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, 2024

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%)**	843	89	44	74	89	92	72	74	98	65
Klebsiella pneumoniae **(approx. 5%)**	181	93	R	81	86	88	81	82	24	82
Proteus mirabilis **(approx. 5%)**	70	90	87	94	96	99	93	93	R	83
Enterobacter cloacae **(approx. 5%)**	99	96	R	R	R	81	88	90	38	89

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, 2024**

*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.

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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 T**able 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 Children: 5-7 days Adolescents: 3-7 days	4 times a day Children: 7-10 days 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 Children: 5-7 days Adolescents: 5 days	*Do not use*	Cap: $$ Susp: $$$	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 Children: 5-7 days Adolescents: 5 days	*Do not use*	$$	Poor kidney penetration.
Cefdinir (Omnicef®)	14mg/kg/DAY, max 600mg/day	Twice a day Children: 5-7 days Adolescents: 3-7 days	*Do not use*	$$	Poor kidney penetration.
Cefixime (Suprax®)	8mg/kg/DAY, max 400mg/day	Daily Children: 5-7 days Adolescents: 3-7 days	Daily Children: 7-10 days Adolescents: 7-10 days	$$$	On Medicaid formulary as of August 2020
Ciprofloxacin (Cipro®)	30mg/kg/DAY, max 1500mg/ day	Twice a day Children: 5-7 days Adolescents: 3 days	Twice a day Children: 7-10 days Adolescents: 7 days	$$	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 ≥ 5 years: Daily Children: 5-7 days Adolescents: 3 days	6 mo to < 5 years: Twice a day ≥ 5 years: Daily Children: 7-10 days Adolescents: 5 days	$$	Suspension not always available in pharmacies other than VCH outpatient pharmacy.
Cefprozil (Cefzil®)	30mg/kg/DAY, max 1000mg/ day	Twice a day Children: 5-7 days Adolescents: 3-7 days	*Do not use*	$$$	Not always available in pharmacies. Poor kidney penetration.
Cefpodoxime (Vantin®)	10mg/kg/DAY, max 200mg/day	Twice a day Children: 5-7 days 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 Children: 5-7 days Adolescents: 3 days	Twice a day Children: 7-10 days Adolescents: 7-10 days	$$	Use with caution for empiric therapy based on antibiogram data.

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

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