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Guidelines

Urinary Tract Infections in Children: EAU/ESPU Guidelines

Raimund Stein^{a,*}, Hasan S. Dogan^b, Piet Hoebeke^c, Radim Kočvara^d,
Rien J.M. Nijman^e, Christian Radmayr^f, Serdar Tekgül^b

^a Division of Paediatric Urology, Department of Urology, Mainz University Medical Centre, Johannes Gutenberg University, Mainz, Germany; ^b Hacettepe University, Faculty of Medicine, Department of Urology, Division of Paediatric Urology, Ankara, Turkey; ^c Department of Urology, Ghent University Hospital, Ghent, Belgium; ^d Department of Urology, General Teaching Hospital in Praha, and Charles University 1st Faculty of Medicine, Praha, Czech Republic; ^e Department of Urology, Division of Pediatric Urology, University of Groningen, Groningen, The Netherlands; ^f Department of Urology, Medical University of Innsbruck, Innsbruck, Austria

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Abstract

Context: In 30% of children with urinary tract anomalies, urinary tract infection (UTI) can be the first sign. Failure to identify patients at risk can result in damage to the upper urinary tract.

Objective: To provide recommendations for the diagnosis, treatment, and imaging of children presenting with UTI.

Evidence acquisition: The recommendations were developed after a review of the literature and a search of PubMed and Embase. A consensus decision was adopted when evidence was low.

Evidence synthesis: UTIs are classified according to site, episode, symptoms, and complicating factors. For acute treatment, site and severity are the most important. Urine sampling by suprapubic aspiration or catheterisation has a low contamination rate and confirms UTI. Using a plastic bag to collect urine, a UTI can only be excluded if the dipstick is negative for both leukocyte esterase and nitrite or microscopic analysis is negative for both pyuria and bacteriuria. A clean voided midstream urine sample after cleaning the external genitalia has good diagnostic accuracy in toilet-trained children. In children with febrile UTI, antibiotic treatment should be initiated as soon as possible to eradicate infection, prevent bacteraemia, improve outcome, and reduce the likelihood of renal involvement. Ultrasound of the urinary tract is advised to exclude obstructive uropathy. Depending on sex, age, and clinical presentation, vesicoureteral reflux should be excluded. Antibacterial prophylaxis is beneficial. In toilet-trained children, bladder and bowel dysfunction needs to be excluded.

Conclusions: The level of evidence is high for the diagnosis of UTI and treatment in children but not for imaging to identify patients at risk for upper urinary tract damage.

Patient summary: In these guidelines, we looked at the diagnosis, treatment, and imaging of children with urinary tract infection. There are strong recommendations on diagnosis and treatment; we also advise exclusion of obstructive uropathy within 24 h and later vesicoureteral reflux, if indicated.

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* Corresponding author. Division of Paediatric Urology, Department of Urology, Mainz University Medical Centre, Johannes Gutenberg University, Langenbeckstr. 1, 55131 Mainz, Germany. Tel. +49 6131 171; Fax: +49 (0)613 117 7690. E-mail address: steinraimund@gmail.com (R. Stein).

1. Introduction

In 30% of children with urinary tract anomalies, urinary tract infection (UTI) can be the first sign [1]. If we fail to identify patients at risk, damage to the upper urinary tract may occur. Up to 85% of infants and children with febrile UTI have visible photon defects on technetium Tc 99–labelled dimercaptosuccinic acid (DMSA) scanning, and 10–40% of these children have permanent renal scarring [2–4] that may lead to poor renal growth, recurrent pyelonephritis, impaired glomerular function, early hypertension, end-stage renal disease, and preeclampsia [5–10].

Identifying children at risk of renal parenchymal damage and follow-up imaging after UTI is controversial. In these guidelines, we provide recommendations for the diagnosis, treatment, and imaging of children presenting with UTI based on evidence, and when this is lacking, based on expert consensus.

2. Background

UTI is the most common bacterial infection in childhood [11–14], and up to 30% of infants and children experience recurrent infections during the first 6–12 mo after initial UTI [15,16]. In very young infants, symptoms of UTI differ in many ways from those in older infants and children. The prevalence is higher in the first age group, with a male predominance. Most infections are caused by *Escherichia coli*, although in the first year of life *Klebsiella pneumoniae*, *Enterobacter* spp, *Enterococcus* spp, and *Pseudomonas* are more frequent than later in life, and there is a higher risk of urosepsis compared with adulthood [17–19].

The incidence of UTIs depends on age and sex. In the first year of life, UTIs are more common in boys (3.7%) than in girls (2%). This is even more pronounced in febrile infants in the first 2 mo of life, with an incidence of 5% in girls and 20.3% in uncircumcised boys, as demonstrated in one prospective study of >1000 patients using urine specimens obtained by catheterisation [18]. Later, the incidence changes, and about 3% of prepubertal girls and 1% of prepubertal boys are diagnosed with a UTI [17–19].

3. Methodology

Several guidelines on dealing with specific subgroups of UTI are currently available, some of which are driven by economic and health care issues [20–22]. The recommendations in these guidelines were developed by the European Association of Urology (EAU)/European Society for Paediatric Urology (ESPU) Paediatric Guidelines Committee after a review of the literature and a search of PubMed and Embase for UTI and *newborn, infants, preschool, school, child, and adolescent*. A consensus decision was adopted when evidence was low. In these cases, all relevant papers and statements were discussed by all the authors until a consensus was achieved. The same criteria for the levels of evidence and grades of recommendation as in the EAU guidelines were used [23].

4. Classification

The four widely used infection classification systems depend on the site, episode, symptoms, and complicating factors. For acute treatment, the site and severity are the most important.

4.1. Classification according to site

Cystitis (lower urinary tract) is inflammation of the urinary bladder mucosa with symptoms including dysuria, stranguria, frequency, urgency, malodorous urine, incontinence, haematuria, and suprapubic pain. However, in newborns and infants, these symptoms are rarely diagnosed accurately.

Pyelonephritis (upper urinary tract) is diffuse pyogenic infection of the renal pelvis and parenchyma with symptoms including fever (≥ 38 °C). But unlike adults, infants and young children may have nonspecific signs such as poor appetite, failure to thrive, lethargy, irritability, vomiting, or diarrhoea.

4.2. Classification according to episode

Classifications are *first infection* and *recurrent infection*, which is subdivided into unresolved or persistent and reinfection [24].

4.3. Classification according to symptoms

Asymptomatic bacteriuria (ABU) indicates attenuation of uropathogenic bacteria by the host or colonisation of the bladder by nonvirulent bacteria that are incapable of activating a symptomatic response (no leucocyturia or symptoms). In patients with significant bacteriuria, leucocyturia can be present without any symptoms.

Symptomatic UTI includes irritative voiding symptoms, suprapubic pain (cystitis), fever, and malaise (pyelonephritis). In patients with a neurogenic bladder and malodorous urine, it is difficult to distinguish between ABU and symptomatic UTI.

4.4. Classification according to complicating factors

Uncomplicated UTI is an infection in a patient with a morphologic and functional normal upper and lower urinary tract, normal renal function, and a competent immune system.

Complicated UTI occurs in newborns, in most patients with clinical evidence of pyelonephritis, and in children with known mechanical or functional obstructions or problems of the upper or lower urinary tract [25].

5. Diagnostic work-up

5.1. Medical history

The site, episode, symptoms, and complicating factors are identified by taking the patient's history. This includes questions on primary (first) or secondary (recurring)

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