

DEFINITION

A Urinary Tract Infection (UTI) is the bacterial invasion in the genitourinary (GU) tract with resulting infection.

- Lower tract infection or cystitis:
 - Infection limited to the bladder, not involving the kidneys; occurs more in older children and adolescents; usually no fever.
- Upper tract infection or pyelonephritis:
 - Infection of the renal parenchyma; vast majority of febrile babies with a positive culture have upper tract infection.

IMMEDIATE CONSULTATION REQUIRED IN THE FOLLOWING SITUATIONS

- < 6 months of age
- Toxic appearing child: Toxic appearing infants and children may be pale or cyanotic and are often lethargic or inconsolably irritable. In addition, they may have tachypnea and tachycardia with poor capillary refill.
- Immunocompromised client
- Vomiting or inability to tolerate oral medication
- Known urologic abnormality
- Prior urologic surgery

CAUSES

Bacterial invasion by one of the following organisms:

- *Escherichia coli* in over 80% of cases
- *Staphylococcus aureus*
- *Enterococcus* spp.
- *Klebsiella* spp.
- *Proteus mirabilis*
- *Pseudomonas* spp.
- *Haemophilus* spp.
- Coagulase-negative staphylococci.

PREDISPOSING AND RISK FACTORS

- Sex/Age: boys are most at risk for UTI during first year of life; girls are most at risk until school age and again in adolescence

URINARY TRACT INFECTION (UTI) PEDIATRIC

- Circumcision status: uncircumcised males < 1 year of age have 10 times the incidence of UTI compared with circumcised males
- Abnormal urinary tract: children with vesicoureteral reflux and obstruction are at higher risk for UTI
- Voiding dysfunction
- Requiring frequent catheterization
- Sexual activity

HISTORY

The history depends on the child's age. Enquire about onset and duration of symptoms and:

- family history of vesicoureteral reflux in parents and siblings.
- sexual activity in adolescents.
- history of UTI and other infections.
- urinary tract abnormalities.
- immunization status.

Neonates and Infants (0-12 months of age)

- Primarily nonspecific, non-urinary symptoms
- Fever
- Irritability ("colic")
- Poor feeding
- Vomiting
- Loose stools
- Jaundice (particularly in neonates)
- Hypothermia
- Failure to thrive
- Decreased activity, lethargy

Younger Children (\leq 3 Years Old)

- Character of urine (dark concentrated, malodorous urine)
- Abdominal complaints including pain (suprapubic tenderness, flank pain)
- Back pain
- Irritability
- Lethargy

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- Fever for > 48 hours in infants and children < 2 years of age, can be the sole manifestation of UTI
- Poor appetite
- Vomiting
- Hematuria may be present
- Withholding maneuvers (e.g., squatting, squirming, sitting on heels)
- Dysuria, urgency, enuresis and frequency may be present
- Lack of circumcision in boys
- Previous history of UTI and success and failure of previous treatments

Older Children (> 3 years of age)

- May present with chronic urinary symptoms - incontinence, lack of proper stream, frequency, urgency, and withholding maneuvers
- Character of urine (dark concentrated, malodorous urine)
- Fever for > 48 hours
- Hematuria
- Abdominal pain, flank, or back pain
- Bed wetting
- Poor appetite
- Nausea and vomiting
- Irritability
- Diarrhea/chronic constipation
- Abdominal pain or tenderness
- History of previous UTI and success or failure of previous treatment

Adolescents

As above plus:

- chills*
- rigors*
- flank pain or back pain*
- increased sexual activity
- failure to void after intercourse
- pregnancy

*These three findings suggest pyelonephritis.

URINARY TRACT INFECTION (UTI) PEDIATRIC

PHYSICAL FINDINGS

- Neonates and Infants:
 - Often no physical findings or fever alone
 - Less common: abdominal pain or distention, poor growth or weight gain, malodorous urine
- Children (≥ 1 year of age):
 - Lower tract (cystitis): suprapubic tenderness, may see evidence of constipation
 - Upper tract (pyelonephritis): fever, costovertebral angle tenderness to percussion
- Be sure to assess hydration status

DIFFERENTIAL DIAGNOSIS

Distinguish between cystitis and pyelonephritis.

Infection of the lower GU tract

- Urethral irritation (e.g., bubble bath, scented soaps, or powders)
- Urethral trauma
- Diabetes mellitus
- Masses adjacent to the bladder
- Vaginitis/urethritis
- Epididymitis
- Vaginal foreign body
- Sexually transmitted infections (STIs)
- Excessive drinking
- Normal toilet training
- Dyes from ingested fluids
- Dehydration with concentrated urine.

Infection of the upper GU tract (pyelonephritis)

- Gastroenteritis
- Pelvic inflammatory disease (PID)
- Tubo-ovarian abscess
- Appendicitis

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- Ovarian torsion

COMPLICATIONS

- Recurrent UTI
- Sepsis, especially in neonates and infants < 6 months of age
- Renal damage leading to adult hypertension, renal failure

INVESTIGATIONS AND DIAGNOSTIC TESTS

Urinalysis is required during routine examination that demonstrates clinically relevant features of 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. Although a specimen obtained through catheterization is most appropriate, a clean catch or midstream urine is acceptable in toilet trained children.

Urine should be sent for culture and sensitivity for all children presumed to have UTI.

Bagged urine specimens are of questionable value in diagnosing UTI in infants as these specimens are usually falsely positive. The one indication for use of this collection mechanism is when UTI is being ruled out as a source of fever. The urine collected in a bag should be placed in a sterile container and examined as soon as it is collected.

- To collect a specimen with a bag, clean the perineal area with an antiseptic towelette and attach the urine collection bag appropriately.

Urine dipstick:

- Positive leukocyte esterase AND positive nitrite on a dipstick is associated with a substantially increased likelihood of UTI.
- Blood and protein in urine are unreliable markers for UTI.
- May be more accurate in a diagnosis of UTI in children > 2 years of age than in children < 2 years of age because of ease of obtaining a clean sample.

Urine for culture and sensitivity:

- Preferably a first morning specimen; in infants, use a clean catheter specimen.
- If results show multiple organisms, suspect contamination and not a true infection.

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Complete blood count, serum creatinine and blood cultures may be requested through consultation if the child is febrile and systemically unwell (i.e. toxic).

Pregnancy test and assess for STI as appropriate.

MAKING THE DIAGNOSIS

In a healthy and non-toxic appearing child, it is reasonable to monitor the child without prescribing antibiotics if the urinalysis from a clean catch or catheterized sample is negative for leukocyte esterase and nitrites, and there are no clinical features of 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 also 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 UTI.

Definitive diagnosis of UTI in febrile children aged > 6 months of age requires:

- Urine culture detects a uropathogen
 - Female: $\geq 50,000$ CFU/mL of uropathogen
 - Male: $> 10,000$ CFU/mL
- Age specific clinical findings consistent with UTI

MANAGEMENT AND INTERVENTIONS

Goals of Treatment

- Eradicate infection
- Prevent progression of disease to systemic infection (e.g., pyelonephritis, sepsis)
- Prevent reoccurrence
- Symptomatic relief
- Identify underlying factors
- Prevent renal scarring

Appropriate Consultation

Consult a physician/RN(NP) for any of the following:

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- Suspected pyelonephritis. The child may be admitted to hospital depending on the age and severity of illness.
- When unsuccessful in obtaining a clean catch, midstream, or catheterized specimen for culture and sensitivity
- When the clinical features of UTI present with a negative urine dipstick result
- Lack of adequate outpatient follow-up (e.g., no telephone, live far from clinic, etc.)
- All males with confirmed UTIs need a referral.
- All clients < 6 months of age

Non-Pharmacological Interventions

- Provide oral hydration

Pharmacological Interventions

Antibiotics

- Oral antibiotics appear adequate for most children with UTI (including acute pyelonephritis).
- 7 days duration of oral antibiotics is sufficient for treatment of cystitis in children.
 - Short course therapy is not effective for children < 5 years of age due to a high incidence of reflux.
- Antibiotic prophylaxis does not decrease the risk of recurrent UTI in children < 6 years of age.
- Immediate treatment may reduce the risk of renal parenchymal defects compared with treatment delayed for over 4 days.

First Line:

- Sulfamethoxazole/Trimethoprim (SMX/TMP) 6-12 mg/kg/day orally divided q12h for 7 days.
 - Alternative to SMX/TMP should be considered when local resistance is anticipated to be > 20%.
- Nitrofurantoin 5-7mg/kg/day orally divided q6h for 7 days
 - Nitrofurantoin is not active against *Pseudomonas aeruginosa* or certain strains of *Klebsiella* and *Proteus*. It should not be used in infants < 1 month of age.

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Second Line:

- Amoxicillin 40 mg/kg/day orally divided q8h for 7 days
 - Amoxicillin is not recommended for short course therapy due to a high percentage of resistant organisms.
- Cephalexin 25-50 mg/kg/day orally divided q6h for 7 days

Children who are toxic appearing, dehydrated, or unable to retain oral intake should receive antibiotics parenterally. These children should be referred to a physician/RN(NP) for care.

Fever and Pain Management

- Acetaminophen 10-15 mg/kg/dose per day orally every 4-6 hours (maximum dose 75 mg/kg/day)
- Ibuprofen 10 mg/kg/day orally in three divided doses (maximum dose 3.2 g daily)

Client and Caregiver Education

- Counsel client/caregiver about appropriate use of medications (dose, frequency, completion of entire course of antibiotics, etc.).
- Instruct client/caregiver to report any deterioration in condition as soon as it occurs.
- Instruct client/caregiver about proper hygiene to prevent recurrence of infection.
- Ask client/caregiver to report recurrence of symptoms immediately.
- Education regarding avoidance of constipation (increase fiber intake).
- Increasing fluid intake (water and juices) will increase urine flow and achieve light coloured urine.
- Teach the child to void with continuous rather than staccato voiding pattern.
- Create a voiding routine every 2-3 hours.
- Avoid bubble baths and encourage showers.
- Frequent underwear and diaper changes.

Monitoring and Follow-Up

- Follow-up in 24 hours to assess condition
- Review after treatment is completed (in 10-14 days)

URINARY TRACT INFECTION (UTI) PEDIATRIC

Referral

- Transport all infants < 6 months of age and those who appear acutely ill (toxic appearing), dehydrated, or who are unable to tolerate oral medication or fluids.
- Older infants and children with suspected pyelonephritis may require transport, depending on this clinical presentation (e.g., acute illness, dehydration, or unable to tolerate medication or fluids).
- Refer to a physician/RN(NP) for evaluation of any child with culture-proven UTI who has been treated on an outpatient basis in whom the condition is not resolving.
- Refer any male with confirmed UTI.
- Female children with any recurrent UTI (e.g., two uncomplicated UTIs within 6 months OR three or more positive urine cultures in the prior 12 months).

DOCUMENTATION

- As per employer policy

REFERENCES

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RNs WITH ADDITIONAL AUTHORIZED PRACTICE
CLINICAL DECISION TOOL
DECEMBER 1, 2016

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