EBM notebook

Jottings

What is evidence-based medicine? Trying to define it is like the old story of the blind men feeling the leg, tail, and trunk of the elephant and all describing it differently. In this month's Notebook, the editors therefore have tried to describe the full elephant and relate this to the various evidence-related disciplines such as evidence synthesis and clinical quality improvement. We welcome suggestions about missing bits of the elephant and other creatures in the evidence jungle.

For those wishing a more face to face discussion of these issues, you might like to attend the 3rd International Conference of EBM Teachers in sunny Sicily. Details are available on the web (http://www.ebhc.org). This is just one of many related conferences. A recent visit to China and Hong Kong opened my eyes to the degree of interest and development of EBM around the world. With nearly 300 delegates from 30 countries, the 3rd Asia-Pacific EBM conference was a testament to this worldwide interest and to the efforts of the Chinese Cochrane Centres.

The Cochrane Collaboration has taken up the challenge of doing systematic reviews on diagnostic tests, and a handbook should be available in 2005. Given there are fewer studies in diagnosis than therapy, and the quality is generally lower, it will be interesting to watch how this develops. Its pleasing to see in this issue, though, that there are 4 diagnostic articles: on the clinical diagnosis of dehydration in children, protein dipsticks in pregnancy, the CAGE questions for alcohol abuse, and tests for acromioclavicular joint pain. We hope this is part of a trend to better diagnostic studies.

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The paths from research to improved health outcomes

Evidence-based medicine aims to provide clinicians and patients with choices about the most effective care based on the best available research evidence. To patients this is a natural expectation. To clinicians this is a near impossible dream. The US report *Bridging the quality chasm* has documented and drawn attention to the gap between what we know and what we do.[1] The report identified 3 types of quality problems—overuse, underuse, and misuse. It suggested: "The burden of harm conveyed by the collective impact of all of our health care quality problems is staggering." While attention has focused on misuse (or error), a larger portion of the preventable burden is likely to be the evidence-practice gaps of underuse and overuse.

Research that should change practice is often ignored for years—for example, crystalloid (rather than colloid) for shock,[2] supine position after lumbar puncture,[3] bed rest for any medical condition,[3] and appropriate use of anticoagulants and aspirin among patients with atrial fibrillation.[4] Antman *et al* documented the substantial delays between cardiovascular trial results and textbook recommendations.[5] However, even when best practices are well known they are often poorly implemented: national surveys show that the majority of hypertensive patients are undetected, untreated, or inadequately controlled,[6] which has led to the current interest in knowledge translation.[7]

PRACTICE FAMINE AMIDST THE EVIDENCE GLUT

What role does evidence-based medicine[8] have in bridging the research-practice gap? Surveys of clinicians suggest that a major barrier to using current research evidence is the time, effort, and skills needed to access the right information among the massive volumes of research.[9] Even for a (mythical) up to date clinician, the problem of maintaining currency is immense. Each year Medline indexes over 560 000 new articles, and Cochrane Central adds about 20 000 new randomised trials. This is about 1500 new articles and 55 new trials per day! Clinicians need clear and efficient strategies to sift, digest, and act on new research likely to benefit their patients. Two stages can be considered: getting the evidence straight, and getting the straight evidence used.[10] [11]

Getting the evidence straight

While individual new research articles are peer reviewed and published, there is little effort to set their results systematically in the context of other, similar studies.[12] Ideally, clinicians could access an updated, well conducted systematic review for all questions, or at least for all clinical research. However, only about 10% of randomised trials have currently been incorporated into Cochrane systematic reviews.[13] For non-therapy questions, the situation is worse. Guidelines are not a panacea here, as they usually rely on existing reviews, or, more often, ignore evidence,[14] and are rarely presented in clinician friendly formats. Hence the Institute of Medicine report recommended that we "establish and maintain a comprehensive program aimed at making scientific evidence more useful and accessible to clinicians and patients."[1]

Getting the evidence used

Clinicians frequently have questions about the medical care of their patients, but the majority go unanswered.[15] Even when questions are "answered" it is often by using out of date textbooks within the immediate clinical setting. The
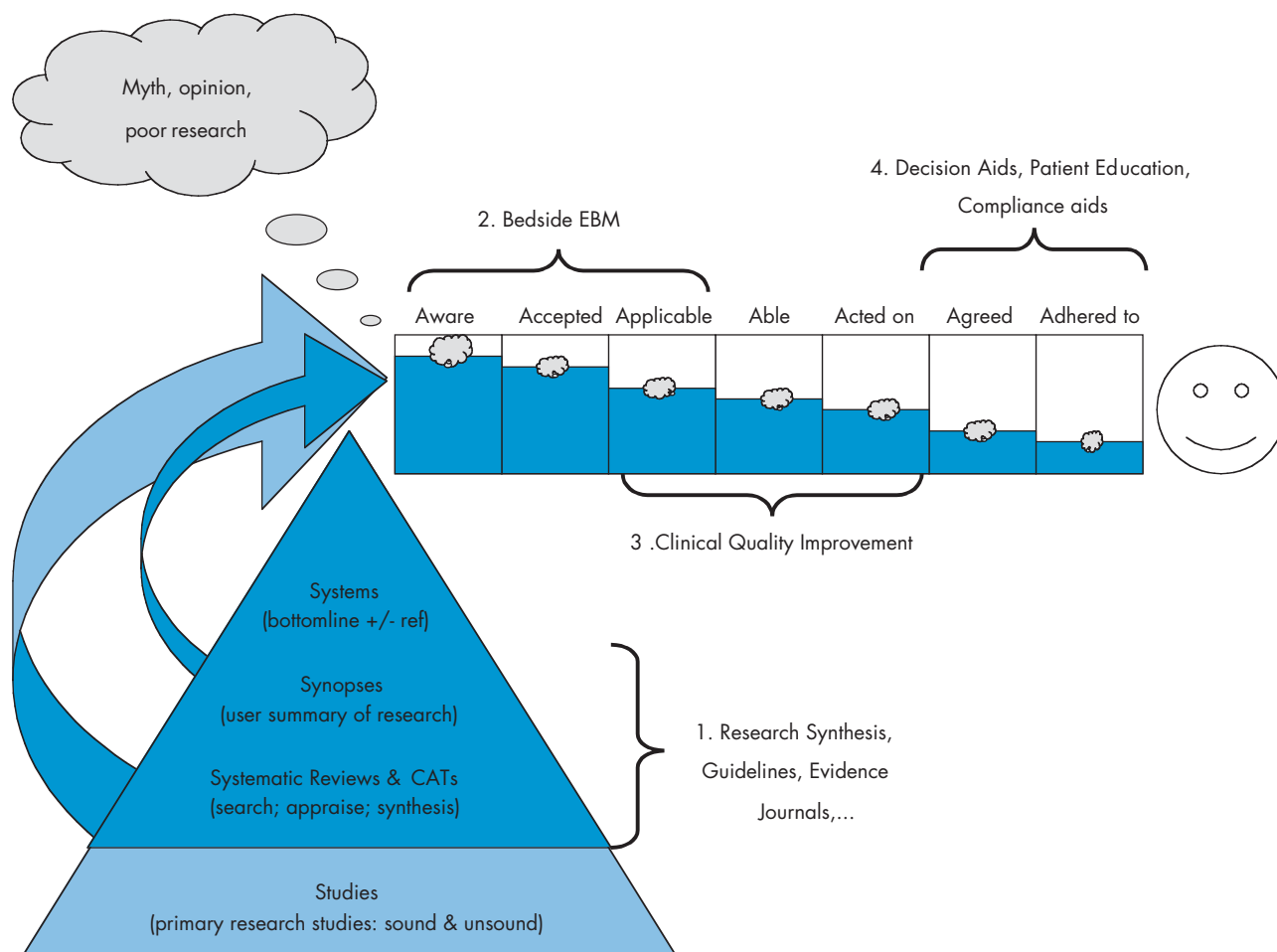
The research-to-practice pipeline. New research, of varying soundness, is added to the expanding pool and enters practice both directly or is reviewed, summarised, and systematised (delay) before entering practice, with leakage occurring at each of several stages between awareness and patient outcome. Different knowledge translation disciplines focus on different parts of the pipeline (1–4).

main predictors of the attempt to answer a question are the belief that an answer exists and the urgency of the patient's problem.[16]

This lack of bedside use of evidence inspired the 4 step model of bedside EBM:[8][17] (i) ask an answerable question; (ii) track down the best evidence; (iii) critically appraise the evidence for validity, impact, and applicability; and (iv) integrate the results with the patient's unique biology, circumstances, and values. In teaching EBM, integration of the steps into the clinical setting and for real patient problems is crucial for changing attitudes and behaviour.[18] Following these steps in clinical practice is challenging, especially given time constraints and the skills needed to complete these steps.

THE EVIDENCE PIPELINE

What underlies substantial gaps between the best evidence and the management patients receive? Pathman *et al*[19] described 4 stages from evidence to action: the clinician needs to be aware, then agree, then adopt, and then adhere. Their survey of physicians' use of vaccine guidelines showed a steady decline at each stage—for example, the rates for acellular pertussis were 90% aware, 67% agree, 46% adopt, and 35% adhere. This is consistent with findings from

research on the diffusion of innovations,[20] which generally suggest a 5 stage model of knowing, accepting, deciding, implementing, and continuing. A subsequent systematic review of barriers to the use of evidence[9] suggested that several further stages might be added. The figure extends the awareness-to-adherence model to include these newer elements—in particular, patient involvement.

The model illustrates that, even with high rates of transfer between stages, there may be little impact on patient outcomes. Thus, even 80% transfer at each of 7 stages would result in only a 21% patient usage ($0.8^7 = 0.21$).

Using this model, we shall look, firstly, at the initial problem of getting the valid and relevant evidence into the clinical ''pipelines,'' and how this can be improved, and secondly, at methods for reducing blockages at each stage.

1. Awareness

Given our information glut, it is not surprising that individual clinicians find it difficult to be aware of all the relevant, valid evidence. Profitable new interventions are likely to have a substantial marketing campaign. However, for many important practice changes, such as low cost pharmaceuticals or non-pharmaceuticals, awareness is more problematic. To ease the burden, several scanning and alert

services have arisen that help clinicians become aware of important changes. For example, journals such as the *ACP Journal Club* and the *Evidence-Based* journals scan over 100 journals to identify new evidence that is valid and important, and this process has been augmented to build a new service, bmjupdates[+] (http://bmjupdates.mcmaster.ca), that allows practitioners to tap into just those articles that their peers rate as highly relevant and interesting for clinical practice.

2. Acceptance

While practitioners may have heard of the benefits of a new intervention or the harms of an old one, they may not be persuaded to change management based on this evidence. A central problem is that clinicians may be persuaded by many means other than unbiased evidence, such as the marketing techniques of advertising, reciprocity (the obligation arising from ''gifts''), authority, social validation (acceptance by peers), and friendship/personal relationships.[21] [22] Pharmaceutical companies and others invest considerable resources in such methods. Hence more work is needed to identify methods that can best ''vaccinate'' clinicians against poor evidence.

3. Applicable

Even if evidence is accepted, clinicians and guidelines may not target the correct groups. For example, a review of 20 guidelines for atrial fibrillation (most of which were not evidence-based) showed the proportion of patients recommended for warfarin varied between 13% and 100%.[23] Whether there are net benefits of anticoagulation depends on balancing the risk of stroke against the risk of haemorrhage. A survey of doctors in Australia suggested good knowledge of factors that increased the haemorrhage risk, but only half correctly identified a patient with a previous stroke as being at high risk of stroke recurrence.[24] Similarly, a Dutch study showed that risk factors which should predict a higher prescription rate of warfarin did not.[25] Unfortunately, the relation between diagnosis and treatment is rarely one to one. Clinicians must usually learn about and understand the multiple factors that make good decisions that balance benefits and harms.[26]

4. Available & able

To carry out an intervention requires both access and know-how. For medications this is challenging enough: becoming familiar with dosing, contraindications, initiation, adverse effects, and monitoring. For more complex interventions, such as brief counselling or spinal manipulation, the learning curve is even steeper and hence is a greater barrier to changing practice. For many complex interventions such as smoking cessation, external cephalic version, or problem solving therapy for depression, clinicians may require additional training before carrying these out as competently as in the trials that documented their benefits.

5. Acted on

Even when we know and accept what to do, we often forget or neglect to do it. Habits do not change easily, despite our best intentions. Omissions are particularly easy for preventive procedures, as they are often not the pressing focus of a consultation. Not surprisingly rates of appropriate preventive procedures are frequently low. A simple reminder is often sufficient for such simple omissions of interventions that we believe in and can do. A review of 16 randomised trials of reminders for preventive procedures showed substantial increase in adherence for most, but not all, areas.[27] Similar but less dramatic results have been shown for reminders in some areas of medication management.[28]

6. Agreed to

When we have remembered to suggest an applicable treatment, the above steps may begin all over again for the patient. For the patient to agree, they must be aware of the options, accept that the management recommended is appropriate, be able to undertake it, etc. This may involve a complex mixture of the patient's values and beliefs, which thus need to be explored. To assist communication and understanding, patient decision aids have been developed. While such aids can reduce patient's decisional conflict with their final choice, it is less clear whether aided decisions result in better patient outcomes.[29]

7. Adhered to

Patients must also contend with competing claims and advice, adverse effects or fear thereof, and sometimes lack of ability to pay for tests and treatments. If resources to inform prescribers of current best evidence are inadequate, they are woefully more so for patients, despite such pioneering efforts as DipEx (www.dipex.org/). Even when patients accept the benefits of therapy and wish to comply, they may not. We may all agree to exercise more, eat less, or stop smoking, but too few do. Even for medications, the dosing frequency, pill size, and simple forgetfulness can all cause problems. Typical adherence rates for medications are less than 50%. Improving adherence to short courses of treatment is relatively easy, but enhancing adherence with long term regimens is more difficult. Helpful elements include information about the regimen, counselling about the importance of adherence and how to organise medication taking, reminders, rewards and recognition for the patient's efforts to follow the regimen, and enlisting social support from family and friends.[30]

CONCLUSIONS

Even when most clinicians are aware of evidence, there may be little impact on quality of care without further attention to the other stages. However, we would see the initial awareness (and discrimination) of high quality research as the first large hurdle. While bedside EBM has focused on clinicians becoming aware of and accepting the best quality research, it is clearly important but insufficient. Not all clinicians will have or use the skills of bedside EBM,[31] and even the well skilled will fail to implement intended changes fully. Hence EBM should not just be concerned with clinical content but also about the processes of changing care and systems of care.

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Journals reviewed for this issue*

Acta Obstet Gynecol Scand	Arch Pediatr Adolesc Med	Gut	J Vasc Surg
Age Ageing	Arch Surg	Heart	Lancet
Am J Cardiol	Arthritis Rheum	Hypertension	Med Care
Am J Med	BJOG	JAMA	Med J Aust
Am J Obstet Gynecol	BMJ	J Am Coll Cardiol	N Engl J Med
Am J Psychiatry	Br J Gen Pract	J Am Coll Surg	Neurology
Am J Public Health	Br J Psychiatry	J Am Geriatr Soc	Obstet Gynecol
Am J Respir Crit Care Med	Br J Surg	J Clin Epidemiol	Pain
Ann Emerg Med	CMAJ	J Fam Pract	Pediatrics
Ann Intern Med	Chest	J Gen Intern Med	Rheumatology
Ann Surg	Circulation	J Infect Dis	Spine
Arch Dis Child	Cochrane Library	J Intern Med	Stroke
Arch Gen Psychiatry	Crit Care Med	J Neurol Neurosurg Psychiatry	Surgery
Arch Intern Med	Diabetes Care	J Pediatr	Thorax
Arch Neurol	Gastroenterology		

*Approximately 60 additional journals are reviewed. This list is available on request.