



How medical pioneers harnessed the power of information

Evidence based medicine

The practice of medicine has been based on evidence since the times of Ancient Greece. Yet the term 'evidence based medicine' refers to a more recent movement to organise and systematically examine the extensive body of scientific evidence, and to apply this to clinical practice and public health policy. The evidence based medicine approach aims to be comprehensive in its treatment of research literature, and therefore to include and evaluate all of the relevant literature relating to a specific topic or query.

Evidence based medicine helps advance medical knowledge and supports clinical practice. Prior to the advent of evidence based medicine, overworked doctors would have to read dozens of articles of generally difficult-to-find primary literature for each intervention or medical question, assessing the relevance and weight of each in order to update their knowledge and practice. Given the restraint on practice time, this laborious task would rarely be undertaken.

Information studies

The emergence of evidence based medicine has produced new bodies of evidence, in the form of systematic reviews, as well as a new system to organise and manage existing forms of evidence. Developments in information studies have made possible this new, more accessible, more easily applicable, way of practising medicine, which has also impacted upon system level decision-making. Information studies is the scientific study of how information is collected, disseminated, and used. It has a long legacy within the humanities in the archiving of information. Modern information studies builds on these humanistic librarianship techniques. More recent research into information management has developed new methodologies and approaches to systematising information.

Such developments have been essential in the development and organisation of extensive electronic databases of scientific studies. For example, appropriate indexing is essential for enabling relevant and efficient searches, and development of methodological filters or "hedges" is key to the retrieval of specific types of evidence. It is through the application of these knowledge management methodologies that systematic evaluation of medical research has become possible and that evidence based medicine movement has evolved.

Development of evidence based medicine

In the early 1970s Archie Cochrane, a British medical researcher who contributed significantly to epidemiological science first introduced the idea that health care resources are always limited and therefore services should be based on effectiveness.

This idea was first taken up in practice by a multidisciplinary research group at McMaster University in Canada, which included medical researchers and information specialists. The group introduced a new curriculum for medical students that emphasised problem based learning. They named this new integration of research and practice 'clinical epidemiology'.

In 1985 a member of the McMaster group, David Sackett, published an influential book that described tools to help doctors use research from a study population to inform their care of an individual patient. The McMaster group went on to coin the term "evidence based medicine" and established the Evidence Based Medicine Working Group in 1992 that published a series of articles (subsequently compiled in a manual) for doctors in the Journal of the American Medical Association.

The rapid expansion of medical information was a key factor in the development of evidence based medicine. Prior to the widespread development of electronic databases it was not possible to gain rapid access to research evidence to inform practice.

Clinical use of evidence based medicine

Prior to the advent of evidence based medicine, doctors risked using ineffective or inferior interventions due to: an overload of information from the growing plethora of scientific studies; difficulty generalising studies to individual patients; and lack of time and necessary skills to search and review literature.

Information studies research has formed standardised criteria for evaluating the quality of individual scientific studies, and guidance for using these criteria has been produced by the Centre for Evidence Based Medicine at Oxford University to aid medical professionals in using the evidence base to answer clinical questions.

Information specialists or 'Team Knowledge Officers' also work in clinical teams performing searches, filtering and processing results, and aiding appraisal of results. In the early days of electronic databases information specialists were essential to accessing and searching such electronic databases. Subsequently, the internet opened up access to these resources directly to users (clinicians) leading to a different role for the information specialist as a guide for appropriate sources and efficient searching of literature.

Developing systematic reviews

Information scientists provide a broad range of support for the development of literature for evidence based medicine. In academic research units at universities such as Sheffield, Southampton, Salford, York and Birmingham, information specialists support the development of systematic reviews and practice guidelines. Academics play a key role in scoping the question, retrieval of literature, management of references and also perform appraisal of studies.

In this way, information specialists possess skills for finding evidence, even if the topic of a clinical query is not within their knowledge base. They provide analytical, critical appraisal skills for the

interpretation of evidence and make informed judgements to assess the validity of the study, suitability of the study to the question asked, design of the study and sources of bias, the reliability of outcome measures chosen, and the robustness of the analysis.

Information specialists help to identify answerable questions where there are areas of uncertainty by identifying knowledge gaps. Research in information studies has developed frameworks to identify appropriate questions, for example the Population, Intervention, Comparison, Outcomes (PICO) framework, which asks of a study: Who? What? Compared with? How is it measured?

The NHS Centre for Reviews and Dissemination was set up in 1994, as a department of the University of York, to provide advice on how to conduct reviews. The Centre is one of the largest of its kind in the world.

System level use of evidence based medicine

The UK is one of the pioneering users of evidence based medicine to the extent that it is now also used in system level decision making. Information specialists contribute to the systematic reviews performed for Health Technology Assessments (HTA) produced by the National Institute for Health and Clinical Excellence (NICE), which inform national policy making.

The success of evidence based medicine is reflected in the spread of evidence based practice to other professional fields such as social care and education, where practitioners benefit from ongoing professional development and regularly updated practice.

Timeline of events contributing to the development of Evidence Based Medicine

- 1920s** Scientific study of information collection, dissemination and use begins.
- 1940s** Systematisation of information science derived from aspects of much older, librarianship, techniques.
- 1950s** Information specialists employed in large companies, particularly in the Research & Development industries.
- 1960s** Computer technology begins to be used in information management.
- 1970s-90s** Development of ICT technology to access sources of information as quickly as possible.
- 1972** Archie Cochrane publishes "effectiveness and efficiency: random reflection on health services" which advocated the use of randomized controlled trials to inform practice and optimize efficiency in healthcare to maximize resources.
- 1989** The first attempt to bring together results of multiple research studies through systematic review and meta-analyses was undertaken by a doctor, Ian Chalmers. Having found that many studies were not large or broad enough he summarized evidence from numerous randomized controlled trials "Effective Care in Pregnancy and Childbirth."
- 1992** Ian Chalmers created the first Cochrane Centre in Oxford.
- 1992** Evidence-based medicine working group set up.
- 1993** Ian Chalmers started the first Cochrane Collaboration that led to the international agreement on processes for systematic reviews.
- 1993** Evidence-based medicine user guidelines first created in the Journal of the American Medical Association.
- 1993** McMaster University, Canada, developed a new curriculum for medical students using problem based learning.
- 1993** Critical Appraisal Skills Programme set up to support those involved in purchasing health care.
- 1994** David Sackett visited David Muir, Director of Research and Development for the Anglia and Oxford health group who set up the Centre for Evidence-Based Medicine.
- 1994** NHS Centre for Reviews and Dissemination set up at the University of York.
- 1995** First UK workshop held for information specialists in the NHS.
- 1996** David Sackett (McMaster team) defines Evidence-based Medicine as "conscientious and explicit use of evidence."
- Late 1990s** Department of Health adopt Evidence-based Medicine concepts for Evidence-based policy.
- 1999** Campbell Collaboration formed for evidence based practice in crime and justice, education and social welfare.
- 2001** ESRC-funded Evidence Network created.
- 2001** Cabinet Office's Better Policy Making identified an evidence based approach to policy development.
- 2005** Office of Science and Innovation's Guidelines on the Use of Scientific Analysis in Policy Making (2005) gives principle-based advice on procurement and presentation of advice for policy making, including science, economics, statistics and the social sciences.