



Got a Bladder Infection? Urine Good Hands.

What is a UTI?

Urinary tract infections (UTIs) are common infections in adults, adolescents, children, and infants. However, the clinical presentation of UTIs often varies with age. Infants and young children aren't able to communicate symptoms, and presentation is usually vague. Common symptoms in these patients are irritability, poor feeding, vomiting, and fever. Additional information such as history of urinary tract infections, suprapubic tenderness on exam, and temperatures over 40 C may be the most helpful clinical signs/symptoms for UTI diagnosis.¹ Older children are more likely able to communicate the "common" signs and symptoms - dysuria, urgency, frequency, and incontinence. Risk factors for UTIs include young age, prolonged catheterization, being uncircumcised, anatomical urinary tract abnormalities, bladder and bowel dysfunction, and previous UTIs.

UTIs can be classified as uncomplicated or complicated based on several criteria. UTIs are considered complicated if they occur in males, pregnant women, immunosuppressed patients, or in those with risk factors that predispose to persistent or relapsing infection (i.e. indwelling catheters, urinary tract anatomical abnormalities). Common pathogens of uncomplicated UTIs include: *E. coli*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, group B streptococci, and *Proteus mirabilis*. Bacteria that commonly cause complicated UTIs include: *Proteus mirabilis*, *Pseudomonas aeruginosa*, and *Enterococcus* species. Recommendations included in this article refer to uncomplicated urinary tract infections only.

How do we diagnose UTIs?

Diagnosis is most often initially based on urinalysis findings due to ease. The presence of leukocyte esterase in the urinalysis is the single most sensitive test for UTI in children.² However, false positives may still occur in children with Kawasaki disease, appendicitis, and kidney stones.¹ False negatives may occur if the patient presents early in the infectious process. The presence of nitrites is more specific, but less sensitive. Since nitrites are not produced by several bacteria that cause UTI (e.g. *Enterococci* and *Pseudomonas*), the absence of nitrites does not rule out UTI. If both leukocyte esterase and nitrites are negative, then UTI diagnosis can effectively be eliminated. Though requiring more time and resources, urine culture obtained using clean technique (catheterization or suprapubic aspiration) remains the gold standard for diagnosis. Bag samples are not reliable specimens for culture and should not be used for diagnosis.² Cobb et al defines a positive urine culture as >100,000 col/mL from spontaneous void and >50,000 col/mL if collected by catheterization or suprapubic aspiration. The AAP guidelines require both a urinalysis indicative of infection (pyuria and/or bacteriuria) and the presence of 50,000 CFU/mL in urine obtained by catheterization or suprapubic aspiration for diagnosis.³

How do we treat infants, children and adolescents with UTI?

Recommendations for treatment of UTIs vary based on the patient's age, and should be used in accordance with local bacterial resistance patterns. For children 2-24 months of age, oral antibiotics commonly used are cephalosporins, amoxicillin-clavulanate, or trimethoprim-sulfamethoxazole, based on the organism's susceptibility. For older children and adults,

nitrofurantoin can be used, however, the AAP does not recommend treating febrile infants with nitrofurantoin, because the concentration of drug in the serum may not be enough to treat urosepsis or pyelonephritis. The AAP recommends a total course of therapy of 7-14 days for children (includes IV and PO treatment).³ However, new evidence suggests shorter course of therapy may be appropriate. Desai et al revealed that infants 60 days old or less who presented with bacteremia plus UTI did not have more frequent UTI recurrence when treated with 7 days or less with IV antibiotics.⁴

When treating UTIs in post-pubescent teens, the adult IDSA guidelines for treatment of urinary tract infections is a useful reference. First line options in adults include sulfamethoxazole-trimethoprim and nitrofurantoin.⁴ Local resistance patterns should help guide therapy choices. According to IDSA guidelines, if local uropathogen resistance patterns show >20% resistance to sulfamethoxazole-trimethoprim, the drug should not be used empirically. For example, the antibiogram data at COA shows high rates of resistance (~30%) to trimethoprim-sulfamethoxazole among *E. coli* (the predominant organism causing UTIs at COA) and in contrast, most isolates are susceptible to cefazolin. Therefore, cephalexin and not trimethoprim-sulfamethoxazole is a better choice as an empiric oral antibiotic to treat UTI. Fluoroquinolones (levofloxacin and ciprofloxacin) are treatment options for teens and adults. Resistant rates for uropathogens to fluoroquinolones is dramatically increasing, so empiric usage is not recommended and these agents should only be prescribed for a UTI based on culture/sensitivity results.

Ultimately, the choice of antibiotics in all ages should be based on urine culture and sensitivity data from urine obtained before treatment is initiated. Treatment based on sensitivities provide the higher chance for treatment success and a lower chance of recurrence.

COA Top Urine Sources Antibiogram: 2018 (Abbreviated)

Organism	Ampicillin	Ampicillin/ Sulbactam	Cefazolin	Ceftazidime	Cefepime	Piperacillin/ tazobactam	SMX/ TMP	Nitrofurantoin	Ciprofloxacin
<i>E. coli</i> (ESBL neg)	37	50	87	95	97	57	62	93	85
<i>Pseudomonas aeruginosa</i>				85	80				95
<i>Enterococcus faecalis</i>								88	
<i>Enterobacter sp.</i>					100	67	91		100

*ESBL = extended spectrum beta-lactamase

Oral Antibiotics for UTI in Infants 2-24 months³

Antibiotic	Dose	Duration
Amoxicillin-clavulanate	20-40 mg/kg/day divided into 3 doses	7-14 days
Trimethoprim-sulfamethoxazole	6-12 mg/kg trimethoprim/day divided into 2 doses	
Cephalexin	50-100 mg/kg/day divided into 4 doses	
Cefuroxime	20-30 mg/kg/day divided into 2 doses	

Parenteral Antibiotics for UTI in Infants 2-24 months^{3,6}

Antibiotic	Dose	Duration
Ampicillin	200 mg/kg/day divided every 6 hours	7-14 days
Ceftriaxone	75 mg/kg/day	
Ceftazidime or Cefepime (PsA coverage)	150 mg/kg/day divided every 8 hours	

*PsA = Pseudomonas

Oral Antibiotics for Children (greater than 24 months of age)²

Antibiotic	Dose	Duration
Amoxicillin-clavulanate	25-45 mg/kg/day divided into 2 doses	3-7 days
Trimethoprim-sulfamethoxazole	8-10 mg/kg trimethoprim/day divided into 2 doses	
Cephalexin	25-50 mg/kg/day divided into 4 doses	

Oral Antibiotics for UTI in Post-Pubescent Teens/Adults⁴

Antibiotic	Dose	Duration
Nitrofurantoin monohydrate/macrocrystals	100 mg twice daily	5 days
Sulfamethoxazole-trimethoprim	800/160mg (Double strength tablet) twice daily	3 days
Fosfomycin	3 g	Once dose

Ciprofloxacin*	250 mg twice daily	3 days
Cefdinir	300 mg twice daily	5-7 days

*used as an alternative when other options not able to be used for *Pseudomonas* UTI

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