teaches us that public anxieties about losing local access to emergency services carries more political clout than professional logic. Maybe it is time for the colleges to explore this public psychology and find a way of connecting with it. Secondly, they could give deeper and wider thought as to how "managed clinical networks" could be introduced so that local emergency units can flourish while complex emergency cases can be swiftly funnelled towards appropriate specialist centres.[4] According to evidence presented by the London Ambulance Service to the Turnberg review of London in 1998, perhaps only 35% of patients arriving via 999 calls are admitted to hospital. The document acknowledges the need to encourage "a flexible approach to working by consultant colleagues in different hospitals forming a managed clinical network." This encouragement now needs to find its response at grass roots level in imaginative and practical proposals supported by these colleagues.

I have argued elsewhere that more work is to be done to evaluate how smaller local emergency units can work in tandem with more major centres of specialist care in a way that exploits the rapidity of access that a local unit brings while gaining the diagnostic leverage of specialist colleagues.[5] If the price of moving the complex emergency to an appropriate centre of expertise is that this patient is accompanied by another nine or 10 patients who are not complex acute cases then another set of problems is launched.

This call by the senate for reconfiguration gives some valuable pointers as to where further policy work might be fruitful—the development of non-medical cadres, greater integration of the ambulance service, the development of information technology, and the involvement of the public. To these could be added the exploration of virtual diagnosis, the amalgamation of primary and secondary care in smaller communities, and the rotation of staff within clinical networks and between smaller and larger units.

Of one thing we may be certain. Any proposals to reconfigure acute emergency hospital services in the United Kingdom are going to be politically controversial and hotly contested.

Andy Black *health services consultant*

Durrow, PO Box 22, Machynlleth SY20 8WQ (abinwales@aol.com)

Competing interests: AB, as a management consultant, may in future receive fees for work involving concepts and ideas mentioned in this editorial.

1 Senate of Surgery of Great Britain and Ireland. *Reconfiguration of surgical, accident and emergency and trauma services in the UK*. Glasgow, 2004. www.rcpsg.ac.uk/recreport.htm (available from 24 January 2003).
2 Senate of Surgery of Great Britain and Ireland. *The provision of emergency surgical services: an organisational framework*. Glasgow, 1997.
3 Royal College of Physicians. *Isolated acute medical services*. London: RCP, 2002.
4 Scottish Office. *Acute services review report*. Stationery Office, 1998.
5 Nuffield Trust. *Local medical emergency units*. London: Nuffield Trust, 2000.

Treatment of acute pyelonephritis in children

Evidence favours the oral route and a short course of appropriate antibiotics

A 9 month old girl presents with high fever, vomiting, lethargy, and bacteriologically confirmed urinary tract infection. The diagnosis is clear—acute pyelonephritis. This is a common problem and the cause of about 5% of febrile episodes in children.[1] But how should she be treated? Which antibiotics should be given and by which route? For how long should antibiotics be given? This article summarises what we know about treatment of acute pyelonephritis from randomised trials and what we think we know about treatment, based on clinical experience.

Acute pyelonephritis comprises urinary tract infection with systemic features including fever, vomiting, abdominal or loin pain, and lethargy. Fever is the most useful symptom clinically. Compared with the reference standard for pyelonephritis—technetium-99m dimercaptosuccinic acid scanning—fever is very sensitive but has only moderate specificity. In few afebrile children—except very young infants—the renal parenchyma is affected. Conversely in about 50% of children with clinical pyelonephritis the renal parenchymal is affected.

The major decisions about treatment that are to be made concern the use of antibiotics. Infants aged 1 month or less with urinary tract infection require intravenous antibiotics because of the high prevalence of concomitant bacteraemia (about 10%) and of uropathology, including posterior urethral valves, obstructed duplex systems and high grade vesicoureteric reflux with serious metabolic disturbance such as hyperkalaemia and hyponatraemia. Also young infants have been systematically excluded from randomised controlled trials, which makes the evidence for treatment very weak. Since *Escherichia coli* and *Enterococcus faecalis* are the most common pathogens in this age group, empiric treatment with a β lactam antibiotic and an aminoglycoside is indicated. The choice of specific antibiotics should be based on data about local uropathogens. Clinical experience indicates that intravenous treatment should be continued until systemic signs resolve and then oral antibiotics, chosen to match the in vitro sensitivities of the isolated uropathogen, should be given for seven to 10 days.

What about children aged over 1 month with acute pyelonephritis? Here the evidence available to guide decision making is based on 18 randomised controlled trials, of which 16 are summarised in a recent Cochrane review.[2]

Should antibiotics be given intravenously or orally? Two trials including 306 and 387 children compared oral (cefixime,[3] amoxicillin-clavulinic acid[4]) with intravenous (ceftriaxone) treatment for three days or defervescence followed by cefixime or amoxicillin-clavulinic acid. Total duration was 10 or 14 days. No differences in the time to defervescence, recurrence of urinary tract infection, or frequency of renal parenchymal abnormality at 6-12 months were evident between the two groups. Failure of treatment was very low in the orally treated group, and treatment costs were about

BMJ 2004;328:179–80

one half of those in the intravenous group.[3] Four trials have compared different intravenous antibiotics given for 7-14 days, with 3-4 days of intravenous and 4-14 days of oral therapy.[2] No differences in recurrence of urinary tract infection and renal parenchymal abnormality were found. So what do we conclude? Oral antibiotics, carefully chosen to cover local uropathogens, are as safe and effective as intravenous antibiotics in children with a clinical diagnosis of acute pyelonephritis. This is not surprising given the combination of high bioavailability and renal excretion of orally administered antibiotics. Intravenous treatment should be preserved for children who are seriously ill, or who fail oral treatment because of persistent vomiting. There is no evidence to support the practice of giving a single dose of parenteral antibiotics in addition to a standard course of orally administered antibiotics.[5]

Which antibiotic should be given? The five trials comparing different antibiotics are largely uninformative for routine clinical care because the antibiotics evaluated have limited availability and are not routinely used.[2] Choice of first line oral antibiotics will vary with local antibiotic resistance patterns, but trimethoprim alone or in combination with sulphamethoxazole, cephalexin or amoxicillin-clavulanic acid are standard first line agents. Given that *E coli* is the causative organism in 90% of cases and that β-lactamase production is present in at least 50%, amoxicillin alone should not be used.

If intravenous antibiotics are required, aminoglycosides or third generation cephalosporins are often given. Aminoglycosides are favoured because of their pharmacokinetic properties, efficacy, widespread availability, and low cost. Three trials, which compared a single daily dose with three times daily doses of aminoglycosides, have shown no differences in persisting bacteriuria, time to resolution of fever, recurrence of urinary tract infections, hearing impairment, or renal dysfunction.[6–8] These results are similar to data from studies in adults, where toxicity tends to favour single dose treatment.[9] Given the equivalence of the dosing regimens, the ease of administration, and reduced nursing time, once daily dosing seems preferable in general.

How long should antibiotics be given for? In children with urinary tract infection other than pyelonephritis, there is evidence that short course treatment (3-4 days) is as effective as standard course (7-10 days) treatment.[10] However, none of the three trials examining duration of treatment in children with pyelonephritis have compared these clinically relevant alternatives.[2] Since children with acute pyelonephritis typically take 3-4 days to recover clinically, it seems prudent to continue antibiotic treatment for 7-10 days until further trials examining treatment duration are performed.

Jonathan C Craig *consultant paediatric nephrologist*
(jonc@health.usyd.edu.au)

Elisabeth M Hodson *head, department of nephrology*

Centre for Kidney Research, Children's Hospital at Westmead, Sydney, NSW 2145 Australia

Competing interests: None declared

1 Hoberman A, Chao HP, Keller DM, Hickey R, Davis HW, Ellis D. Prevalence of urinary tract infection in febrile infants. *J Pediatr* 1993;123:17-23.
2 Bloomfield P, Hodson EM, Craig JC. Antibiotics for acute pyelonephritis in children. *Cochrane Database Syst Rev* 2003;(3):CD003772.
3 Hoberman A. Wald ER. Hickey R, Baskin M, Charron M, Majd M, et al. Oral versus initial intravenous therapy for urinary tract infections in young febrile children. *Pediatrics* 1999;104:79-86.
4 Montini G, Murer L, Gobber D, Comacchio S, Toffolo A, Dall'Amico R, et al, on behalf of the IRIS Study Group. Oral vs initial intravenous antibiotic treatment of urinary tract infections in children: a multicentre trial. *Nephrol Dial Transpl* 2003;18(suppl 4):816a.
5 Baker PC, Nelson DS, Schunk JE. The addition of ceftriaxone to oral therapy does not improve outcome in febrile children with urinary tract infections. *Arch Pediatr Adolesc Med* 2001;155:135-9.
6 Carapetis J, Jaquiery A, Buttery J, Starr M, Cranswick N, Kohn S, et al. Randomized, controlled trial comparing once daily and three times daily gentamicin in children with urinary tract infections. *Pediatr Infect Dis J* 2001;20:240-6.
7 Vigano A, Principi N, Brivio L, Tommasi P, Stasi P, Dalla Villa A. Comparison of 5 milligrams of netilmicin per kilogram of body weight once daily versus 2 milligrams per kilogram thrice daily for treatment of Gram-negative pyelonephritis in children. *Antimicrob Agents Chemother* 1992;36:1499-503.
8 Cong CY, Tan AS, Ng W, Tan-Kendrick A, Balakrishnan A, Chao SM. Treatment of urinary tract infection with gentamicin once or three times daily. *Acta Paediatr* 2003;92:291-6.
9 Hatala R, Dinh T, Cook DJ. Once-daily aminoglycoside dosing in immunocompetent adults: a meta-analysis. *Ann Intern Med* 1996;124:717-25.
10 Michael M, Hodson EM, Craig JC, Martin S, Moyer VA. Short compared with standard duration of antibiotic treatment for urinary tract infection: a systematic review of randomised controlled trials. *Arch Dis Child* 2002;87:118-23.

Health claims for functional foods

Regulations vary between countries and often permit vague claims

Functional foods are foods that claim to improve wellbeing or health.[1] The health claim may be implicit ("rich in vitamin C"), or vague ("strengthens the body's defence system"), but invariably the product is presented with the suggestion of a benefit. Sales of such products are huge and growing. What ingredients do such foods contain—and who safeguards the truth of claims?

Many functional foods contain added vitamins, minerals, and other essential nutrients. Some of these added nutrients indeed promote health: folic acid reduces the risk of neural tube defects, table salt with potassium reduces blood pressure, and polyunsaturated fatty acids reduce the risk of heart disease. But other claims are more dubious—for example, that zinc lozenges protect against colds or that drinks rich in vitamin C protect against cardiovascular disease.

Functional foods may also contain non-nutritive ingredients. Examples of effective non-nutritive ingredients are sugar alcohols in chewing gum, which reduce risk of dental caries; plant stanols and sterols, which lower low density lipoprotein cholesterol (although effects on heart disease remain to be shown); and probiotic bacteria, which may diminish rotavirus diarrhoea in infants. But other effects of probiotics are insufficiently substantiated, as are effects of phytoestrogens against breast cancer,[2] of oligosaccharides for "gut health," of flavonoids against heart disease, and of conjugated linoleic acid for weight loss. Herbs such as Kava, St John's wort, and echinacea can also be considered

BMJ 2004;328:180–1