

Urinary Tract Infection in the Pediatric Patient

Urgent message: Diagnosing UTI in a child is challenging in the urgent care setting. Fever, abdominal or back pain, frequency or new onset of incontinence all should raise your index of suspicion.

KIMBERLY GIBSON, MD

Cases such as the following are common in urgent care and they present unique challenges:

J.S., a 2-year-old girl, presents to an urgent care clinic on a Saturday afternoon for evaluation of low-grade fever and fussiness. Her parents have been trying to potty train her, but now the child is indicating that it hurts her to urinate. She has no prior history of a urinary tract infection (UTI). Her parents deny any cough, complaint of ear pain, vomiting or diarrhea. The child's dietary intake is normal.

On observation, J.S. is quiet but interactive, and she appears to be a well-developed child. Her temperature is 99.2°; pulse 110. Physical exam is normal except for mild pain on palpation of the bladder area. Examination of the child's external genitalia is normal.

J.S. is not cooperative with collection of a clean-catch urine specimen. Therefore, the urgent care clinician gently cleanses her perineum with an obstetrical towelette and applies a bag for urine collection underneath her "pull-ups." Forty-five minutes later, a urine sample is obtained. Dipstick urinalysis reveals the following:

- pH: 6
- Blood: negative
- Sp. Gravity: 1.020
- Nitrites: positive
- Glucose: negative
- Leukocytes: 250/microL
- Protein: negative

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Introduction

Urinary tract infections (UTIs) in children, such as that illustrated by the case vignette above, are common and a major source of morbidity. Estimates indicate that 7% of girls and 2% of boys will have a UTI by age 6. Among infants younger than age 1, more boys are diagnosed with UTI than girls, and incidence is 10-fold greater in uncircumcised than in circumcised boys. Beyond age 1 year, UTIs are largely diagnosed in girls.

UTI can involve the bladder or the kidney. Kidney infections are of particular concern because they can lead to permanent renal scarring in children. Kidney infections represent a significant health burden, accounting for 13,000 annual inpatient pediatric admissions in the United States, at an estimated cost of \$180 million.

Table 1. Signs and Symptoms of UTI in Children

• Fever	• Enuresis
• Dysuria	• New-Onset Incontinence
• Urgency	• Constipation
• Urinary Frequency	• Genitourinary Irritation

In the urgent care setting, diagnosis of UTI can be divided into two categories. The first category is differential diagnosis of fever in a child who is too young to communicate symptoms. The second category is evaluation of dysuria in the child who can talk.

Our challenge, as with all illnesses and injuries for which patients present to an urgent care clinic, is to accurately diagnose, treat if appropriate, triage if hospital work-up and care is necessary, and arrange for timely follow-up care and/or consultation.

History

Fever may be the only presenting complaint of a significant UTI in a non-verbal child. In one study, 5.9% of infants with fevers higher than 38° C had culture-confirmed UTIs. In older children who present with UTI, most of whom are girls, the children themselves (or the parents) may give a history of vomiting, diffuse or suprapubic abdominal pain, constipation, dysuria, urgency, frequency and enuresis, as well as fever (**Table 1**). Evidence supports that most UTIs are ascending infections that begin with perimeatal colonization. The shorter length of the urethra, rather than the narrower caliber, accounts for the increased incidence of UTI in girls. Therefore, urethral dilatation is not useful in limiting UTIs and is discouraged.

Local irritation is a common cause of dysuria and should be explored. However, diagnostic evaluation for UTI should be pursued because local irritation is a common finding in children with and without UTI. It should also be noted that urinary frequency, urgency, and intermittent incontinence are common, even in potty-trained children, largely because of uninhibited detrusor muscle contractions in this age group.

Neurogenic and congenital abnormalities should be considered potential risk factors for UTI. Vesicoureteral reflux (VUR) is the most common anatomic abnormality. Neurogenic causes of voiding dysfunction vary and predispose patients to UTI via impaired urodynamics. Often, overlapping cognitive impairment lends additional challenges that can predispose these children to UTI.

Secondary incontinence, starting after at least 6

Table 2. Diagnostic Essentials for UTI in Children

• Abdominal Examination: Presence/absence of suprapubic and/or costovertebral angle tenderness
• External Genital Examination: Presence/absence of vulvovaginitis, vaginal foreign body, epididymitis, circumcision
• Urine Dipstick: Presence of leukoesterase and nitrites highly specific for UTI
• Urine Culture: Obtain culture on all children in whom dipstick is positive

months of continence, can be associated with sexual abuse, though not exclusively. Withdrawn nature and unusual fear of examination are also risk factors.

Sexual activity is the most common risk factor for UTI in older children. Careful history-taking is warranted to evaluate for the presence of risk factors. Sexually transmitted diseases (STDs) such as chlamydia, gonorrhea and trichomoniasis all can cause urethritis and symptoms that mimic UTI. The pain of herpetic lesions also may be described as “burning with urination.” It is advisable, as a matter of routine, to interview all teenagers both with and without a parent in the room. The presence of fever, abdominal pain, or vaginal discharge should alert the clinician to the possibility of an STD in this age group and should prompt consideration of pelvic examination and diagnostic testing.

Physical Examination

Findings on physical examination can be non-specific. In addition to a thorough general examination to rule out other sources of fever, particular attention should be paid to documenting the abdominal exam, including presence or absence of suprapubic and/or costovertebral angle tenderness (**Table 2**). An external genital exam also should be performed to look for vulvovaginitis, vaginal foreign body, epididymitis, and circumcision. Irritation of the urethral opening from yeast infection or dermatitis should be considered in children who complain of dysuria but in whom a urine specimen is negative for UTI. Presence of genital or perianal bruising or lacerations should alert the clinician to the possibility of sexual abuse. Prompt—and even immediate—referral to child protective services is warranted in such cases.

When children present to an urgent care clinic with a history of recurrent UTIs, structural abnormalities such as VUR or renal scarring, and/or chronic conditions that render them immunocompromised, the clinician should have a low threshold for transferring them to the

Table 3. Selected Antibiotic Regimens for UTI in Children

- Trimethoprim/sulfamethoxazole
- Amoxicillin/clavulanate
- Cephalosporins (cefixime, cefpodoxime, cefprozil, cephalexin)

emergency room (ER), where a more in-depth work-up can be undertaken. Likewise, unstable children who appear septic and those with drainage problems or underlying renal insufficiency should be transferred to the ER for evaluation and possible admission.

Diagnosis

The standard test for diagnosing UTI is urine culture yielding a colony count of greater than 10^5 cfu/mL of pure bacterial growth. However, this method requires a 48- to 72-hour incubation period, reducing its performance in the acute evaluation of children.

In the urgent care setting, the primary diagnostic tool is a dipstick urinalysis. A well-collected urine specimen is critical to making the diagnosis of UTI, but an uncontaminated specimen can be hard to obtain. In children who are not toilet-trained, urine collection can be from a bag, or from a urine pad, provided that the pad is changed every 30 to 45 minutes to reduce the risk of contamination. The National Institute for Health and Clinical Excellence (NICE) guidelines suggest urine collection pads over bags, because they are most cost-effective, have a similar contamination rate, and are easier for both clinic staff and parents. Perineal/genital cleansing prior to application of a pad or bag will reduce risk of false-positives and unnecessary antibiotic treatment.

Suprapubic aspiration and catheterization are invasive approaches for obtaining non-contaminated urine, but may be impractical in an urgent care setting because most urgent care providers lack experience with the procedures and they can be anxiety-provoking for both parents and physician. Dipstick urinalysis via bagged specimen is suitable for the diagnosis of UTI in non-toilet-trained infants and children aged 2 months to 2 years. There remains some disagreement over whether a properly obtained bagged specimen can be used for culture, although the most current American Academy of Pediatrics (AAP) guidelines still suggest a more sterile method (like transurethral catheterization) for culture. This is of particular importance in the evaluation of infants with fever of undetermined source. For

infants with fever without a source, empiric antimicrobial therapy should be withheld until a sterile specimen is obtained. Likelihood of UTI in febrile infants increases with temperature greater than 39°C for at least 2 days in girls or more than 24 hours in boys, along with absence of another source of infection. It is also well appreciated that uncircumcised boys are at significantly greater risk for UTI than are circumcised boys.

In toilet-trained children, a clean-catch urine specimen is the most popular noninvasive method for obtaining urine and has been defined by NICE (2007) as the gold standard. This involves catching a sample by holding a sterile specimen bottle in the urine stream. Reports indicate that in girls aged 2 to 12 years, rates of contamination are similar for clean-voided specimens and those obtained by catheterization, therefore, a clean-catch specimen is acceptable for culture.

The presence of leukoesterase and nitrites in a dipstick specimen is highly specific for UTI, with a false-positive rate of 2%. Likewise, a sample negative for both leukoesterase and nitrite is considered to accurately rule out disease. A dipstick specimen should be interpreted as positive if either leukoesterase or nitrite is positive. The literature supports sending a urine specimen for culture on all children in whom a dipstick is positive.

Urine Gram stain and microscopy have been found to be more sensitive for determining presence of UTI, but they are not readily available or cost-effective in an urgent care setting.

Treatment

Enterobacteriaceae, which include *Escherichia coli*, *Klebsiella*, *Proteus*, *Pseudomonas*, and enterococci, account for more than 95% of urinary isolates. Initial oral antibiotic treatment should address these pathogens. After a positive urine dipstick has been obtained, and urine has been collected for culture, empiric antibiotic treatment for cystitis can be initiated with trimethoprim/sulfamethoxazole (TMP/SMX). Traditionally, amoxicillin was used as a first-line antibiotic, but rates of *E. coli* resistance are increasing, and studies have found higher cure rates with TMP/SMX. Amoxicillin/clavulanate or cephalosporins, such as cefixime, cefpodoxime, cefprozil and cephalexin, are good alternatives in patients with sulfa allergy (**Table 3**).

Fluoroquinolones are not generally used in children because of concern about injury to developing joints. Ciprofloxacin, however, is FDA-approved for complicated UTI and pyelonephritis in patients aged 1 to 17 years.

The duration of treatment for uncomplicated lower

UTI is controversial. Shorter courses of therapy have been advocated in order to reduce cost, limit side effects, and increase compliance. In children older than age 5, cystitis can be treated with a 3- to 5-day course of oral antibiotics. In children younger than age 5, antibiotics should be continued until radiologic evaluation has been completed to detect renal scarring.

Children with pyelonephritis have a much higher (40%-50%) risk of renal scarring, therefore, treatment should be started immediately with an oral third-generation cephalosporin or consideration for 1 to 2 days of ceftriaxone administered intramuscularly. This should be followed by a full 10- to 14-day course of the appropriate oral antibiotic, as determined by culture.

Consideration of admission should be given for any child who is acutely ill or younger than age 2 months, and in the following circumstances:

1. Toxicity
2. Dehydration
3. Inability to manage oral fluids
4. Failure of outpatient treatment

5. Concerns regarding compliance with recommendations

Follow-up

Follow-up assessment in 48 to 72 hours should be arranged for all children in whom antibiotic therapy is initiated. Strong consideration should be given to referring all children with positive dipsticks back to their pediatricians for follow up on culture results and consideration for imaging of the upper urinary tract to look for reflux, renal stones, or renal scarring. A history of high-grade fever with a UTI suggests kidney involvement.

In 1999, the AAP recommended renal ultrasound and a voiding cystourethrogram (VCUG) to identify anatomic abnormalities that could lead to recurrent infections and kidney damage. Although renal ultrasound is noninvasive, VCUG requires urethral catheterization and radiation exposure. An alternative to this is to take a "top-down" approach and do an initial dimer-captosuccinic acid (DMSA) renal scan and proceed to VCUG only if DMSA shows renal cortical defects.

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Prevention

While preventive advice is plentiful, little in the way of scientifically valid studies support any specific recommendations for UTI. Nonetheless, several practical suggestions can be made, with little in the way of risk or undue burden.

Perineal exposure to chemical irritants is best avoided whenever possible, including exposure to bubble baths, oils, and many lotions (especially fragrances). Swimming and using a hot tub can cause chemical irritation that is exacerbated by friction from water slides, etc.

Cotton underwear dries readily, whereas synthetic undergarments retain moisture and create an environment conducive to bacterial overgrowth. Airing out the perineum is a good idea when practical, and night time would be an appropriate time for a child to go without clothing from the waist down. Moisture barriers such as petroleum jelly can be useful for children who are not yet potty-trained.

Aggressive management of constipation is perhaps the most important intervention for reducing the risk of UTI and other urinary voiding problems in children.

Children should be encouraged to take their time when urinating to allow for the bladder to completely empty; to take bathroom breaks every 3 to 4 hours while awake; and to drink plenty of fluids. They should be instructed to drink enough fluids to turn urine light yellow in color. Dark yellow or brown urine indicates they are not getting enough fluids. Cleaning the perineal/anal area from front to back after using the toilet is common sense, but supporting evidence for prevention of UTI is limited.

Indiscriminate use of antibiotics for viral illness not only contributes to resistant organisms, but greatly diminishes helpful bacteria counts in the perineal area, thereby contributing to overgrowth of bacteria known to cause UTI.

Patient information on UTI can be downloaded for free from the Website for the National Institute of Diabetes and Digestive and Kidney Diseases of the U.S. Department of Health and Human Services.

Visit http://kidney.niddk.nih.gov/KUDiseases/pubs/utichildren/UTIs_in_Children_508.pdf for the publication "Urinary Tract Infections in Children" and http://kidney.niddk.nih.gov/KUDiseases/pubs/utichildren_ez/WINTKA_Child_UTI_508.pdf for the publication, "What I Need to Know About My Child's Urinary Tract Infection."

Conclusion

Diagnosing UTI in children, particularly in those who

cannot verbalize their symptoms, presents challenges in the urgent care setting. The presence of a fever in addition to abdominal pain, back pain, dysuria, frequency or new onset incontinence, increases the likelihood of the diagnosis by two- to six-fold. Special consideration should be given to infants with fever of uncertain origin, risk factors for STD, signs of child abuse and/or history of recurrent UTI. Hospitalization should be considered for newborns aged less than 2 months and any patients who are unable to tolerate or fail to respond to outpatient therapy.

Finally, while bagged specimens are reasonable for preliminary diagnosis of UTI, sterile specimens are necessary for culture and should be strongly considered before empiric therapy is initiated in infants with fever of uncertain source. The AAP guidelines released in 2011 stress that urinalysis of an appropriately collected specimen can only suggest a UTI diagnosis. Confirmation is made by definitive culture of 50,000 colonies/mL or more of a single uropathogenic organism. ■

Bibliography

- Azzarone G, Liewehr S, O'Connor K. Cystitis. *Pediatr Rev.* 2007;28(12):474-476.
- Bauer R, Kogan BA. New developments in the diagnosis and management of pediatric UTIs. *Urol Clin North Am.* 2008;35(1):47-58.
- Baumer JH, Jones RW. Urinary tract infection in children, National Institute for Health and Clinical Excellence. *Arch Dis Child Educ Pract Ed.* 2007;92(6):189-192.
- Bensman A, Ulinski T. Pharmacotherapy of lower urinary tract infections and pyelonephritis in children. *Expert Opin Pharmacother.* 2009;10(13):2075-2080.
- Clark CJ, Kennedy WA 2nd, Shortliffe LD. Urinary tract infection in children: when to worry. *Urol Clin North Am.* 2010;37(2):229-241.
- Larcombe J. Urinary tract infection in children. *Am Fam Physician.* 2010;82(10):1252-1260.
- Merguerian PA, Sverrisson EF, Herz DB, McQuiston LT. Urinary tract infections in children: recommendations for antibiotic prophylaxis and evaluation. An evidence-based approach. *Curr Urol Rep.* 2010;11(2):98-108.
- Mori R, Laxhanpaul M, Verrier-Jones K. Diagnosis and management of urinary tract infection in children: summary of NICE guidance. *BMJ.* 2007;335(7616):395-397.
- Mori R, Yonemoto N, Fitzgerald A, et al. Diagnostic performance of urine dipstick testing in children with suspected UTI: a systematic review of relationship with age and comparison with microscopy. *Acta Paediatr.* 2010;99(4):581-584.
- Subcommittee on Urinary Tract Infection. Steering Committee on Quality Improvement and Management. 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. Available at <http://www.pediatrics.org/cgi/doi/10.1542/peds.2011-1330> Accessed March 5, 2012.
- Tanaka ST, Brock JW 3rd. Pediatric urologic conditions, including urinary infections. *Med Clin North Am.* 2011;95(1):1-13.
- White B. Diagnosis and treatment of urinary tract infections in children. *Am Fam Physician.* 2011;83(4):409-415.