URINARY TRACT INFECTIONS

Epid. The prevalence of UTI at all ages is 1-3% of girls and 1% of boys. Below 1 yr, male : female ratio is **≈ 4:1**, especially among **uncircumcised**

males, but after 1 yr, there is striking female preponderance with ratio

1:10.

Et. UTI is mainly caused by colonic bacteria e.g. ***Escherichia coli***,

followed by ***Klebsiella*** and ***Proteus***. Infrequently it caused by *Staphylococcus saprophyticus* and enterococcus as well as to viral infection e.g. adenovirus. **Path.** Virtually **all UTIs are ascending infections**. The bacteria arise

from the **fecal flora**, colonize the perineum, and enter the bladder via urethra. In uncircumcised boys, it arises from the flora beneath the prepuce. Rarely, in some neonates, renal infection may occur by hematogenous spread. **Risk factors of UTI** include: Female gender; Uncircumcised male; Vesicoureteral reflux; Toilet training; Voiding dysfunction; Obstructive

uropathy; Urethral instrumentation; Wiping from back to front in females; Tight clothing (underwear); Pinworm infestation; Constipation; Bacteria with P fimbriae "mannose-resistant"; Anatomic abnormality (labial adhesion); Infants with bottle feeding; Neuropathic bladder; Sexual activity; & Bubble bath!. **C.M.** There are 3 main types of UTI: asymptomatic bacteriuria, cystitis, and pyelonephritis. Some suggest lower UTI for cystitis & upper UTI for

various forms of pyelonephritis. 1. ***Asymptomatic Bacteriuria*** refers to a condition that results in a **positive urine culture** without any manifestations of infection. It is

most common in girls. 2. ***Cystitis*** indicates infection of bladder → **dysuria, urgency, frequency, suprapubic pain, incontinence, and malodorous urine**. **It does not cause fever or renal injury**.

Other forms of cystitis include: **Acute Hemorrhagic Cystitis** that often caused by E. coli & less by adenovirus; whereas Eosinophilic &

Interstitial cystitis are rare conditions.

3. ***Pyelonephritis*** is clinically manifested as **abdominal or flank pain, fever, malaise, nausea, vomiting, and occasionally diarrhea.**

Newborns may show nonspecific symptoms e.g. poor feeding, irritability, and weight loss; whereas **infants** may present with FUO only. Pyelonephritis has many forms, include:- **Acute Pyelonephritis** when there is involvement of the renal

parenchyma. **Acute Lobar Nephritis (Nephronia)** is localized renal bacterial

infection involving >1 lobe. **Pyelitis** when there is no parenchymal involvement.

Renal abscess may occur following pyelonephritis or may be secondary to primary bacteremia. **Perinephric abscesses** may be secondary to contiguous infection in the perirenal area or pyelonephritis that dissects to the renal capsule. **Pyelonephritic scarring** refers to an acute pyelonephritis that resulted in renal injury. **Xanthogranulomatous pyelonephritis** is a rare type of renal infection characterized by granulomatous inflammation with giant cells and

foamy histiocytes. **Cx.** Chronic recurrent UTI → renal scarring which result in chronic

hypertension & renal insufficiency. **Inv.** Dx of UTI is generally depends on the symptoms, GUE, & urine culture. **Collection of urine sample** depend on age & sex of patient; in infants, it is by application of adhesive, sealed, sterile collection bag after

disinfection of the skin of the genitals, whereas in toilet-trained children, a midstream urine (clean-catch urine); in uncircumcised males, the

prepuce must be retracted. **GUE;** Freshly motile bacteria suggest UTI, microscopic hematuria is

common in acute cystitis. WBC casts suggest renal involvement. Pyuria

suggests infection, although it is more **confirmatory rather than diagnostic** because infection can occur without pyuria & vice-versa.

Note: *Causes of sterile pyuria include: partially treated bacterial UTI, viral infection, renal TB, renal abscess, urinary obstruction, and inflammation near urinary tract e.g. appendicitis.* **Urine Culture;** the patient is considered to have UTI if shows **>50,000 colonies of a single pathogen** (regardless of symptoms), or if there is **>10,000 colonies with symptoms**. In borderline cases, consider

bladder **catheterization** which is better inserted after voiding (to measure the residual urine). ***Note:*** *Urine sample should be analyzed & cultured promptly because if left*

at room temperature for >1 hr, overgrowth of minor contaminant will suggest UTI when the urine actually may not. Refrigeration is a reliable method of storing the urine until it can be cultured. **CBP;** in upper UTI, there is leukocytosis (neutrophilia), ↑ ESR & CRP; blood culture also may be +ve. **Imaging studies** are used to identify the anatomical abnormalities, it include:- **Ultrasound of kidney** is indicated initially for all infants with UTI as well as children with +ve urine culture, febrile UTI, recurrent UTI, & UTI which associated with systemic disease. If there is any significant abnormality detected by US, patient should be further evaluated using either VCUG or DMSA. **Voiding Cystourethrogram (VCUG)** is in 2 types; contrast or

radionuclide (which can ↓ irradiation dose especially for girls). The timing of VCUG is controversial; some recommend it before discharge of patient from hospital, whereas others prefer delay for 2-6 wk (to allow inflammation in bladder to resolve to reduce the incidence of vesicoureteral reflux). However recent studies show that incidence of reflux is the same whether VCUG is done now or then. **Renal scanning using DMSA** (di-mercapto-succenic acid) is used to detect renal scars that usually develop after severe or recurrent upper UTI. **CT scan** can also detect these renal scars. **Rx.** Patients with severe UTI should receive emperical antibiotics before the results of culture.

 Empirical Rx of ***cystitis*** include: **TMP-SMZ, Nitrofurantoin** (5–7 mg/kg ÷ 3 or 4), or **Amoxicillin** (50 mg/kg ÷ 3) for **3-5 days**.

 Indications of admission to hospital include: acute febrile UTI (pyelonephritis), age ≤1 mo, dehydration, vomiting, or unable to drink.

Rx is by **IV fluids** & IV broad-spectrum antibiotics for **7-14 days** by either **Ceftriaxone** (50–75 mg/kg), or **Ampicillin** (100 mg/kg) **+**

aminoglycoside e.g. **Gentamicin** (3–5 mg/kg ÷ 1 or 3). ***Note: Alkalinization*** *of urine by sodium bicarbonate increases the efficacy of aminoglycosides in the urinary tract.* ***Nitrofurantoin*** *should not be used in children with febrile UTI because it does not achieve*

significant renal tissue levels. **Some patients with febrile UTI** can also be treated as an outpt by a

single IM injection of Ceftriaxone followed by oral agent of 3rd-

generation cephalosporin e.g. **Cefixime**. Fluoroquinolones e.g. **Ciprofloxacin** is an alternative agent for resistant bacteria especially *Pseudomonas*.

 Children with **renal or perirenal abscess** or with infection in obstructed urinary tracts often require surgical or percutaneous **drainage** in addition to the antibiotic therapy. **Urine culture after 1 wk of Rx** may be required to ensure that the urine is sterile. **Px.** Children with **recurrent UTIs** should evaluated for the risk factors of UTI *(see above)* in order to correct them properly; in addition, they may need long-term Px (especially those with neurogenic bladder, urinary tract stasis/obstruction, reflux, calculi) by either; **TMP-SMZ, Trimethoprim, or Nitrofurantoin by 1/3 of normal therapeutic dose once daily.**