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Victor M. Montori; Gordon H. Guyatt

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Progress in Evidence-Based Medicine

SUMMARY OF THE ORIGINAL ARTICLE

Evidence-Based Medicine: A New Approach to Teaching the Practice of Medicine

Evidence-Based Medicine Working Group

JAMA. 1992;268(17):2420-2425.

A new paradigm for medical practice is emerging. Evidence-based medicine de-emphasizes intuition, unsystematic clinical

experience, and pathophysiologic rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research. Evidence-based medicine requires new skills of the physician, including efficient literature searching and the application of formal rules of evidence evaluating the clinical literature.

See www.jama.com for full text of the original *JAMA* article.

Commentary by Victor M. Montori, MD, MSc, and Gordon H. Guyatt, MD, MSc

IN 1992 *JAMA* PUBLISHED AN ARTICLE BY THE EVIDENCE-BASED MEDICINE WORKING GROUP focusing on the role of evidence-based medicine (EBM) in medical education.¹ Although the term *evidence-based medicine* first appeared in the published literature the prior year,² the *JAMA* publication brought both the label and the underlying philosophy to the attention of a wider medical community.

The article was audacious in suggesting that EBM represented a new paradigm in the teaching and practice of medicine by deemphasizing unsystematic clinical observations, pathophysiologic inference, and authority. The article honored traditional skills (eg, understanding biology, demonstrating empathy), but emphasized new skills that learners must acquire and use: question formulation, search and retrieval of the best available evidence, and critical appraisal of the study methods to ascertain the validity of results. The article aggressively presented EBM as a fundamentally new approach.

The Rapid Development and Uptake of EBM

The Users' Guides to the Medical Literature series in *JAMA*³ that quickly followed the article¹ provided tools for learners and teachers to hone their skills in appraising and applying results of studies focused on questions of therapy, diagnosis, prognosis, and harm. Subsequent articles in this series, which eventually addressed 25 separate topics, helped readers understand the value of systematic reviews, decision and economic analyses, and practice guidelines. Courses on how to teach EBM, popular books on the subject (in-

cluding one based on the Users' Guides series⁴); related series in medical and surgical specialties; and enthusiastic uptake by junior faculty (mostly in general medicine), students, and trainees followed. The term EBM proved extraordinarily popular and is now widely used in related health fields (eg, evidence-based health policy, evidence-based nursing). The influence of EBM has been widely recognized both in lay publications (eg, the *New York Times* listed EBM as one of its ideas of the year in 2001) and in the academic press (eg, *BMJ* listed EBM as one of the 15 greatest medical milestones since 1840).

Key developments since the recognition of EBM have included enormous advances in ease of accessing and understanding information, the development of preprocessed evidence-based information, and the increasing emphasis on patients' values and preferences in clinical decision making.

Evolution of EBM: Knowledge Access and Dissemination

The development of the Internet has made finding and retrieving original articles much easier. Emblematic of this effort is the pioneering work of the National Library of Medicine in developing and maintaining the MEDLINE database. Users often access this database from its own interface,

Author Affiliations: Knowledge and Encounter Research Unit, Department of Medicine and Department of Health Sciences Research, College of Medicine, Mayo Clinic, Rochester, Minnesota (Dr Montori); and Clinical Advances Through Research and Information Translation (CLARITY) Research Group, Department of Clinical Epidemiology and Biostatistics, and Department of Medicine, Faculty of Health Sciences, McMaster University, Hamilton, Ontario, Canada (Dr Guyatt).

Corresponding Author: Gordon H. Guyatt, MD, MSc, Department of Clinical Epidemiology and Biostatistics, Health Sciences Centre, Room 2C12, McMaster University, Hamilton, ON, Canada L8N 3Z5 (guyatt@mcmaster.ca).

PubMed, but also from Internet search engines (eg, Google), and from commercial MEDLINE interfaces (eg, OVID). These search and retrieval interfaces have improved with the development of “hedged,” search strategies that retrieve articles with optimal sensitivity and precision,⁵ and by linking the title and abstract to the full-text publications and related documents.

Clinicians and other learners benefit not only from these “pull” services, but also from services that electronically “push” selected evidence screened for quality, newsworthiness, and relevance to the user (eg, services produced by the McMaster Premium Literature Service [PLUS] such as the ACP Journal Club Plus). A key benefit of some of these push services is the rigorous preappraisal of evidence. For instance, the *ACP Journal Club* not only highlights selected articles with high methodological quality and potential relevance but also offers structured abstracts that document methodological quality criteria, which allows readers to evaluate the validity of the results. In addition, these services present pertinent results transparently and offer independent commentary.

The dissemination of systematic reviews of primary studies, which was gaining credibility at the time of the EBM publication¹ has also helped clinicians integrate all of the best available evidence addressing a particular clinical problem.⁶ Systematic reviews have demonstrated the limitations of basing practice on the most salient, most recent, or most popular study. The Cochrane database now includes more than 3000 systematic reviews and the Cochrane Collaboration has played a crucial role in advancing the science of knowledge synthesis.

Relative to traditional medical texts, a number of electronic textbooks represent a revolutionary change in gathering and summarizing evidence and making recommendations—a change driven largely by EBM. These resources (eg, PIER, BMJ Clinical Evidence, UpToDate), which make use of the preappraised resources detailed in the previous paragraphs, increasingly bring evidence explicitly and practically to the point of care. Decision support systems that embed such summaries in the medical record and the clinical workflow are still evolving.

Evolution of EBM: Values and Preferences

Identifying, critically appraising, and summarizing the evidence were initial areas of focus for EBM. As the 1992 article¹ had hinted, however, evidence alone is not sufficient to make clinical decisions. In 2000, the Evidence-Based Medicine Working Group presented the second fundamental principle of EBM (the hierarchy of evidence being the first): whatever the evidence, value and preference judgments are implicit in every clinical decision.⁷

A key implication of this second principle is that clinical decisions, recommendations, and practice guidelines must not only attend to the best available evidence, but also to the values and preferences of the informed patient. Values and preferences refer not only the patients’ perspectives, be-

liefs, expectations, and goals for life and health, but also the processes individuals use to consider the available options and their relative benefits, harms, costs, and inconveniences. Since 1992, much work in the fields of shared decision making and of patient decision support technologies (ie, decision aids), the evolution of the patient rights movement, and the Internet-enabled democratization of technical information have changed the landscape substantially. Recently, the first National Health Service Constitution in Great Britain suggests that patient participation in decision making is a patient’s right⁸; in the United States, the Institute of Medicine designated evidence-based patient-centered health care delivery as a key feature of high-quality medical care.⁹

Evolution of EBM: GRADE

The pioneering work of Eddy¹⁰ in strengthening the evidence base of clinical practice guidelines preceded the EBM article.¹ The Evidence-Based Medicine Working Group initially focused on the relationship between individual clinicians and the application of the original literature to clinical care. Recognition of the importance of preappraised resources and guidelines has led the EBM movement to a greater focus on the methodology of applying EBM principles to management recommendations.

The Grades of Recommendation Assessment, Development and Evaluation Working Group (GRADE) has developed a framework for the formulation of treatment recommendations that is based on the contemporary principles of EBM.¹¹ The GRADE process highlights the importance of clear specification of the question with identification of all patient-important outcomes and the necessity for systematic summaries of all the best evidence to guide recommendations. The GRADE process includes an important evolution in EBM: the definition of quality of evidence and the components that determine quality (including study design and study limitations, consistency, precision, and the extent to which the evidence directly applies to the patients, interventions, and outcomes of interest). The GRADE framework requires the specification of values and preferences in making recommendations and demands attention to circumstances (and resources for competing priorities) in deciding how confident one is that following a recommendation will do more good than harm. This system produces either strong recommendations (ideal targets for quality improvement efforts) or weak ones (ideal targets for careful incorporation of patient preferences [eg, using decision aids in practice]).

EBM and the Current Health Care Context: Misuses of EBM

An analogy can be made between EBM and nuclear fission: it can be very powerful when used appropriately and dangerous when used inappropriately. The term *evidence-based* precedes many recommendations, guidelines, and al-

gorithms that are not transparently linked to the underlying evidence base and do not represent the results of a systematic and critical appraisal of that evidence. It sometimes appears as if using the term obviates the need to describe the quality of underlying evidence, the magnitude of effects, or the applicability of any of the results in the context, values, and preferences of the patients.

This is particularly problematic because the EBM era has coincided with a dramatic increase in the for-profit funding of research. Researchers funded by industry interpret their results differently and in favor of the industry product relative to not-for-profit funding.¹² Problems associated with industry funding include use of inappropriate control interventions, surrogate outcomes, publication and reporting bias, and misleading descriptions and presentations of research findings—all forms of corrupting the evidence base.¹³ Unsophisticated users of the medical literature, assuming that medical editors, peer reviewers, and topic experts have now become familiar with the tenets of EBM, may trust these corrupted research reports and advocate for their application in practice.

Many medical schools and training programs, in a form of premature closure, are moving away from teaching the fundamentals of careful evidence appraisal to emphasize the implementation of evidence. The intent of this new focus is to produce high-quality, safe, and low-cost care (ie, Accreditation Council for Graduate Medical Education competencies of systems-based practice and improvement and practice-based learning¹⁴). However, abandoning appropriate skepticism regarding the effectiveness of these interventions may lead to large investments in quality-improvement, safety, and efficiency activities that fail to yield the expected benefits.

EBM in the Current Health Care Environment: Appropriate Application

EBM continues to hold substantial promise for the increasing conduct of high-quality studies that address important questions using optimal study designs and large sample sizes, and the unbiased, meticulous summarization of the best evidence. Achieving this goal is crucial in a world moving hurriedly toward molecular medicine. Clinicians and researchers who understand the EBM approach and tenets will look beyond the novelty and deal with the special challenges that arise from the use of information from molecular diagnostic and prognostic tests and from treatments linked to these technologies. EBM remains the fundamental framework for investigators intent on conducting translational research from clinical research to clinical practice.

When based on EBM principles, quality improvement science can realize the reliable application of evidence and make health care a high-value proposition. With the emergence of the electronic medical record, many see opportunities in the use of practice-based information to make inferences regarding treatment effectiveness and recommendations based

on these inferences. However, it is essential to remember the perils of ignoring the hierarchy of evidence and abandoning awareness of the biases associated with observational studies. The medical community must resist the temptation to use information accrued in practice based on choice rather than chance to assess treatment efficacy among patient subgroups. At the same time, these information sources will likely prove valuable in detecting rare harms and unintended consequences of clinical actions.¹⁵

Reliance on easily obtained but potentially misleading evidence and the increase in commercial interests to produce and interpret evidence for physicians will remain potent. The appropriate application of EBM will continue to provide safeguards against these dangers. Clinicians will enjoy a set of increasingly accessible sources of evidence, evidence summaries, and guidelines that acknowledge the most current EBM thinking—perhaps best captured in the GRADE system—and in particular the role of values and preferences in decision making. Medical and health policy training must continue to evolve, allowing clinicians and policy makers to successfully differentiate truly evidence-based sources of information and interpretation of information, from those that are not.

Financial Disclosures: Dr Guyatt has acted as a consultant to UpToDate for the last 5 years; Drs Montori and Guyatt are associate editors of *ACP Journal Club*, and are active members of the GRADE Working Group. Both authors accept no royalties for books and honoraria for speaking on EBM as personal income, but as contributions to their respective research endeavors.

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