

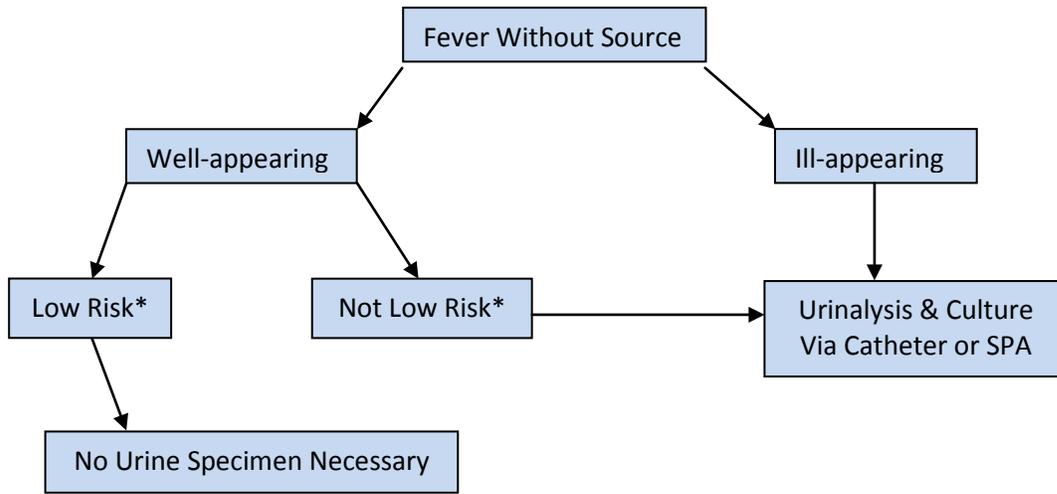
Diagnosis and Management of Urinary Tract Infections in Children \leq 24 Months of Age:

Emergency Department Management
Clinical Practice Guideline (CPG)

Protocol approved by:
Division of Pediatric Emergency Medicine
Date of approval: 9/14

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Emergency Department Diagnosis and Management of Urinary Tract Infections in Children ≤ 24 Months of Age



*Individual Risk Factors

(Taken from AAP)

Individual Risk Factors: Girls
White race Age < 12 mo Temperature ≥ 39°C Fever ≥ 2 d Absence of another source of infection

Probability of UTI	No. of Factors Present
≤1%	No more than 1
≤2%	No more than 2

Individual Risk Factors: Boys
Nonblack race Temperature ≥ 39°C Fever > 24 h Absence of another source of infection

Probability of UTI	No. of Factors Present	
	Uncircumcised	Circumcised
≤1%	a	No more than 2
≤2%	None	No more than 3

a. Probability of UTI exceeds 1% even with no risk factors other than being uncircumcised

Clinical factors to determine risk of UTI and need for further screening in girls 2 to 24 months of age with fever

(Taken from Zorc, et al)

Risk Factor	Relative Risk of UTI (95% CI)
Age < 1 year	2.8 (1.6 – 5.1)
Fever for ≥ 2 days	1.5 (0.9 – 2.6)
White Race	6.0 (3.7 – 9.5)
Fever without source	1.9 (1.1 – 3.2)
Temperature ≥ 39°C	1.7 (0.9 – 3.1)

Urine screening recommended if 2 or more risk factors present

Urinalysis is Positive if:

- Nitrite Positive (Negative does not rule out UTI)
- WBC > 10 / hpf on microscopy
- Bacteriuria and Leukocyte Positive
- Leukocyte Positive (Consider high false positive rate)
- Culture showing > 50,000 CFU

Urine Collection Process

- Send all catheter specimens for UA & Culture
- In Clean Catch specimens, collect UA & Culture, send UA to lab and hold Culture
 - If UA positive, send Culture
 - If UA negative, discard culture
 - If UA contaminated (epithelial cells ≥ WBC), repeat UA and Culture

Management of Urinary Tract Infections

Parental Antibiotics in ill-appearing, dehydrated, or not tolerating PO fluids/medication.

Antimicrobial Agent	Dosage
Ceftriaxone	75 mg/kg, every 24 h
Cefotaxime	150 mg/kg per day, divided every 6–8 h
Ceftazidime	100–150 mg/kg per day, divided every 8 h
Gentamicin	7.5 mg/kg per day, divided every 8 h
Tobramycin	5 mg/kg per day, divided every 8 h
Piperacillin	300 mg/kg per day, divided every 6–8 h

Oral Antibiotics in well-appearing children who are tolerating PO.

Antimicrobial Agent	Dosage
Amoxicillin-clavulanate ¹	20–40 mg/kg per day in 3 doses
Trimethoprim-sulfamethoxazole ¹	6–12 mg/kg trimethoprim and 30–60 mg/kg sulfamethoxazole per day in 2 doses
Cephalosporin	
Cefixime	8 mg/kg per day in 1 dose
Cefpodoxime	10 mg/kg per day in 2 doses
Cefprozil	30 mg/kg per day in 2 doses
Cefuroxime axetil	20–30 mg/kg per day in 2 doses
Cephalexin	50–100 mg/kg per day in 4 doses
Cefdinir	14 mg/kg per day in 1 or 2 doses

1. Use with caution due to high resistance rates. See section on “Management” below

Preferred duration of treatment is 7 to 14 days. (see Management section below)

Introduction:

Urinary Tract Infections (UTI) are frequently encountered problems for Pediatricians and Pediatric Emergency Physicians. Depending on demographics, prevalence of UTIs in febrile infants ranges from 2 – 16%. This is further discussed in the next section.

Long term complications of UTIs can lead to renal scarring, hypertension, and end-stage renal disease, accentuating the need to correctly diagnose this disease when it occurs. Traditionally, in older children and adults, fever has been an important diagnostic sign in differentiating lower (cystitis) and upper (pyelonephritis) UTIs. However, in infants and younger children, this association has been found to be less reliable [Hoberman]. Easy diagnosis is further complicated by the fact that the highest risk population is mostly non-verbal and unable to communicate pain and complaints effectively, if at all.

Epidemiology & Risk Factors:

The two tables on page 1 show two different ways to identify risk factors and high risk individuals. Two additional risk factors, not mentioned above, are 1) having a history of previous UTI and 2) the presence of suprapubic tenderness, which have positive likelihood ratios of 2.9 and 4.4, respectively [Shaikh, JAMA]. It has been found that among infants presenting to the Emergency Department with fever, the total prevalence of UTI was 7%, with the majority being under 12 months of age [Shaikh]. This same meta-analysis found the prevalence of UTIs in febrile infants and children in specific subgroups as seen below:

Demographic Group	Prevalence or Pretest Probability (95% CI)
0 to 24 months	7.0 percent (5.5 – 8.4)
Girls	7.3 percent (5.0 – 9.6)
White girls with temperature $\geq 39^{\circ}\text{C}$	16 percent
Boys	8.0 percent (5.5 – 10.4)
White children	8.0 percent (5.1 – 11)
Black children	4.7 percent (2.1 – 7.3)
0 to 3 months	7.2 percent (5.8 – 8.6)
Girls	7.5 percent (5.1 – 10)
Circumcised boys	2.4 percent (1.4 – 3.5)
Uncircumcised boys	20.1 percent (16.8-23.4)
3 to 6 months	6.6 percent (1.7 – 11.5)
Girls	5.7 percent (2.3 – 9.4)
Boys	3.3 percent (1.3 – 5.3)
6 to 12 months	5.4 percent (3.4 – 7.4)
Girls	8.3 percent (3.9 – 12.7)
Boys	1.7 percent (0.5 – 2.9)
12 to 24 months	4.5 percent
Girls	2.1 percent (1.2 – 3.6)

Circumcised boys > 1 year	< 1 percent
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There are some important conclusions that can be derived from this data. Febrile white females under the age of 2 years have a 16% prevalence of UTI. The only subgroup with higher risk is uncircumcised males under 3 months, whose prevalence is 20%. **This suggests that, as providers, we should be highly suspicious of a UTI in 1) white females with a fever, especially those less than 1 year of age, and 2) uncircumcised boys with fever, especially those less than 3 months of age.** In fact, White females with fever, as a group, have a high enough risk of UTI that a urine evaluation should be considered even if they have no risk factors other than their race. On the other hand, the prevalence of UTI in males is very low (<2%) once they reach the age of 6 months, regardless of circumcision status.

Microbiology & Management:

E. coli remains the most common pathogen isolated in pediatric UTIs, accounting for approximately 80% of isolates. Other common pathogens include *Enterococcus*, *Proteus*, and *Klebsiella* species. Less common species causing UTIs in children include *Citrobacter*, *Enterobacter*, and *Staph* [Edlin].

Viruses and Fungi can also cause UTIs, but this is not very common. Viruses associated with UTIs include adenovirus, enterovirus, coxsackievirus, echovirus and HSV. Aside from HSV, these viral infections are generally self-resolving [Wald]. Fungal pathogens associated with UTIs include *Candida*, *Aspergillus*, and *Cryptococcus* species. Fungal UTIs are rare without specific risk factors, which include children that are immunocompromised, have indwelling urinary catheters, or a history of long-term antibiotic use [Sobel].

The official AAP recommendation for antibiotic management of UTIs is seen in the above tables. However, when treating children with oral antibiotics, it is strongly cautioned to keep local resistance patterns in mind. In many areas, there is a high resistance to Penicillins and TMP/SMX. **Due to this resistance, we recommend using a cephalosporin (cefixime, cephalexin, cefdinir) as first line outpatient treatment.**

You can see the most up to date local resistance patterns on the Cardinal Glennon Internet Web page, under the category “For Professionals”:

Visit: <http://www.cardinalglennon.com/Pages/ForProfessionals.aspx>, then click on “Annual Antibigram Data”

The issue of asymptomatic bacteriuria continues to be controversial. Bacteriuria without pyuria is not thought to be of much clinical significance, even in infants and young children, as the bacteria tend to be of low virulence and do not often lead to the long-term complications associated with acute UTIs [Fitzgerald]. However, in the 2 – 24 month age group, the collection of urine is usually performed in the setting of fever without source or high risk/suspicion of UTI so the provider must apply sound clinical judgment when deciding on treatment.

There are no rigorous studies demonstrating a specific duration a treatment for pediatric UTIs. The standard of care is a treatment period of 7 to 14 days, which is the official recommendation of the AAP. A 2003 Cochrane review showed equal effectiveness of a 2 - 4 day course compared to a 7 - 14 day course of antibiotics [Michael]. However, a 2002 meta-analysis in Pediatrics, which showed 7 – 14 day courses of antibiotics had significantly fewer treatment failures than a 1 - 3 day course [Keren]. Our recommendation in the population of febrile children 2 to 24 months of age follows the official AAP position, which is a treatment course of 7 days for uncomplicated cystitis and 10 to 14 days for those with suspected pyelonephritis.

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