CREDIT · VALLEY THE CREDIT VALLEY HOSPITAL	CLINICAL PRACTICE GUIDELINE	PROFESSIONAL PRACTICE
TITLE: **Management of Urinary Tract Infections in Children**		
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SUPERCEDES: New	**ISSUED BY:** _____ **TITLE:** Chief of Medical Staff	
	ISSUED BY: _____ **TITLE:** President	

Purpose:

To provide guidelines for the diagnosis and management of urinary tract infections in children.

Definitions:

Urinary Tract Infection (UTI):

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 ≥ 50 X 10^6 CFU/L and should result in full identification and sensitivity testing.

Selection Criteria:

The incidence of urinary tract infections is approximately 5% in febrile children 2-24 months of age. Presentation varies and is often non-specific, especially in infants.
Table I: Presentation of Urinary Tract Infection in Children identifies the most common signs of UTI in children.

Table I: Presentation of Urinary Tract Infection in Children

AGE	SIGNS
Infant	▪ 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	▪ Unusual odor of urine ▪ Frequency, dysuria, and urgency are common ▪ Other non-specific signs may be present
School Age	▪ 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

Assessment and Management:

The recommendation for testing children suspected of having a UTI is outlined in **Table II: Recommendations for Testing for UTI.**

Table II: Recommendations for Testing for UTI

AGE	SIGNS	
Infants < 2 months	Fever (> 38°C with or without): ▪ Unexplained jaundice ▪ Vomiting ▪ Sepsis ▪ Generally unwell	
2 – 24 months	**Girls** Risk Factors: (test if one or more present) ▪ Temp ≥ 39°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) ▪ < 6 months of age ▪ Non-circumcised ▪ Absence of another potential source of fever
2 – 12 years	Test if any are present: ▪ 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	• Sepsis syndrome • Septic shock • "Unwell" or febrile with known underlying urological abnormalities, regularly catheterized, and/or previous UTI	

STD: Sexually transmitted diseases

Table III: Testing Methods for Urine Culture 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. Bag specimens will be rejected by the laboratory and the physician will be notified. The laboratory will request the collection of an appropriate specimen.

*In situations where a child's parent/caregiver **refuses** a catheter specimen after receiving an explanation of the need for a sterile urine sample, a mid stream urine may be collected if the child is clinically stable. Instruct the caregiver to observe the child for voiding and catch the midstream urine directly into a specimen container.*

Table III: 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.
Catheterization (using strict aseptic technique and careful cleansing)	• Febrile infants • Toxic/septic/shocky children • All age groups with urgent clinical indications to start antibiotic treatment **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.**
Suprapubic Aspiration	• **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 will be the responsibility of the physician. **Table IV: Culture Interpretation** outlines pathogenicity of various organisms that may be found in a urine culture.

When a bacterial count in the urine is present, the urinalysis will be reviewed and consideration given to the following findings when making the diagnosis of UTI:

- If $\geq$ 10 WBC/mm^3 are present an infection should be considered likely
- If < 10 WBC/mm^3 are present, an infection should be considered suspicious and a repeat urinalysis and culture should be done.

Table IV: Culture Interpretation

PROBABLE PATHOGEN	PROBABLE NON-PATHOGEN
Escherichia coli	Coagulase negative staphylococci
Klebsiella spp.	Viridans streptococci
Citrobacter spp.	Corynebacterium species (diphtheroids)
Enterococcus spp.	Lactobacilli
Pseudomonas aeruginosa	
Staphylococcus saprophyticus	

Antibiotic Therapy:

When deciding on the most appropriate antibiotic refer to **Table V: Susceptibility Profile**, which outlines the bacterial antibiotic resistance patterns for CVH Emergency Department 2002 data. (The HSC Emergency Department, 2000 data was used as a comparator.)

Table V: Susceptibility Profile (Credit Valley Hospital 2001/02)

ANTIBIOTIC		Ampicillin	Cephalexin	Ceftriaxone	Ceftazidime	TMPSMX	Nitrofur	Gentamicin	Tobramycin	Amikacin
ORGANISM	**N**									
Escherichia coli	**330**	60	95	100		77	99	99	99	100
Klebsiella pneumoniae	**22**	0	96	100		82	60	100	100	100
Proteus mirabilis	**22**	91	100	100		91	0	96	96	100
Enterococcus spp.	**14**	100	0				100			
Pseudomonas aeruginosa	**10**				90	90	0	100	100	100

1. Oral antibiotics:

Preferred Agent: Cephalexin is the most effective agent against the top three pathogens (E. coli, Klebsiella pneumoniae, Proteus mirabilis) isolated from the urine of 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.

Alternative Agent: Cefixime is recommended as an alternative, it 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.

2. Intravenous antibiotics:

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

Alternative Agent: If allergic to penicillin, gentamicin alone may be sufficient.
Duration of therapy:
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. **Seven to fourteen days** treatment regimens are recommended.
Exclusion: Children under 6 months of age will be evaluated on an individual basis.

Admission Criteria:

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 and the rationale (other than urine culture) are indicated according to **Table VI: Immediate Additional Investigations.**

Table VI: Immediate Additional Investigations

AGE/CONDITION	RECOMMENDED TEST	RATIONALE
Neonate * < 30 days	Complete septic workup	To avoid missing a diagnosis of meningitis
Febrile infant * 30-90 days	CBC Blood culture	
Children with sepsis syndrome/shock	CBC, lytes, urea, creatinine, blood sugar, PTT, INR (includes PT) Blood culture +/- chest xray +/- lumbar puncture and other investigations	
Children with significant vomiting	Lytes, urea, creatinine, blood sugar	To rule out dehydration and/or impaired renal function
Immunodeficient children	Blood culture	To rule out secondary complications
Children with impaired renal function	Lytes, urea, creatinine	To rule out secondary complications

* Refer to CPG 6.3 Management of Febrile Infants 30-90 days for additional information.

Current practices recommended in **Table VII: Follow Up Imaging Investigations Recommended** are based on the best opinions until evidence is available.

Table VII: Follow Up Imaging Investigations Recommended

AGE/CONDITION	RECOMMENDED TEST	RATIONALE
All children following first UTI	Abdominal Ultrasound *	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

VCUG: Voiding cystourethrogram

* For admitted patient, perform prior to discharge if possible.

Patient Education:

Upon discharge from the Emergency Department/In Patient Unit, the patient/caregiver will be given the discharge instruction sheet entitled "Urinary Tract Infections in Children".

Evaluation:

An audit will be done to determine compliance and outcomes of the CPG after it has been in place for 1 year.

Microbiology will monitor the number of bag urine culture specimens rejected per month.

Approval:

Paediatric Department: March 25, 2003
Emergency Department: March 5, 2003
Emergency Steering Committee: March 18, 2003
Paediatric Steering Committee: February 5, 2003
Pharmacy and Therapeutics: March 11, 2003
Clinical Quality Care Committee: March 19, 2003
Professional Practice Committee: April 29, 2003
Medical Advisory Committee: April 7, 2003

References:

1. Child Health Network Guideline – Management of Urinary Tract Infections in Children June 2002
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. Shaw KN, Gorelick MH: Urinary tract infection in the pediatric patient. Pediatric Clinics of North America 1999, 46:1111-24.
4. Jarvis DA, Scolnik D. A clinical perspective on diagnosis of urinary tract infections in children. Canadian Journal of Emergency Medicine 2000, 2: 201-2.
5. Linshaw MA. Controversies in childhood urinary tract infections. World J Urology 1999 17:383-95.
6. Baraff L. J. Management of fever without source in infants and children. Ann Emerge. Med.,2000 36:602-14.
7. Crain EF, Gershel JC. Urinary tract infections in febrile infants younger than 8 weeks of age. Pediatrics 1990, 86:363-7.
8. 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.
9. Lohr JA, Donowitz LG, Dudley SM. Bacterial contamination in voided urine collections in girls. J Pediatr 1989, 114:91-3.
10. Boehm JJ, Haynes JL, Lexington KY. Bacteriology of "midstream catch" urines. Amer J Dis Child 1996, 111:366-9.
11. McCarthy JM, Pryles CV. Clean voided and catheter neonatal urine specimens. Amer J Dis Child 1963, 106:473-8.
12. Hardy JD, Furnell PM, Brumfitt W. Comparison of sterile bag, clean catch and suprapubic aspiration in the diagnosis of urinary infection in early childhood. Br J Urol 1976, 48:279-83.

13. Hoberman A, Wald ER, Reynolds EA, Penchansky L, Charron M. Pyuria and bacteriuria in urine specimens obtained by catheter from young children with fever. J Pediatrics 1994, 124:513-9.
14. Hoberman et al. Oral versus initial intravenous therapy for urinary tract infections in young febrile children. Pediatrics 1999, 104:79-86.
15. Wiswell TE et al: - No lumbar puncture in the evaluation for early neonatal sepsis: will meningitis be missed? Paediatrics 1995, 95: 803-6.
16. 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
17. 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.