

MANAGEMENT OF CHILDHOOD URINARY TRACT INFECTIONS

GUIDELINES ON MANAGEMENT OF CHILDHOOD URINARY TRACT INFECTIONS

1.0 Introduction

Urinary tract infection (UTI) is one of the most common bacterial diseases in childhood and by far the most frequent indication for long term antibiotic prophylaxis and imaging studies. Those in early childhood have a higher risk of renal damage following pyelonephritis and >90% of febrile UTI in infants are clinically consistent with pyelonephritis and even septicaemia. Fever, therefore, is considered an indication of upper urinary tract involvement or pyelonephritis in young children. At present the universally accepted method of minimizing renal damage is effective treatment of acute pyelonephritis. The primary care clinician has a major role in this initial management, which involves early and accurate diagnosis, prompt treatment and appropriate referral for further evaluation.

The important reason to investigate children with UTI is to detect or exclude structural abnormalities that may predispose them to recurrent infections and kidney damage. These guidelines are prepared based on existing evidence for their appropriateness and also according to the availability and cost effectiveness.

Table 1
Definitions

Significant bacteriuria	Colony count of $>10^5$ /ml of a single species in a midstream clean catch sample
Asymptomatic bacteriuria	Presence of significant bacteriuria in two or more specimens in a child with no symptoms.
Complicated UTI	Toxicity, persistent vomiting, dehydration, renal angle tenderness, renal impairment, clinical non response to treatment after 48 hours
Simple UTI	UTI with low grade fever, dysuria, frequency, urgency but none of the above symptoms

2.0 Initial evaluation

2.1 Clinical features of UTI

- *Dysuria, **straining, increased frequency, incontinence
(*Infants usually cry when the bladder is full and also after the passage of urine due to the wet nappy. **Lots of infants also strain due to aerophagia and are usually relieved after passage of urine which very commonly leads to unnecessary investigations. But, if the baby cries while passing urine in **distress** - suspect UTI)
 - Secondary enuresis,
 - Macroscopic haematuria or pyuria
 - Unexplained lower abdominal pain, flank pain
 - Infant and young child with unexplained fever (>38.5°C) for more than three days or persistent vomiting or irritability
- ⇒ Exclude UTI in all neonates with septicaemia and prolonged jaundice

2.2 Specific physical signs to look for in a child with UTI

- Fever
- Dehydration
- General ill health
- Elevated blood pressure
- Palpable bladder (after voiding) – Can be due to acute retention. May also be due to a neurogenic bladder or posterior urethral valves (PUV) in a male child.
- Ballotable kidneys
- Renal angle tenderness
- Spinal defects
- External genitalia:
 - Labial adhesions
 - Phimosis (fore skin is usually not retractable < 4 yrs)
 - Signs of inflammation

Table 2
Specific features suggesting upper tract involvement

- Unexplained fever (>38.5°C)
- General ill health/ toxicity
- Loin pain / tenderness
- +CRP or ESR

Table 3
Other conditions with urinary symptoms mimicking lower UTI:

- Vulval irritation from soap, bubble baths, poor hygiene
- Threadworms
- Labial adhesions and phimosis – (Also a common cause for false positive urine cultures)
- Sexual abuse

Table 4

KEY POINTS

- 1. Fever is an indication of upper tract involvement in childhood UTI**
- 2. An ill toxic child has to be evaluated carefully**

Table 5
Conditions predisposing to UTI

- VUR
- Obstructive uropathy
- Infrequent voiding habits
- Voiding dysfunction
- Urethral instrumentation
- Poor personal hygiene
- Inappropriate/ prolonged use of diapers
- Wiping of the perineum from back to front
- Sexual abuse
- Constipation
- Impaired host defenses

3.0 Diagnosis

- a. **Urinalysis** - supportive
- b. **Urine for culture / ABST – Positive urine culture is the gold standard of diagnosis and its validity depends on the proper collection, transportation and inoculation of the urine specimen and accurate interpretation of results. Refer tables 6-8**

Table 6
Method of urine collection

Infant or young child who is not potty trained

1. Clean catch mid stream sample (CCMS)
2. Supra pubic aspiration (SPA)
3. Catheter samples (only in failed attempts of SPA)

Older child

- CCMS
- SPA (in special situations)

Table 7
Advice to parents on collection of CCMS urine sample

- Wash hands and genitalia with water - No antiseptics
(Retract the prepuce of the older boys)
- Do not wash the urine culture bottle and do not leave the lid opened for a long time
- Send first few ml of urine out and collect a mid stream specimen directly into the sterile culture bottle without contamination
- Close the cap and hand over immediately

Transportation

- Method and time* of collection must be stated in the request form (*to be written by the nursing officer who takes the sample)
- Send immediately to the lab
- If the specimen cannot be transported within 2 hours, refrigerate immediately at 4°C – **maximum time of refrigeration is 24 hours**

Interpretation of results

Urinalysis: (centrifuged sample)

WBC >10 /HPF – indicates significant pyuria

Nitrites (Dipstix) positive – suggestive of infection

Table 8
Interpretation of urine culture

Method of collection	Colony count (<u>pure growth</u>)	Probability of infection
CCMS	>10 ⁵	80-95%
	10 ⁴⁻⁵	Infection likely
SPA	Any number	>99%
Catheter sample	>10 ⁵	95%
	>10 ⁴⁻⁵	Infection likely
	(can increase sensitivity by taking second 2-4 ml of urine)	

4.0 Management of the acute phase

- a. Correct dehydration
- b. Control pain & fever (Liberal fluid intake also reduces dysuria)
- c. Persistent vomiting – *domperidone may be useful*
- d. Other investigations:
 - Febrile child
FBC
 - Ill or septic child
Blood urea, serum creatinine,
Serum electrolytes
Blood culture
LP (if indicated)
 - Urgent USS – in complicated UTI, neonates, children with distended bladder and ballotable kidneys

e. Antibiotics

- **A valid urine sample must be obtained before antibiotic therapy and this may warrant a SPA for infants and young children.(x)**
 - **Prompt treatment with the best guess antibiotic in appropriate dosage must be started in all suspected cases of febrile UTI pending the urine culture result and the drug can be changed according to the ABST pattern latter. Refer tables 10-11 (x)**
 - Treatment can be delayed till urine culture report is available if the child is afebrile and not ill.
 - *Urinary antiseptics like nitrofurantoin and nalidixic acid are not suitable for treatment of febrile UTI*
 - IV antibiotics are indicated for the neonate, ill and septic child and who cannot tolerate oral intake. (x)
 - Aminoglycosides should be used with caution in children with renal impairment.
 - Duration 7 days
- f. All outpatients must be reviewed after 48 hours to assess the clinical response If no response after 48 hours of antibiotic treatment:
- Check the drug dosage and the ABST pattern
 - Repeat urine culture
 - Consider urgent USS to exclude predisposing urinary tract abnormalities and complications of UTI.
- g. Commence prophylactic antibiotics for all children below 5 yrs and continue until follow up investigations are available. (Refer table 12)

Table 9
Admission criteria

1. Neonates and young infant
2. Ill, toxic and dehydrated child
3. Persistent vomiting
4. Symptoms and / or signs suggestive of obstruction or calculi

Refer to a Paediatrician when:

- a. The child is <5 years of age
- b. Diagnosis of uncomplicated urinary tract infection (UTI) is in doubt
- c. It is necessary to arrange imaging of the urinary tract to rule out obstructions (including calculi), anatomical defects, and dysfunctional bladder emptying
- d. There is a failure to respond to appropriate therapy after 48 hours
- e. There are recurrent attacks of UTI

Patient and parent education

- a. Stress on the importance of early recognition and prompt treatment of further attacks
- b. Advice on the importance of continuation of prophylaxis
- c. Increase fluid intake and maintain good urine output.
- d. Avoid predisposing factors. (Refer table 5)
- e. Double micturition in patients with VUR

Table 10
Oral antibiotics for treatment of UTI

Medication	mg/kg/day	Doses/day
Cefixime	8	2
Cephalexin	30-60	3
Co-amoxycylav	20-40 oral Amoxy content	3
	25-45 oral Amoxy content	2 (duo)
Cotrimoxazole	6-10 trimethoprim or 30-50 sulphamethoxazole	2

Include preference order

Table 11
Parenteral antibiotics for treatment of UTI

Medication	mg/kg/day	Doses/day
Cefotaxime	100-150	2
Ceftriaxone	50-100	1-2
Cefuroxime	50-100	3
Co-amoxycylav	50-100	3
Gentamicin	7.5	3

Table 12
Antibiotics for prophylaxis of UTI

Medication	mg/kg/dose	Remarks
Cephalexin	10	Recommended drug in first 1-3 months until trimethoprim is available in Sri Lanka
Cotrimoxazole	2 (trimethoprim)	Avoid in infants <1 month age
Trimethoprim	2	Recommended in neonates; but require specialist supervision
Nalidixic acid	12.5	Avoid <6 months
Nitrofurantoin	1-2	Avoid in infants <3 months age

Table 13

KEY POINTS

- 1. Child with UTI needs prompt antibiotic treatment in appropriate dosages to minimize kidney damage**
- 2. A valid urine sample must be obtained before antibiotic therapy and this warrants a SPA for infants and young children.**
- 3. Do not use urinary antiseptics for febrile UTI**
- 4. Assess all the patients after 48 hours of therapy for clinical improvement**
- 5. Refer the patients when indicated.**

5.0 Imaging in UTI

- Confirm the diagnosis before planning long term prophylaxis and imaging studies.

5.1 USS

- USS is recommended for all children following first attack of UTI
- This should be performed urgently in neonates, in complicated UTI and in patients with persistently distended bladder or ballotable kidneys. It is indicated at the earliest convenient time for the other patients.
- Abnormal USS – further investigations to be done preferably after consultation with the Radiologist.

- If imaging shows an abnormality, a repeat USS of kidneys is recommended before discontinuation of prophylaxis to assess the renal growth.
- Patients must be sent with full bladder for USS and they must be well hydrated before all imaging studies.

5.2 MCUG

- MCUG is the best investigation to detect abnormalities of urethra and bladder and it is also useful in detecting and grading VUR, but is extremely invasive, hence should be undertaken after careful evaluation.
- MCUG has to be done 6 weeks after UTI except in bladder outlet obstruction where it is indicated immediately.

Indications for MCUG

- a. Suspected bladder outlet obstruction
- b. Dilated ureter / dilated ureter and dilated pelvicalyceal system in the USS under 5 years of age
- c. Abnormal DMSA scan:
 - Significant scarring under 5 years of age
 - Dysplastic kidneys
- d. First attack of febrile UTI under 1 year of age and DMSA scan is not available
- e. Second attack of febrile UTI under 5 years of age
- f. Clinical picture is highly suggestive of acute pyelonephritis of children below 5 years and DMSA scan is not available.

5.3 DMSA

- DMSA scan is indicated 6 months after an attack of UTI to detect scarring. (Reversible renal parenchymal changes of acute infection can mimic permanent scarring in the DMSA scan during the first 3-4 months.)

Indications for DMSA scan

- *Under 1 year of age*
 - a. All children with febrile UTI
- *Under 5 years of age*
 - a. Clinical picture is highly suggestive of acute pyelonephritis other than fever
 - b. Second attack of febrile UTI before 5 years of age
 - c. Abnormal USS: hypoplastic / dysplastic kidneys, scarring
 - d. Other structural anomalies: VUR, duplex system, ureterocele etc.

5.4 Other imaging studies

Indications for DTPA scan

- a. Suspected pelvi-ureteric or vesico-ureteric junction obstruction

Indications for X-Ray KUB

- a. UTI associated with persistent or recurrent microscopic or macroscopic haematuria

Table 14

KEY POINTS

1. USS is indicated for all children with UTI.
2. DMSA, MCUG and DTPA scans are indicated after careful evaluation.
3. Please note the contrast and isotope studies are invasive, costly and carry a risk of radiation. In addition, isotope studies are not freely available.
4. If the imaging studies are abnormal a repeat USS is recommended at discontinuation of prophylaxis to assess renal growth.

6.0 Prophylaxis for UTI

- Refer Table 12.
- Drugs are given as a single dose in the night
- **Antibiotic prophylaxis is indicated for all children below 5 years following the first attack of UTI until an USS of the kidneys is available. Continuation of prophylaxis is decided according to following factors.**
- **First attack <1 year**
 - a. If the USS is normal in infants with afebrile UTI it is recommended to stop the prophylaxis and to follow up without further investigations.
 - b. In infants with febrile UTI, it is continued till recommended imaging studies are available or until their first birthday, whichever comes last.
 - c. Those with structural abnormalities or recurrent UTI need prophylaxis till 5 years or longer.
- **First attack between 1-5 years**
 - a. Those children with normal USS following an afebrile or a simple febrile UTI will be followed up without prophylaxis or further investigations. (Refer figure 1)
 - b. Those with structural abnormalities or recurrent UTI need prophylaxis till 5 years or longer.

7.0 Management of recurrent attacks of UTI

- Confirm the diagnosis, and obtain a urine sample via a SPA for repeat culture, in children not potty trained.
- Treat promptly with an appropriate antibiotic pending the culture report.
- Identify correctable risk factors e.g.: constipation, poor hygiene, inappropriate voiding practices etc
- Treat phimosis or labial adhesions appropriately. (They lead to false positive culture reports)
- Imaging studies as indicated.
- Check the compliance, especially if the urine culture yields organisms sensitive to the prophylactic antibiotic used.

8.0 Asymptomatic bacteriuria

- Do not treat the asymptomatic patients with positive urine cultures as this will lead to resistance and true pyelonephritis.
- But always exclude urinary symptoms by direct questioning.
- Routine urine cultures are not necessary.

9.0 Vesico Ureteric Reflux (VUR)

VUR can be a risk factor for recurrent UTI. With bladder growth and maturation there is a tendency for reflux to resolve or improve.

Management of VUR:

- a. Prophylaxis is recommended for VUR till 5 years of age. Longer regimes are indicated for recurrent UTI.
 - b. Advice on double micturition.
 - c. Recurrent attacks of UTI need prompt treatment.
 - d. A repeat DMSA scan to assess new scar formation might be recommended in case of repeat attacks of febrile UTI
 - e. Repeat MCUG to assess the improvement of reflux is not usually recommended unless there is a plan for surgery.
- **There is no world wide consensus regarding the indications for surgical intervention in VUR. Each patient with reflux has to be assessed individually.**

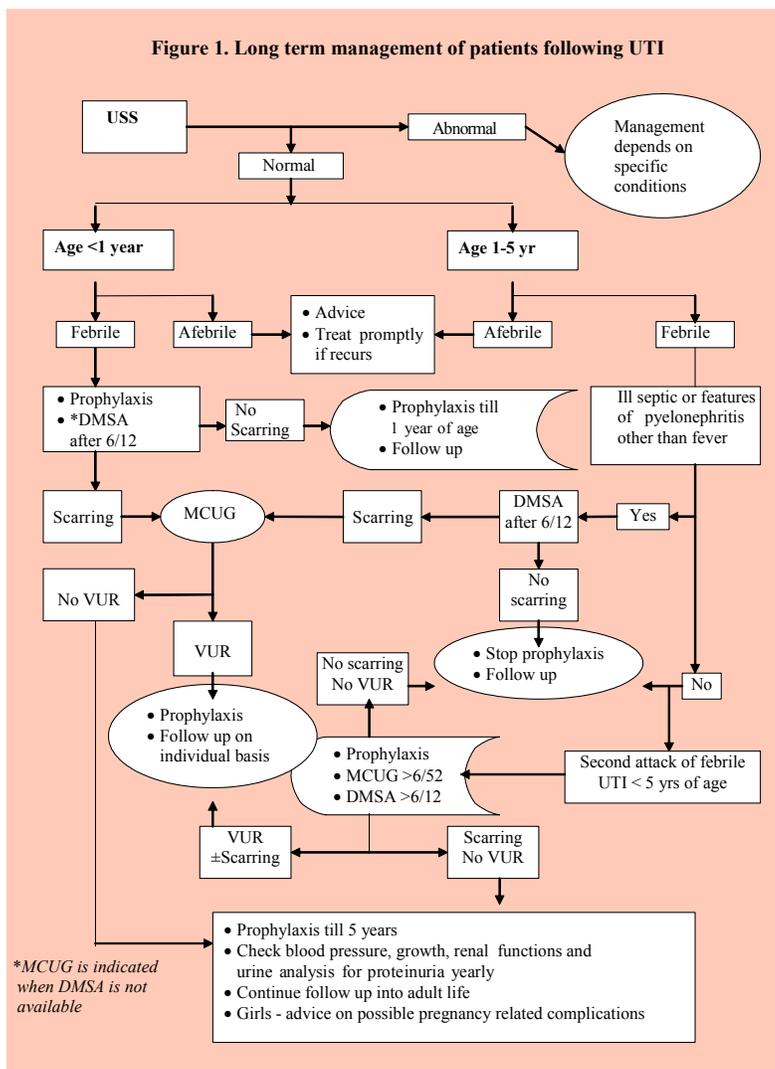
Definite indications

- a. Recurrent break through infections

Relative indications

- a. Poor compliance for prophylaxis
- b. Recurrent infections in spite of prophylaxis.
- c. New scar formation
- d. Impaired renal function
- e. Persistent gross VUR (Grade IV - V) or persistent moderate VUR (grade III) with recurrent infections after discontinuation of prophylaxis

Figure 1. Long term management of patients following UTI



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