

Urinary tract infection:

Summary

A urinary tract infection is an infection of the bladder, urethra, ureters, and/or kidneys and is a common infection in infancy and childhood. Risk factors include congenital anomalies of the kidneys and urinary tract (CAKUT), female sex, lack of circumcision in young boys, and bladder and bowel dysfunction. As in adults, the most common causative pathogen is *Escherichia coli*. Children and adolescents often present with classic symptoms of UTI (e.g., dysuria, urinary frequency). However, nonverbal and/or young children often have nonspecific symptoms, which may include fever, irritability, poor feeding, and new-onset urinary incontinence. Diagnosis is based on symptoms and urinalysis and urine culture results. Imaging is not required for diagnosis but is used to evaluate for suspected acute complications (e.g., renal abscess) and underlying structural anomalies (e.g., vesicoureteral reflux). The first-line imaging modality is renal and bladder ultrasound (RBUS); further imaging depends on the patient's history, ultrasound results, and/or specialist recommendations. Treatment of pediatric UTIs involves antibiotics (oral or IV) and management of any underlying causes. Recurrent UTIs are common in children, and patients and/or their caregivers should be educated on preventive measures. Complications of pediatric UTIs, especially if severe or recurrent, include sepsis, renal scarring, chronic kidney disease, and hypertension.

UTI in adults is discussed in a separate article; see "Urinary tract infections."

FEEDBACK

A. Epidemiology. UTI is one of the most common bacterial infections in children.

1. **Incidence** of symptomatic UTI during infancy is 0.4–1%.
2. Until 6 months of age, UTIs are twice as common in infant boys than girls. After 6 months of age, UTIs are much more common in girls.
3. Before 6 months of age, UTIs are 10 times more common in **uncircumcised boys** as compared with boys who are circumcised.

B. Etiology. The vast majority of UTIs are caused by enteric bacteria, especially *E. coli*. Other pathogens include *Klebsiella*, *Pseudomonas*, *Staphylococcus saprophyticus* (especially in adolescent females), *Serratia*, *Proteus* (associated with a high urinary pH), and *Enterococcus*.

C. Pathogenesis

1. Most bacteria enter the urinary tract by **ascending** through the urethra.
2. Bacterial properties that promote the adherence of bacteria to the urothelium increase the likelihood of UTI (such as the presence of P fimbria on *E. coli*).

⊕ Risk Factors for UTI :

1. uncircumcised male → 50% e.coli أول ما يولد قبل ما يتطعم
2. Female → 80% e.coli بيكرن 10 أخفاف البنت
3. toilet training ; لكر بعد ما يتطعم بيصير
4. School going. النسبة بين صبي الطفل وحشر جالسه ما يروح وقتها 2.8 : 1 F M
5. congenital malformation in genitourinary tract وما يجب ترفع على إيد المدرسة فيتنش جالسا
6. cleaning in Female child from behind to front
7. ملودة السريعة بطلع من intestine بيكون ملابطة e.coli فلو أجست المنطقة بيحصل UTI
8. tight underwear
9. constipation, cause compression of urinary tract
10. Neurological deficit : neurogenic bladder نحو جيل مبيع تحتضنه قيم العمل والرحمة والأمانة والخلص والرحمة

According to Dr.Zeyad: UTI Risk Factors:

- 1.uncircumcised male
- 2.Female (short urethra)
- 3.Age <1year
- 4.congenital anomalies(VUR).
- 5.Constipation
- 6.Neurogenic bladder
- 7.toilet trainer
- 8.school going
- 9.tight clothes
- 10.bubbles path
- 11.urethral instruments
- 12.poor hygiene
- 13.pregnancy
- 14.sexual activity
- 15.whooping from backward to forward.



D. Clinical features. UTI symptoms vary with the age of the child.

1. In neonates, symptoms are nonspecific and include lethargy, fever or temperature instability, irritability, and jaundice.
2. In older infants, symptoms include fever, vomiting, and irritability. Pyelonephritis is difficult to diagnose in young nonverbal children but should be suspected if fever or systemic symptoms are present.
3. In young children who were previously toilet-trained or dry at night, UTI may present with nocturnal enuresis or daytime wetting.
4. In older children, cystitis (lower tract infection) is diagnosed when children present with only low-grade or no fever and with complaints of dysuria, urinary frequency, or urgency. Pyelonephritis (upper tract infection) is associated with back or flank pain, high fever, and other symptoms and systemic signs such as vomiting and dehydration.

upper UTI	lower UTI	acute bacteriuria
→ high grade fever	→ afebrile / low grade fever	→ in pregnant :
→ shivering	→ frequency	need ttt
→ abd. pain	→ bad odor	→ in child :
→ vomiting	→ discoloration	No need / مش حاجة
→ Diarrhea	→ urgency	→ in adult
→ Neck stiffness (not 812)	→ dysuria	Not Need ttt
	→ suprapubic pain	

E. Diagnosis and evaluation

1. Diagnosis depends on the proper collection of the urine specimen.
 - a. In neonates and infants, urine for culture must be collected by suprapubic aspiration of the urinary bladder or via a sterile urethral catheterization. A clean "bagged" urine sample is adequate for a screening urinalysis but not for culture.
 - b. In older children who can void on command, a careful "clean-catch" urine sample is adequate for culture.
 - c. Because bacteria multiply exponentially at room temperature, it is crucial that the urine be cultured immediately or at least refrigerated immediately until it can be cultured.
2. Urinalysis findings suggestive of UTI include the presence of leukocytes on microscopy ($>5-10$ WBCs/HPF) and a positive nitrite or leukocyte esterase on dipstick. Note however that not all bacteria produce nitrites (e.g., enterococcus), which may lead to a negative nitrite test.
3. Urine culture remains the "gold standard" for diagnosis. Significant colony counts depend on the culture method:

Even if there one organism, we then consider UTI

 - a. Any growth on urine collected by suprapubic aspiration
 - b. $\geq 10,000$ colonies in samples obtained by sterile urethral catheterization
 - c. $\geq 50,000-100,000$ colonies of a single organism in urine collected by clean-catch technique

2. Urine analysis / urine culture
suggestive definitive 100%
Urine analysis : 1. Color : abnormal / Red / clear Yellow
2. WBC normally <5 , >10 abnormal
3. RBC normally <5 HPF
4. Casts 5. Crystals (calcium / uric acid)
6. Nitrate 7. Leukocyte esterase
definitive diagnosis 100%
Urine culture
Urine culture : 1. Any growth on urine collected by suprapubic aspiration
2. $\geq 10,000$ colonies in samples obtained by sterile urethral catheterization
3. $\geq 50,000-100,000$ colonies of a single organism in urine collected by clean-catch technique

1. bag	if ⊖	if ⊕	definitive ⊖	more than one organism : $>10^5$	one organism : $>10^5$
2. by catheter					
3. suprapubic					
4. Midstream					

to diagnose UTI : $>10^5$ colonies

4. Imaging

- Imaging is indicated in selected children with UTI, because children with UTI have an increased incidence of structural abnormalities of the urinary tract (e.g., vesicoureteral reflux).
- All children with pyelonephritis, all children with recurrent UTI, prepubertal males, and girls younger than 2 years of age with cystitis should have an imaging evaluation, which should include a renal ultrasound and consideration for a VCUG.

F. Management

- Empiric antibiotic therapy** should be started in symptomatic patients with a suspicious urinalysis while culture results are pending. Commonly used oral antibiotics include trimethoprim-sulfamethoxazole or cephalexin.
- Neonates** with UTIs are admitted to the hospital for initial IV management, which commonly includes ampicillin and gentamicin.
- Toxic-appearing children** with high fever and children with dehydration should also be admitted to the hospital for initial IV antibiotics and hydration. Patients can be transitioned to oral antibiotics once the child has shown clinical improvement and sensitivities are available.
- Duration of treatment for cystitis is usually 7–10 days, and for pyelonephritis, 14 days.

* management :

→ Lower UTI :	→ upper UTI :
Nitrofurantoin	3 rd generation cephalosporin
Sulprim = Sulfu + TMP 5-8 mg	Ceftriaxone (I.V.) أول يوم
Duration : 3-5 Days	Cefixime (oral) ثاني يوم
	Duration : 7-14 Days

* Indication to admission :

lie! → any febrile UTI → admission

- toxic look
- persistent vomiting
- neonate lie! → < 3 months
- dehydrated

① admission

② Kidney fn / CBC / chemistry / urea & creat / ultrasound abdomen

* indication to do VCUG = voiding cystourethrogram

! MCUG = micturating cystourethrogram

- recurrent febrile UTI : > 2 times
- 1st febrile UTI → culture & Not E-Coli
- Not respond to ttt
- US abnormality in urinary tract

بنتشوف إذا فيه reflux

follow up + Symptomatic ttt = grade 1, 2, 3

انت بتقرر علاج وبتقرر حجم العلاج = grade 4

surgery = grade 5

Kidney Scoring : reflux الـ reflux
النسبة : 1, 2, 3, 4, 5
في العمر الصغير : 1, 2, 3, 4, 5
في العمر الكبير : 1, 2, 3, 4, 5

علاج : 1, 2, 3, 4, 5

* Prophylactic ttt for grade 1, 2, 3 reflux :

sulprim 2-3 mg / Kg, once / Day

Nitrofurantoin 1 day / dose

By: Deema Muhanna