Cystitis, Uncomplicated (uUTI)	Alternatives
TMP-SMX DS bid x 3 days (IF resist < 20% + no use in past 90 days)	Ciprofloxacin 250mg PO BID x 3 days
Nitrofurantoin 100mg PO BID x 5 days	Levofloxacin 250mg PO q24hrs x 3 days
Fosfomycin 3gm PO x 1 (less effective tban Nitrofurantoin)	Amox/Clav 875mg PO bid x 5 - 7 days
	Cephalexin 500mg PO BID x 5 - 7 days
	Cefdinir 300mg PO BID x 3 - 7 days
	Cefixime 400mg PO qday x 3 - 7 days
Antimicrobial Considerations	
Nitrofurantoin	*** Good choice d/t minimal resistance and comparable efficacy** *** Do NOT use in upper urinary tract infx d/t poor penetration** *** Inactive against *Proteus, Pseudomonas*** *** Frequent GI upset**
SMX-TMP	*** Use if E. coli resist < 20% and no use in past 90 days**
Fosfomycin	*** Lower efficacy compared to NF/SMX-TMP**
Fluoroquinolones	*** Use ONLY if severe symptoms AND** **- Allergy to first-line agents or** **- Abx treatment in prior 3 months (except FQ)**
Amox/Clav	*** Second-line for empiric Tx of uUTI** *** First-line if etology known to be Gm+** *** E. coli resist approx 25 - 40% in many US locations**
Trimethoprim	*** TMP alone is equiv to SMX-TMP when used for 7 + days** *** Fever ADRs compared to SMX-TMP**
Cephalexin	*** Never first-line for empiric uUTI**

Cystitis, Complicated or Catheter-related (cUTI)	Alternatives
Ciprofloxacin 500mg PO BID x 7 - 14 days	Nitrofurantoin 100mg PO BID (for catheter-related w/o s/s of systemic infx (fever T>102F, flank pain)
Levofloxacin 750mg PO q24hrs x 7 - 14 days	SMX-TMP DS BID (if resist < 20%)
	IF MDR-risk high or Systemic Illness
	Ertapenem 1gm IV q24hrs
	Pip/Tazo 3.375 - 4.5gm IV q6hrs (for high MDR risk)
	Cefepime 2gm IV q12hrs (for high MDR risk)
	Ceftazidime 2gm IV q8hrs (for high MDR risk)
	Imipenem 500mg IV q6hrs (for high MDR risk)
	Meropenem 1mg IV q8hrs (for high MDR risk)
	if Gm+ cocci, consider
	Vancomycin per protocol
Antimicrobial Considerations	
Aztreonam	* Reasonable empiric choice in pts with rash or immeidate hypersensitivity to PCN. For severe infx, combine with second agent
Carbapenems	* For severe pts. * covers Pseudomonas (except Ertapenem) * Can be used in pts with PCN allergy if rxn NOT a type-1 immediate hypersensitivity
Cefepime	* for Severe pts if ESBL-risk os low * Covers Pseudomonas * Can be use in PCN-allergy if NOT type-1 Immediate hypersensitivity
Ceftazidime	* for Severe pts if ESBL-risk os low * Covers Pseudomonas * Can be use in PCN-allergy if NOT type-1 Immediate hypersensitivity
Fluoroquinolones	* For empiric cUTI in mild infection

Cystitis Information

Pyelonephritis - Outpatient	Alternatives
Low-risk of Resistance	Ertapenem 1gm IV q24hrs
Ciprofloxacin 500mg PO BID x 5 - 7 days	Gentamicin 5mg/kg IV q 24hrs
	SMX-TMP DS BID
Ceftriaxone 1gm IV q24hrs x 10 days (consider 1st line of *E.coli* resist to FQ > 10%)	Amox/Clav 875mg PO BID Cefixime 400mg PO qday
High-Risk MDRO (previous MDRO, recent IP, travel)	**FQ or beta-lactam use, recent travel**
Ertapenem 1gm IV q24hrs	Pip/Tazo 3.375gm IV q6hrs
High-risk MDRO and/OR prior *Pseudomonas* infxn	Cefepime 2gm IV q12hrs
Meropenem 1gm IV q8hrs	
Considerations	
Bacteremia	* 7 days of Tx may be as effective as 14 days in pts with Gm(-) bacteremia * Follow-up blood cultures are unlikely helpful in Gm(-) bacteremia
Beta-lactams (PO)	* Second-line due to high rates of relapse
Duration	* Uncompilcated = 7 days (for FQ) * Complicated 10 - 14 days
Fosfomycin	* Do NOT use due to limited systemic absorption
FQ resist to *E. coli* > 10% - consider initial IV dose	* Ceftriaxone 1gm IV or IM * Gentamicin 5mg/kg IV or IM * Ciprofloxacin 400mg IV x 1
Gentamicin	* Effective for first dose in OP therapy * May be preferrable for first dose (OP) due to long Post-Abx Effect
Nitrofurantoin	* Not recommended as it does NOT attain therapeutic levels in renal parenchyma
SMX-TMP	* Usually not appropriate for empiric therapy * 14 days is appropriate Tx for pathogens KNOWN to be sens

Pyelonephritis - Inpatient	.
Ceftriaxone 1gm IV q24hrs	With or Without Gentamicin 5mg/kg IV q24hrs
Gentamicin 5mg/kg IV q24hrs	With or Without Ampicillin 2gm IV q4hrs
Piperacillin/Tazobactam 3.375gm IV q6hrs	With or Without Gentamicin 5mg/kg IV q24hrs
Meropenem 2gm IV q8hrs	
IF local FQ Resistance Rate < 10%	
Ciprofloxacin 400mg IV q12hrs	
Levofloxacin 500mg IV q24hrs	
Considerations	
Duration	* Typically 48hrs of parenteral therapy, or until afebrile, then to PO to complete 7 day (FQs) or 14 days (SMX-TMP). * if beta-lactam is used to complete therapy, 10 - 14 days
Enterococcus suspected or proven	* Ampicillin 2gm IV q4hrs + Gentamicin 5mg/kg IV qday, then * Amoxicillin to complete 10 - 14 days
Specific Antimicrobial	
* Amoxicillin	* Mild to mod acute uncomplicated Pyelo caused by *Enterococcus* .. Or to complete 10 - 14 days of tx
* Ampicillin	* for severe infx caused by *Enterococcus* with/without AG. * Seitch to Amoxicillin PO to complete 14 days
* Cefazolin	* May be an alternative (1 obs study showed non-inferior to CTR)
* Ceftriaxone	* Active against most *Enterobacteriaceae* * No long-term post-antibiotic effect (opposed to AG)
* Ceftazidime	* Active against most Gm(-) incl. *Pseudomonas* * Attains good levels in urine
* Fosfomycin	* Do NOT use due to limited systemic absorption
* Gentamicin	* Effective for first dose in OP therapy * May be preferrable for first Dose (OP) due to long Post-Abx Effect
* Nitrofurantoin	* Not recommended for pyelonephritis as it does NOT attain therapeutic levels in renal parenchyma

Cystitis Information

Recurrent UTI (defined as 3+ culture-pos UTI / year)	Alternatives
Post-Coital	**Failed other Tx Options**
Nitrofurantoin 100mg PO x 1	Nitrofurantoin 50 - 100mg PO qhs
SMX-TMP SS - 1/2 tablet PO x 1	TMP 100mg PO qhs
TMP 100mg PO x 1	SMX/TMP SS - 1/2 tablet PO qhs or TIW
Cephalexin 250mg PO x 1	Cephalexin 250mg PO qhs
Ciprofloxacin 125mg PO x 1	
Considerations	
Cefaclor	* Shown to be effective against recurrent cystitis when given daily. * No clinical trials have shown efficacy as post-coital prophylaxis
Fluoroquinolones	* Consistently good evidence for efficacy.
Nitrofurantoin	* Consistently good evidence for efficacy. * Low cost option * Rarely associated with ADR (except pulmonary)
SMX-TMP	* Increasing E. coli resistance limits utility in some regions * Consistently good evidence for efficacy

UTI Treatments in Pregnancy	.
Asymptomatic Bacteriuria and Cystitis	* Nitrofurantoin 100mg BID x 5 days - consider alternate near-term in G6PD-deficient mothers d/t theoretical risk of maternal and fetal hemolytic anemia * Cephalexin 500mg PO BID x 3 - 7 days * Cefuroxime 500mg PO BID x 3 - 7 days * Fosfomycin 3gm PO x 1 * SMX-TMP may be considered during 2nd and 3rd trimester - Theoretical risk of neural tube defects during 1st trimester - Theoretical risk of kernicterus with near-term use
Group-B Streptococcus	* PCN VK 500mg QID x 3 - 7 days * Amoxicillin 500mg PO TID x 3 - 7 days
Acute Pyelonephritis	* Cefazoin 1gm IV q8hrs until afebrile x 48 hrs, then change to PO to complete 14 days * Ceftriaxone 1gm IV /IM q24hrs until afebrile x 48 hrs, then change to PO to complete 14 days (consider alternative near term due to theoretical kernicterus risk) * Gentamicin 2mgkg IV q8hrs, then change to PO to complete 14 days (for PCN & Cephalosporin allergic pts)

Asymptomatic Bacteriuria	.
Should NOT be treated in most populations	
Commonly associated with pyruia (presence of WBC does NOT warrant treatment	
ASB screening is only recommended in pregnant pts and pts undergoing invasive urologic procedures	
ASB Tx in Pregnancy	
- Amox, Nitrofurantoin, Oral Cephalosporin, TMP-SMX, Trimethoprim x 3 - 7 days	

Urine Analysis Pearls	.
Leukocyte Esterase - positive --> indicates pyuria	
Nitrite - positive --> may indicated Gram-negative bacteria	
WBC - > 10 / HPF --> pyuria	
Epithelial Cells > 20 / HPF --> may indicate contamination	

Cystitis Information

Pearls
E. coli resistance is increasing to SMX/TMP and FQ
ESBL-producers are often susceptible to fosfomycin or ertapenem
IF failure on 3-day course, culture and Tx for 2 weeks
Pregnancy
- 7-day Tx recommended
- Do not use sulfonamides near term (2 weeks before EDC) --> incr risk of kernicterus
- Do not use nitrofurantoin in last trimester of pregnancy nor during labor for fear of causing hemolytic anemia in the newborn
- Avoid fluoroquinolones throughout pregnancy
Phenazopyridine 200mg PO TID x 2 days to reduce sx
Duration
- For CAUTI, tx for 7 days if prompt resolution of sx
- For CAUTI, tx for 10 - 14 days if delayed response

Antimicrobial Pearls	Considerations
Nitrofurantoin	Cystitis, uncomplicated * Good choice d/t minimal resistance and comparable efficacy * Do NOT use in upper urinary tract infx d/t poor penetration
SMX-TMP	Cystitis, Uncomplicated * Use if E. coli resist < 20% and no use in past 90 days
Fosfomycin	Cystitis, uncomplicated * Lower efficacy compared to NF/SMX-TMP
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Cystitis Information