Imaging guidelines for urinary tract infection in childhood; time for change?

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Commentary on the paper by Zamir *et al*

Despite the frequency of urinary tract infection (UTI) in childhood,¹ and the numerous contributions on the subject in the literature, there is surprisingly little consensus on urinary tract imaging requirements, perhaps reflecting the paucity of high quality intervention studies and data on long term outcome.

Diagnostic imaging following UTI in childhood has been accepted practice for nearly 40 years since the original studies² showed a high prevalence of abnormalities, and specifically a link between renal scarring and vesicoureteric reflux (VUR). Inherent in this strategy was the assumption that identification of these abnormalities would influence outcome. In the intervening decades, much has been learned about additional risk factors for post-infection renal scarring, such as obstructive uropathy, recurrent febrile UTI, particularly in the infant and young child, diagnostic delay, inadequate treatment, dysfunctional voiding, the host inflammatory reaction, as well as factors specific to the infecting bacterium.³

In addition, clear gender specific differences in renal scarring have been established, with global parenchymal loss occurring more often in boys with dilated VUR, and focal scarring in the absence of VUR being seen more often in girls, particularly after recurrent febrile UTI.⁴ These findings support the contention that high grade (4 and 5) VUR is associated with renal dysplasia that occurs during fetal life with UTI as a risk factor for postnatal renal functional decline.⁵

Fortunately the great majority of children with UTI have an excellent prognosis, and although more long term follow up data are necessary, it appears that the risk of renal functional impairment and/or hypertension is much lower than previously thought,^{6,7} and likely to be limited mainly to those with renal dysplasia.

Intervention studies in patients with VUR have shown no benefit of anti-reflux surgery over medical treatment in UTI recurrence, renal function, or new scar formation.⁸ However, low dose antibiotic prophylaxis is the commonest

intervention used to prevent UTI, but a recent review highlighted the fact that this intervention has not been appropriately studied in patients with VUR.⁹

Initial imaging guidelines for febrile children up to the age of 2 years by the American Academy of Pediatrics,¹⁰ involve a combination of ultrasound (US), contrast (MCUG), or isotope cystography. UK guidelines^{11,12} are similar for the infant and young child, but also include renal cortical scintigraphy with technetium-99m dimercaptosuccinic acid (DMSA). Guidelines for the older child reflect differing professional opinion, predominantly on the need for scintigraphy.

In the light of the increasing use of prenatal US, Zamir and colleagues, in this issue, have tested the value of routine diagnostic imaging and specifically questioned whether US is necessary.¹³ The study involved a prospective assessment of the value of US in 255 children under the age of 5 years with a first diagnosed uncomplicated febrile UTI. Abnormalities on US were found in 14.1% of patients, but in none did this influence management. MCUG revealed VUR in 47 (18.4%) of patients, grade 1–3 in all but one patient. No scintigraphy was carried out.

This report and a similar one published early last year,¹⁴ confirm the previously recognised low sensitivity of US for VUR. The authors suggest that in the patient who has a normal late prenatal US, further US should be limited to those who have a complicated course and MCUG should be used as the sole screening test. However, apart from the invasive nature of MCUG and the reluctance of many radiologists to undertake this study beyond infancy, this protocol is predicated on the unproven assumption of the value of prophylaxis in patients with VUR. In addition, VUR is of low grade in the majority of patients and associated with a low risk of parenchymal scarring.³

Both studies referred to above involved infants and young children with febrile UTI, and whether the same recommendations would apply to the older child remains an open question.

Despite the availability and recognised high sensitivity of renal cortical scintigraphy, the use of this modality in imaging practice is variable. Some advocate DMSA scanning as a first line investigation in lieu of US because of the greater sensitivity in identifying acute pyelonephritis (APN),¹⁵ although it is difficult to justify this approach unless confirmation of APN is shown to alter initial management and subsequent outcome. There is nevertheless some logic in adopting an imaging strategy beyond the acute phase, that defines the presence or absence of renal scarring and/or dysplasia as this is associated with long term risk, albeit small. However, as renal scintigraphy is invasive there is a need for a controlled application dictated by factors such as age, recurrence, and the presence of fever/systemic upset,¹⁶ accepting that some of the abnormalities found may have no long term significance.

One must exercise some caution before dispensing with US in the child with uncomplicated UTI. Prenatal anomaly scanning is by no means universal in the UK and for maximum sensitivity for the detection of a dilated fetal urinary tract the scan would have to be carried at or greater than 20 weeks gestation.¹⁷ In addition, US is of value in demonstrating bladder wall morphology and voiding efficiency in the older child with UTI and day wetting.

In view of the link between referral and imaging, one would have to ensure that other important aspects of the consultation, particularly simple preventive advice, are not lost merely because imaging may be considered unnecessary. Finally, the debate on imaging has to a significant extent diverted attention from the importance of early and accurate diagnosis and treatment and care must be taken to avoid minimising this aspect of management.

In conclusion, the existing encouraging long term outcome data, particularly if confirmed, along with the advent of controlled trials on prophylactic antibiotic therapy and universal prenatal anomaly scanning, should encourage the development of imaging guidelines that are both targeted and less invasive.

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Evidence based medicine

Evidence based medicine: is it practical?

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Commentary on the paper by Riordan *et al*

It has become axiomatic that high quality health care requires application of the best available evidence in the context of the individual patient's situation. Medical schools and residency training programmes are required to provide training in critical appraisal of the literature, and no self respecting guideline would claim to be other than "evidence based". In spite of this wide acceptance of evidence based medicine as the right thing to do, it is clear, from studies such as the one by Riordan *et al* in this issue, that we are just not quite there yet.¹ These investigators wondered whether "best paediatric evidence" was accessible and used by on-call doctors working at inpatient paediatric and neonatal units. What they found was perhaps predictable: the sources they defined as "best paediatric evidence" were generally accessible, but they were not often used.

Other studies suggest that the problem is widespread: only a minority of Canadian internists reported using evidence based information sources,² and similar results were found on a survey of family practitioners in New Zealand.³ Fewer than 5% of Australian general practitioners had ever used the Cochrane Library in 1999.⁴ Insufficient time, inadequate skills, and limited access to evidence are the most commonly cited reasons that physicians give

for not seeking and using evidence more consistently.⁵

The practice of evidence based medicine has been conceptualised as a five step process: recognising information needs and describing them in well formulated clinical questions; efficiently finding information; critically appraising the information; applying the information to the individual patient; and evaluating the outcomes.⁶ If this is the EBM process, and it seems like EBM is not being practiced, then what is the rate limiting step? This study and many others address step two: accessing information.

What information do doctors need? Therapeutic interventions dominate the questions that relate to medical knowledge.⁷ Is information available to support decision making in paediatrics? In spite of dismal predictions about how little evidence there is to support medical practice, studies in paediatric settings show that from 47% (in a community paediatric setting) to 75% (in an inpatient paediatric setting) of interventions are supported by good quality evidence.^{8–9}

What are the best sources of evidence for paediatric practice? Riordan *et al* asked on-call doctors about access to Medline, the Cochrane Library, paediatric journals, and local guidelines. Although Medline is a rich source of

information, and can be tailored (by the use of the "Clinical Queries" feature) to select for higher quality evidence, it is nonetheless a giant database for which searching is time consuming and often frustrating. Information that is already critically appraised and synthesised will provide more rapid access to best quality evidence. The Cochrane Library is one such source; its abstracts are freely available on the internet, and the large majority of subjects in the current study had access to the entire Cochrane Library, at least for some part of the day. For neonatologists, the Cochrane neonatal reviews are available in full text on the NICHD's website at <http://www.nichd.nih.gov/cochrane/>. Clinical Evidence, a resource that is question driven, very concise, and readily available to primary care practitioners in the UK and the United States, may provide even more rapid access to high quality synthesised information relevant to primary care. Nearly 100 topics in Issue 9 (June 2003) are relevant to paediatric practice (www.clinicalevidence.com). Other resources, such as UpToDate, Archimedes, and Evidence-based On-Call are also readily available on the internet.

Not having enough time is one of the most consistent reasons given by doctors for not practicing evidence based medicine. Studies of the amount of time it takes to find evidence show that going to the primary literature, in particular, really is very time consuming—ranging from 43 minutes to 4.5 hours for skilled searchers.^{10–11} However, the increasing number and quality of sources of high quality synthesised evidence are ameliorating the complaint that it takes too much time to find information. Using predigested sources of information, many common questions can be answered very quickly.¹²

Even if they can find evidence, do doctors recognise the best quality

evidence? Studies of information sources that practising clinicians actually use suggest that most do not. They answer their questions by reading review articles or textbooks, or consulting with colleagues.²⁻¹³ Medical students and residents can be trained to search for and critically appraise evidence from the medical literature,¹⁴ but they do not seem to carry this into clinical practice.

So which is the rate limiting step? Evidence is available, much of it (and this will only increase) on the internet; the internet is progressively more available to anyone at any time. I believe that the rate limiting step is not availability or accessibility of evidence, or even the skills of critical appraisal. The rate limiting step is the first one: practitioners don't really recognise the extent of their information needs. In 1985, Covell and colleagues compared self reported information needs with information needs of the same physicians when they were observed in practice.¹³ The study physicians hugely underestimated (by more than a factor of 10) the number of questions that would arise in practice.

This problem will be addressed not by haranguing physicians to ask more questions, but by—painlessly and quickly—providing the information they need at the point of care. In fact, when physicians identify their own information needs, the majority of what they need is patient related clinical information—information from the history, the physical examination, or from diagnostic studies.⁷ Relevant evidence from scientific studies should be provided along with patient information just at the time that the knowledge could be applied. Christakis *et al* randomised physicians to receive or not receive an evidence based message about antibiotic use in otitis media at the point of entering a prescription into an electronic system. The doctors who received the information were significantly less likely

to prescribe antibiotics than those who did not.¹⁵ Clearly, the advance of information technology with the emerging (slowly in some places!) electronic medical record, electronic physician order entry, and intelligent systems that can recognise what information might be needed in a given situation has great potential to increase the use of evidence in practice. This kind of technology is still uncommon in inpatient settings and rare in outpatient settings, due in part to high start-up costs and lack of standardised (computer) language.

Guyatt and colleagues have identified several levels of evidence based practice: the “doer” of evidence based medicine, who has the time and skills to construct appropriate questions, search efficiently, and critically appraise and synthesise information; the “user” of evidence based medicine who recognises information needs and seeks information from secondary sources; and the “unconscious user” of evidence based medicine who practices in an environment of strategies that target specific clinical behaviours.¹⁶ It is clearly naïve to assume that all paediatricians will become “doers” of evidence based medicine. The current study suggests that a great deal of time and effort will be required to increase the number of “users” of evidence based medicine.

Medicine is a combination of art and science. We must constantly refine the art by listening to and learning from our patients, and we must constantly update the science by recognising that our knowledge is time limited and seeking updated information every time we need it. Technology can help move the process forward—information offered at the point of care, information sources available and easily searched on the practitioner's wireless handheld computer, and increasing availability of synthesised information will all help. But underneath it all is our awareness of our limitations and knowledge of the

ways to overcome them in order to provide the very best care we can.

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