

Imaging in confirmed urinary tract infections in children: a retrospective, Trust-wide study.

Rebecca Critchley, Abdul Rehman.
Paediatric Unit
Bishop Auckland General Hospital
rebeccacritchley@doctors.org.uk

Abstract

Objective: To establish which guidelines are being followed in County Durham and Darlington NHS Foundation Trust (CDDFT) for paediatric urinary tract infections (UTI) and identify cases where management would have differed as a result of which guidelines were followed.

Design: A Trust-wide retrospective case note study of imaging used in confirmed urinary tract infections in children (0-18 yrs) over an eight month period.

Setting: Audited against current standards as set out by NICE guidelines and Newcastle guidelines^{1,2}.

Patients: All children with a confirmed urine culture with significant growth ($>10^4$ colonies of bacteria/microlitre) with or without the presence of white blood cells.

Results: Forty seven suspected UTIs were identified over a period of eight months in CDDFT. Sixteen (34%) had confirmed UTI on culture. All investigations carried out on the confirmed UTI group were normal. Fourteen children were investigated inappropriately according to both guidelines (unconfirmed UTI); four (28%) of these investigations were abnormal.

Conclusion: Newcastle guidelines are simpler than NICE guidelines but result in over investigation. The NICE guidelines need to be clearer with fewer categories to decrease human error. Following NICE guidelines resulted in less investigation, which according to this study would not affect management.

In general CDDFT follow the regional guidelines. This study highlights however that in some cases no guidelines are being followed.

Improved screening methods are required to identify those patients that truly need investigating further.

A re-audit with a large case sample is required.

What is already known about this topic

Investigation of confirmed UTIs is important to diminish the occurrence of long-term sequelae. Change in imaging practice has occurred as a result of concerns regarding unnecessary radiation exposure³. However comprehensive imaging is still advised by national guidelines⁴.

What this study adds

The NICE guidelines are complex and difficult for doctors to follow. This resulted in local guidelines being preferentially used which resulted in over-investigation in CDDFT.

Introduction

UTIs are common in children. They can present

in numerous ways and often the signs are non-specific, especially in young children⁵. Urinary tract infections can have serious consequences if left untreated but with advancing technology and treatment methods – antimicrobials - the management of UTIs in children has changed immensely over the past few decades¹.

Clinicians have a number of imaging modalities available to them⁶. Renal ultrasound is the imaging method of choice to assess size and blood flow to the kidneys⁷. Renal defects may however remain undetected with ultrasound alone⁸. Micturition cystourethrography (MCUG) remains the imaging modality of choice for assessing vesicoureteric reflux⁸. Isotope DMSA scanning is used to detect renal scarring.

The choice of imaging modalities in UTI is

complicated³. There is current controversy surrounding the recent NICE UTI guidelines, pertaining mainly to imaging. Due to the complicated nature of the NICE guidelines the type of UTI may be incorrectly identified due to misinterpretation of the criteria and personal medical opinion.

Methodology

Study design

A Trust-wide retrospective case note study of imaging was used in confirmed urinary tract infections in children over an eight month period. NICE guidelines and Newcastle guidelines (Department of paediatric nephrology) were used.

Patients had to be less than 18 years of age with a confirmed UTI. Confirmed culture was classified as significant growth ($>10^4$ colonies of bacteria/microlitre) with or without white blood cells present. Patients were excluded from the study if the laboratory advised repeat sample and/or contamination. Recurrent UTIs were only classified as recurrent if the patient had previous confirmed UTIs on culture. According to the NICE guidelines the UTI was classified as typical if they did not fulfil criteria for atypical or recurrent UTIs.

Demographics

Results

Forty seven suspected UTIs were identified over a period of eight months in CDDFT, of which 16 (34%) had confirmed UTI on culture. The confirmed UTI group had an average age at presentation of 25.7 months, a male to female ratio of 5:11 and the main UTI type was typical. The main referral source was the Emergency Department. This is summarized in table 1.

All investigations carried out on the confirmed

UTI group were normal.

Of the 31 (66%) unconfirmed UTIs, 14 were investigated further. Of these 14, one showed scarring on DMSA (US performed previously showed hydronephrosis following confirmed UTI, MCUG not performed as per guidelines); one showed dilatation and hydronephrosis on ultrasound (DMSA and MCUG performed in 2007 after unconfirmed UTI) and two showed reflux on MCUG (First patient - ultrasound and DMSA performed previously after unconfirmed UTI therefore not done this episode. Second patient - ultrasound and DMSA also performed but both normal). As summarized in figure 1

14 children were investigated inappropriately according to both guidelines; four (28%) of these investigations were abnormal.

Average age at presentation in months	25.7
Male to female ratio	5:11
Main UTI type	Typical
Main Referral source	A&E

Table 1. Confirmed UTI group demographics

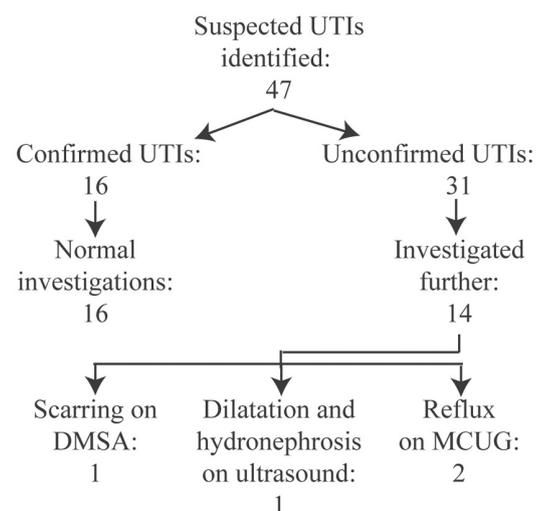


Figure 1. Investigations performed and outcome.

Discussion and conclusion

The correct diagnosis and investigations of UTIs in children is an important part of paediatric practice. National and local guidelines differ such that the same child may be investigated in different ways depending on which guidelines are followed.

The complexity of the NICE guidelines and individual interpretation may lead to the UTI being classified incorrectly. Therefore the NICE guidelines need to be clearer with fewer categories to minimise human error. If the NICE guidelines are used, fewer investigations are carried out, which, according to this study would not affect outcome.

Regional guidelines are simpler to follow but result in over investigation of children.

Urine microscopy findings correlated poorly with culture findings. Possible explanations include an inaccurate diagnostic test or poor individual technique. We recommend doctors working in the speciality of paediatrics should undergo urine microscopy training.

In general CDDFT is following the regional guidelines. In addition this study highlighted that in some cases no guidelines are being followed.

All investigations carried out on the confirmed UTI group were normal yet four patients in the unconfirmed group had abnormal results. Therefore better screening methods are required to identify those patients with proven UTIs that require further investigation.

A re-audit with a large case sample is required.

References:

1. Urinary tract infection in children: diagnosis, treatment and long-term management. National Collaborating Centre for Women's and Children's Health, Commissioned by National Institute for Health and Clinical Excellence, August 2007. Available at: <http://guidance.nice.org.uk/CG54/niceguidance/pdf/English>.
2. Department of Paediatric Nephrology. Investigating urinary tract infections in children. Newcastle: The Newcastle Upon Tyne Hospitals NHS trust; 2008
3. Lim R. Vesicoureteral reflux and urinary tract infection: evolving practices and current controversies in pediatric imaging. *American Journal of Roentgenology* 2009; 192(5): pp. 1197-1208.
4. Tullus K, Lakhanpaul M, Mori R. A different view on imaging of UTI. *Acta Paediatrica* 2008; 97: pp. 1016-1018.
5. Iacobelli S, Bonsante F, Guignard JP. Urinary tract infection in children. *Archives de Pediatric* 2009;16(7): pp. 1073-9.
6. Luk WH, Woo YH, Au-Yeung AW, Chan JC. Imaging in paediatric urinary tract infections: a 9-year local experience. *American Journal of Roentgenology* 2009;192(5): pp. 1253-1260.
7. Rosenberg HK, Ilaslan H, Finkelstein MS. Work-up of urinary tract infection in infants and children. *Ultrasound Quarterly* 2001;17(2): pp. 87-102.
8. Zaki M, Mutar G, Al-Saleh Q, Ramadan DG. Febrile urinary tract infection in children: Role of 99mTc-dimercaptosuccinic acid (DMSA) scan and other imaging techniques. *Annals of Saudi Medicine* 1996;16(4): pp. 410-3.