

- UTIs in pregnancy are a risk factor for low birth weights and prematurity⁸
- Screen for asymptomatic bacteriuria in pregnancy at 12-16 weeks, and if patient develops a UTI, screen once per month thereafter⁸
- In pregnancy 20-40% of bacteriuria develops into a UTI, and only 1-2% of patients with negative cultures develop a UTI⁸
- Treat for 3-7 days^{1,8}
- Treatment options for cystitis or asymptomatic bacteriuria (treatment should be guided by C&S results):
 - Nitrofurantoin (avoid at term: +36 weeks) is often considered the treatment of choice in pregnancy¹
 - Amoxicillin is a safe alternative to use in pregnancy (but increasing resistance)¹
 - TMP/SMX (avoid in the last 6 weeks); caution with TMP in the 1st trimester, and if TMP is used, give with folic acid¹
 - Cephalexin is also safe in pregnancy¹
- Avoid fluoroquinolones in pregnancy¹

Fluoroquinolone Resistance in Urinary Tract Infection

- Fluoroquinolone resistant S. pneumoniae, E.coli, Pseudomonas and gonococcus found in Canada²
- Although resistance is still fairly low, it is predicted that if resistance continues to grow, fluoroquinolones will no longer be useful in 5-10 years²
- Practices that encourage resistance include overusing, underdosing and not adjusting therapy in response to C&S testing²
- Ciprofloxacin is the fluoroquinolone with the most activity against P.aeruginosa (72-82% susceptible found in Saskatoon and Regina Health Regions), so it should be **reserved for use in P.aeruginosa**^{1,2}
- In Saskatchewan, E.coli is the most common AUC organism, and both TMP/SMX and nitrofurantoin have good activity against E.coli²

	<u>E.coli sensitivity in SK</u> ^{1,2}
TMP/SMX	≥83-87%*
Nitrofurantoin	≥99%
Ciprofloxacin	≥94%

* resistance rates for TMP/SMX(at ~15%) are likely an overestimate because they only consider cases that were cultured which are more likely complicated or recurrent cases²

“Reserving fluoroquinolones for cases most likely to benefit from their use may preserve their long term effectiveness”

UTI Antibiotics

Generic Drug	Brand Name	Resistance/Coverage	Notes
Miscellaneous Antibiotics			
Cotrimoxazole (TMP/SMX)	Bactrim, Septra	<ul style="list-style-type: none"> - Covers E.coli, P.mirabilis, K.pneumonia, S.aureus - Consider resistance if failed empiric therapy or recently on TMP/SMX¹ - E.coli resistance is ~15% in SK, but might be higher in institutions; should not be used if resistance is >20%¹ - E.coli ≥83-87% susceptible in SK¹ - Enterococcus resistant in SK¹ 	<ul style="list-style-type: none"> - Limited by sulfa allergy¹ - Avoid in last 6 wks of pregnancy¹
TMP	Proloprim		<ul style="list-style-type: none"> - Can use TMP alone in sulfa allergy¹ - Caution in 1st trimester of pregnancy; if used give folic acid¹
Nitrofurantoin	Macrobid (100mg macrocrystals) Macodantin (50mg macrocrystals)	<ul style="list-style-type: none"> - Does not cover pseudomonas or proteus¹ - Good for E.coli, S.aureus and enterococcus¹ - E.coli ≥99% sensitive in SK¹ - Enterococcus ≥99% sensitive in SK¹ - Very little resistance has developed despite using nitrofurantoin for almost 50 years⁶ 	<ul style="list-style-type: none"> - Use 7 day regimen¹ - Avoid if Cl_{cr} <50ml/min¹ - Macrocrystals better tolerated and convenient¹ - Not used in pyelonephritis¹
Fosfomycin	Monurol	<ul style="list-style-type: none"> - Often not as effective as TMP/SMX, especially against S. saprophiticus¹ - Less E.coli resistance than TMP/SMX¹ 	<ul style="list-style-type: none"> - Single dose¹ - Mix powder in ½ cup water¹ - Only used in AUC⁶
Imipenem (IV)	Primaxin	- Broad spectrum, covers pseudomonas ¹	
Penicillin			
Amoxicillin	Amoxil	<ul style="list-style-type: none"> - E.coli resistance is increasing (>35% in SK)¹ - Use for strep or enterococci UTI or if C&S shows organism is susceptible; not usually empiric therapy¹ 	- Safe in pregnancy ^{1,3}
Amoxicillin/clavulanate	Clavulin	<ul style="list-style-type: none"> - Less E.coli resistance than amoxil (~20%)¹ - E.coli ≥ 82% sensitive in SK¹ - Coverage broader than amoxicillin, including more resistant organisms like enterococcus¹ 	
Ampicillin (IV)	Ampicillin	<ul style="list-style-type: none"> - Good group B strep activity (good in diabetes and pregnancy)¹ - Good strep and enterococcus coverage¹ - Enterococcus ≥98% sensitive in SK¹ 	
Piperacillin/Tazobactam (IV)	Tazocin	<ul style="list-style-type: none"> - Covers pseudomonas, broad spectrum¹ - Poor evidence¹ 	
Cephalosporin			
Cephalexin (1 st gen)	Keflex	- E.coli resistance ~10% in SK ¹	- Safe in pregnancy ^{1,3}
Cefotaxime (3 rd gen) (IV)	Claforan	- No enterococcus coverage ¹	
Ceftriaxone (3 rd gen) (IV)	Rocephin	- No enterococcus coverage ¹	
Ceftazadime (3 rd gen) (IV)	Fortraz	- Reserve for pseudomonas coverage ¹	
Fluoroquinolones (<i>Fluoroquinolones have good activity, but we need to preserve them because of increasing resistance¹</i>)			
Ciprofloxacin (po or IV)	Cipro	<ul style="list-style-type: none"> - E.coli ≥94% sensitive in SK¹ - Enterococcus ≥74% sensitive in SK¹ - Fluoroquinolone with the best activity against pseudomonas⁴ 	<ul style="list-style-type: none"> - Use lower doses in uncomplicated cystitis and higher doses in complicated and pyelonephritis¹
Norfloxacin	Noroxin	- Good pseudomonas activity ¹	- Moxifloxacin is not used in UTIs because it does not reach sufficient concentrations in the urine ¹
Gatifloxacin	Tequin		- Avoid in pregnancy ¹
Levofloxacin	Levaquin		
Aminoglycosides			
Gentamycin (IV)	Garamycin	- Very good gram negative coverage ¹	<ul style="list-style-type: none"> - Q24H dosing safe and effective¹ - Do not need levels if <7d¹ - Lower doses needed in elderly¹
Tobramycin (IV)	Nebcin	- Reserve for pseudomonas coverage ¹	- Lower doses needed in elderly ¹

See "Fluoroquinolone Resistance" on previous page