Physics and Engineering in Medicine in the New Millennium

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6.2 Internet-Based Health Care

G Kernohan

Internet-based health care

Health and health research is undergoing a major shift, towards the better use of existing research and away from primary research that ends with publication of a paper in an academic journal, towards clinical application of research results. This new idea has quickly taken hold in the health systems of many countries, gaining the attention of clinicians, managers, civil servants, policy analysts and politicians. It has led to the founding of major new institutions in several countries and even an international organisation to lead the new movement. Several new journals have been set up to raise awareness and satisfy the growing demand for information about this new idea (Sacile *et al* 1999). The idea has started to influence the thinking of policy-makers and to have an increasing impact on the organisation and funding of health services. It will shortly impact on services delivered to, or by, each of us. Health professionals need access to information to ensure that interventions are clinically effective, while commissioners need information to support these activities too. There are also opportunities for business development. Most importantly, patients have a lot to gain. The new idea is that the health services provided should be based on the best available evidence of their effectiveness, drawing particularly on the findings of rigorously conducted research – what has been labelled evidence-based health care, but what may be called Internet-based health care.

For far too long the patterns of clinical practice and the way in which we organise and deliver health has been overly influenced by professional opinion, historical practice and precedent, fashion, and organisational and social culture. As a result we persist in using health-care interventions that are ineffective, fail to do that which is known to be effective and suffer such large variations in practice that some patients receive ineffective care. In future science and evidence must play a much greater role in decision-making, in what clinicians and clinical scientists do, and what people decide to do about their own health.

Historical note

More than 160 years ago PCA Louis published 'Researches into the effects of blood-letting' (Louis 1836). This was the first formal exposition of the results of the only true method of investigation of the therapeutic value of remedial agents. At the time, blood-letting was almost universally accepted as the 'proper' method of treating pneumonia. Louis gathered vast amounts of data, which allowed him to investigate systematically the efficacy of treatments. His conclusion, that the apparent efficacy of bleeding for pneumonia is a mere therapeutic illusion, was a bombshell. He based recommendations for therapy on the results of collective experience, rather than on limited individual experience, tradition, or theory.

Fifty years ago, in 1948, the National Health Service was born and since that time we have seen tremendous progress in a service that provides state-of-the-art health service, regardless of ability to pay. In 1998 it was time to celebrate 50 years' success, reflect and look forward to the

future of a national institution which has touched the lives of all of us. Looking over these developments, one might argue that there is nothing new in the idea of using evidence. Health professionals, medical physicists and bioengineers, have been practising in accordance with best intentions for many years but, unfortunately, ineffective and outdated clinical practices are widespread.

Cochrane

The idea of evidence-based practice started with 'Effectiveness and efficiency: random reflections on health services' by Archie Cochrane (1972). He spent his life evaluating the effectiveness of health services and exploring the epidemiology of disease, arguing that many common health services were of dubious effect. He criticised the health-care professionals for failing to take proper account of the evidence from clinical and health services research. Instead, he said, practice was based on personal experience, expert opinion, precedent and even fashion.

A recent contribution to the problem is so-called 'information overload'. This problem has been plaguing health professionals for many years. Back in 1982 Stephen Lock asked whether the sheer number of biomedical journals, estimated to be in the region of 20 000, could lead to 'important discoveries being missed because vital papers are buried in a mass of inferior ones' (Lock 1982). Nearly 20 years later, this subject is still being debated as more than 100 000 medical web sites serve information to the world's connected.

Cochrane advocated the establishment of a register of all randomised controlled trials (RCTs), regarded by most people as the best source of evidence on the effectiveness of health-care interventions. The register would be continually updated and easily accessible. It would make the health service more effective.

Cochrane had been particularly critical of some practices of obstetricians and gynaecologists and this spurred a group of clinicians led by Dr Chalmers to take up his challenge in the field of pregnancy and childbirth. They gathered all the RCTs in this area, and then started to produce systematic reviews on particular themes. This was a massive task and led to the publication of a collection of hundreds of systematic reviews drawing on thousands of RCTs (Chalmers 1989).

Initially poorly received, because the reviews challenged widespread clinical practice, obstetrics and gynaecology was subsequently the first speciality to adopt Cochrane's proposals. Chalmers listed forms of care that should be started and those that should be stopped. He listed 61 forms of care that should be abandoned in the light of the available evidence, four of which are given below:

- Performing X-ray pelvimetry in cephalic presentation.
- Routine continuous monitoring of the foetal heart rate without foetal scalp blood sampling.
- Failing to provide adequate warmth for new-born infants.
- Measuring haemoglobin at every antenatal visit.

Cochrane's approach and Chalmers' book have met with growing support, and health professionals began to think about how this work could be replicated in other clinical areas. But disseminating material in book form is a major limitation, particularly as new evidence becomes available. The Internet has already gone some way towards solving the problem. Cochrane's

idea is ideally suited for the Web where information may be updated constantly.

The science of undertaking systematic reviews of the literature has developed recently. Traditionally, literature reviews on clinical topics tended to be somewhat biased viewpoints. The method was unclear; the process of selection was not given; the quality of studies reviewed was variable and the quality of the reviews themselves was variable and weak. Gradually a more systematic and objective approach to literature review has emerged, with standards and agreed statistical methods for combining results from RCTs. High quality reviews are now recognised as a valuable source of evidence in themselves, making them an important feature of today's health research. Several Internet sites now deal with systematic reviews that establish where the effects of health care are consistent, where research results can be applied and where effects may vary significantly. So has the Internet allowed us to solve all the problems? No.

Implementation remains a problem

Here is an example of the problem facing health care. It has been known for about ten years that the chance of heart attack victims surviving is increased significantly if they are given prophylactic thrombolysis, to break up blood clots and prevent further clots forming. However, clinical audit of practice shows that 65 per cent of patients with myocardial infarctions who should get thrombolytic therapy do not get it. Some must be dying as a result. Clearly, more work is needed on the application of existing knowledge.

Leg ulcers are a significant cause of chronic ill health, mainly in the elderly. For many years, venous leg ulcers have been treated with a variety of dressings and preparations, but with little success. Surgical debridement and skin grafting have also been used, with poor results. However, research in the 1980s showed that a particular form of compression bandaging was effective. This was designed to apply graduated compression to the leg and so prevent the fluid accumulations that cause venous leg ulcers. However, audit showed that half of patients with leg ulcers still do not receive compression bandaging, causing not only pain and suffering, but needless expense.

At the start of the new millennium, stroke patients consume about 5 per cent of health care spending in the UK, both in the immediate aftermath of the stroke and also in long-term care to patients with severe mental and physical impairment. However, the arrangements for stroke patients vary widely. In some places stroke patients are cared for at home, while in other areas there are specially designated stroke units. The provision of speech therapy, physiotherapy and other rehabilitation is also haphazard. Whilst our current understanding of stroke care is limited, there is evidence to suggest that specialised stroke units achieve better outcomes. The current variations and patterns of care in practice cannot be justified and must result in some patients receiving ineffective care. It is not so much that new research is needed, but that we need to examine the process of using existing knowledge.

IT has started to make a difference

Information systems and Internet-based evidence-based resources are already starting to make a difference. Firstly, the aversion to computers that seemed so common only a few years ago is now beginning to evaporate. The majority of professionals in the health service have accepted

that computers are useful tools for audit and activity analysis, management of resources and decision support.

The UK Government has recognised the potential of IT in the health service. In late 1998, it launched 'Information for Health' committing £1bn for the NHS information systems over seven years (NHS 1998). Frank Dobson claimed 'For the first time ever IT in the NHS will be geared towards helping health professionals treat patients, rather than churning out figures to support the internal market'. If the new strategy is to be effective, clinical scientists will need to meet the education and training requirements of all health-care professionals in the use of information. Simultaneously, they will have to satisfy the requirement for research and evaluation of information and communication systems within health care. As the strategy document states, a significant increase in investment is needed for the delivery of this strategy. It is not clear whether new monies will be available, or whether the strategy will rely solely on 'reshuffling' of existing funds. Systems need to be put in place to avoid the problems and waste of public resources that have plagued previous information management and technology projects within the NHS

There are now several Internet sites of evidence-based practice. In 1999, the BMJ Publishing Group began a compendium of the best available evidence for effective health care. It can be found at *http://www.evidence.org* and provides a concise account of the current state of knowledge, ignorance and uncertainty about the prevention and treatment of a wide range of clinical conditions based on thorough searches of the literature.

Back pain

How comprehensive is the Internet in specific clinical areas? Take the example of a group of nurses, physiotherapists and clinical scientists who want to develop guidelines on the treatment of back pain. What evidence is available on the Web on prevention, screening, diagnosis and treatment of back pain?

There is a 'one-stop shop' for guidelines: the Scottish Intercollegiate Guidelines Network at *http://www.show.scot.nhs.uk/SIGN/intro.htm.* Although this site lists 40 evidence-based clinical practice guidelines, it does not (as of February 2000) include back pain. Another place to look is *http://omni.ac.uk/.* This is a good comprehensive index that can be used to locate useful sites and includes a clinical practice guideline for back pain and a site which reviews the effect of transcutaneous electrical nerve stimulation.

Some of the most valuable information for general use has been provided for (or by) patients. The role of clients and users in our consumer society is changing, with more emphasis on patients' choices and patients' involvement.

While technology provides a new style of interaction and interpersonal dynamics, there is a lack of guidance on how to make electronic communications work between health-care professionals and patients. Technically minded health-care consumers have pressed for a variety of ways of accessing their providers. As a result, we are under pressure to regularise the activity, and this requires two issues to be addressed: firstly, the interpersonal dynamics between the two parties, and secondly, the problem of medico-legal issues. Who is likely to take responsibility for the quality of Internet information, or its accuracy? These are some of the unanswered questions in Internet health care; questions for clinical scientists to consider.

The Internet is of real value to health-care professionals. While there is a lot of evidence

available via the Internet, there is no single strategy for identifying useful material. *Health-news* is a new Internet magazine for health professionals. Of course the Internet is a valuable resource for patients as well. For example, the Cyber Hospital aims to offer on-line medical education and to provide a forum for professionals to discuss relevant professional topics. The number of such sites is increasing rapidly.

The future

There is a need for new tailor-made Web services that are capable of combining aspects of the health-care process such as clinical records, treatment protocols, and care guidelines. It could offer discussion lists for on-line professional debate, schemes for continuing professional development, and provide rapid communication around the health service. In addition, there is the potential for new services to the public and for health promotion, while new devices, such as the set-top boxes for TV Internet and digital TV, will make tele-care a reality. The potential to reach a wider audience as TV and Internet merge should not be underestimated.

Some people claim that the Internet is all hype, describing it as the 'world-wide wait' instead of the 'world-wide web'. Evidence-based health care might already have been oversold, no doubt there will be a backlash of disappointment and disillusion when the reality fails to match the expectations. Nevertheless, it would be churlish not to note the significant improvements to the research and development process which have already been brought about by initiatives such as the Cochrane collaboration. But we have some way to go. In the past we have failed to use the evidence properly. Ineffective practices perpetuate, while effective practices come in slowly or not at all. It is still to be proven that the new focus on evidence, the new tools of the Internet, will change the situation for the better. That means that we all have lifelong tasks either in generation of evidence or in its clinical implementation.

> *Through seeking we may learn and know things better. But as for certain truth, no man hath known it, for all is but a woven web of guesses.*
>
> Xenophanes, 6th century BC

This ancient quotation reminds us that our best guesses about the truth - for example, about the true effects of various kinds of health care interventions - may often be wrong. The amount and the quality of evidence available to us will almost always be less than we might wish, but choices and decisions have to be made nevertheless.

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