# Urinary Tract Infection (UTI)
## Clinical Practice Guideline
**Background**

Monroe Carell Jr. Children's Hospital at Vanderbilt

## Table 1 - Local Outpatient Antibiogram Data for Microorganisms Associated with UTI, 2025

| ORGANISM % UTI Pathogen* | Number of Isolates | Gentamicin | Ampicillin or Amoxicillin | Amoxicillin-Clavulanate | Cefazolin or Cephalexin | Ceftriaxone | Ciprofloxacin | Levofloxacin | Nitrofurantoin | Trimethoprim-Sulfamethoxazole |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Escherichia coli*** **(approx. 75%)** | 628 | 90 | 46 | 76 | 88 | 92 | 74 | 77 | 97 | 68 |
| ***Klebsiella pneumoniae*** **(approx. 5%)** | 105 | 91 | R | 79 | 90 | 90 | 84 | 85 | 15 | 80 |
| ***Klebsiella oxytoca*** **(approx. 5%)** | 36 | 100 | R | 74 | 23 | 75 | 97 | 97 | 77 | 83 |
| ***Pseudomonas aeruginossa*** **(approx. 5%)** | 45 | R | R | R | R | R | 86 | 77 | R | R |
| ***Proteus mirabilis*** **(approx. 5%)** | 37 | 95 | 89 | 97 | 97 | 97 | 97 | 97 | R | 78 |

Enterococcus spp are not susceptible to cephalosporins. Ampicillin / amoxicillin are the treatment of choice for most enterococcal UTIs. *Percentages based on local outpatient urine culture data, 2025.

***Inclusion Criteria**

Patients >60 days of age with most or all of the following:

- Fever ≥ 38 degrees Celsius
- Dysuria
- Urinary frequency
- Flank pain
- Vomiting

*Note: if <60 days, refer to febrile young infant pathway*

**Exclusion Criteria**

- Major comorbidity (immunocompromise, malignancy etc.)
- Known urinary tract abnormalities
- Neurogenic bladder
- Chronic/complex conditions (i.e. spina bifida, indwelling or intermittent urinary catheter, hardware, etc.)
- Recent GU surgery or instrumentation
- Critical illness
- Perinephric or renal abscess

Definition of a UTI:
Use the UTI Calculator to determine probability of UTI for children ages 2-23 months: https://uticalc.pitt.edu/

Compatible clinical syndrome plus the following laboratory abnormalities:

- *Catheterized specimen or suprapubic aspiration*
  - Definite: > 50,000 cfu/mL
  - Possible: > 10,000 cfu/mL
- *Clean-catch specimen*
  - Definite: > 100,000 cfu/mL
  - Possible: >50,000 cfu/mL

Considerations:

- If patient is able to verbalize sympmtoms, only obtain UA in patients who report symptoms consistent with UTI (refer to inclusion criteria)
- Poly-microbial and normal flora cultures in an otherwise healthy child should be considered contaminated and do not warrant treatment with antibiotics.

| Rare Pathogenic Organsims | Other Organisms Considered Contaminants |
|---|---|
| Group B *Streptococci* | "Other Gram positives" *Lactobacillus* |
| Staphylococcus saprophyticus | *Corynebacteria,* diptheroids |
| *Candida* (in premature infants) | *Micrococcus* sp. |
| *Pseudomonas* sp. | *Bacillus* sp. |
| *Staph aureus* | Coagulase-negative *Staphylococci* |

**All children with UTI should have follow-up with their PCP. after hospital or ED discharge** Per AAP guidance, febrile infants (aged 2-24 months) with UTIs should undergo renal and bladder ultrasound and may need VCUG if ultrasound is abnormal.

Last updated: 6.2026

**This guideline does not take into account individual patient situations, and does not substitute for clinical judgment**

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**Antibiotic Therapy**

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**Inpatient treatment**
- <28 days of age: refer to Fever in Young Infants guideline
- ≥28 days of age: Ceftriaxone 50 mg/kg/day, max 1000 mg/day, once daily
- For step-down therapy, see outpatient treatment recommendations below

**Outpatient treatment**- refer to **Table 2** for dosing
- Uncomplicated UTI:
  - 1st choice - cephalexin (based on local outpatient antibiogram data)
  - 2nd choice - nitrofurantoin
  - 3rd choice - cefixime
  - 4th choice - ciprofloxacin
- Complicated UTI (i.e. pyelonephritis)
  - If isolate is susceptible (MIC <=2), consider cephalexin (has good kidney penetration)
  - Use culture results to guide therapy / identify most narrow spectrum agent.
  - Bactrim, ciprofloxacin or levofloxacin may be preferred for more severe infections based on adult data.

**Considerations:**
- If previous UTI, review previous organism & susceptibilities
- If patient is on UTI prophylaxis, do not use the same antibiotic for treatment
- For all patients treated empirically, use culture results to guide therapy. Targeted antibiotic therapy should be based on organism ID and susceptibility.
- Do not obtain a follow up urinalysis if clinically improved with appropriate antibiotic treatment.
- Stop empiric treatment if culture results as contaminant, normal flora or negative
- Check response to treatment within 48 hours.
- For bacteremia, renal abscess or resistant organisms, including ESBL producers, consult infectious diseases for treatment recommendations
- *Consider upper tract infection (pyelonephritis) if signs/symptoms of fever, flank pain, or ill appearance*

## Table 2- Antibiotic Dosing

| Antibiotic Name | Dose | Frequency & Duration for Uncomplicated UTI | Frequency & Duration for Complicated UTI (i.e. Pyelonephritis) | Relative Cost* | Notes |
|---|---|---|---|---|---|
| **Cephalexin (Keflex®)** | 50mg/kg/DAY, max 4000mg/day | 3 times a day<br>Children: 5-7 days<br>Adolescents: 3-7 days | 4 times a day<br>Children: 7-10 days<br>Adolescents: 7-10 days | $ | Good kidney penetration. First-line for empiric coverage. |
| **Nitrofurantoin (Macrodantin®)** | < 30 kg OR cannot swallow capsules: 6 mg/kg/DAY, max 400mg/day | 4 times a day<br>Children: 5-7 days<br>Adolescents: 5 days | *Do not use* | Cap: $$<br>Susp: $$$ | Capsules can be sprinkled. Suspension may be difficult to obtain. Poor kidney penetration. |
| **Nitrofurantoin (Macrobid®)** | ≥ 30 kg AND able to swallow capsules: 200 mg/DAY | Twice a day<br>Children: 5-7 days<br>Adolescents: 5 days | *Do not use* | $$ | Poor kidney penetration. |
| **Cefdinir (Omnicef®)** | 14mg/kg/DAY, max 600mg/day | Twice a day<br>Children: 5-7 days<br>Adolescents: 3-7 days | *Do not use* | $$ | Poor kidney penetration. |
| **Cefixime (Suprax®)** | 8mg/kg/DAY, max 400mg/day | Daily<br>Children: 5-7 days<br>Adolescents: 3-7 days | Daily<br>Children: 7-10 days<br>Adolescents: 7-10 days | $$$ | On Medicaid formulary as of August 2020 |
| **Ciprofloxacin (Cipro®)** | 30mg/kg/DAY, max 1500mg/day | Twice a day<br>Children: 5-7 days<br>Adolescents: 3 days | Twice a day<br>Children: 7-10 days<br>Adolescents: 7 days | $$ | Suspension not always available in pharmacies other than VCH outpatient pharmacy. |
| **Levofloxacin (Levaquin®)** | 10mg/kg/DOSE max 750 mg/day | 6 mo to < 5 years: Twice a day<br>≥ 5 years: Daily<br>Children: 5-7 days<br>Adolescents: 3 days | 6 mo to < 5 years: Twice a day<br>≥ 5 years: Daily<br>Children: 7-10 days<br>Adolescents: 5 days | $$ | Suspension not always available in pharmacies other than VCH outpatient pharmacy. |
| **Cefprozil (Cefzil®)** | 30mg/kg/DAY, max 1000mg/day | Twice a day<br>Children: 5-7 days<br>Adolescents: 3-7 days | *Do not use* | $$$ | Not always available in pharmacies. Poor kidney penetration. |
| **Cefpodoxime (Vantin®)** | 10mg/kg/DAY, max 200mg/day | Twice a day<br>Children: 5-7 days<br>Adolescents: 3-7 days | *Do not use* | $ | Not always available in pharmacies. Poor kidney penetration. |
| **Trimethoprim-sulfamethoxazole (Bactrim®, Septra®)** | 10mg/kg/DAY, max 320mg/day | Twice a day<br>Children: 5-7 days<br>Adolescents: 3 days | Twice a day<br>Children: 7-10 days<br>Adolescents: 7-10 days | $$ | Use with caution for empiric therapy based on antibiogram data. |

***Estimated average wholesale price per 10-day course**

REFERENCES

National Institute for Health and Care Excellence. Diagnosis of urinary tract infection in children. NICE Pathways. https://www.nice.org.uk/guidance/cg54/chapter/Recommendations. October 2018. Accessed June 10, 2019.
Shaikh N, Hoberman A, Hum SW, et al. Development and Validation of a Calculator for Estimating the Probability of Urinary Tract Infection in Young Febrile Children. JAMA Pediatr. 2018;172(6):550-556.
American Academy of Pediatrics Subcommittee on Urinary Tract. Urinary tract infection: clinical practice guideline for the diagnosis and management of the initial UTI in febrile infants and children 2 to 24 months. Pediatrics. 2011;128(3):595-610.
Glissmeyer EW, Korgenski EK, Wilkes J, et al. Dipstick screening for urinary tract infection in febrile infants. Pediatrics. 2014;133(5):e1121-1127.
Doern CD, Richardson SE. Diagnosis of Urinary Tract Infections in Children. J Clin Microbiol. 2016;54(9):2233-2242.
Roberts KB, Wald ER. The Diagnosis of UTI: Colony Count Criteria Revisited. Pediatrics. 2018; 141(2): e20173239.
Primack W, Bukowski T, Sutherland R, et al. What Urinary Colony Count Indicates a Urinary Tract Infection in Children? J Pediatr. 2017; 191: 259-261.
Strohmeier Y, Hodson EM, Willis NS, Webster AC, Craig JC. Antibiotics for acute pyelonephritis (Review). *Cochrane Database of Systematic Reviews*, 2014 (7). DOI: 10.1002/14651858.CD003772.pub4
Michael M, Hodson EM, Craig JC, Martin S, Moyer VA. Short versus standard duration oral antibiotic therapy for acute urinary tract infection in children. *Cochrane Database of Systematic Reviews,* 2003, Issue 1. Art. No.: CD003966. DOI: 10.1002/14651858.CD003966.
Gupta K, Hooton TM, Naber KG, Wult B, Colgan R, et al. International Clinical Practice Guidelines for the Treatment of Acute Uncomplicated Cystitis and Pyelonephritis in Women: A 2010 Update by the Infectious Diseases Society of America and the European Society for Microbiology and Infectious Diseases. *Clinical Infectious Diseases*. 2011; 51(5); e103-e120.
Poole NM, Kronman MP, Rutmal L, et al. Improving Antibiotic Prescribing for Children with Urinary Tract Infection in Emergency and Urgent Care Settings. *Pediatr Emerg Care*, 2020 Jun;36(6):e332-e339. doi: 10.1097/PEC.0000000000001342.
Fernandez M, Merkel KG, Ortiz JD and Quick RD. Oral Narrow-Spectrum Antibiotics for the Treatment of Urinary Tract Infection in Infants Younger than 60 Days. *JPIDS*, 2019 (epub ahead of print).
Afolabi TM, Goodlet KJ, Fairman KA. Association of antibiotic treatment duration with first recurrence of uncomplicated urinary tract infection in pediatric patients. Presented at: IDWeek 2018; October 3-7, 2018; San Francisco, California.
Fox MT, Amoah J, Hsu AJ, Herzke CA, Gerber JS, Tamma PD. Comparative Effectiveness of Antibiotic Treatment Duration in Children With Pyelonephritis. JAMA Netw Open. 2020 May 1;3(5):e203951. doi: 10.1001/jamanetworkopen.2020.3951.
Zaoutis T, Shaikh N, Fisher BT, Coffin SE, Bhatnagar S, Downes KJ, Gerber JS, Shope TR, Martin JM, Muniz GB, Green M, Nagg JP, Myers SR, Mistry RD, O'Connor S, Faig W, Black S, Rowley E, Liston K, Hoberman A. Short-Course Therapy for Urinary Tract Infections in Children: The SCOUT Randomized Clinical Trial. JAMA Pediatr. 2023 Aug 1;177(8):782-789.
Nelson Z, Tarık Aslan A, Beahm NP, et al. Guidelines for the Prevention, Diagnosis, and Management of Urinary Tract Infections in Pediatrics and Adults: A WikiGuidelines Group Consensus Statement. JAMA Netw Open. 2024;7(11):e2444495. doi:10.1001/jamanetworkopen.2024.44495
Stultz JS, Francis N, Ketron S, Bagga B, Shelton CM, Lee KR, Arnold SR. Analysis of Community-Acquired Urinary Tract Infection Treatment in Pediatric Patients Requiring Hospitalization: Opportunity for Use of Narrower Spectrum Antibiotics. J Pharm Technol. 2021 Apr;37(2):79-88.
Hay AD, Birnie K, Busby J, Delaney B, Downing H, Dudley J, Durbaba S, Fletcher M, Harman K, Hollingworth W, Hood K, Howe R, Lawton M, Lisles C, Little P, MacGowan A, O'Brien K, Pickles T, Rumsby K, Sterne JA, Thomas-Jones E, van der Voort J, Waldron CA, Whiting P, Wootton M, Butler CC. The Diagnosis of Urinary Tract infection in Young children (DUTY): a diagnostic prospective observational study to derive and validate a clinical algorithm for the diagnosis of urinary tract infection in children presenting to primary care with an acute illness. Health Technol Assess. 2016 Jul;20(51):1-294.
AAP Red Book Systems-Based Treatment Table, 32nd Edition, 2021-2024.
Lloyd A, Grey J, Fronczek C, Durkin H and Marr K. Cefdinir vs cephalexin for the treatment of urinary tract infections: A retrospective evaluation. Am J Health Syst Pharm. 2024 May; 81(Supplement_2): S55-S60.
Cardinale B, Zembles TN, Ray K, Bushee G, Leigl M, Simpson P and Mitchell M. Retrospective comparison of cefdinir, cephalexin and sulfamethoxazole-trimethoprim in the treatment of outpatient pediatric urinary tract infections. Clin Pediatr (Phila). 2023 Jan; 62(1):47-54.