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# Clinical Decision Making Tool:

# Empiric Management of Pediatric Patient with Urinary Tract Infection

**Purpose**

The purpose of this clinical decision tool is to help clinicians determine how to manage pediatric patients with possible urinary tract infections (UTI) in the outpatient setting. This guidance document is updated annually based on local antibiotic susceptibility patterns and does not override clinical judgement. If the patient has signs or symptoms of urosepsis, see sepsis pathway and refer to emergency room or inpatient management as indicated.

**Empiric Management of Pediatric Urinary Tract Infection Algorithm v1.0**

| Inclusion | Exclusion |
|---|---|
| • Age 2 months to 18 years<br>• Presence of signs and symptoms of UTI<br>  ○ Fever<br>  ○ Abdominal pain<br>  ○ New incontinence<br>  ○ Dysuria<br>  ○ Hematuria<br>  ○ Suprapubic or costovertebral angle tenderness | • Neonatal ICU admission in past 6 months<br>• History of recurrent UTI<br>• Chronic kidney disease<br>• Known anatomic abnormality of genitourinary tract such as<br>  ○ Vesicoureteral reflux<br>  ○ Hydronephrosis<br>  ○ Ureterocele<br>• Prior surgery of genitourinary tract<br>• Concern for sepsis or severe systemic illness<br>  ○ Chills, hypotension, tachypnea, poor perfusion<br>• Immunocompromised host<br>• Intolerance to oral medications |

## Diagnostic Definitions

- **Cystitis**: (evidence of infection by any of the following)
  - **Urinalysis**: pyuria > 10 WBC/hpf, bacteria, presence of nitrates and/or leukocyte esterase OR
  - **Urine culture**: >50,000 CFU/mL bacteria present, but can be less if symptoms strongly concerning for UTI
- **Pyelonephritis:**
  - **Urinalysis**: pyuria > 10 WBC/hpf, bacteria, presence of nitrates and/or leukocyte esterase; or
  - **Urine culture**: >50,000 CFU/mL bacteria present, but can be less if symptoms strongly concerning for UTI; **and**
  - **Pyelonephritis symptoms:** Fever > 38° C or 100.4° F, flank pain, or chills

## Urine Laboratory Evaluation

| Pre-Toilet Trained Children: | Toilet Trained Children: |
|---|---|
| • Obtain CATHETERIZED urinalysis (UA) and urine culture<br>• ***Bagged specimens are not recommended***<br>• If a bagged specimen is obtained for UA and appears presumptively positive, a catheterized sample *MUST* be obtained for urine culture | • Obtain mid-stream clean catch UA and urine culture |

## Antibiotic Treatment

| | |
|---|---|
| **1st line** | Amoxicillin/clavulanate (Augmentin®); 20mg/kg/dose of amoxicillin by mouth twice daily<br>• Maximum dose of 875mg amoxicillin/dose |

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| | |
|---|---|
| **2nd line: cystitis, ≥40kg:** use for beta-lactam allergy; must be ≥ 40 kg for capsule formulation | Nitrofurantoin macrocrystals (Macrobid®) 100mg/dose by mouth twice daily<br>• Indicated for reported type 1 mediated beta-lactam allergy<br>• Must be able to swallow whole pills<br>• Dosing for children < 40 kg requires use of nitrofurantoin suspension which is costly and often not covered on private insurance plans. |
| **2nd line: <40kg, reported pyelonephritis, severe infections OR beta-lactam allergy** | Sulfamethoxazole/trimethoprim (Bactrim®) 4mg/kg/dose of trimethoprim (TMP) by mouth twice daily<br>• Maximum dose of 160mg of TMP/dose<br>• Do not use in patients with known G6PD deficiency |
| **Treatment Duration** | • 5-7 days for cystitis or uncomplicated UTI<br>• If on Nitrofurantoin: 5 days for female patients, 7 days for male patients<br>• 7-10 days for pyelonephritis<br>• *Test of cure with urine culture is NOT recommended* |

## Special Considerations

- If history of prior UTI, use previous culture to guide therapy
- Modify therapy based on culture results and sensitivities
- Stop antibiotics if culture negative
- Consider referral to ED or arrange for inpatient management for any pathogen without oral antibiotic option for treatment, intolerance to oral therapy, or ill- appearing (i.e. signs or symptoms or urosepsis)
- Nitrofurantoin should **NOT** be utilized for suspected or confirmed pyelonephritis
- If adolescent patient, consider additional pathogens and risks for sexually active individuals and those at risk for sexual assault

## Follow-Up Management

- Obtain renal and bladder ultrasound (RBUS) if:
  - Age 2 months to 2 years: first febrile UTI
  - Above age 2 years: male gender or female with greater than 2 UTIs
  - Can be done in outpatient setting if patient able to follow up within the next week
- Obtain Voiding Cystourethrogram (VCUG) If:
  - Abnormal RBUS (eg. Solitary kidney, scarring, hydronephrosis, ureterocele, duplicated collecting system)
  - Normal RBUS, but > 2 febrile UTI < age 2 years
- **Contact pediatric urology referral line at (216) 844-8440 if any of the below**:
  - Recurrent UTI
  - Voiding dysfunction
  - Abnormal GU exam
  - Abnormal RBUS: Hydronephrosis (Society of Fetal Urology Grade 2 or greater; urinary tract dilatation 2 or greater)
  - Ureterocele
  - Ureteral dilation
  - Nephrolithiasis

## Major References


1. White B. Diagnosis and treatment of urinary tract infections in children. 2011. American Academy of Family Physicians. 83 (4)
2. Hoberman A, Wald E, Hickey R, et al. Oral versus initial intravenous therapy for urinary tract infections in young febrile children. 1999. Pediatrics. 104
3. Zorc J, Kiddoo D, Shaw K. Diagnosis and management of pediatric urinary tract infection. 2005. American Society of Microbiology. 417-422
4. Korbel L, Howell M, Spencer J. The clinical diagnosis and management of urinary tract infections in children and adolescents. 2017. Pediatrics and International Child Health. 37 (4)

5. Fox M, Amoah J, Hsu A, et al. Comparative effectiveness of antibiotic treatment duration in children with pyelonephritis. 2020. JAMA Network 3 (5)
6. Eremenko R, Barmatz S, Lumelsky N, et al. Urinary tract infection in outpatient children and adolescents: risk analysis of antimicrobial resistance. 2020. 236- 240.
7. Lee P, Kim M, Herold B, et al. Under-utilization of narrow-spectrum antibiotics in ambulatory management of pediatric UTI: a single-center experience. 2021. Frontiers in pediatrics.
8. Afolabi T, Goodlet K, Fairman K. Association of antibiotic treatment duration with recurrence of uncomplicated urinary tract infections in pediatric patients. 2020. Annals of Pharmacotherapy. 54 (8). 2021.

**Acronyms and Abbreviations**

UTI Urinary tract infection

**Disclaimer**: Practice recommendations are based upon the evidence available at the time the clinical practice guidance was developed. Clinical practice guidelines (including summaries and pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his/her independent judgement in the management of any specific patient and is responsible, in consultation with the patient and/or the patient's family to make the ultimate judgement regarding care.

If you have questions about any of the clinical practice guidelines or about the guideline development process please contact the Rainbow Evidence Practice Program at RainbowEBPprogram@uhhospitals.org

# Pediatric Patient with Urinary Tract Infection

**NOTE**: This is for empiric therapy only for patients with confirmed UTI and meet inclusion/exclusion criteria. Therapy should be modified based on culture and susceptibility results. This document requires annual modification based on local susceptibility patterns for common pathogens that cause UTI

**Inclusion:**

- Age 2months-18 years
- UTI signs/symptoms
  - Fever
  - Abdominal pain
  - Dysuria
  - Hematuria
  - Suprapubic or Costovertebral angle Tenderness
  - New incontinence

**Exclusion:**

- Neonatal ICU admission in past 6 months
- H/O recurrent UTI
- Chronic kidney disease
- Known anatomic abnormality of GU tract
- Prior GU tract surgery
- Sepsis or severe systemic illness
- Immunocompromised patient

**UA/culture confirms UTI with evidence of infection by any of the following**

- Pyuria >10 WBC/hpf,
- Bacteriuria,
- Presence of nitrites/ leukocytes, or
- Culture > 50,000 CFU/mL or less if symptoms are strongly concerning for UTI

S/S of Urosepsis?
**OR**
Intolerance to oral options?

**Signs and symptoms of Urosepsis:**
Chills
Hypotension
Tachycardia
Tachypnea
Poor perfusion

***If signs/symptoms of sepsis present, refer to ED (if applicable) and see sepsis pathway (use sepsis order set)***

NO

Discharge Home on oral antibiotics

Type 1 Mediated Beta-lactam allergy?

NO

**First Line:**
Amoxicillin/Clavulanate 20mg/kg/dose PO twice daily (max 875 mg Amoxicillin/dose).
For cystitis or uncomplicated UTI, treat for 5-7 days. For pyelonephritis, treat for 7-10 days

YES

**Second Line: No concern for pyelonephritis or severe infection:**
Patients > 40 kg and able to swallow whole pills:
Nitrofurantoin macrocrystals (Macrobid®) 100mg/dose PO twice daily. For females, treat for 5 days. For males, treat for 7 days.
**Second Line or <40kg: With concern for pyelonephritis or severe infection:**
Sulfamethoxazole/trimethoprim 4mg/kg/dose of TMP PO BID (max 160mg of TMP/dose).
Treat for 7-10 days

YES

Refer to ED if applicable or arrange for Inpatient Admission

Type 1 Mediated Beta-lactam allergy?

NO

**Inpatient First Line:**
Ceftriaxone 50 mg/kg/dose IV daily (max 1000mg/dose)

YES

**Inpatient Second Line:**

**< 12 years of age**:
Ertapenem 15 mg/kg/dose IV q12h (max 500 mg/dose)

**≥ 12 years of age:**
Ertapenem 1,000 mg IV once daily