

Management of Urinary Tract Infections in Children

Practice Guideline



June 2002

Background

Management of Urinary Tract Infections in Children (UTI) was identified as a priority for clinical practice guideline development by members of the Child Health Network for the Greater Toronto Area during a 2001 consensus forum.

An expert panel¹ was established, the guideline was developed and distributed throughout the membership for input. The final draft was approved by the Coordinating Committee in April 2002. Implementation throughout the Child Health Network will be accomplished through the following process:

1. Network organizations will facilitate a supportive environment for adoption of CHN Practice Guidelines by incorporating the guidelines into their existing guideline process (order sets, intranet availability, etc).
2. Network organizations will identify a "champion" to take the lead in ensuring implementation at the organization.
3. The CHN guideline will proceed through the organizational process for "approval" (MAC, Pharmacy, etc).
4. Education sessions will be provided for staff. CHN will provide a Power Point Presentation for organizational use.
5. CHN will monitor implementation through a variety of methods and report to members (surveys, chart audits, etc).

Introduction

The incidence of urinary tract infections is approximately 5% in febrile children 2 – 24 months of age². Presentation varies and is often non-specific, especially in infants (Table 1)³.

¹ Appendix 1 – Members of CHN Expert Panel for Paediatric Urinary Tract Infection

² American Academy of Pediatrics, Subcommittee on Urinary Tract Infection: Practice Parameter. The diagnosis, treatment, and evaluation of the initial urinary tract infection in febrile infants and young children. *Pediatrics* 1999, 103:843-52.

³ Jarvis DA, Scolnik D. A clinical perspective on diagnosis of urinary tract infections in children. *Canadian Journal of Emergency Medicine* 2000, 2: 201-2.

Table 1 Presentation of Urinary Tract Infection in Children

AGE	SIGNS
Infant	<ul style="list-style-type: none"> ▪ Non-specific complaints of feeding difficulties, anorexia, irritability, vomiting and/or diarrhea ▪ Fever (66%) ▪ Sepsis syndrome or shock (rarely) ▪ Late onset jaundice with elevation of both direct and indirect bilirubin
Toddler/ Preschooler	<ul style="list-style-type: none"> ▪ Unusual odor of urine ▪ Frequency, dysuria, and urgency are common ▪ Other non-specific signs may be present
School Age	<ul style="list-style-type: none"> ▪ More likely to have classical symptoms – frequency, dysuria, fever ▪ Reduced intensity of symptoms in recurrent infections ▪ “changed behavior, vomiting, anorexia, fever, abdominal pain, secondary enuresis ▪ Untreated UTI may result in diminishing symptoms but culture remains positive

Definition

A UTI is defined by the presence of bacteria in the urinary tract and by the host inflammatory response (leukocytes). A diagnosis of UTI is defined as $\geq 50 \times 10^6$ CFU/L and should result in full identification and sensitivity testing.

Testing

Table 2 outlines the recommendations for testing children suspected of having a UTI.

Table 2 Recommendations for Testing for UTI

Age	Signs	
Infants <2 months	Fever with or without: <ul style="list-style-type: none"> ▪ Unexplained jaundice ▪ Vomiting ▪ Sepsis ▪ Generally unwell 	
2 – 24 months	Girls Risk Factors: (test if one or more present) <ul style="list-style-type: none"> ▪ Temp $\geq 39^\circ\text{C}$ ▪ Fever for 2 days or more ▪ White race ▪ <1 year of age ▪ Absence of another potential source of fever 	Boys Risk Factors: (test if one or more present) <ul style="list-style-type: none"> ▪ < 6 months of age ▪ Non-circumcised ▪ Absence of another potential source of fever
2 – 12 years	Test if any are present: <ul style="list-style-type: none"> ▪ Dysuria, frequency or other change in pattern of urination ▪ Secondary enuresis or daytime incontinence ▪ Recurrent, unexplained fevers or abdominal pain ▪ Failure to thrive ▪ Unexplained irritability or change in behavior in a child with a previous UTI 	
Adolescent	If any signs are present. Consider STD if sexually active and send appropriate cultures.	

All ages	<ul style="list-style-type: none"> • Sepsis syndrome • Septic shock • "Unwell" or febrile with known underlying urological abnormalities, regularly catheterized, and/or previous UTI
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Method

Table 3 outlines recommendations for testing methodology. Screening tests are not recommended as there is no justification for their use in the bedside evaluation of children with suspected UTI.

Note: Bag specimens are inappropriate for urine culture testing and should not be used.⁴

Table 3 Testing Methods for Urine Culture*

Culture Testing Method	Appropriate Patient Population
Midstream/Clean Catch	All toilet trained children without obvious infection or anomaly of external genitalia. No cleansing is necessary prior to collection. ⁵
Catheterization (using strict aseptic technique and careful cleansing)	<ul style="list-style-type: none"> • Febrile infants • Toxic/septic/shocky children • All age groups with urgent clinical indications to start antibiotic treatment <p>NOTE: Voiding may occur during or prior to the catheter being introduced. If a clean catch urine can be obtained during the void, catheterization is not necessary.</p>
Suprapubic Aspiration	<ul style="list-style-type: none"> • Diapered, uncircumcised boys whose urethral opening cannot be visualized • Infants/children with urgent indications for initiation of therapy who cannot be catheterized or who cannot produce an uncontaminated midstream sample

*All urine specimens should be refrigerated immediately until sent to the laboratory for testing.

Interpretation of Culture Results

In addition to the presence of a bacterial count in the urine, if ≥ 10 WBC/mm³ are present, an "infection likely" comment is added. If < 10 WBC/mm³ are present,

⁴ Shaw KN, Gorelick MH: - Urinary tract infection in the pediatric patient. Pediatric Clinics of North America 1999, 46:1111-24.
 Linshaw MA. Controversies in childhood urinary tract infections. World J Urology 1999 17:383-95.

⁵ Lohr JA, Donowitz LG, Dudley SM. Bacterial contamination rates for non-clean-catch and clean-catch midstream urine collections in boys. J Pediatr 1986, 109:659-60.
 and Lohr JA, Donowitz LG, Dudley SM. Bacterial contamination in voided urine collections in girls J Pediatr 1989, 114:91-3.

the comment “suspicious of infection, please repeat” should be added. The chart below outlines pathogenicity of various organisms that may be found in a urine culture:

Table 4 Culture Interpretation

Probable pathogen	Probable non-pathogen
Escherichia coli	Coagulase negative staphylococci
Klebsiella spp.	Viridans streptococci
Citrobacter spp.	<i>Corynebacterium</i> species (diphtheroids)
Enterococcus spp.	Lactobacilli
Pseudomonas aeruginosa	
Staphylococcus saprophyticus	

Antibiotic Therapy

Bacterial antibiotic resistance patterns are geographically determined. In the absence of local data, the following susceptibility profile (from HSC Emergency Department, 2000 data) may be applied.

Table 5 Susceptibility Profile

Antibiotic/ Organism	n	% Susceptibility										
		Amp	Keflex	ceftriax	ceftaz	TMP SMX	cipro	nitrofu r	gent	tobra	amik	vanco
E. coli	330	48	95	100		69	99	99	99	99	100	
Klebsiella pneumoniae	22	0	96	100		82	100	60	100	100	100	
Proteus mirabilis	22	91	100	100		91	100	0	96	96	100	
Enterococcus spp.	14	100	0					100				100
Pseudomonas aeruginosa	10				90	90	90	0	100	100	100	

Oral antibiotics:

At present (2002), **cephalexin** is the most effective agent against the top three pathogens (E. coli, Klebsiella pneumoniae, Proteus mirabilis) isolated from the urine of HSC emergency patients. Neither ampicillin nor trimethoprim-sulfamethoxazole can be recommended as the sole initial empiric therapy at this time due to the percentage of resistant organisms to these drugs.

An alternative to cephalexin is **cefixime**, which is more active against Gram negative bacilli and can be given once a day (instead of Q6H dosing of cephalexin). Due to its comparative cost and the fact that more widespread use could contribute to an increase in resistant organisms, it is not recommended as a first line therapy.

Duration of therapy:

Seven to fourteen days treatment regimens are recommended.

Intravenous antibiotics:

For patients requiring hospitalization, a regimen of ampicillin plus gentamicin is highly effective for the five most common causes of UTI.

Non-toxic children <4 years of age who are:

- Afebrile after 24 hours and
- Tolerating oral fluids

can be switched to oral antibiotics and discharged home.

Hospitalization vs Ambulatory Treatment

Children who should be hospitalized include:

- Neonates and infants up to 4 months of age
- Children of any age with sepsis or shock syndromes
- Known complex underlying urological pathology
- Persistent vomiting, dehydration or inability to take oral medication
- Known/suspected causative organism resistant to oral medication
- Psychosocial issues including inability of family to care for child appropriately (ability to observe and respond to signs of deterioration, access to ongoing medical supervision)

Investigation and Follow-up

Immediate investigations (other than urine culture) are indicated according to the following table.

Table 6 Immediate Additional Investigations Recommended

Age/Condition	Recommended Test	Rationale
Neonate	Complete septic workup	To avoid missing a diagnosis of meningitis ⁶
Children with sepsis syndrome/shock	Blood culture Biochemical, coagulation and hematological profiles +/- chest xray +/- lumbar puncture and other investigations	
Febrile infant	Hematological profile Blood culture	
Children with significant vomiting	Biochemistry profile	To rule out dehydration and/or impaired renal function
Immunodeficient children	Blood culture	To rule out secondary complications
Children with impaired renal function	Biochemistry profile	To rule out secondary complications

⁶ Wiswell TE et al: - No lumbar puncture in the evaluation for early neonatal sepsis: will meningitis be missed? Paediatrics 1995, 95: 803-6.

Recommendations for follow up investigations are based on the best opinions until evidence is available.

Table 7 Follow Up Investigations Recommended⁷

Age/Condition	Recommended Test	Rationale
All children following first UTI	Abdominal U/S	To rule out major urinary tract structural pathology
All children following first febrile UTI	VCUG (7 – 10 days after completion of treatment)	To rule out ureteric reflux

References:

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⁷ Craig A, Knight JF, Sureshkumar P et al. Vesicoureteric reflux and timing of micturating cystourethrography after urinary tract infection. *J Arch Dis Child* 1997, 76:275-7
and
Merguerian PA, Jamal Ma, Agarwal SK et al. Utility of SPECT DMSA renal scanning in the evaluation of children with primary vesicoureteral reflux. *Urology* 1999, 53:1024-8.

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13. Hoberman et al. Oral versus initial intravenous therapy for urinary tract infections in young febrile children. *Pediatrics* 1999, 104:79-86.
14. Wiswell TE et al: - No lumbar puncture in the evaluation for early neonatal sepsis: will meningitis be missed? *Paediatrics* 1995, 95: 803-6.
15. Craig A, Knight JF, Sureshkumar P et al. Vesicoureteric reflux and timing of micturating cystourethrography after urinary tract infection. *J Arch Dis Child* 1997, 76:275-7
16. Merguerian PA, Jamal Ma, Agarwal SK et al. Utility of SPECT DMSA renal scanning in the evaluation of children with primary vesicoureteral reflux. *Urology* 1999, 53:1024-8.

Adapted from HSC guideline developed by Dr. Anna Jarvis and Dr. Susan Richardson

APPENDIX 1

Expert Panel for Urinary Tract Infection in Children

Members

Dr. Leo Levine	Paediatrician, Markham Stouffville Hospital
Dr. Ian Katai	Paediatrician, Rouge Valley Health System
Dr. Dennis Geary	Paediatric Nephrologist, HSC
Dr. Susan Richardson	Director, Microbiology, HSC
Dr. Anna Jarvis	Emergency Physician, HSC
Margaret Brady	RN, Nephrology Clinic, HSC
Susan Hastings	RN, Urology, HSC
Mary Paulin	North York CCAC