How has research changed my practice in the last 5 years?

Duncan Cameron

Arch Dis Child 2007;92:1020–1023. doi: 10.1136/adc.2006.094961

You can't teach old dogs new tricks. Teaching middle-aged dogs new tricks is hard enough. They tend to stick to particular styles of attacking the postman that over the years have proved pretty reliable, often choosing to ignore new findings, or simply failing to keep up with progress in current discussions on, say, the old trouser versus postbag debate. Some unsettling papers are even asking whether dogs really need to attack postmen at all.

So how do middle-aged paediatricians in district general hospitals learn new tricks? What changes our practice? For me, in recent years, some of the key influences have been:

- the immediate availability of internet access in most hospital settings,
- special interest groups generated by managed clinical networks, and
- the *Education and Practice* edition of the *Archives*.

Keeping involved in educational activities is also crucial for me. Beyond that, it must be an amalgam of influence from colleagues, guidelines from official bodies, registrars alerting me tactfully to some new development of which I am unaccountably ignorant, a ragbag of difficult cases encountered in day-to-day practice, and here and there solid, practical research that I have read.

To capture my changes in practice in the last 5 years I sat down in the hospital library with a weighty volume or two and browsed through the years. Familiar stories surfaced again – subjects of a gripping journal club, or fodder for education meetings, or half-remembered articles looked up urgently in the middle of the night. Famous articles come to light again, with sometimes slightly different results (worrying, this) than those I have been regularly and knowledgeably quoting on ward rounds. And I have an overwhelming sense of respect for those who toil to produce articles.

So here are a few examples of changed practice, in no particular order of importance, and gathered not just from browsing but also from reflection and coffee-time discussion, but most relating to common and useful pieces of knowledge.

COSTIVENESS

A cheerful florid faced man from the pharmaceutical company hands me a glass of water into which he has just tipped the contents of a sachet. It tastes bland and just slightly salty. But hidden within is medication which has had a huge impact on a heartsink paediatric problem. Polyethylene

glycol (is it a miracle laxative?¹) has been used for radiological procedures for years, but now the indications for its use have widened. It's not often been my experience that parents sing the praises of any medication, but polyethylene glycol has proved an exception. There is a steadily increasing research base for its use in constipation; for example, in a well-designed double-blind randomised controlled trial an increased stool frequency and a decreased encopresis rate were noted when compared with lactulose.² It has also become the method of first choice in our department when faced with a child with faecal impaction.³ Enemas may be effective in clearing impacted stool, but they are also quite often effective in making a child even more spooked about their nether regions. Oral polyethylene glycol in increasing doses has been much better tolerated than enemas. I found it almost tasteless, but some children dislike it – fruit squash seems to get round this.

THE FLUX

One of my favourite recent papers was the evidence- and consensus-based guidelines for acute diarrhoea management.⁴ I quote this often – for individual case management, for eager juniors planning an audit, and as an example of a useful, clear and (mostly) evidence-based review article to inspire would-be authors. It reminds me that it is possible to teach about even the most mundane cases on the ward round, as follows:

- one should check for features that might suggest an alternative diagnoses to gastroenteritis, such as intussusception, haemolytic uraemic syndrome or an acute surgical abdomen,
- weighing at admission and then at discharge helps correlate the degree of dehydration suggested by the admitting doctor and thereby refines assessment skills,
- children with mild to moderate dehydration should have their deficit estimated and replaced with oral rehydration solution (ORS) over 3–4 h in a little and often pattern,
- ORS is quicker and safer than intravenous fluids in the correction of dehydration and acidosis in such children, and
- nasogastric tubes may be a useful option if a child is reluctant or unable to drink.

So has our practice changed? The key elements of this paper have found their way into our ward guidelines, and yes, we reach for the iv cannula less often in our wards now, although we have not always been particularly good about using nasogastric tubes which are often a little uncomfortable. We check unnecessary blood tests less often,

Correspondence to:
Dr Duncan Cameron,
Department of Paediatrics,
Glan Clwyd Hospital, Rhyl,
Denbighshire LL17 0DF,
UK; DrDuncan.Cameron@
cd-tr.wales.nhs.uk

Accepted
15 December 2006

and I do not recall that we have had any nasty surprises through easing back on such investigations.

Sometimes a case report can be a powerful weapon. The report of fatal iatrogenic hyponatraemia in an infant proved sobering reading.⁵ She was 13 months old and presented with gastroenteritis, lethargy and moderate dehydration, and was given iv fluids in the form of 4% dextrose/0.18% saline. Within 12 h she had a seizure and her serum sodium had dropped from 137 to 120 mmol/l. She went on to develop cerebral oedema and died. I recall this case being discussed in our department with an uncomfortable feeling that such an event could readily have occurred in most paediatric wards in the country. A single case does not mandate change, but the report was one in a lengthy chain that has gradually led to recommendations from the National Patient Safety Agency.⁶ Pronouncements from NPSA carry power, and action follows. We have removed all 0.18% saline and 4% dextrose bags from our ward.

WHEEZERS

And hot on the heels of the acute diarrhoea management paper, indeed the very next one, I find a paper that I must have read and digested, as this now is my practice: persistent wheezing in infants with an atopic tendency responds to inhaled fluticasone.⁷ This is a perennial problem – you have discussed recurrent viral infection, advised about smoking, worried about cystic fibrosis (though in Wales we have some reassurance through the screening programme) and set your mind at rest about the child's growth, but he continues to wheeze. So inhaled steroids are worth using, and this seems borne out at the coalface by parental feedback.

THE URINE

Those of us of a certain age have grown up with the Royal College of Physicians guidelines for the management of urinary tract infections, which advocated a clear and fairly invasive management of infections, especially for younger children.⁸ The research base seemed clear and unequivocal, and was a trusty rock to cling to when new findings were undermining many of our most fondly held practices. If nothing else, we knew our RCP guidelines. But even they are gradually being eroded, and the reasons are neatly dissected in a review of the value of imaging following urinary infection,⁹ prompted by an analysis of the rate of pick-up of significant abnormalities. "In the presence of a normal ultrasound, cystography contributes little to the management of children under the age of 1 with a urinary tract infection."¹⁰ So we have amended our departmental guidelines. Shades of grey are in – black and white is out. DMSA scans are there, but discretion now applies for the micturating cystourethrogram. This has always been one of those tests that are requested quite readily in clinic until one is asked to catheterise a shrieking purple-faced child clinging to a sobbing mother because of some difficulty encountered by the clinical investigations nurse. Such an experience tends to be quite influential – perhaps just as much as the research papers.

EDUCATION

Telling a story has gained a new respect in educational theory and in paediatric literature.^{11 12} It has had influential proponents (Calman¹³) and aptly named authors (Storr¹²). The new *Education and Practice* section of the *Archives* enthusiastically embraces this trend – so, for example, it is easier to learn by reading the story of a child's journey to a diagnosis of chronic fatigue syndrome¹⁴ than it is to fight through the (admirable) college guidelines. I have had the good fortune to work with some great story-tellers, who would often use a story to impart research-based knowledge; and so I try to emulate them. The skills that our ancestors developed, sitting at the fireside,

handing down the accumulated wisdom of those who had gone before, are worth acquiring.

OXYGEN

In the neonatal setting, one of my favourite stories has been the tale of the Five Neonatal Units.¹⁵ In some units far away in the North of England, the consultants liked to run the oxygen saturations reasonably high, with arterial lines, and frequent samples, and consequently quite a few transfusions. In one unit however, the head of department was not keen on arterial lines, either peripheral or umbilical, and was happy for the oxygen saturations to grumble along at lower levels. And one day, they bravely agreed to review all the cases that had come through their units and compare outcomes. This caused a certain degree of unease in each of the units, in case they had messed up. And even though it was a retrospective study, potentially prone to a huge kitbag full of bias, it suggested that babies nursed within the oxygen saturation range 70–90% had a lower (6.2%) chance of threshold retinopathy, while those cared for in the oxygen saturation range 88–98% had a higher (27.7%) chance. It was a good read. Despite the acknowledged limitations of this paper, I am sure that it has been very influential, encouraging us to tolerate lower oxygen saturations in our preterm infants than we would previously have accepted. Looking this up in Cochrane,¹⁶ I learn that there is further supporting evidence to suggest that lower oxygen levels are associated with less retinopathy, but that there is insufficient evidence when considering other outcome measures.

And whilst in the land of the soft blue lights and the chirruping alarms, the use of sucrose for analgesia in neonates has impressed me. Used to just plunging the cannulas in, I was at first sceptical when the nurses, advocates as ever for their tiny charges, stayed my hand until the sucrose was given. But it clearly works. Patient and well-planned trials¹⁷ have wrought this change in practice.

THE FALLING SICKNESS

Within our department, I have an interest in epilepsy. There has always been discussion about whether one should discuss risk of death in children with epilepsy, and this was fuelled by the National Clinical Audit of Epilepsy Related Death.¹⁸ Careful and useful responses to the audit have rejected the sensationalist interpretations of the audit in the press, and pointed out that those children who suffer epilepsy-related death are most often those with severe underlying neurological problems.^{19 20} It has gradually become my practice to discuss this possibility with the parents of such children, as an honest approach is clearly appreciated. At the same time, it is now my habit to reassure parents and children where there is no major underlying neurological abnormality that the risk is very low for them, indeed somewhat less than the risk of being killed in a road traffic accident.

The use of buccal midazolam has blossomed in recent years. For a teenager with epilepsy, it is bad enough having a fit in the first place, without the threat of someone having to insert a tube of medicine up your rectum in the midst of it; so buccal midazolam has proved popular. In addition, it is clearly far more acceptable for a carer at school or in a hospice to use the buccal route. In a study comparing the use of rectal diazepam and buccal midazolam in accident and emergency units,²¹ time to seizure cessation was 8 min (midazolam) and 13 min (diazepam); treatment success (seizures stopping within 10 min) was 56% (midazolam) and 27% (diazepam). A slight note of caution came with the observation that respiratory depression occurred in 5/109 (midazolam) and 7/110 (diazepam) patients. So do we need to give a test dose in hospital? This would probably not be informative, as it is likely that it is

the combination of the seizure and the medication that leads to respiratory depression. A good compromise is to recommend calling an ambulance on the first occasion that the medication is given, unless it has been used without problems in a hospital setting.

I have often had trouble clarifying whether or not an event is a seizure, or whether, if a seizure, it is epilepsy. I am happier in my occasional uncertainty following a paper from Norfolk,²² where the author assiduously collected details of children presenting with paroxysmal events and analysed them, using the term (which is perhaps a little cumbersome in daily practice) unclassified paroxysmal event. Expressing uncertainty before concerned parents is hard, but generally accepted by them when explained carefully, particularly with the implications of an incorrect diagnosis of epilepsy. And this diagnostic challenge is partly why I find epilepsy to be such a stimulating area of practice.

CHILD PROTECTION

The bleeding child – is it NAI?²³ For me, this is an area where a research paper followed a personal change in practice. The paper gives a crucially important breakdown of the reasons why one must be circumspect in attributing bruising to non-accidental injury (NAI), and reminds us that bleeding disorders may co-exist with NAI. It asks us to take a proper history for bleeding problems within a family (post-op bleeds, bleeding after dental procedures, particularly heavy periods, the works) and to record it carefully in our notes. It points out that whilst individual clotting disorders may in themselves be rare (except for von Willebrands), as a group they are not uncommon. Beware the “normal clotting screen” which in most units comprises prothrombin time, activated partial thromboplastin time (APTT) and fibrinogen levels. Lurking behind a normal screen, or one with marginal APTT, may be a von Willebrand disease, ready to complicate assessment of possible child protection cases.

BILE AND BUTTERFLIES

Two final small pieces of information are filed away securely for future use. A cunning and clinically important paper revealed our uncertainties about the colour of bile.²⁴ A paediatric surgical

team was concerned that not all their colleagues were very clear about this point. So they offered various practitioners a colour strip ranging from palest yellow, through Dijon mustard to a dark jungle green, and asked them to locate bile on the spectrum. In the paper (and in our journal club when the paper was presented), there was a startlingly wide range of answers. In a nutshell, we should ask the parents “was the vomit green?”.

And a short report on the use of an intraosseous butterfly needle as a means of maintaining access to the circulation in an oedematous extremely preterm infant.²⁵ Just a photo and a few words, but useful, and I’m sure I’ll remember this for the next time a baby’s survival appears to hang upon getting access to the circulation, and the veins are brown and shattered.

FOR THE FUTURE

I would find it difficult to predict which practices we employ today will be debunked by research or superseded by new techniques in years to come. No doubt an RSV (respiratory syncytial virus) vaccine would alter our working patterns considerably, and a means of stalling preterm labour for mothers would also have a major impact, but so far these seem elusive. A reliable and cost-effective imaging modality for diagnosing acute appendicitis would certainly sell well. The best way to investigate urine infections will, I suspect, continue to evolve.

SUMMARY

I am sure that most of these changes in practice (box 1), and many more besides, have also taken place within paediatric departments up and down the land. Sometimes we think that little changes, but in retrospect, the dogged determination of all those researchers has its due effect. I salute them, their perseverance, their endless redrafts and their quiet successes.

ACKNOWLEDGEMENTS

I acknowledge the contribution that the pithy and illuminating comments of my excellent departmental colleagues made to the preparation of this manuscript.

Competing interests: None declared.

Box 1: Some changes in my practice

- I prescribe more polyethylene glycol and shun the enemas.
- I try to encourage oral rehydration more on the wards.
- We have removed 4% dextrose/ 0.18% saline from the wards.
- I give inhaled steroids to recurrently wheezy infants.
- Micturating cystourethrogramms are less common.
- We run babies at slightly lower saturations than previously.
- We use oral sucrose analgesia.
- I talk about the risks of death with families of children with epilepsy, use more buccal midazolam and am happier in my occasional diagnostic uncertainty within epilepsy.
- I check the family history very carefully in bruised children and always ask for a von Willebrand screen.
- I ask about the colour of bile.
- I encourage the telling of clinical stories to relay knowledge.

REFERENCES

- 1 Bishop WP. Miracle laxative? *J Pediatr Gastroenterol Nutr* 2001;**32**:514–15.
- 2 Voskuil W, de Looij F, Verwijns W, et al. M. PEG 3350 (Transipeg) versus lactulose in the treatment of childhood functional constipation: a double blind, randomised, controlled, multicentre trial. *Gut* 2004;**53**:1590–4.
- 3 Arora R, Srinivasan R. Is polyethylene glycol safe and effective for chronic constipation in childhood? *Arch Dis Child* 2005;**90**:642–50.
- 4 Armon K, Stephenson T, MacFaul R, et al. An evidence and consensus based guideline for acute diarrhoea management. *Arch Dis Child* 2001;**85**:132–42.
- 5 Playfor S. Fatal iatrogenic hyponatraemia. *Arch Dis Child* 2003;**88**:646–7.
- 6 National Patient Safety Agency. Reducing the risk of hyponatraemia when administering intravenous infusions to children. Patient safety alert 22. www.npsa.nhs.uk (accessed 16 August 2007).
- 7 Chavasse RJ, Bastian-Lee Y, Richter H, et al. Persistent wheezing in infants with an atopic tendency responds to inhaled fluticasone. *Arch Dis Child* 2001;**85**:143–8.
- 8 Royal College of Physicians. Guidelines for the management of acute urinary tract infection in childhood. Report of a working group of the Research Unit. *J R Coll Physicians Lond* 1991;**25**:36–42.
- 9 Verrier Jones K. Time to review the value of imaging after urinary tract infections in infants. *Arch Dis Child* 2005;**90**:663–4.
- 10 Moorthy I, Easty M, McHugh K, et al. The presence of vesicoureteric reflux does not identify a population at risk for renal scarring following a first urinary tract infection. *Arch Dis Child* 2005;**90**:733–6.
- 11 Rudolf MCJ, Storr E. Tell me a story... what can paediatricians gain from reading stories. *Arch Dis Child* 2003;**88**:635–7.
- 12 Storr E. Once upon a time... *Arch Dis Child* 2003;**88**:545–8.
- 13 Calman K. A study of storytelling, humour and learning in medicine. *Clin Med* 2001;**1**:227–9.
- 14 Crawley E, Chambers T. It’s not all in ME mind, doc. *Arch Dis Child Educ Pract Ed* 2005;**90**:ep92–7.

- 15 **Tin W**, Milligan DW, Pennefather P, *et al*. Pulse oximetry, severe retinopathy, and outcome at one year in babies of less than 28 weeks gestation. *Arch Dis Child Fetal Neonatal Ed* 2001;**84**:F106–10.
- 16 **Askie LM**, Henderson-Smart DJ. Restricted versus liberal oxygen exposure for preventing morbidity and mortality in preterm or low birth weight infants. *Cochrane Database Syst Rev* 2001;(4):CD001077.
- 17 **Acharya A**, Annamali A, Taub NA, *et al*. Oral sucrose analgesia for preterm infant venepuncture. *Arch Dis Child Fetal Neonatal Ed* 2004;**89**:F17–18.
- 18 **Hanna NJ**, Black M, Sander JWS, *et al*. *The National Sentinel Clinical Audit of Epilepsy-Related Death: epilepsy-death in the shadows*. London: Stationery Office, 2002.
- 19 **Appleton RE**. Mortality in paediatric epilepsy. *Arch Dis Child* 2003;**88**:1091–4.
- 20 **O'Callaghan FJK**, Osborne JP, Martyn CN. Epilepsy related mortality. *Arch Dis Child* 2004;**89**:705–7.
- 21 **McIntyre J**, Robertson S, Norris E, *et al*. Safety and efficacy of buccal midazolam versus rectal diazepam for emergency treatment of seizures in children: a randomised controlled trial. *Lancet* 2005;**366**:205–10.
- 22 **Beach R**, Reading R. The importance of acknowledging clinical uncertainty in the diagnosis of epilepsy and non-epileptic events. *Arch Dis Child* 2005;**90**:1219–22.
- 23 **Thomas AE**. The bleeding child; is it NAI? *Arch Dis Child* 2004;**89**:1163–7.
- 24 **Walker GM**, Neilson A, Young D, *et al*. Colour of bile vomiting in intestinal obstruction in the newborn: questionnaire study. *BMJ* 2006;**332**:1363.
- 25 **Lake W**, Emmerson AJB. Images in neonatal medicine. *Arch Dis Child Fetal Neonatal Ed* 2003;**88**:F409.

ARCHIVIST.....

Prophylactic fluconazole for very low birthweight infants

Colonisation rates of up to 60% for candida species have been reported among very low birthweight (VLBW, <1500 g) infants in neonatal intensive care units (NICUs). Invasive fungal infection may develop in up to 20% of these children. The report of a single-centre trial published in 2001 showed that prophylactic fluconazole reduced candida colonisation and invasive infections among extremely low birthweight (<1000 g) neonates. Now a trial in three NICUs in Italy (Paolo Manzoni and colleagues. *New England Journal of Medicine* 2007;**356**:2483–95) has provided similar results for VLBW neonates.

A total of 322 VLBW infants were randomised, after surviving at least 3 days, to fluconazole 6 mg/kg, fluconazole 3 mg/kg or placebo. Each dose was to be given every third day for 2 weeks and then on alternate days for another 2 weeks (or 4 weeks in the case of infants <1000 g at birth). Fungal colonisation occurred in 9.8% (fluconazole 6 mg), 7.7% (3 mg) and 29.2% (placebo) of the infants. The rates of invasive fungal disease were 2.7%, 3.8% and 13.2%, respectively. There were 21 episodes of invasive fungal infection caused by *Candida albicans* (16), *C parapsilosis* (2), *C glabrata* (2), *C tropicalis* (1) and *C guilliermondii* (1) (one infant was infected with both *C parapsilosis* and *C glabrata*). Prophylaxis had no significant effect on rates of progression from colonisation to invasive infection.

Overall mortality was similar in the three groups (8.0% vs 8.7% vs 9.4%). Two infants died from candida infection, both in the placebo group. All isolates remained sensitive to fluconazole throughout the study. There were no serious fluconazole-related adverse events, but there were mild and transient increases in concentrations of aspartate aminotransferase and alanine aminotransferase in the fluconazole groups. The incidence of cholestasis was not increased with fluconazole.

Prophylaxis with fluconazole reduced candida colonisation and invasive disease. More data are needed concerning possible toxicity and development of drug resistance and to define the infants at highest risk.