

# Editorial: Evidence-Based Medicine



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*EVIDENCE-BASED MEDICINE (EBM), RECENTLY HERALDED AS ONE OF THE TOP 15 MEDICAL BREAKTHROUGHS, INVOLVES THE USE OF THE BEST AVAILABLE MEDICAL LITERATURE, IN ADDITION TO KNOWLEDGE OF DISEASE MECHANISMS, TO IDENTIFY THE BEST CLINICAL DECISION. THIS ARTICLE OUTLINES THE ARGUMENT FOR EBM, THE METHODOLOGY BEHIND ITS PRACTICE, AND SOME COMMON MISCONCEPTIONS REGARDING ITS USE.*

In January 2007, the *British Medical Journal* published a comprehensive list of the top fifteen medical breakthroughs since the journal's inception in 1840. Breakthroughs ranged from antibiotics, birth control, and vaccines to the theory of evidence-based medicine (EBM) which was developed, in large part, at McMaster during the 1980's and emerged with publications from McMaster University in 1991 and 1992.

## WHAT IS EVIDENCE-BASED MEDICINE?

According to Dr. David Sackett, a member of the original team, EBM is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research." (Schartd, 2004). EBM represents a paradigm shift in the practice of clinical medicine. The old paradigm relies on a sound understanding of disease mechanisms and pathophysiology, and building a foundation of knowledge through unsystematic clinical observations. This foundation of content and expertise guides clinical decision making (Guyatt et al., 1992).

The new paradigm displaces the emphasis from

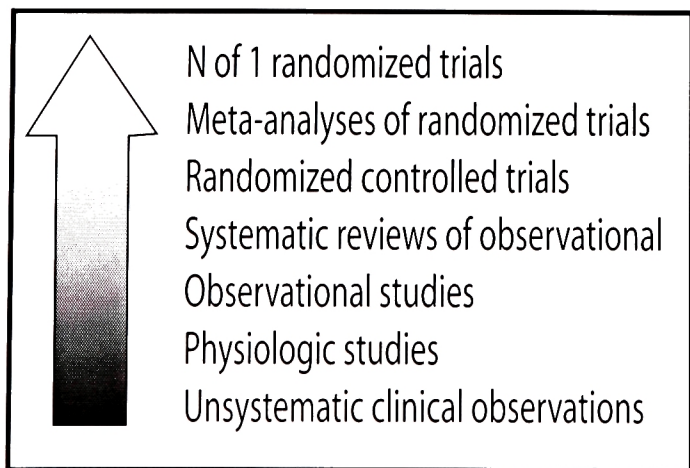


Figure 1: The increasing quality of evidence. Modified from Montori et al., 2002.

experts and presents a problem-solving strategy with a focus on utilizing the best available evidence. In addition to pathophysiological knowledge and clinical experience, a physician must possess the necessary skills to retrieve, critically appraise, and appropriately implement medical literature, in the context of the values, preferences and health status of the patient (Guyatt et al., 1992). At its core, "evidence-based medicine is an explicit and formal problem-solving strategy" (Montori & Guyatt, 2002).

## HOW IS EVIDENCE-BASED MEDICINE PRACTICED?

### Formulate a Question

The first step to practicing evidence-based medicine is formulating a question following the PICO approach. PICO comprises four important components of a good clinical query: the patient population, the intervention, the control, and the outcome of interest (Belsey & Snell, 2003).

### Retrieving Evidence

With a clinical question guiding the search, a prudent clinician must identify the highest quality of available evidence. Differentiating studies in terms of quality can follow a defined hierarchy of evidence (Figure 1) (Montori et al., 2002)

This hierarchy differentiates evidence, but also demonstrates that evidence is always present in some form. Weak evidence is provided by a physician's personal experience or discussion with a colleague about prior cases. Physiological studies are of greater quality because they provide biological support (Montori et al., 2002). Observational studies examine the effects of an intervention on a population over time; their main drawback is that patient allocation into groups are based on physician or patient preference, as opposed to randomization (Guyatt & Rennie, 2002). Systematic reviews that combine the results of multiple studies addressing the same question

provide a stronger impetus for directing clinical action. A randomized control trial improves on an observational trial because individuals are randomly assigned to either the control or intervention arms of the trial. Naturally then, a meta-analysis of randomized control trials addressing the same question will provide a more accurate estimate of the true treatment effect. Finally, the N of 1 trial provides the best evidence for guiding clinical practice. N of 1 trials are studies designed by the clinician and the only subject is the patient in question. The trial will determine the best intervention for that patient (Guyatt et al., 2002).

### *Critical Appraisal*

After identifying a potential article, a clinician must critically appraise its applicability based on three questions:

- Are the results valid?
- What are the results?
- Are the results applicable to my patient?

The validity of the results is established by evaluating the study's methodological quality, which entails features such as adequate blinding, allocation concealment, randomization, and completeness of follow-up (Guyatt et al., 2002).

The results are assessed by examining the magnitude and precision of the treatment effect. Clinicians should be aware of the relative risk reduction, the number-needed-to-treat, and the confidence intervals of therapeutic trials (Guyatt et al., 2002).

When determining the applicability of the results, the physician should try to determine if the subjects of the study are similar to the patient. If so, does the study evaluate patient-important outcomes? Finally, if the patient is somewhat different from the study subjects, does this difference shift the balance between benefits and risk? (Guyatt et al., 2002)?

## **COMMON MISCONCEPTIONS OF EVIDENCE-BASED MEDICINE**

### *Shortage of Literature*

Physicians practicing EBM must realize that they will encounter situations where there is minimal, or even a lack of relevant medical literature. While the continued expansion of research will address this shortcoming, clinicians must realize that there is always evidence. It may be less than ideal, and evidence that is lower on the hierarchy, but it does, nonetheless, exist. Evidence-based medicine suggests use of the best available evidence (Straus & McAlister, 2000).



**Figure 2:** EBM calls for the use of medical literature, such as the academic journals found in the McMaster Health Science Library.

### *There is a lack of evidence suggesting that EBM works*

Admittedly, no randomized control trials have demonstrated the effectiveness of evidence-based medicine, and any such trial would face issues of sample size, biases, and blinding. Further, the trial would be hard to justify on ethical grounds: is it appropriate to withhold evidence from physicians and patients in the control arm of such a trial (Straus & McAlister, 2000)?

Nonetheless, research does suggest that patients provided with interventions of demonstrated efficacy have better outcomes than patients who do not (Straus and McAlister, 2000).

### *Evidence-based medicine disregards clinical experience and knowledge*

EBM suggests the use of the best available medicine, not the disregard of important physician attributes. Experienced clinicians can ascertain a better diagnosis and may also possess superior technical skill, which can be important for diagnostic modalities such as ultrasounds. Furthermore, a thorough understanding of basic sciences is required so that the physician may quickly narrow down the search. This



knowledge of underlying mechanisms is also important in evaluating the applicability of literature to a specific patient (Straus & McAlister, 2000).

### *Difficulties transferring evidence to actual patient care*


While variation in the biology of each patient likely hinders full application of evidence, this is also a universal property of medicine, not just evidence-based medicine. Study types such as N of 1, and large, simple trials are approaches to reconcile the barriers of evidence extrapolation with the unique conditions of patients. Other recent developments such as the number-needed-to-treat and the number-needed-to-harm are also increasingly accepted methods to apply evidence to patients more effectively. These expressions in particular enable the clinician to simplify evidence at the

bedside to indicate whether harm or benefit will likely result. This allows patient values to be integrated into decision making about care and therapy provision (Straus & McAlister, 2000).

### **WHO HAS BEEN INVOLVED IN THE DEVELOPMENT OF EBM?**

Clinicians have always strived to integrate the best available evidence with medical insight in providing care to patients. The foundations of EBM were paved by several key figures: Archie Cochrane who argued for the summarizing of clinical evidence; Alvan Feinstein who carved the principles behind quantitative clinical reasoning; Dr. David Sackett who pushed for teaching of critical appraisal; and Dr. Gordon Guyatt located at McMaster University, who published the first article specifically on EBM in ACP Journal Club in 1991 (Guyatt et al., 2004).

### **LOOKING INTO THE FUTURE**

Knowledge translation will continue to be one of the biggest areas in the development of EBM application into clinical practice. Issues such as lack of time or resources to retrieve the information, as well as critical appraisal skills, are challenges that need to be addressed by both academics in the field and clinicians. With the development of online tools to make evidence more readily available and further synthesized, and decision aids to increase incorporation of patient values, innovations in EBM as a model of care are promising (Guyatt et al., 2004). Future efforts should focus on educating clinicians to transfer evidence into practice. In addition, policy makers should be assisted with integrating evidence to set clear agendas for the academic community. These steps will benefit both providers and patients alike. 

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