

# Urinary Tract Infection

UTI is among the most common serious bacterial infections seen in infants and children. UTI with fever is indicative of an upper tract infection/pyelonephritis, as opposed to afebrile cystitis. It is important to diagnose and empirically treat febrile UTIs in infants and children, as delayed treatment may increase the risk of bacteremia. There are a number of risk factors associated with increased rates of UTI in young children such as age, gender and height of fever. An [evidence-based decision tool](#) has been developed to assess risk factors and help with urine result interpretation.<sup>1</sup>

## CLINICAL SIGNS AND SYMPTOMS

- » Infants and/or non-verbal children may have fever without another apparent source, increased crying, vomiting, poor feeding and/or other non-specific symptoms. (See [TREKK Recommendations for Fever in Young Infants](#))
- » Children greater than 2 years old typically have urinary symptoms, abdominal/flank/back pain, new incontinence, with or without fever.

## RECOMMENDED TESTING

Urine sample collection:

- » A mid-stream urine sample can sometimes be obtained in young infants using bladder stimulation such as the Clean Catch or [Quick Wee method](#).<sup>2</sup>
- » If a mid-stream sample cannot be obtained, screen infants greater than 2 months old with an adhesive bag for collection of urine.
- » If the urinalysis and microscopy are negative, the likelihood of UTI is low and in most cases a urine culture is not required.
- » If the bag sample is positive, then a catheter (or suprapubic aspirate) sample **MUST** be obtained for cultures to be sent.
- » Alternatively, in and out catheterization can be done directly to collect a urine sample for urinalysis, microscopy and culture.
- » A mid-stream urine sample may be sent for culture; a bag sample should **NEVER** be sent for culture.
- » Infants (greater than 2 months old) and children with a clear viral syndrome such as bronchiolitis should have a urinalysis and microscopy sent **ONLY** if there is clinical suspicion of UTI.
- » Consider gonorrhoea, chlamydia, and HSV testing if there is a possible/confirmed history of a sexual encounter and dysuria.
- » Urine cultures should be sent to the laboratory as soon as possible or **stored at refrigerator temperature** to avoid false positive results.

Recommended testing	Dipstick urinalysis	Microscopy	Urine culture	Blood work: CBC and differential, blood culture, urea, creatinine
2 months old – 2 years old and/or non-verbal with fever without source (greater than 39°C)	Screen urine with dipstick. If leucocyte esterase, nitrites and bacteria negative, UTI is ruled out.	Yes, if dipstick/urinalysis positive	<b>No</b> - if urinalysis and microscopy is normal  <b>Yes</b> - if urinalysis or microscopy is abnormal	Yes - if infant appears unwell* (i.e. poor feeding, persistent irritability, vomiting)
Greater than 2 years old and verbal with complaints related to urinary tract and fever				Yes - if child appears unwell*
Greater than 2 years old and verbal with complaints related to urinary tract and no fever				<b>No</b> – bloodwork is not required in uncomplicated afebrile cystitis

\*Refer to [TREKK Sepsis BLR and PedsPac](#) for infants/children who remain unwell and/or have signs of hypoperfusion. A lumbar puncture should be performed in any infant/child with clinical signs/symptoms of meningitis

## DIAGNOSIS

- » Urinalysis and microscopy results suggestive of UTI are:
  - » Leucocyte Esterase positive, **AND/OR**
  - » Nitrite positive, **AND/OR**
  - » Greater than 5 WBC/high power field on microscopy, **AND/OR**
  - » Bacteria on microscopy (catheter or suprapubic aspirate sample)
- » If the urinalysis and microscopy are negative in an infant greater than 2 months old, the risk of UTI is less than 1%.

## INTERPRETING URINE CULTURE RESULTS

- » Bacterial growth usually takes 24 hours with susceptibility testing and final identification available 24-48 hours later.
- » UTIs typically have growth of a single uropathogen with significant growth being at least:
  - » Greater than or equal to  $5 \times 10^7$  colony forming units (CFU)/L ( $50 \times 10^6$  CFU/L) from a catheter/suprapubic aspirate specimen, **OR**
  - » Greater than or equal to  $10 \times 10^7$  CFU/L ( $100 \times 10^6$  CFU/L) from a midstream urine specimen



- » Confirm the diagnosis of UTI in an infant/child with **BOTH** a **POSITIVE** urinalysis and/or microscopy **AND** a **POSITIVE** culture. This is especially important if the colony count is  $50 \times 10^6$  CFU/L as positive culture in the absence of positive urinalysis/microscopy likely indicates contamination at the lower end of bacterial colony growth.

## EMPIRIC THERAPY FOR SUSPECTED URINARY TRACT INFECTION

- » Healthy infants and children greater than 2 months old may be treated as outpatients with oral antibiotics if they are alert, well-appearing, hydrated, can tolerate oral medication and appropriate follow-up is assured.
- » In a first febrile UTI, the most likely bacteria is *E. coli*.
- » If possible, choose an antibiotic with less than 10% resistance to *E. coli* on the most recent local antibiogram available.
- » For children with a history of previous UTIs or known genitourinary abnormalities, empiric therapy should be determined by the result of the most recent urine culture available.
- » Nitrofurantoin should **ONLY** be prescribed to treat afebrile cystitis in the adolescent age group (i.e. not in younger children or febrile UTI).

Age	Antibiotic	Disposition
Greater than 2 months old and well-appearing	<b>Oral Antibiotics</b> <ul style="list-style-type: none"> <li>» Cephalexin 75-100 mg/kg/day divided TID or QID (max 4000 mg/day, or 1000 mg/dose)</li> <li>» TMP-SMX 8-12 mg of TMP component/kg/day divided BID (usual max 320 mg TMP/day; may increase to 640 mg TMP/day)</li> <li>» Cefixime 8 mg/kg/day divided once daily (max 400 mg/day). (Note: broader spectrum but does not cover extended spectrum beta-lactamase and is more likely to induce resistance)</li> </ul>	Discharge home with follow-up assured in 24-48 hours
Greater than 2 months old and unwell <b>OR</b> unable to tolerate oral medication <b>OR</b> IV/IM route preferred	<b>IV/IM Antibiotics</b> <ul style="list-style-type: none"> <li>» <b>Preferred: Gentamicin or Tobramycin 7.5 mg/kg/day divided q24h (max 360 mg/day before levels).</b> (Note: if concern for enterococci, add Ampicillin 100-200mg/kg/day divided q6h) <b>OR</b></li> <li>» Ceftriaxone 50-75 mg/kg/day divided q24h (max 2000 mg/dose). (Note: broader spectrum but does not cover extended spectrum beta-lactamase and is more likely to induce resistance)</li> </ul>	Admit to hospital
<b>Note:</b> Refer to local formulary for more specific dosing information		

## DURATION OF THERAPY

- » For uncomplicated afebrile cystitis: 5 days.
- » For uncomplicated febrile UTI: 7 to 14 days.
- » For complicated febrile UTI (i.e. renal abscess, focal pyelonephritis/nephronia): May be longer than 14 days. Consider referral to Pediatrics, Infectious Diseases, or Urology depending on local practice.

## FOLLOW-UP

- » Children who are still febrile or have persistent dysuria after 24-48 hours of appropriate therapy should be reassessed:
  - » Use culture results to verify bacterial susceptibilities
  - » Consider IV antibiotics and admission to hospital
  - » Consider renal ultrasound to detect complications
- » At discharge, communicate to families and primary care physicians that all infants less than 12 months with a first febrile UTI should have a renal and bladder ultrasound to detect significant renal structural abnormalities/high grade vesicoureteral reflux.
- » Discuss modifiable risk factors for urinary tract infections in children and adolescents such as constipation and sexual activity when appropriate.

**The purpose of this document is to provide healthcare professionals with bottom line recommendations for the diagnosis and treatment of urinary tract infection in children in the ED.** This summary was produced by the urinary tract infection content advisors for TREKK, Drs. Nicole Le Saux and Gina Neto of CHEO, and uses the best available knowledge at the time of publication. However, healthcare professionals should continue to use their own judgment and take into consideration context, resources and other relevant factors. The TREKK Network is not liable for any damages, claims, liabilities, costs or obligations arising from the use of this document including loss or damages arising from any claims made by a third party. The TREKK Network also assumes no responsibility or liability for changes made to this document without its consent. This summary is based on:

- 1) University of Pittsburgh. [UTICalc – For Children 2 to 23 months of age](#). 2018. Accessed online: December 20, 2018.
- 2) Kaufman, J. [Quick Wee Method](#). University of Melbourne, Murdoch Children's Research Institute. Accessed online: December 20, 2018.
- 3) Montini G, Tullus K, Hewitt I. [Febrile urinary tract infections in children](#). *N Engl J Med* 2011;365:239–250.
- 4) Tzimenatos L et al. [Accuracy of the urinalysis for urinary tract infections in febrile infants 60 days or younger](#). *Pediatrics*. 2018 Feb;141(2).
- 5) Robinson JL, Finlay JC, Lang ME, Bortolussi R, Canadian Pediatric Society. [Urinary tract infection in infants and children: Diagnosis and management](#). *Paediatr Child Health*. 2014;19(6):1-7.
- 6) Subcommittee on Urinary Tract Infection; Steering Committee on Quality Improvement and Management; Roberts KB. [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.
- 7) National Institute for Health and Care Excellence. [Diagnosing urinary tract infection in under 16s: Clinical pathway](#). Accessed online: November 5, 2018.