REVIEW

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

Mitch Blair

The outcome of any serious research can only be to make two questions grow where only one grew before Thorsten Veblen, US sociologist (1857–1929).

My starting point for this article is defining my "practice". Over the past 5 years, I would describe myself as an academic general paediatrician with specialist expertise in child public health. My job divides up roughly into one third each of clinical practice (outpatient work, child public health practice and acute on call), teaching and research. I started off as a senior lecturer in community paediatrics in Nottingham and changed direction but not philosophy in 1998, when I moved back to London to take up a senior lecturer's post at Imperial College with my clinical base at the Northwick Park Hospital campus in North London—a large teaching district general hospital with integrated acute and community services.

What is my philosophy? To use my skills to manage and prevent ill health, and to promote positive health in the child and family in whichever setting I see them. I wish to highlight the influence of research on specific aspects of both the clinical and teaching aspects of my post as I see it over the past 5 years. I will use three specific examples; the under fives clinic, my teaching clinic and my current child public health practice.

"UNDER FIVES" CLINIC

In response to the increasing demands from primary-care staff to see children with behavioural and emotional difficulties, I decided to focus my attention on supporting children and their parents in the early years, and set up my under fives clinic in London. This clinic was set up as a training clinic for undergraduates and postgraduates, with a particular remit for managing emotional and behavioural problems referred from primary care. My interest in this area started in Nottingham, where I had worked for several years in a special school for children with severe emotional and behavioural disorders, providing both paediatric care and support to members of the local Child and Adolescent Mental Health Service team. The local child and adolescent psychiatrist and I began to recognise undiagnosed conditions including severe conduct disorder, attention deficit hyperactivity disorder, anxiety disorder, depression and sex dysphoria. I soon realised that I was dealing with the tip of the pyramid of social and psychological disorder. The conditions were very much of chronic disability, and I saw my role as one of providing tertiary preventive/rehabilitative care. A local survey of clinical records in that school confirmed that many of these children had had many negative experiences in early life (table 1), as

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noted in other studies of seriously disturbed children and young people. It was clear to me that early adverse events had set these children on a particular trajectory in their lives.

At about this time, Kuh and Ben Shlomo¹ produced their ground-breaking work on life-course epidemiology, which helped me to better appreciate the importance of early life experiences on later outcomes in adult life. Prenatal nutritional deprivation, thyroid dysfunction and environmental lead exposure are known examples of biological factors that have an adverse outcome on normal growth and neurological development. I have been particularly influenced by research into the role of smoking and drug taking in pregnancy on later behavioural problems, which has shown a clear dose–response relationship between cigarette use and risk of hyperactivity.^{2–3} As a result, I am much more aware of taking a full antenatal environmental exposure history.

New research into the biological mechanisms of attachment have led me to reread Bowlby's⁴ and Winnicott's⁵ older research on attachment and the infant–mother interaction. There is clear evidence of the powerful influences of early parent–infant interactions on later child and adult mental health. Interesting biological correlation are being discovered, which are helping to integrate the biological and psychological literature bases. Megan Gunnar's research on stress hormones in mothers and infants and later dysregulation impairments have given us great insight into the sensitivity of the neuroendocrine environment for later emotional health.^{6–7} The dampening down of the normal circadian rhythm of the hypothalamo–pituitary–adrenal axis can lead to chronic hypocortisolism, and this in turn may explain cardiovascular impairment in adulthood.⁸

This body of evidence encouraged me to ascertain early factors in a child's development that might be amenable to early intervention. In this I was much influenced by the work of Dilys Daws,⁹ one of the founding members of the Association of Infant Mental Health and an exponent of brief intervention techniques of psychotherapy and behavioural management.¹⁰ These techniques are well suited to sleep and feeding management issues as well as tantrums, toilet training difficulties and peer relationship impairments, all very common referrals. However, although an independent audit showed a successful outcome of this approach in most patients for periods of up to 2 years,¹¹ I became increasingly concerned about the over-medicalisation of early childhood behavioural and emotional difficulties, the majority of which are, in my view, due to parenting competencies or the lack of them. More precisely, they arise from a suboptimal psychological and socioeconomic environment for facilitating

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Table 1 From a case note review of children and young people attending school for emotional and behavioural disability (Heussler H and Blair M, unpublished, 1995)

Average number of addresses	5.4
Average number of schools	5.6
Average number of general practitioners	3.8
Hearing concerns	47%
Speech and language concerns	41%
Learning difficulty	29%
Failure to attend health professional appointments >4 times	100%
Maternal depression/mental health	53%
FTT in the first 12 months	65%
Family not intact at 12 months	65%
Domestic violence recorded	47%
Change of carer in the first 2 years	29%
Average number of injuries presenting to A/E <5 years	3.7
Head injuries before 5 years	29%
Sibling with "SIDS"	11%
Nocturnal enuresis current/past 2 years	65%
Known police involvement	53%

A/E, accident and emergency; FTT, failure to thrive; SIDS, sudden infant death syndrome.

positive parenting, for which health professionals are being asked for their "expert" advice. There are clearly a number of behavioural disorders influenced by underlying medical conditions such as iron deficiency, developmental disorders and eczema, and my role is clearly to identify and treat these where possible, but the vast majority are as a direct result of psychosocial factors. This has led to a change in my whole history-taking style. I now use a recording system (the "Bioecogram") based on an ecological and social determinants model based on the work of Bronfenbrenner¹² and further developed by Tamhne.^{13 14} This has been immensely valuable when working with parents and young children in showing the various multilevel links between factors as diverse as interparental relationship and the adequacy of the physical environment in the home or neighbourhood. Figure 1 shows a blank and completed Bioecogram (parent version) for a boy who presented with asthma, poor growth and faddy eating together with aggressive behaviour. The symbol system used shows a socially isolated, depressed mother with a conflictual relationship with the boy's father, and a damp, overcrowded and restrictive housing environment. There are positive relationships with a family social worker, and a number of other professionals are involved in care. Parents and children have reported how much they like this pictorial method of history taking, and it helps the paediatrician to "see" the interactions involved.

Barlow's¹⁵ systematic review of parenting in community settings including primary care has reinforced the importance of referrals being made to evidence-based programmes of support and specific guidance. Health visitors, working in collaboration with other statutory agencies and the voluntary sector, where relationship building and community development is the focus, are more likely to have sustainable benefit in reducing the incidence and prevalence of early behavioural problems.¹⁶ Locally, we have seen the expansion of primary care mental health teams with community psychiatric nursing expertise who can help identify parental mental health difficulties and support the family health visitor in providing relevant early intervention and specific advice.

TEACHING CLINIC

I have been teaching medical students in my clinics for >20 years, and in the past 5 years I have been influenced by the medical education literature, which has changed my practice considerably. I structure my ward-based teaching on

Murdoch Eaton's excellent schema,¹⁷ having adapted this to emphasise the detailed history of the "patient journey". In recent years, this journey has changed considerably and includes a huge variety of service provision in the 21st century, including NHS Direct, internet advice, out-of-hours co-operatives, extended pharmacies, walk-in centres, minor injuries units, emergency nurse practitioners, ambulatory care units and "hospital at home" nursing teams. As always, the challenge is to clearly define the learning objectives for the students and to use the clinical environment to illustrate these. I finish each teaching session now with a question to the students, asking them to reflect on what they have learnt to ensure that these objectives have been met or how they might be met through self-directed learning.

Outpatient teaching has been transformed by reading Heidenreich,¹⁸ describing an 11-step approach, which is summarised in box 1. Assessment of medical students, especially with increasing numbers, has become more challenging, and I have been using latest research evidence to support in-course formative assessments.^{19 20} We are now shifting from testing the student's skills in examining relatively well children with chronic disease—those typically brought for examinations—assessing the student in a real life in situ environment in the emergency areas, wards or outpatients departments, which is a better reflection of the competencies they need immediately after qualification.

Another way in which research has influenced my teaching practice has been the use of evidence to teach and influence clinical management. After an on-call session, I have nearly always had a question to answer about a case I or one of the team has seen. I feel that these questions should be harnessed, shaped and answered for the education of junior and senior staff alike, and I produce a regular post-on-call letter "Questions from the ward round", which reviews the literature on a particular topic for junior staff to reflect on. I very much enjoy searching the literature to find the answers where they exist and indeed where they do not (an example of this is shown on the web version).

CHILD PUBLIC HEALTH

Child public health is the art and science of preventing disease, and promoting and protecting the health of children through the organised efforts of society.²¹ I spend about a day a week on various child public health activities including injury prevention, promoting health and nutrition in preschoolers, and co-ordinating the child health screening and promotion programmes in Harrow. I have been very much influenced by Canadian Research, which has pulled together biophysical, psychological and epidemiological data to support investment in early years, especially in community settings. Fraser Mustard, originally a haematology researcher and later Head of the Canadian Institute of Advanced Research, changed career direction and worked with economists to understand and describe the effects of investment in the early childhood years and later outcomes for society.²² This work has been pivotal in influencing state policy and the development of early years programmes such as Sure Start. Recent research²³ on social cohesion and social capital has begun to yield interesting results in relation to upstream determinants of maternal and child health outcomes, and has influenced the way I practise in terms of understanding the importance and effect of the neighbourhood as part of formulating a diagnosis and management plan. Describing these outcomes at a community level is challenging and requires academic rigor. This has led me to research the area of indicator development at a country and regional level. My own interest in child health informatics and the means by which the National Service Framework for

A

Bioecogram v3 (Tamhne and Blair, 2002)

Biology	Name of child: (sticky label)		Parental occupation	
	Completed on date / /			
Professionals	Family genogram	Social network	Typical day

Lifestyle parent/child	Issues/problems	Action agreed	Physical environment	

B

Personal behaviour <i>Richard, 10 years old</i>	<i>Name of child: John Spencer</i> <i>Date: 11/01/01</i>	Psychosocioeconomic environment
Professionogram	Family genogram
Biology <i>John, 10 years old</i> <i>John, 10 years old</i> <i>John, 10 years old</i>		Physical environment

Figure 1 (A) Bioecogram parent version (v3). (B) Example of Bioecogram completed during consultation (v1).

Children can be monitored has been influenced by the work of Mike Rigby and Lennart Kohler²⁴ among others, who have taught me the value and power of indicators as a tool for child and youth advocacy. The measures chosen need to be robust and reliable over time to allow us to monitor the effects of policy on later outcomes. To give an example, in Sweden, a set of six indicators of children's health (including external injury, tobacco exposure during pregnancy, low birth weight, breastfeeding, immunisation uptake and teenage abortions) have been combined to produce a "municipality index". This has been used to show an improvement in child health outcomes from 1990 to 2000 at locality level and have helped inform public health policy development.²⁵ This approach could be promising in the UK.

One of the interesting challenges in child public health is the need to evaluate the effects of government policy on health

service provision. I feel that the Children's Centre agenda is one we should embrace as paediatricians, and I am continuing to develop the work of Spencer and others^{26, 27} in supporting paediatric outreach services to disadvantaged areas. The research on this is mixed and I see a part of my role being to help evaluate these changes locally. At a time when our acute hospital Trust is aiming towards decreasing outpatient activity by 10%, this has become a particularly relevant area to further evaluate.

Another priority area for child public health is injury prevention. I chair our local interagency injury prevention group and have been influenced by the excellent work of Denise Kendrick *et al*,²⁸ who have researched how health visitors can prevent injury in the home. We have spent much time analysing local injury data to help inform our local policies. Injury surveillance is poorly developed in the UK, with some

Box 1 Eleven steps to help teach in an outpatient setting (adapted from Heidenreich C¹⁸)

- **Step 1** Orientating learner. Familiarise the student with the medical records used, the way in which letters and results are filed, and the various growth charts used (it will be assumed that they know the basic structure of a height and weight centile chart). Parent-held records (the red book) are a very useful source of information about previous development and growth, and contain information on immunisation and useful health education topics such as safety and feeding.
- Involve the student in the consultation, encouraging them to contribute to history taking, physical examination, formulation of a diagnosis, decision on further investigations and management of the child and family.
- **Step 2** Prioritising or assessing a learner's needs.. Ask: What are your past experiences of outpatient work? What are your goals and expectations? What are the kinds of educational resources you have found valuable in this setting? What feedback do you desire?
- **Step 3** Problem-oriented learning. Review of referral letters and themes (common problems referred, ethnicity, preventive and other service aspects)
- **Step 4** Priming: orienting the learner. Tell the student what you want from this specific encounter—that is, i.e. 10 min of focused history or respiratory examination. Tell the students when you will reconnect with them. Provide a brief review of the patient if known. What product is required after this time;- note in record, 3-min presentation of problems and so on.
- **Step 5** Pattern recognition. Ask the student to state what the chief complaint is, and the presumptive diagnosis. The teacher then interviews the patient as the student writes down the notes. The object is to emphasise problem solving and recognition of commonly presenting symptoms and signs.
- **Step 6** Teaching in the presence of patients. Ask the student for his or her diagnosis and reasoning, focus on one relevant learning point, go out of the room to discuss good and bad points, and how these can be rectified, then return.
- **Step 7** One to two focal teaching points: "less teaching can lead to more learning". Do not be too eager to share all your pearls of wisdom in one go. The teacher selects one teaching point or general rule, emphasising rational statements or principles that will apply to other clinical cases; partially addressed problems to be dealt with at next session after the student has done some work on it in the meantime.
- **Step 8** Reflective modelling: adult learning approach based on student modelling teacher's behaviour. "Thinking out aloud" rationale for decision making, ascertaining urgency of situation, need for consultation of the literature or colleagues and so on.
- **Step 9** Questioning: wait 3–5 secs after posing the question. Ask one question at a time. Ask higher order questions to stimulate higher order thinking "what do you associate with abdominal pain in an adolescent?"
- Students have to feel "safe" when they answer incorrectly. Do not humiliate them.
- **Step 10** Feedback: direct, timely and clear. Make sure that the student is aware that feedback will be given and a specific action plan is agreed upon for improvement.
- **Step 11** Teacher/learner reflection: student-directed, teacher-stimulated reflection in small groups. Individual patient or groups of patients—for example, refugees, parents of premature infants and so on. "Wrap up" rounds for both SpR and students where interesting cases can be discussed: "What specific questions do you have regarding this patient's care?"

exceptions. Kendrick has shown clearly that while injury surveillance is useful for alerting the local community to take action, hazard surveillance is where the effort should go.²⁹ We are using the results of this research to develop a targeted and universal programme of prevention, especially around falls and scalds. The research of Ian Roberts *et al*³⁰ has influenced our practice in that smoke alarm fitting alone is insufficient in itself—a lesson in the importance of fully engaging the local community to understand their perspectives.

Writing this piece has helped me reflect on the true role of research findings over the years in influencing my thinking and practice and to some degree my own research. I feel that one of the biggest challenges we face is to be able to first find and then translate what has been discovered in a timely fashion so that we can maximise our ability to be effective doctors for children. The speed at which we do this is ultimately a rate-limiting step to better care, and the challenge we must set ourselves is how best to achieve this.

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IMAGES IN PAEDIATRICS.....

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Green teeth

When primary teeth erupted in an 11-month-old male infant with congenital cytomegalovirus infection they were green and had hypoplastic enamel (fig 1). He had been icteric from birth, with a serum bilirubin concentration of 156 $\mu\text{mol/l}$ (72% conjugated) 1 h after delivery. At the age of 9 days, bilirubin concentrations peaked at 497 $\mu\text{mol/l}$ (95% conjugated), remaining >100 $\mu\text{mol/l}$ until he was 6 months old. Serum bilirubin normalised at 13 months of age. When permanent teeth erupted at the age of 6 years, some molars had green pigmentation.

Green teeth are a rare finding in children with neonatal hyperbilirubinaemia due to blood group incompatibility, sepsis-induced cholestasis or biliary atresia.¹ Through direct analysis, the green pigment was shown to be bilirubin,² which seems to be incorporated into enamel and dentin during matrix formation.³ Although it was initially thought that bilirubin levels should exceed 500 $\mu\text{mol/l}$ to induce green staining,⁴ subsequently patients were reported who had had peak bilirubin levels <200 $\mu\text{mol/l}$.¹ As the duration of hyperbilirubinaemia varies widely between patients with green teeth, and many patients with a longer or more intense hyperbilirubinaemia do not have any teeth discolouration, it seems that other factors may determine which patients develop green dental staining

Figure 1 Infant with congenital cytomegalovirus infection showing green teeth and hypoplastic enamel. (A) Primary teeth at 18 months and (B) permanent teeth at 8 years. Informed consent was obtained for publication of this figure.

and which patients do not. This might be related to the density of the matrix, or to individual disturbances in the absorption of calcium, phosphate and fat-soluble vitamins in these patients with cholestasis.⁵

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