College of Registered Nurses of Saskatchewan

Urinary Tract Infection (UTI): Pediatric

Genitourinary

Clinical Decision Tools for RNs with Additional Authorized Practice [RN(AAP)s]

Effective Date: June 9, 2022

Background

A urinary tract infection (UTI) is an inflammation of the urinary epithelium usually caused by bacteria from intestinal flora (Ring & Huether, 2019). A UTI can occur in the urethra, bladder, ureter, or kidney so a UTI must be identified according to location (Burns, Dunn, Brady, Starr, & Blosser, 2017). Lower tract infections, or cystitis, are limited to the bladder and do not generally cause fever or renal damage (Burns et al., 2017). Lower tract infections are more common in older children and adolescents.

Upper tract infections, or pyelonephritis, are the most severe type of UTI and involve the renal parenchyma. Prompt identification and treatment is required to prevent irreversible kidney damage (Burns et al., 2017). Upper tract infections are responsible for the majority of fevers of unknown origin in infants less than 24 months of age (Burns et al., 2017). Most UTIs in pediatrics are due to bacterial colonization that begins in the urethral area and ascends the urinary tract (Burns et al., 2017). The most common bacterial pathogen is *Escherichia coli (E. coli)*, which is identified in over 80% of cases.

Other pathogens that may be implicated include *Staphylococcus aureus*, *Enterococcus spp.*, *Klebsiella spp.*, *Proteus mirabilis*, *Pseudomonas spp.*, *Haemophilus spp*, and coagulase-negative *staphylococci* (CoNS) (Anti-infective Review Panel, 2019; Burns etal., 2017).

Immediate Consultation Requirements

The RN(AAP) should seek immediate consultation from a physician/NP when any of the following circumstances exist:

- the client is less than six months of age;
- toxic-appearing infant or child, may be pale or cyanotic and is often lethargic or inconsolably irritable. In addition, tachypnea and tachycardia with poor capillary refill may be present;

- immunocompromised client;
- vomiting or inability to tolerate oral medication;
- signs and symptoms consistent with pyelonephritis;
- client with clinical features of UTI and a negative urine dipstick result;
- prior urologic surgery;
- inability to obtain a clean catch, midstream, or catheterized specimen for culture and sensitivity; or
- concerns about follow-up (e.g., no telephone, live far from the clinic, etc.) (Interprofessional Advisory Group [IPAG], personal communication, October 2, 2019).

Predisposing and Risk Factors

Predisposing and risk factors for UTI in pediatric clients include:

- vesicoureteral reflux (VUR),
- toilet training,
- structural abnormality or dysplasia of genitourinary tract (e.g., obstruction),
- functional abnormalities (e.g., dysfunctional voiding, constipation),
- poor hygiene,
- female gender (after age one),
- irritation (e.g., harsh soaps, detergents),
- sexual activity or sexual abuse,
- pinworms, and
- uncircumcised males (especially infants) (Burns et al., 2017; Ring & Huether, 2019).

Health History and Physical Exam

Subjective Findings

Symptoms of UTI in children are often nonspecific and make it difficult to differentiate a bladder or kidney infection from symptoms alone (Burns et al., 2016). The circumstances of the presenting complaint should be determined. These include:

- onset and duration of symptoms,
- fever,
- vomiting,
- diarrhea,
- abdominal or back pain,
- irritability,
- lethargy,
- jaundice,
- failure to thrive,
- family history of vesicoureteral reflux in parents and siblings,
- sexual activity or sexual abuse,

- history of UTI and other infections,
- urinary tract abnormalities,
- circumcision,
- immunization status,
- hygiene habits (e.g., wiping front to back),
- voiding patterns (e.g., frequency, abnormal stream, incomplete emptying, dribbling, enuresis),
- new onset incontinence,
- constipation,
- perianal itching (e.g., pinworms),
- high blood pressure,
- irritants (e.g., bubble baths, tight pants/underclothes), or
- diaper rash (Burns et al., 2017; Ring & Huether, 2019).

Objective Findings

The signs and symptoms of UTI may include:

- flank or costovertebral angle discomfort to percussion;
- suprapubic tenderness;
- bladder distention;
- flank mass;
- vaginal erythema, edema, irritation or discharge, or labial adhesions in females; or
- urethral ballooning, weak or dribbling urinary stream in uncircumcised males (Burns et al., 2017).

Clinical findings associated with UTI are often different based on age. The findings indicated with an asterisk (*) are more likely to be indicative of pyelonephritis.

Neonates:

- poor feeding,
- jaundice,
- hypothermia,
- failure to thrive,
- sepsis,
- vomiting or diarrhea,
- cyanosis,
- abdominal distention, and/or
- lethargy (Burns et al., 2017; Ring & Huether, 2019).

Infants:

- malaise and/or irritability,
- poor feeding,

- poor weight gain,
- fever*,
- vomiting or diarrhea,
- malodorous urine,
- dribbling, and/or
- abdominal pain (Burns et al., 2017; Ring & Huether, 2019).

Toddlers and preschoolers:

- altered voiding pattern,
- diaper rash,
- malodorous urine,
- abdominal/flank pain*,
- enuresis,
- vomiting or diarrhea*,
- malaise, and/or
- fever* (Burns et al., 2017; Ring & Huether, 2019).

School aged and adolescents:

- frequency, urgency, and/or dysuria;
- malodorous urine;
- enuresis;
- abdominal/flank pain*;
- fever/chills*;
- vomiting or diarrhea; and/or
- malaise (Burns et al., 2017; Ring & Huether, 2019).

Differential Diagnosis

The following should be considered as part of the differential diagnosis:

- urethritis,
- pinworms,
- diaper rash,
- vaginitis,
- viral cystitis,
- foreign body,
- sexual abuse,
- dysfunctional voiding,
- appendicitis,
- pelvic abscess,

- pelvic inflammatory disease,
- gastroenteritis,
- ovarian torsion,
- diabetes mellitus,
- epididymitis,
- sexually transmitted infections,
- excessive intake of fluids,
- normal toilet training,
- dyes from ingested fluids, or
- dehydration indicated by concentrated urine (Burns et al., 2017; Richardson, 2020).

Making the Diagnosis

In a healthy and non-toxic appearing child, it is reasonable to monitor the child without prescribing antibiotics if the urinalysis is from a clean catch or catheterized sample is negative for leukocyte esterase and nitrites, and there are no clinical features of a UTI. A presumptive diagnosis of UTI in children cannot be made based on the results of positive urine dipstick alone but must be made taking into consideration the overall presenting clinical features. This is due to the high probability of specimen contamination and the presence of leukocytes in urine with many febrile illnesses. Classical adult symptoms are not reliable in diagnosing UTI in young children. It should be noted that pyuria does not diagnose a UTI (Ring & Huether, 2019).

The presence of age-specific clinical findings consistent with UTI plus the following urine culture results supports the diagnosis of a UTI:

- colony count of single uropathogen ≥ 10,000 CFU/mL collected via catheterization,
- colony count of single uropathogen ≥ 50,000 CFU/mL collected via clean void in females,
- colony count of single uropathogen ≥ 10,000 CFU/mL collected via clean void in males (Roberts & Wald, 2018).

Investigations and Diagnostic Tests

Urine should be sent for culture and sensitivity for all children presumed to have UTI. Urinalysis is required during routine examination that demonstrates clinically relevant features of a UTI. It can be accomplished through a midstream specimen for older children or a catheter specimen for infants and children who are not toilet trained (Richardson, 2020). Although a specimen obtained through catheterization is most appropriate, a clean catch or midstream urine is acceptable in toilet trained children.

Urine dipstick results may be more accurate in a diagnosis of UTI in children greater than two years of age than in children less than two years of age because of the ease of obtaining a clean sample, unless catheterization is used (Richardson, 2020). Positive leukocyte esterase and positive nitrites on a dipstick are associated with a substantially increased likelihood of a UTI (Richardson, 2020). However, nitrites will only be positive in the presence of gram-negative bacteria or if urine

has been in the bladder for four hours or longer (Burns et al., 2017). Blood and protein in urine are unreliable markers for a UTI (Richardson, 2020).

Urine for culture and sensitivity should preferably be a first morning specimen in toilet trained children. In infants, use a clean catheter specimen. If results show multiple organisms of low colony count, suspect contamination and not a true infection (Richardson, 2020).

Management and Interventions

Goals of Treatment

The primary goals of immediate treatment are to eradicate infection, prevent progression of disease to systemic infection (e.g., pyelonephritis, sepsis), prevent reoccurrence, provide symptomatic relief, identify underlying contributing factors, and prevent renal injury (Richardson, 2020).

Non-Pharmacological Interventions

The RN(AAP) should recommend, as appropriate, increased oral hydration, and frequent and complete voiding in toilet-trained children (Richardson, 2020).

Pharmacological Interventions

The pharmacological interventions recommended for the treatment of UTI in the pediatric population are in accordance with the *RxFiles: Drug Comparison Charts* (Rx Files Academic Detailing Program, 2021) and the *Anti-infective Guidelines for Community-acquired Infections* (Anti-infective Review Panel, 2019).

Analgesics and Antipyretics

	Drug	Dose	Route	Frequency	Duration
Pediatric					
	Acetaminophen	10-15 mg/kg/dose (maximum dose 75 mg/kg/day)	p.o.	q4-6h prn	5-7 days
AND/ OR	Ibuprofen	5-10 mg/kg/dose (maximum dose 40 mg/kg/day)	p.o.	q6-8h prn	5-7 days

Oral Antibiotics

Antibiotic therapy is based on the suspected location of the UTI and antibiotic resistance patterns in the community (Burns et al., 2017). Short course therapy is not effective for children under five years of age due to a high incidence of reflux.

	Drug	Dose	Route	Frequency	Duration
Pediatric (First line)					
	Sulfamethoxazole/ Trimethoprim (SMX/TMP)	5-10 mg/kg/day (TMP is used for calculations) (do not exceed adult dose of 800/160 mg)	p.o.	divided q12h	7-14 days
Pediatric (Second line)					
	Amoxicillin	40 mg/kg/day (do not exceed adult dose of 1500 mg/day)	p.o.	divided q8h	7-14 days
OR	Cephalexin	25-50 mg/kg/day (do not exceed adult dose of 1 gram/day)	p.o.	divided q6h	7-14 days
OR	Trimethoprim	4 mg/kg/day do not exceed adult dose of 200 mg /day	p.o.	divided q12h	7-14 days

Client and Caregiver Education

The RN(AAP) provides client and caregiver education as follows:

- Counsel about appropriate use of medications (dose, frequency, completion of the entire course of antibiotics, etc.).
- Advise to report any deterioration in condition as soon as it occurs.
- Teach proper perineal hygiene (wiping from front to back) to prevent recurrence.
- Advise to report recurrence of symptoms immediately.
- Management of constipation as needed.
- Increasing fluid intake (water and juices) to increase urine flow and achieve light coloured urine.
- Teach to void with continuous rather than staccato pattern as appropriate.
- Create a voiding routine (e.g., every two to three hours).
- Avoid bubble baths and encourage showers.

- Advise to have frequent underwear and diaper changes (Burns et al., 2017).

Monitoring and Follow-Up

The RN(AAP) should recommend follow-up in 24 hours to assess condition and review the client after treatment is completed, in seven to 10 days.

Complications

The following complications may be associated with UTI:

- recurrent UTI;
- sepsis, especially in neonates and infants under six months of age; or
- renal injury leading to adult hypertension, renal failure (Richardson, 2020; Ring & Huether, 2019).

Referral

Refer to a physician/NP if client presentation is consistent with those identified in the *Immediate Consultation Requirements* section; any child with culture-proven UTI who has been treated on an outpatient basis in whom the condition is not resolving; any male with confirmed UTI; or female client with any recurrent UTI (e.g., two uncomplicated UTIs within six months OR three or more positive urine cultures in the prior 12 months) (IPAG, personal communication, October 2, 2019).

References

Anti-Infective Review Panel. (2019). *Anti-infective guidelines for community-acquired infections*. MUMS Guideline Clearinghouse.

Burns, C., Dunn, A., Brady, M., Starr, N., & Blosser, C. (2017). *Pediatric primary care* (6thed.). Elsevier.

Richardson, B. (2020). *Pediatric primary care* (4th ed.). Jones & Bartlett Learning. https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1884447&site=ehost-live&scope=site

Ring, P., & Huether, S. (2019). Alterations of renal and urinary tract function in children. In K. McCance & S. Huether (Eds.), *Pathophysiology: The biologic basis for disease in adults and children* (8th ed., pp. 1278-1292). Elsevier.

Roberts, K. B., & Wald, E. R. (2018). The diagnosis of UTI: Colony count criteria revised. *Pediatrics, 141*(2). doi.org/10.1542/peds.2017-3239

RxFiles Academic Detailing Program. (2021). *RxFiles: Drug comparison charts* (13th ed.). Saskatoon Health Region.