Randomised controlled trial of three day versus 10 day intravenous antibiotics in acute pyelonephritis: effect on renal scarring

D Benador, T J Neuhaus, J-P Papazyan, U V Willi, I Engel-Bicik, D Nadal, D Slosman, B Mermillod, E Girardin

Abstract

**Background**—Acute pyelonephritis often leaves children with permanent renal scarring.

**Aims**—To compare the prevalence of scarring following initial treatment with antibiotics administered intravenously for 10 or three days.

**Methods**—In a prospective two centre trial, 220 patients aged 3 months to 16 years with positive urine culture and acute renal lesions on initial DMSA scintigraphy, were randomly assigned to receive intravenous ceftriaxone (50 mg/kg once daily) for 10 or three days, followed by oral cephradine (4 mg/kg twice daily) to complete a 15 day course. After three months, scintigraphy was repeated in order to diagnose renal scars.

**Results**—Renal scarring developed in 33% of the 110 children in the 10 day intravenous group and 36% of the 110 children in the three day group. Children older than 1 year had more renal scarring than infants (42% (54/129) and 24% (22/91), respectively). After adjustment for age, sex, duration of fever before treatment, degree of inflammation, presence of vesico-ureteric reflux, and the patients’ recruitment centres, there was no significant difference between the two treatments on renal scarring. During follow up, 15 children had recurrence of urinary infection with no significant difference between the two treatment groups.

**Conclusion**—In children with acute pyelonephritis, initial intravenous treatment for 10 days, compared with three days, does not significantly reduce the development of renal scarring. (Arch Dis Child 2001;84:241–246)

Keywords: urinary tract infection; pyelonephritis; antibiotics; radionuclide imaging

Renal scarring is a frequent sequel of pyelonephritis in children. Appropriate antibiotics are used to eradicate urinary tract infections. Epidemiological studies and experiments on animals have shown that antibiotics were equally effective in preventing or limiting the progression of permanent renal lesions. In children with acute pyelonephritis the administration of intravenous antibiotics is often recommended. However, there is controversy regarding the duration of intravenous treatment, ranging from a few days to more than 10–15 days. A potential advantage of prolonged parenteral treatment might be that it would reduce the frequency of development of renal scarring.

We therefore carried out a randomised study to compare the effects of initial parenteral treatment for 10 days or for three days on the incidence of renal scarring. To diagnose the acute lesions and renal scars we used scintigraphy with technetium-99m labelled dimercaptoposuccinic acid (DMSA), currently one of the most reliable methods of detecting renal parenchymal damage.

**Methods**

This randomised two centre study was carried out between June 1995 and April 1999. The study protocol was approved by the local ethics committees of the two Swiss centres, Geneva and Zurich, which recruited the patients. Written informed consent was obtained from the patients’ parents before enrolment. Children with acute pyelonephritis were treated with antibiotics administered either intravenously for 10 days then orally for five days, or intravenously for three days then orally for 12 days. The primary end point was the development of renal scarring.

Eligible children were those aged between 3 months and 16 years with probable acute pyelonephritis, hospitalised in the department of paediatrics in the Cantonal University Hospital of Geneva or in the University Children’s Hospital of Zurich. Exclusion criteria were: age less than 3 months (in this age group pyelonephritis is often associated with bacteraemia or sepsis); in our institutions these infections are therefore treated with parenteral antibiotics for more than three days; a history of abnormalities of the urinary tract; and hypersensitivity to cephalosporins.

Laboratory tests on admission included blood count, C reactive protein, blood cultures, urinary dipstick or urinalysis, and urine culture. Urine samples were collected by suprapubic puncture or in sterile bags from the younger children, and clean voided midstream from the older children. Diagnosis of acute pyelonephritis was considered probable in children with an abnormal urinary dipstick test (leucocyte esterase ≥1+, or nitrite positive) or urinalysis (pyuria with at least 10 white blood cells per high power field in centrifuged urine, and bacteriuria with any bacteria per high
power field on an unstained specimen of urinary sediment) and who had at least one of the following clinical or biological signs: fever with renal temperature of 38°C or higher; abdominal or flank pain in children old enough to report pain accurately; general, non-specific signs such as irritability, vomiting, diarrhoea, or feeding problems in infants; or C reactive protein concentrations above 10 mg/l.

For children who had a positive urine culture ($\geq 10^5$ colony forming units/ml for voided urine, any colony forming units/ml for suprapubic collection), urine culture and C reactive protein were repeated on day 3–4 of the treatment, and a renal scintigraphy with DMSA and ultrasonography were performed. At this stage, children whose scintigraphy showed signs of acute lesions were finally enrolled in the study. For practical reasons, the patients were not randomised at the time when they met both criteria for final enrolment (a positive initial urine culture and a first scintigraphy showing signs of acute pyelonephritis).

As the results of urine cultures and scintigraphy (carried out only on the working days of the week) were not consistently available on the third day of treatment (that is, before the antibiotic treatment was carried out either intravenously or orally), patients were randomised at the time of admission by using blocks of 20 sealed opaque envelopes containing an equal number of assignments for the two antibiotic treatments, with stratification for the centre. Investigations were completed six weeks after infection by voiding cystourethrography to detect vesicoureteric reflux and, after an interval of three months, by a second DMSA scintigraphy to follow the evolution of renal lesions. The three month interval between the first and second scintigraphy was chosen according to a study by Goldraich et al.12

During the three month follow up, recurrent urinary tract infection constituted a secondary end point. Specimens for urine culture were obtained at the time of the voiding cystourethrography and, when the children had fever or symptoms of urinary tract infection. All patients who completed the study were reviewed at the time of their voiding cystourethrography and at the end of the follow up period. Parents were asked whether their child had had fever, recurrences of urinary tract infection, side effects of treatment or prophylaxis, and whether the prophylaxis had been given as prescribed.

TREATMENT AND ANTIBIOTIC PROPHYLAXIS

The antibiotics were administered intravenously for 10 days or for three days, then orally to 15 days. Taking account of local epidemiological data, the antibiotics chosen were ceftriaxone (50 mg/kg once daily; Rocéphine, Roche) for the intravenous treatment, and cefixime (4 mg/kg twice daily; Cephoral, Merck) for the oral treatment. The therapy was given immediately after a urine sample had been taken.

At the end of treatment, antibiotic prophylaxis with co-trimoxazole (1–2 mg trimethoprim, 5–10 mg sulphamethoxazole per kg once daily) was introduced up to the time of the voiding cystourethrography. This was then stopped for those children who had no vesicoureteric reflux and no other malformations of the urinary tract shown by ultrasonography.

RENAI DMSA SCINTIGRAPHY

Scintigraphy was done with intravenous injection of DMSA (CIS Bio, Medipro, Switzerland) labelled with $^{99m}$Tc (3.7 MBq per kg; minimum 18.5 MBq, maximum 185 MBq). Three hours after injection, six views (one posterior, two posterior oblique, one anterior, and two anterior oblique projections) were obtained with a three heads gamma camera (Toshiba GCA-9300 A/HG, Toshiba Medical Systems Inc., Japan) or, at the minimum two views (one posterior and one anterior) with a two heads gamma camera (Body Scan, Siemens, Erlanger, Germany).

All scintigrams were independently interpreted by two experienced paediatric radiologists who were unaware of the treatment assigned to the patients. Interpretation was based on the standard criteria previously defined by Patel et al.16 The progression of renal lesions was assessed by topographic analysis of each lesion. We defined renal scars as persistent changes in the same location, complete or partial reversible lesions as complete or partial resolution of changes that had been observed on first scintigraphic examination, and new lesions as lesions not present during the acute phase of urinary tract infection.

The relative size of each lesion was estimated by relating the surface of the lesion to the surface of the kidney, in the view of the scintigram where the size of the lesion was most pronounced (for an atrophic kidney, the contralateral kidney was used as a reference). The lesions were considered small if the relation to the surfaces was less than 10%; moderate if this relation was 10–30%; and large if it was 30% or greater.

As scintigraphy with DMSA does not always distinguish between pre-existing renal scar and an acute lesion,17 we analysed the results of two subgroups of children to reduce the risk of overestimating the incidence of renal lesions at the time of the second scintigraphy. These were composed of children who had presented with their first documented episode of urinary tract infection, and those whose renal lesions had partially or totally regressed between the first and second scintigraphy (regression was interpreted as the sign of a recent lesion, and in the case of partially regressive lesions, the persistent part of the lesion as a new renal scar).

STATISTICAL ANALYSIS

On the basis of previous studies, we estimated that the minimum incidence of renal scarring was approximately 35%.13 In order to detect a difference of 20% between the rate of renal scarring of the two treatment groups (from 35% to 55%) with a power of 80% and a value of 0.05 (two tailed), the sample size should be 106 children completing the study in each...
Two children did not have voiding cystourethrography, one with renal scarring, the other without.

Table 2 Renal scarring in patients who completed the study

<table>
<thead>
<tr>
<th>Event</th>
<th>IV 10 days</th>
<th>IV 3 days</th>
<th>p value</th>
<th>Difference of proportions (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal scarring (%) &lt;= 1 year of age</td>
<td>36/110 (33)</td>
<td>40/110 (36)</td>
<td>0.57</td>
<td>0.036 (-0.09 to 0.16)</td>
</tr>
<tr>
<td>&gt; 1 year of age</td>
<td>25/56 (45)</td>
<td>29/73 (40)</td>
<td>0.57</td>
<td>-0.049 (-0.22 to 0.12)</td>
</tr>
<tr>
<td>Among children with vesicoureteric reflux</td>
<td>15/38 (39)</td>
<td>14/36 (39)</td>
<td>1.00</td>
<td>0.006 (-0.22 to 0.23)</td>
</tr>
<tr>
<td>Among children without vesicoureteric reflux</td>
<td>21/72 (29)</td>
<td>25/72* (35)</td>
<td>0.47</td>
<td>0.056 (-0.10 to 0.21)</td>
</tr>
<tr>
<td>Renal scarring in the subgroup of children who had a first urinary tract infection (%)</td>
<td>29/93 (31)</td>
<td>32/90 (36)</td>
<td>0.93</td>
<td>0.044 (-0.09 to 0.18)</td>
</tr>
<tr>
<td>Renal scarring in the subgroup of children who had partially or totally reversible renal lesions (%)</td>
<td>34/108 (31)</td>
<td>36/106 (34)</td>
<td>0.70</td>
<td>0.025 (-0.10 to 0.15)</td>
</tr>
</tbody>
</table>

*Two children did not have voiding cystourethrography, one with renal scarring, the other without.

In univariate analyses, age and sex were the two factors that had a significant effect on the development of renal scarring. Children aged greater than 1 year developed renal sequelae more frequently than infants of 1 year of age or less (42% (54/129) and 24% (22/91), respectively; p = 0.007); as did girls compared to boys (51% (50/98) and 37% (44/118), respectively; p = 0.04). The development of renal sequelae was not associated with the children's recruitment centre. Age was modelled as a continuous or binary variable (<= 1 year and > 1 year). All reported p values are two tailed.

Results

PATIENT CHARACTERISTICS

After initial evaluation, 206 of the 435 children randomised (100 in the 10 day intravenous group and 106 in the three day intravenous group) did not fulfill the criteria for final enrolment in the study: 84 children had a negative initial urine culture and in 122 the first renal scintigraphy showed no signs of acute pyelonephritis. Therefore, two subgroups defined to reduce the risk of confusion with pre-existing renal scars, there were no significant differences between the rates of renal scarring according to treatment group (table 1).

In univariate analyses, age and sex were the two factors that had a significant effect on the development of renal scarring. Children aged greater than 1 year developed renal sequelae more frequently than infants of 1 year of age or less (42% (54/129) and 24% (22/91), respectively; p = 0.007); as did girls compared to boys (51% (50/98) and 37% (44/118), respectively; p = 0.04). The development of renal sequelae was not associated with the children's recruitment centre. Age was modelled as a continuous or binary variable (<= 1 year and > 1 year). All reported p values are two tailed.

Table 2 Renal scarring in patients who completed the study

<table>
<thead>
<tr>
<th>Event</th>
<th>IV 10 days</th>
<th>IV 3 days</th>
<th>p value</th>
<th>Difference of proportions (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal scarring (%) &lt;= 1 year of age</td>
<td>36/110 (33)</td>
<td>40/110 (36)</td>
<td>0.57</td>
<td>0.036 (-0.09 to 0.16)</td>
</tr>
<tr>
<td>&gt; 1 year of age</td>
<td>25/56 (45)</td>
<td>29/73 (40)</td>
<td>0.57</td>
<td>-0.049 (-0.22 to 0.12)</td>
</tr>
<tr>
<td>Among children with vesicoureteric reflux</td>
<td>15/38 (39)</td>
<td>14/36 (39)</td>
<td>1.00</td>
<td>0.006 (-0.22 to 0.23)</td>
</tr>
<tr>
<td>Among children without vesicoureteric reflux</td>
<td>21/72 (29)</td>
<td>25/72* (35)</td>
<td>0.47</td>
<td>0.056 (-0.10 to 0.21)</td>
</tr>
<tr>
<td>Renal scarring in the subgroup of children who had a first urinary tract infection (%)</td>
<td>29/93 (31)</td>
<td>32/90 (36)</td>
<td>0.93</td>
<td>0.044 (-0.09 to 0.18)</td>
</tr>
<tr>
<td>Renal scarring in the subgroup of children who had partially or totally reversible renal lesions (%)</td>
<td>34/108 (31)</td>
<td>36/106 (34)</td>
<td>0.70</td>
<td>0.025 (-0.10 to 0.15)</td>
</tr>
</tbody>
</table>

*No. of patients with reflux/no. of patients having had voiding cystourethrography.
Table 3  Size of acute renal lesions and renal scars in patients where the six views for their first and second scintigraphy were available

<table>
<thead>
<tr>
<th>Event</th>
<th>Treatment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV 10 days</td>
</tr>
<tr>
<td>Acute renal lesions—small*</td>
<td></td>
</tr>
<tr>
<td>Patients†</td>
<td>12</td>
</tr>
<tr>
<td>Lesions</td>
<td>44</td>
</tr>
<tr>
<td>Patients who developed scarring, no. (%)</td>
<td>3/12 (25)</td>
</tr>
<tr>
<td>Lesions developing into scarring, no. (%)</td>
<td>5/44 (11)</td>
</tr>
<tr>
<td>Acute renal lesions—moderate*</td>
<td></td>
</tr>
<tr>
<td>Patients†</td>
<td>46</td>
</tr>
<tr>
<td>Lesions</td>
<td>75</td>
</tr>
<tr>
<td>Patients who developed scarring, no. (%)</td>
<td>13/46 (28)</td>
</tr>
<tr>
<td>Lesions developing into scarring, no. (%)</td>
<td>19/75 (25)</td>
</tr>
<tr>
<td>Acute renal lesions—large*</td>
<td></td>
</tr>
<tr>
<td>Patients†</td>
<td>17</td>
</tr>
<tr>
<td>Lesions</td>
<td>22</td>
</tr>
<tr>
<td>Patients who developed scarring, no. (%)</td>
<td>11/17 (65)</td>
</tr>
<tr>
<td>Lesions developing into scarring, no. (%)</td>
<td>11/20 (50)</td>
</tr>
</tbody>
</table>

*Acute lesions—small, moderate, and large were defined by relating the surface of the lesion to the surface of the kidney: <10%, 10% to <30%, and ≥30% respectively, in the incidence of the scintigraphy where the size of the lesion was more pronounced.
†When patients had several lesions of different sizes, the largest lesion was considered.

Table 4  Recurrence of urinary tract infections during the follow up period among children who completed the study

<table>
<thead>
<tr>
<th>Event</th>
<th>Treatment groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IV 10 days</td>
</tr>
<tr>
<td>Patients who had at least one recurrence of urinary tract infection (%)</td>
<td>6/110 (5)</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2/28 (7)</td>
</tr>
<tr>
<td>Female</td>
<td>4/82 (5)</td>
</tr>
<tr>
<td>Median age at time of first recurrence (y)</td>
<td>2.2</td>
</tr>
<tr>
<td>Number of episodes of recurring urinary tract infection</td>
<td>104</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Children who exhibited recurring urinary tract infection with fever</td>
<td>4</td>
</tr>
<tr>
<td>Interval between end of treatment and first recurrence</td>
<td></td>
</tr>
<tr>
<td>≤7 days</td>
<td>0</td>
</tr>
<tr>
<td>&gt;7 and ≤14 days</td>
<td>1</td>
</tr>
<tr>
<td>&gt;14 days</td>
<td>5</td>
</tr>
<tr>
<td>Recurrence under antibiotic prophylaxis</td>
<td>4</td>
</tr>
<tr>
<td>Recurrences with abnormalities of urinary tract</td>
<td>2</td>
</tr>
<tr>
<td>Vesicoureteric reflux</td>
<td>1</td>
</tr>
<tr>
<td>Stenosis of vesicoureteric junction</td>
<td>1</td>
</tr>
<tr>
<td>Renal duplication</td>
<td>1</td>
</tr>
</tbody>
</table>

*Two children had two abnormalities of the urinary tract (one child had vesicoureteric reflux and a vesicoureteric stenosis, and one child had vesicoureteric reflux and renal duplication).

Discussion

The therapeutic modalities used to treat renal infection effectively and prevent renal sequelae in children are subject to controversy. We have found that antibiotics initially administered intravenously for 10 days do not confer a significant advantage in reducing the incidence of renal scarring when compared with an initial intravenous administration of three days.

To diagnose the renal lesions, we used DMSA scintigraphy, one of the most sensitive methods in detecting damage to renal tissue.12–14 However, the rate of renal scarring resulting from recent episodes of pyelonephritis may be overestimated by this method, as it can be difficult to clearly distinguish between pre-existing renal scars and new lesions.15 In children, pre-existing renal scarring may be a result of past renal infections, undiagnosed urinary tract infection,16–20 or other pathological conditions such as renal dysplasia.17,21,22 In our study, patients with pre-existing renal scarring were not known. For this reason, we determined the incidence of renal scarring in two subgroups, formed respectively by children with a first documented urinary tract infection and those in whom the lesions had partially or totally regressed between the first and second scintigraphy (regression was interpreted as the sign of recent lesion). In these two subgroups, the incidence of renal scarring was 33%, no different from that of the entire group of patients (35%).

Data from previous scintigraphy investigations following acute pyelonephritis in children have documented the incidence of renal scarring to be 35–60%.14 However, in these studies, either the information on antibiotic

boys (39%) (67/171) and 18% (9/49) respectively; p = 0.007). In contrast, the duration of fever before treatment, the degree of inflammation at the beginning of treatment (C reactive protein), the presence or absence of vesicoureteric reflux, or the patient recruitment centre had no significant effect on the incidence of renal scarring (p > 0.3). After adjustment for age (as a continuous or binary variable), sex, duration of fever before treatment, degree of inflammation, presence or absence of vesicoureteric reflux, and the patients’ recruitment centres, the difference between the two treatments on renal scarring remains non-significant (p ≥ 0.84).

We calculated size of the renal lesions in 156 children (75 in the 10 day intravenous group, 81 in the three day intravenous group), where the six views for their first and second renal scintigraphy were available (table 3). Evolution to renal scarring was more frequent as the size of the acute renal lesions increased: thus, 9% of the small acute lesions, 26% of the moderate, and 46% of the large acute lesions evolved into scars. In taking the largest size category among children who had acute lesions of different sizes, evolution to renal scarring involved 14% of children who had small acute lesions, 33% of children who had moderately large acute lesions, and 56% of children who had large acute lesions. There was no significant interaction between the size of the initial renal lesions and the treatment in relation to the rate of renal scarring (p = 0.10 in the homogeneity test).

Recurrence of Urinary Tract Infection

In the course of the three month follow up, 15 of the 220 children (7%) had at least one recurrence of urinary tract infection (table 4). Bacteriological eradication was achieved on the third day of treatment in 14 of these children, for one child the urine sample for culture was not obtained. In two children, an asymptomatic urinary tract infection was diagnosed at the time of voiding cysotourethrography. Eight children on antibiotic prophylaxis developed a urinary tract infection (in one child the organism was resistant to the antibiotic used for prophylaxis), six of whom had an abnormality of the urinary tract (table 4). DMSA scintigraphy was performed in seven children who had a recurrence of febrile urinary tract infection: two children had new acute renal lesions (both were in the three day intravenous group), which later completely regressed in one child and partially regressed in the other.
Intravenous antibiotics in acute pyelonephritis

...treatment administered was incomplete, or treatment was not standardised. Hoberman and colleagues suggested that the vulnerability of renal tissue varies with age. Although this was more often, suggesting that the vulnerability of children aged over 1 year developed renal scarring compared with infants, children aged over 1 year who had acute pyelonephritis. This was also reported by Nakao and colleagues. Our results have shown that age has an effect on the development of renal scarring. Compared with infants, children aged greater than 1 year developed renal scarring more often, suggesting that the vulnerability of renal tissue varies with age. Although this difference of susceptibility has been reported previously, the reason is not known. In the univariate analyses, we found that sex had a significant effect on the rate of renal scarring, but this result should be interpreted with caution, bearing in mind the small number of boys aged over 1 year who had acute pyelonephritis. Vesicoureteric reflux is the most common abnormality of the urinary tract in children. Hellstrom et al. found that a minority of children with renal scarring after a urinary tract infection did not have reflux. As with other data, our results do not confirm the association between reflux and renal scarring, reflux being identified in only 39% of children with renal scarring. In the logistic regression models that we used, after adjustment for these different potential prognostic factors, the difference between the two treatments on renal scarring remains non-significant (p = 0.84).

Oral antibiotics alone as a treatment for pyelonephritis is an attractive alternative to combined intravenous and oral treatments. This avoids hospitalisation of children, thus reducing health care costs, but increases the risks of renal sequelae associated with “inadequate” treatment, whether this is caused by poor compliance or vomiting (36% of the children in our study who had acute pyelonephritis had vomiting). Pyelonephritis, especially in infants, is frequently associated with bacteremia. Oral treatment of bacteremia, even when compared with parenteral treatment, limited to one single intramuscular injection of antibiotic, significantly exposes the child to serious infectious complications, such as meningitis, sepsis, or pneumonia. Under these conditions the value of giving oral treatment to young patients with acute pyelonephritis is debatable.

Following the episode of acute pyelonephritis, a high percentage of the children (35%) developed renal sequelae, particularly those aged over 1 year. This response to treatment suggests that effectiveness in preventing scarring is limited, despite antibiotics administered intravenously, at least initially. One possible strategy to improve the treatment of renal infections would be to act directly on the acute inflammation, as shown in studies carried out on animals. However, the modality of treatment using anti-inflammatory drugs together with antibiotics has yet to be defined and tested in children.

Shared decision making in pediatrics

Both in Great Britain and the United States, shared decision making is a relatively new concept in medicine. The term describes a partnership between health care providers and patients, in which each contributes equally to decisions about different aspects of treatment. The importance of shared decision making varies, depending upon the amount of discretion that exists in a particular decision. The concept has been explored extensively in adult medicine, focusing on surgical procedures and other medical decisions associated with significant morbidity—such as mammography as an appropriate screen for breast cancer. In the US, the goal has been to produce decision aids, such as videos, that give patients information presented in a neutral fashion about risks and benefits of different options. For example, it remains unclear if screening adult males for prostatic carcinoma is worthwhile. Videos have been produced that describe the pros and cons of screening, diagnosis, and treatment.

Shared decision making should not be confused with the informed choice model of communication, “in which control over decision making is vested entirely in the patient”, and the physician withdraws from the process. It is obviously quite different from older more traditional paternalistic style of decision making. Whether shared decision making is fundamentally different from family centred care is less clear, although family centred care often focuses on children with chronic medical conditions, inpatient issues and comprehensive services, rather than individual medical decisions.

How does shared decision making affect child health? In some regards, as many of the decisions we make in the ambulatory environment lack clear evidence of benefit, and uncertainty is common, shared decision making is an important aspect of paediatric care. For example, the question of treating children with acute otitis media with antibiotics is one in which shared decision making could play a vital role. Approximately 80% of patients recover from acute otitis media without antibiotics. Few go on to have serious complications. Can this information be presented in a neutral fashion so parents can participate as shared decision makers? I have often been asked by parents with children who have Attention Deficit Hyperactivity Disorder about the role of alternative medicine in their treatment. I inform parents that there are no definitive data demonstrating harm or benefit, and since the placebo effect is quite powerful, I support parents if they decide to use an alternative medicine approach. Other examples of common problems in paediatrics in which shared decision making should play an important role include: appropriate radiographic evaluation of children with urinary tract infections, immunisations for varicella and perhaps hepatitis B and pneumococcal disease, circumcision, asthma treatment, and various approaches to behavioural and developmental problems.

It is not possible to produce decision aids for the myriad choices we face in paediatrics that should involve shared decision making. Unfortunately, it is time consuming and takes a great deal of knowledge to present information in a neutral unbiased manner. Many of us neither have the skills nor the time to do this. However, as our patients become better informed about their options, shared decision making will become a necessary part of medicine. Recently, Towle and Godolphin’ described eight principles that physicians need to adopt in order to practice shared decision making:

- Develop a partnership with the patient
- Review the patient’s preference for information
- Review the patient’s preference for role in decision making
- Ascertain and respond to patient’s ideas, concerns, and expectations
- Identify choices and evaluate evidence from research
- Present evidence
- Make or negotiate a decision
- Agree on an action plan.

How well these principles will work in paediatrics, with parents who serve as surrogates for the real patients, is unknown. However, I suspect that most are applicable to the parent-physician encounter. As few of us have received any formal training about shared decision making, we must once again educate ourselves about a new and exciting development in medicine.

H BAUCHNER

US Editor

Randomised controlled trial of three day versus 10 day intravenous antibiotics in acute pyelonephritis: effect on renal scarring

D Benador, T J Neuhaus, J-P Papazyan, U V Willi, I Engel-Bicik, D Nadal, D Slosman, B Mermillod and E Girardin

Arch Dis Child 2001 84: 241-246
doi: 10.1136/adc.84.3.241

Updated information and services can be found at:
http://adc.bmj.com/content/84/3/241

These include:

References
This article cites 26 articles, 5 of which you can access for free at:
http://adc.bmj.com/content/84/3/241#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

- Drugs: infectious diseases (965)
- Renal medicine (273)
- Urology (446)
- Clinical trials (epidemiology) (480)
- Immunology (including allergy) (2018)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/