

Urinary Tract Infections	
Definition	<ul style="list-style-type: none"> • Age < 2 mo: ≥ 50,000 CFU/mL of a uropathogen OR 10,000-50,000 CFU/mL with pyuria on UA • Age ≥ 2 mo: significant bacteriuria (≥100,000 CFU/mL of single uropathogen from clean catch or ≥50,000 CFU/mL of uropathogen from cath sample) with associated inflammatory response (+LE/nitrite/WBC -- except if due to Enterococcus, Klebsiella, or PsA) and lower urinary tract symptoms (if appropriate age) • Cystitis: infection of urinary bladder • Pyelonephritis: infection of upper urinary tract (kidneys and ureters)
Etiology	<ul style="list-style-type: none"> • ~90% due to <i>E coli</i>; others include <i>Enterococcus</i>, <i>Proteus</i>, <i>Pseudomonas</i>, and <i>Enterobacter</i> • Adenovirus may cause acute infectious cystitis • Risk factors <ul style="list-style-type: none"> • Ages 2-23 months: age <12 mo, max T ≥ 39 °C, nonblack race, female sex, uncircumcised male, no additional source of fever identified • Ages ≥ 2 years: <ul style="list-style-type: none"> ■ Female sex (shorter urethra, wetter periurethral environment) ■ Lack of circumcision (in male infants) ■ Sexual activity (receptive vaginal intercourse -- S saprophyticus; unprotected insertive anal intercourse) ■ Urinary tract anomalies (bladder stones, constipation, urinary retention, posterior urethral valves, VUR) ■ Bladder catheterization or instrumentation (predisposes to PsA, coag-neg Staph) ■ Sickle cell disease ■ DM or other immunosuppressive conditions
Pathophysiology	<ul style="list-style-type: none"> • Newborns: rare in first 6d life. May be due to hematogenous spread or ascending infection. Hematogenous spread more likely among preterm infants. Congenital anomalies of the kidney and urinary tract may predispose to UTI • Beyond newborn period: colonization of periurethral area by uropathogens → attachment of pathogens to uroepithelium → inflammatory response. Inflammation of upper urinary tract (pyelonephritis) → renal scarring → HTN, ESRD
Clinical Presentation	<p>Age < 2 years: fever may be sole manifestation, esp when ≥ 39 °C (102.2 °F)</p> <ul style="list-style-type: none"> • Concomitant upper respiratory infection or AOM does not r/o UTI • May have concomitant poor feeding, irritability, or FTT • May cause conjugated hyperbilirubinemia <p>Age ≥ 2 years:</p> <ul style="list-style-type: none"> • Cystitis: dysuria, urinary frequency, hematuria, suprapubic pain and TTP • Pyelonephritis: fever, flank/back pain, nausea/vomiting, headache
Diagnostic Studies	<p>Don't Forget the UTI Clinical Pathway</p> <p>Age < 2 mo: catheterized UA + urine culture.</p> <ul style="list-style-type: none"> • Obtain blood culture given risk of urosepsis • Strongly consider LP (1-3% of infants with UTI have bacterial meningitis) • Obtain renal/bladder U/S and consider VCUG if abnormal, if UTI is recurrent, or if pathogen other than <i>E. Coli</i> is identified • If ultrasound suggests renal damage - consider DMSA scan after resolution of acute illness <p>Age 2 mo-2 years:</p> <ul style="list-style-type: none"> • Low pre-test probability of UTI → consider starting with POCT UA on bagged urine sample. If normal, stop. If abnormal, obtain catheterized UA and send for culture. Do NOT send a bagged sample for culture. • High pre-test probability of UTI → obtain catheterized UA and send for culture <p>Age ≥ 2 years: clean catch UA → if +LE, nitrite, or WBC, send for culture</p> <ul style="list-style-type: none"> • Consider empiric antibiotics for ≥1+ LE and nitrite, ≥1+ LE +/- nitrite, or ≥10 WBC/hpf <ul style="list-style-type: none"> • Consider baseline creatinine if initiating nephrotoxic antibiotics • Consider CRP and procalcitonin: CRP <2 mg/dL helps exclude pyelo, while procalcitonin >0.5 ng/mL can help confirm pyelo

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Treatment	<p>See BCH Clinical Pathway for Fever 0-1 month for additional recommendations</p> <p>Neonate 0-1 month (consult reference for preterm neonates):</p> <p>≥35 wk GA and ≤7 days old:</p> <ul style="list-style-type: none"> ■ Ampicillin 50 mg/kg IV q8h ■ Cefotaxime 50 mg/kg/dose q8h OR Gentamicin 4 mg/kg IV q24h <p>≥35 wk GA and >7 days old:</p> <ul style="list-style-type: none"> ■ Ampicillin 50 mg/kg IV q6h ■ Cefotaxime 50 mg/kg/dose q12h OR Gentamicin 5 mg/kg IV q24h <p>Infant/Child/Adolescent:</p> <p>Duration: 5-7 days if afebrile, 7-10 days if febrile</p> <p>1st line: cephalexin 25 mg/kg/dose PO TID (max 500 mg/dose) vs ceftriaxone 50 mg/kg/dose IV q24h (max 2 g/dose)</p> <p>2nd line: TMP/SMX, amoxicillin-clavulanate, cefdinir, cefuroxime, ciprofloxacin (for adolescents with pyelo), nitrofurantoin (for adolescents with cystitis)</p> <p>If Grade III-V VUR is identified on VCUG, can consider prophylactic antibiotics, though the decrease in UTIs is exactly matched by an increase in MDROs as the etiology for UTI, when present (Selekman RE et al., Uropathogen Resistance and Antibiotic Prophylaxis: A Meta-Analysis. Pediatrics 2018, e20180119)</p>
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