

Work-up of Pediatric Urinary Tract Infection



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KEYWORDS

- Pediatric • UTI • Guidelines • Uropathogen • Suprapubic aspiration • Vesicoureteral reflux
- Antibiotic resistance

KEY POINTS

- Given the high false-positive rate of urinary tests it is important to test a population with a high pre-test probability of infection.
- The sensitivity and specificity of a catheterized specimen is significantly better than those of a bagged sample, and has a specificity of 83% to 89% compared with a suprapubic sample; in samples with greater than 100,000 colony-forming units/mL approaches 99%.
- Comparing a positive urine dipstick and positive microscopic analysis showed no difference between the two methods when correlating with urine culture.
- Pediatric UTIs are treated with 2 goals: to eliminate the infection and prevent severe systemic illness; and to prevent and/or reduce possible long-term complications, such as renal scarring and hypertension.

INTRODUCTION

Pediatric urinary tract infection (UTI) is a common cause of presentation to health care providers and is an area of concern for parents and clinicians alike. There is a broad spectrum of presentations ranging from asymptomatic infection to mild lower urinary tract symptoms, to febrile and systemic illness.

The prevalence and incidence of pediatric UTI varies by age, race/ethnicity, sex, and circumcision status (**Table 1**).¹ Although calculating the true cumulative incidence is challenging given the varied reporting in different clinical settings, it is likely to be at least 2% in boys and 7% in girls in the first 6 years of life, with 2.2% of boys and 2.1% of girls having had a UTI before reaching 2 years of age.^{2,3} Controlling for other clinical parameters, Hispanic and white children are more likely to be diagnosed with a UTI than black children.⁴ After the first 12 months, girls are more likely to be diagnosed with a UTI. About half of boys with UTI are diagnosed within the first 12 months of life;

however, 80% of girls are diagnosed at a later age.² Circumcision has been shown to have a protective effect on UTI, reducing the odds of infection by 87%, with an even greater effect for boys with recurrent infections or posterior urethral valves.^{5,6}

Pediatric UTI costs the health care system more than \$180 million annually, and accounts for more than 1.5 million clinician visits per year.³ Accurate and timely diagnosis of these infections is important for determining appropriate treatment and preventing long-term complications, such as renal scarring, hypertension, and end-stage renal disease.⁷

HISTORY AND PHYSICAL

Clinicians must have a high index of suspicion for UTI in the pediatric population, especially in infants and children less than 2 years of age. The evaluation must include a thorough history and the importance of the physical examination in pediatric patients cannot be overstated.

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Table 1
Uropathogen prevalence by sex and visit setting

Organism	Male		Female	
	Outpatient (%)	Inpatient (%)	Outpatient (%)	Inpatient (%)
<i>Escherichia coli</i>	50 (48–52)	37 (35–39)	83 (83–84)	64 (63–66)
<i>Enterobacter</i>	5 (5–6)	10 (8–11)	1 (1–1)	4 (4–5)
<i>Enterococcus</i>	17 (16–18)	27 (25–29)	5 (5–5)	13 (12–14)
<i>Klebsiella</i>	10 (9–11)	12 (10–13)	4 (4–5)	10 (9–11)
<i>Pseudomonas aeruginosa</i>	7 (6–8)	10 (8–11)	2 (2–2)	6 (5–7)
<i>Proteus mirabilis</i>	11 (10–12)	5 (4–6)	4 (4–4)	2 (2–3)

Based on national data from The Surveillance Network (TSN). Prevalence varies based on region.

Children Less Than 2 Years of Age

This is the most challenging population in which to make the diagnosis of UTI. Presentations are often vague and include irritability, poor feeding, lethargy, jaundice, vomiting, and fever.⁸ In evaluating risk factors among children less than 2 years old presenting to emergency rooms with an ill appearance, high fever (greater than 39°C); history of UTI; change in urine characteristics (malodor or hematuria); and distension and tenderness in the suprapubic area, abdomen, or flanks were associated with UTI.⁹ History of a previous UTI, temperature greater than 40°C, and suprapubic tenderness are the most useful for diagnosing UTI in febrile infants.¹⁰

Children Aged 2 to 12 Years

Toddlers and verbal children are more able to describe their symptoms and localize them to the urinary tract; however, given the high prevalence of UTI, the lack of localizing symptoms does not rule out UTI in this population.

History

Descriptions of dysuria, frequency, urgency, and urinary incontinence (in a toilet-trained child) increase the likelihood of UTI diagnosis.

Examination

A thorough examination should include evaluation of external genitalia, with special attention to identifying any external lesions, discharge, or foreign bodies. Palpation of the abdomen, suprapubic region, and costovertebral angles to elicit tenderness is key.¹⁰

- Special considerations for girls include evaluation for labial adhesions, foreign bodies, vulvovaginitis, and signs of sexually transmitted diseases.¹¹

- Special considerations for boys include evaluation for phimosis, meatal stenosis, and tenderness in the testes to suggest epididymitis and/or orchitis.¹²

Adolescent Children

Although adolescents are better able to provide history and participate in physical examinations, sexual activity is a special consideration for this population that requires additional diagnostic attention. Among surveyed high-school students in 2013, 47% had had sexual intercourse and 34% reported having sexual activity in the last 3 months.¹³ Sexually transmitted infections (STIs) are an important consideration for adolescents with urinary symptoms.

ADOLESCENT GIRLS AND URINARY TRACT INFECTION

- Adolescent girls with urinary symptoms often present with a UTI, STI, or both. Statistics on STI rates vary, with a prospective study finding that 29% of adolescent girls with urinary symptoms had had an STI.¹⁴ Among sexually active girls with urinary symptoms, history of STI, more than 1 partner in the last 3 months, and urinalysis with blood and leukocyte esterase were predictive of STI.
- No specific symptoms or history findings have been shown to reliably predict which adolescent girls with urinary symptoms are at increased risk for either UTI or STI.^{15,16}
- Current recommendations suggest testing sexually active girls with urinary symptoms for UTI as well as STIs including *Neisseria gonorrhoeae*, *Chlamydia*, and *Trichomonas*, especially in those with sterile pyuria.¹⁵ Patients being evaluated or treated for STI should be offered HIV testing.¹⁷

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