Outpatient Management of Pediatric Urinary Tract Infection
Clinical Practice Guideline
MedStar Health

“These guidelines are provided to assist physicians and other clinicians in making decisions regarding the care of their patients. They are not a substitute for individual judgment brought to each clinical situation by the patient’s primary care provider-in collaboration with the patient. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication, but should be used with the clear understanding that continued research may result in new knowledge and recommendations.”

I. Scope: Acute urinary tract infection is a common infection in children. In fact, 8% of girls and 2% of boys will have a UTI before seven years of age. Each year, pediatric UTIs account for 1 million office visits and 13,000 admissions. Prompt diagnosis and treatment of both lower and upper urinary tract infections is imperative as urinary infections are associated with permanent renal damage. Complications of renal damage/scarring from UTI can manifest as hypertension, chronic renal failure and pre-eclampsia/eclampsia in pregnancy.

It is the purpose of this guideline to provide practitioners with practical knowledge and direction regarding the treatment of children of all ages with suspected or proven UTI.

II. UTI Symptoms by Age Group

Infants aged 0-2 months (Symptoms may include but are not limited to):

- Fever
- Irritability
- Jaundice
- Poor feeding
- Vomiting
- Failure to thrive

Infants and children aged 2 months to 2 years (Symptoms may include but are not limited to):

- Fever
- Irritability
- Poor feeding
- Strong-smelling urine
- Vomiting
- Abdominal pain
Children aged 2-6 years (Symptoms may include but are not limited to):

- Urinary symptoms (dysuria, urgency, frequency)
- Enuresis
- Fever
- Strong-smelling urine
- Vomiting
- Abdominal pain

Children older than 6 years and adolescents (Symptoms may include but are not limited to):

- Urinary symptoms (dysuria, urgency, frequency)
- Enuresis
- Fever
- Incontinence
- Flank/back pain
- Strong-smelling urine
- Vomiting
- Abdominal pain

III. Risk Factors

A. General Risk Factors:
   - Congenital urinary tract abnormality:
     - Vesicoureteral reflux
     - Ureteropelvic junction obstruction
     - Ureterocele
     - Neuropathic bladder
     - Posterior urethral valves
     - Prune belly syndrome
     - Urachal remnants
   - Urinary stones
   - Sexual abuse
   - Children receiving antibiotics for other infections (these antibiotics may alter GI and periurethral flora increasing risk of UTI)
   - Chronic constipation
   - Uncircumcised penis
B. Age Specific Risk Factors: As the number of risk factors listed below increase there is an increased risk of infection

- >56 DAYS OF AGE, BUT NOT TOILET TRAINED:
  
<table>
<thead>
<tr>
<th>MALE:</th>
<th>FEMALE:</th>
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<tbody>
<tr>
<td>Non-black</td>
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<tr>
<td>Fever ≥ 39°C</td>
<td>Fever ≥ 39°C</td>
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<tr>
<td>Fever ≥ 2 days</td>
<td>Fever ≥ 2 days</td>
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<tr>
<td>No source</td>
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<tr>
<td>&lt; 6 months of age</td>
<td>&lt; 12 months of age</td>
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</table>

**Male Circumcised:** Consider screening for ≥ 3 risk factors

Recommend screening for ≥ 4 risk factors

**Male Uncircumcised:** Consider screening for ≥ 2 risk factors

Recommend screening for ≥ 3 risk factors

**Female:** Consider screening for ≥ 3 risk factors

Recommend screening for ≥ 4 factors

- Recommend screening male or female if prior history of UTI, fever ≥ 2 days.
- FULLY TOILET TRAINED – 18 YEARS: reasons to screen
  
  - Prior history of UTI
  - Symptoms referable to UTI
  - Prolonged fever ≥ 5 days

IV. PATHOGENESIS: Bacterial pathogens are the most common etiology of UTI. Specific pathogens are:

- Escherichia coli species
- Klebsiella species
- Enterococcus species
- Staphylococcus saprophyticus
- Group B Streptococcus
- Pseudomonas aeruginosa
• Fungal UTIs can be seen in the setting of invasive devices, immunocompromise and antibiotic exposure
• Viral UTIs are also possible (Adenovirus, Influenza, Polyomavirus BK, HSV can cause irritative voiding symptoms, hemorrhagic cystitis, urinary retention and vesicoureteral reflux. CMV, Zoster and Adenovirus cystitis can be seen in immunosuppressed children)

V. DIAGNOSTIC TESTING

Definition of UTI: Significant bacteruria in a patient with pyuria.

The American Academy of Pediatrics definition of UTI in children 2-24 months is pyuria and/or bacteriuria and at least 50,000 colony forming units per mL of a single urinary pathogen collected by catheterization or suprapubic catheterization.

Urine Collection Techniques:

• <6 months of age: Catheterized urine specimen is ideal.
• ≥6 months up until toilet trained: Bagged urine collection for URINALYSIS only (decrease contamination by cleaning diaper area with betadine). If urinalysis is abnormal a catheterized urine specimen is needed for Urinalysis and culture.
• Toilet trained children: Midstream, clean catch urine collection is appropriate for children with urinary control.
• Suprapubic aspiration, which is recommended with ultrasound guidance, when unable to catheterize (Due to redundant/tight foreskin or in a female with tight labial adhesions.)

Laboratory Studies:

• Complete blood count, BUN/Creatinine, electrolytes and blood culture could be considered when pyelonephritis is suspected.
• Sepsis should be referred to an Emergency Department for management.
• Urine microscopy is considered positive if there are at least 10 white blood cells per high power field.

Imaging Studies:

After the first febrile UTI, children should have a renal/bladder ultrasound. If the ultrasound is abnormal (hydronephrosis, scarring, or other findings suggestive of obstruction/vesicoureteral reflux), a voiding cystourethrogram (VCUG) should be done.

• VCUG is indicated after a second (febrile) UTI is diagnosed.
VCUG should not be performed routinely after the first febrile UTI. VCUG is indicated if RBUS reveals hydronephrosis, scarring, or other findings that would suggest either high grade VUR or obstructive uropathy, as well as other atypical or complex clinical circumstances. Further evaluation should be conducted if there is a recurrence of febrile UTI. VCUG should be performed if there is a recurrence of febrile UTI.

VI. DIAGNOSIS OF UTI: To establish the diagnosis of UTI, clinicians should require BOTH urinalysis results that suggest infection (pyuria and/or bacteriuria) and the presence of a least 50,000 colony forming units (CFUs) per mL of a uropathogen cultured from a urine specimen obtained through catheterization of SPA (suprapubic aspiration).

- General Considerations: Urinalysis cannot substitute for urine culture to document the presence of UTI but needs to be used in conjunction with culture. Because urine culture results are not available for at least 24 hours, there is considerable interest in tests that may predict the results of the urine culture and enable presumptive therapy to be initiated at the first encounter.
- Urine Specimen: Urinalysis can be performed on any specimen, including one collected from a bag applied to the perineum. However, the specimen must be fresh (< 1 hour after voiding with maintenance at room temperature or < 4 hours after voiding with refrigeration).
- Nitrite test: Not a sensitive marker for children, particularly infants, who empty their bladders frequently. The test is helpful when the result is POSITIVE, because it is highly specific.
- Leukocyte Esterase test (a surrogate marker of pyuria): The sensitivity of the leukocyte esterase (LE) test is 94% when it is used in the context of clinically suspected UTI. The absence of pyuria in children with true UTIs is rare. However, positive LE test results should be interpreted with caution, because false-positive results are common. Other conditions that can give a positive LE test include: fever from streptococcal infections, fever from Kawasaki disease or after vigorous exercise.
- Culture: The diagnosis of UTI is made on the basis of quantitative urine culture results in addition to evidence of pyuria and/or bacteriuria. Urine specimens should be processed as expeditiously as possible. In most instances, an appropriate threshold to consider bacteriuria “significant” in infants and children is the presence of at least 50,000 CFUs per mL of a single urinary pathogen.

VII. ADOLESCENTS AND STI CONSIDERATIONS: Adolescents are more likely to present with typical urinary symptoms (eg. dysuria, urgency, frequency). Adolescent girls with vaginitis or sexually transmitted infection (STI) may present with similar symptoms. Adolescent girls who are diagnosed with cystitis may have a concurrent vaginitis due to STI.

- Document a sexual history
- Perform an external genitourinary exam if clinically indicated
- Bimanual exam in females if clinically indicated (e.g., in cases of pelvic pain)
Consider the following:
- Consider testing “dirty” urine for Gonococcus (GC) and Chlamydia
- If GC/Chlamydia positive consider syphilis screen
- HSV: Culture visible lesions or cervical culture if indicated
- Annual HIV Screen
- Pregnancy testing in females

VIII. EMPIRIC ANTIMICROBIAL AGENTS for ORAL TREATMENT of UTI:

When initiating treatment the clinician should base the choice of route of administration on practical considerations. The clinician should base the choice of agent on local antimicrobial sensitivity patterns (if available) and should adjust the choice according to sensitivity testing of the isolated uropathogen

<table>
<thead>
<tr>
<th>ANTIMICROBIAL AGENT</th>
<th>DOSAGE</th>
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<tbody>
<tr>
<td>Sulfonamide</td>
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<tr>
<td>Trimethoprim-sulfamethoxazole</td>
<td>6-12 mg/kg trimethoprim and 30-60 mg/kg sulfamethoxazole per d in 2 doses</td>
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<tr>
<td>Sulfisoxazole</td>
<td>120-150 mg/kg per d in 4 doses</td>
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<tr>
<td>Cephalosporin</td>
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<tr>
<td>Cefdinir</td>
<td>7 mg/kg per d in 2 doses or 14 mg/kg per d in 1 dose</td>
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<tr>
<td>Cefixime</td>
<td>8 mg/kg per d in 1 dose</td>
</tr>
<tr>
<td>Cefpodoxime</td>
<td>10 mg/kg per d in 2 doses</td>
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<tr>
<td>Cefprozil</td>
<td>30 mg/kg per d in 2 doses</td>
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<tr>
<td>Cefuroxime axetil</td>
<td>20-30 mg/kg per d in 2 doses</td>
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<tr>
<td>Cephalexin</td>
<td>50-100 mg/kg per d in 4 doses</td>
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<tr>
<td>Aminopenicillin</td>
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</tr>
<tr>
<td>Amoxicillin-clavulanate</td>
<td>20-40 mg/kg per d in 3 doses</td>
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IX. DURATION OF TREATMENT: Whether the initial route of administration of the antimicrobial agent is oral or parenteral (then changed to oral), the total course of therapy should be **7 to 14 days**. There is evidence that 1 to 3 day courses for febrile UTIs are inferior to courses in the recommended range; therefore, the minimal duration selected should be **7 days**. Follow up urine cultures for test of cure are **NOT routinely indicated**.

X. Antibiotic Prophylaxis

- The National Institute for Health and Clinical Excellence (NICE) recommends against prescribing antibiotic prophylaxis routinely in infants and children following first-time UTI, although antibiotic prophylaxis may be considered in infants and children with recurrent UTI.
- Among children with documented vesicoureteral reflux after urinary tract infection, antimicrobial prophylaxis was associated with a substantially reduced risk of recurrence but not of renal scarring.

- Ongoing antibiotic prophylaxis **IS NOT routinely recommended** for patients with first febrile UTI or with low grade (I – III) VUR. In setting of Grade III VUR, consider need for antibiotic prophylaxis with Urology.

Other indications for antibiotic prophylaxis include:

- Severe obstruction
- Recurrent symptomatic UTI, especially with bladder instability or voiding dysfunction in girls with frequent UTIs
- Infective stones
- Prior to reconstruction of renal abnormality which predisposed to patient to UTI
- More than one episode of pyelonephritis

XI. MINIMIZING ANTIMICROBIAL RESISTANCE

1. Antibiotic exposure selects for antibiotic resistance; therefore, **limiting exposure to any antibiotic**, whenever possible, is preferred.
2. **Limiting the spectrum of activity of antimicrobials** to that specifically required to treat the identified pathogen is preferred.
3. **Using the proper dosage of antimicrobial** to be able to achieve a minimal effective concentration at the site of infection is important to decrease the development of resistance.
4. **Treatment for the shortest effective duration** will minimize exposure of both pathogens and normal microbiota to antimicrobials, and minimize the selection for resistance.
XII. CRITERIA FOR REFERRAL TO UROLOGY

1. Any circumcised male with a documented UTI.
2. Any child with recurrent UTIs.
3. Any child with abnormal imaging: Anatomic abnormality detected on Ultrasound or VCUG.
   • If uncertain if the patient’s medical condition requires Urology management please consult an Urologist to discuss further.

XIII. PATIENT EDUCATION

1. When to seek help – if your child has any of the following, make an appointment with his or her doctor.
   • Fever – fever (temperature higher than 100.4 F or 38 C may be the only symptom of urinary tract infection in infants and young children.
   • Urine becomes red or changes to a dark color. It is difficult or painful for your child to urinate.
   • Sudden or frequent need to urinate.
   • Pain in the lower back or just below the ribs.
   • Abdominal (belly) pain.
   • Change in the smell of the urine – strong or “bad” smelling.

2. Urinary Tract Infection Prevention – About 8% – 30% of children who have a urinary tract infection (UTI) develop another UTI. This usually happens within the first six months after the first infection and is more common in girls
   • Bubble bath products, detergents, shampoos or shower gels should not be used in bath water because they can irritate the urinary opening.
   • Do not use colored or scented toilet paper.
   • Teach your child to go to the bathroom and empty the urinary bladder as soon as the urge is felt, rather than trying to hold the urine in.
   • Drinking plenty of liquids, especially water, (6-8 glasses a day) will help “flush out” wastes from the urinary system.
   • Children should be taught to keep their genital area clean and to change their underwear every day.
   • Treatment of constipation will also help prevent UTIs.
   • SPECIAL TIPS FOR GIRLS
     ➢ After using the toilet, your child should always wipe from front to back. If this is not done, bacteria from the bowel movement material can get into the opening where the urine comes out and cause and infection.
If your child has an accident (soils or wets her underpants), the skin area should be cleaned and the underpants changed as soon as possible to keep bacteria away from the urinary opening.

It is best for your child to wear underpants made of cotton rather than synthetic materials. Cotton allows the air to flow more freely. This helps to keep the area around the urinary opening dry. Germs do not multiply as fast in a dry area as they do in a moist area.
References


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<th>Initial Approval Date and Reviews:</th>
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<td>April 2016</td>
<td>April 2018 by Pediatric Ambulatory Workgroup</td>
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