URINARY TRACT INFECTION-
DIAGNOSIS & MANAGEMENT

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UTI is one of the frequently encountered bacterial
infections of childhood affecting 5-7% girls and 1-2% boys before 6 years of age.

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>F (%)</th>
<th>M (%)</th>
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<tbody>
<tr>
<td>&lt; 1</td>
<td>0.7</td>
<td>2.7</td>
</tr>
<tr>
<td>1 - 5</td>
<td>0.9 – 1.4</td>
<td>0.1 – 0.2</td>
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<tr>
<td>6-16</td>
<td>0.7 – 2.3</td>
<td>0.04 – 0.2</td>
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<tr>
<td>18-24</td>
<td>10.8</td>
<td>0.83</td>
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</tbody>
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UTI causes acute morbidity and in minority of cases can progress to chronic kidney disease due to recurrent episodes and renal scars resulting in

- Hypertension
- Reflux nephropathy
- Chronic renal insufficiency
- Rarely ESRD or toxaemia of pregnancy

Key Issues

- Early diagnosis
- Prompt treatment with appropriate drug for 10-14 days
- Detection of underlying lesions (congenital or acquired)
- Prevention of recurrence and
- Complete relief of obstruction are important points to remember in successful manage of UTI
Diagnosis of UTI

- All febrile infants without focus of infn. (AAP)
- Suspect UTI – clinically, routine urine, dipstick
- Send a properly collected urine sample under aseptic conditions for urine culture
- Start broad spectrum antibiotics
  - oral – simple UTI – 10-14 days
  - IV – complicated (fever, vomiting, dehydration, sick) for 3-4 days and then oral for 7-10 days

When to suspect UTI

- At any age:
  - Unexplained fever
  - Failure to thrive, loss of appetite, anemia, vomiting, diarrhea
  - Urologic abnormalities / procedures
  - Voiding problems
  - N.B: lethargy, jaundice, seizures, fever, vomiting, ‘septic’.

Infants and preschool: recurrent fever, diarrhea, febrile fits

Older: Abdominal/back pain, fever, Vomiting.

Urinary symptoms: burning, urgency, enuresis, foul urine.

Collection or urine

- **Neonates and infants** → single catheterised specimen – $10^5$
  - Suprapubic aspiration – single bacteria = $10^5$ CFU
  - Girls – urine collection bag (negative rules out UTI)
- **Older children**
  - Clean catch midstream specimen after cleaning prepucial/vulval region with soap and water
Diagnosis of UTI

- Significant bacteriuria is a gold standard
- Urine Culture with colony count > 10^5/ml of pure strain of gm neg. bacteria

Urinalysis

- Urinary microscopy – presence of bacteria under high power 3 x 10^4/ml
- Pyuria > 5 pus cells/high powder field > 10 /CMM^3
- Chemical Tests – Nitrite → nitrate – colour reaction, leucocyte esterase – enzyme from neutrophils
- CBC, ESR, CRP, Procalcitonin level in blood are additional tests if clinical or urine tests are inconclusive.

Drug Therapy of UTI

**Acute Pyelonephritis:** X 7-10 days
**Cystitis:** X 3-5 days

N.B. & Infants: IV Ampicillin + Gentamicin

Above 1 year: IM Gentamicin/Amikacin SINGLE DOSE/Cephalosporins

**Oral:** Cotrimoxazole Amoxicillin Quinolones (to be avoided) Cephalosporins

Recommendation for USG, MCU & DMSA after 1st UTI

<table>
<thead>
<tr>
<th></th>
<th>USG</th>
<th>MCU</th>
<th>DMSA</th>
</tr>
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<tbody>
<tr>
<td>Royal College of Physician London (1991)</td>
<td>All</td>
<td>&lt; 1yr</td>
<td>1-7 years</td>
</tr>
<tr>
<td>AAP (1999)</td>
<td>&lt; 2 yrs</td>
<td>&lt; 2 yr</td>
<td>If USG / MCU-abn</td>
</tr>
<tr>
<td>IPNG (2001)</td>
<td>All</td>
<td>&lt; 2 yrs</td>
<td>&lt; 5 yrs</td>
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Marks (2008): Unresolved, complicated, recurrent UTI
Abnormal prenatal US, clinical clues – “High risk”
Ped Nephrol. 2008, 23:9-17
### Table: High Risk vs. Low Risk

<table>
<thead>
<tr>
<th>Condition</th>
<th>High Risk (15-20%)</th>
<th>Low Risk (85%)</th>
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<tbody>
<tr>
<td>USG ablation of kidney and urinary tract – (PUV, VUR, PUJ etc.)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Neonatal sepsis</td>
<td>Febrile but no bacteremia</td>
<td></td>
</tr>
<tr>
<td>Poor urinary stream, renal lumps</td>
<td>Clinically – N</td>
<td></td>
</tr>
<tr>
<td>Non E.coli inha.</td>
<td>E.Coli infection</td>
<td></td>
</tr>
<tr>
<td>Poor/incomplete Response to drug Rx</td>
<td>Complete resolution with appropriate drug Rx</td>
<td></td>
</tr>
<tr>
<td>Complicated UTI</td>
<td>No</td>
<td></td>
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<tr>
<td>Recurrent UTI</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Immune def.</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Voiding dysfunction</td>
<td>No (toilet trained)</td>
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### Diagnostic Imaging Studies

- Not required in acute setting
  - USG if no response to appropriate antimicrobial therapy within 72 hrs
  - CT Scan (?)

- **Infants and children** (≤ 3 yrs) should have USG of kidneys, ureters and bladder to R/o hydronephrosis, hydrourerter, distended bladder, ureterocele, diverticuli and post void residue at a convenient time.

### MCU

- R/O VUR (50% of UTI)
- High grade VUR (IV-V)
  - risk of renal scars 4-6 times that of low grade (I-III)
  - 8-10 times without VUR
- Detect PUV, diverticuli, ureterocele
• DMSA renal scan or MRI
  3-6 months after febrile UTI to detect scars
  Renal scarring – 10-30% after UTI
Children at risk for renal scars

- Young age (< 2-3 yrs)
- Boys > girls in first year
- Obstructive uropathy
- Reflux nephropathy (high gr VUR)
- Voiding dysfn.
- Recurrent UTI
- Complicated UTI (febrile, sick, infant)
- Immunocompromised

Aim of investigations of a child with UTI

- To detect important malformations req. surgery or continuation of urinary prophylaxis and medical management.
- To prevent subsequent infections in child at risk

Attacks of Pyelonephritis and Renal Scars

<table>
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<tr>
<th>Year</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>0</td>
<td>5%</td>
</tr>
<tr>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>3</td>
<td>35%</td>
</tr>
<tr>
<td>4</td>
<td>60%</td>
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Key Messages

- suspect UTI (clinical, urine)
- start antibiotics in 72 hrs
- establish dx – urine culture, colony count
- continue antibiotic Rx for 10-14 days
- identify high risk group (clinical, resp. to Rx.)
- investigate for underlying lesions
- treat constipation, voiding problems
- continue antibiotic prophylaxis
- imaging investigations
Investigations of high risk Children

USG

Normal or Abn.
Without dilatation

< 3 yrs
DMSA
Normal
Stop
Abnormal
MCU
VUR, PUV

≥ 3 yrs
DTPA with (?) IRC

≥ Abnormal with dilatation
only pelvic
Abn. bladder + ureteric dilatation
PUJ, PUV, VUR

DTPA with (?) IRC

MCU + Diuretic renogram

VUR, PUV