Evidence-Based Medicine

A Brief Review

Commentary provided by Elliot J. Rayfield, MD, FACE, FACP
Mount Sinai School of Medicine, New York, New York

Evidence-based medicine (EBM) is a hot topic for primary care physicians, internists, endocrinologists, and the public. But what exactly is it? One commonly used definition is as follows[1]: "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual expertise with the best available external clinical evidence from systematic research." While aspects of EBM originate from ancient Greece, its serious introduction as a fundamental way of practicing medicine did not commence until the late 20th century. Professor Archie Cochrane's book, *Effectiveness and Efficiency: Random Reflections on Health Services* (1972),[2] formally put forth the initial concepts of EBM. Prior to the introduction of EBM, it was assumed that a physician's clinical judgment, based on experience and the research literature, would lead to best practices.[3] However, in the 1980s, a group at the RAND Corporation recognized that despite contemporary expert standards, many procedures being performed by physicians were not appropriate.[4]

There also existed a gap between clinical research and what was happening in clinical practice. Even when randomized controlled trials were conducted, it was several years before physicians began incorporating what was being done in clinical research into their practices. Furthermore, there was the realization that many of the available treatment guidelines were the beliefs of the authors and were not based on clinical evidence.[5]

It was at the same time that a number of new methodologies were being developed for enhancing decision-making, including decision trees, utility theory, Bayes theorem for analyzing diagnostic tests, mathematical modeling, cost-effectiveness analysis, technology assessment, clinical epidemiology, outcomes measures, meta-analysis, and costs of delivering health care.[3] These new methodologies were to become the foundation for evidence-based guidelines.

EVIDENCE-BASED GUIDELINES

Four features characterize evidence-based guidelines[3]: (1) analysis of the evidence for a guideline is conducted by a small group of experts and is usually sponsored by a medical organization; (2) a defined process is used; (3) the results are generic and intended for patients in general and not a specific patient; and (4) the effects are indirect and executed by the health care provider.

Several papers published in the early 1990s in the *Journal of the American Medical Association* used the term *evidence-based* in the context of treatment guidelines.[6–8] The topics of these papers—part of the Users' Guides to the Medical Literature—included the role of medical literature and treatment guidelines in making medical decisions, critical steps in guideline design, and the importance of incorporating the notion of costs into guidelines. Medical organizations such as the American College of Physicians[9] and the Council of Medical Specialty Societies began to embrace the notion of evidence-based guidelines. In 1989, the US Preventive Services Task Force (USPSTF) was charged with issuing guidelines for preventive interventions.[10] In 1995, the BMJ Publishing Group launched Clinical Evidence, an authoritative online medical resource, to update evidence-based knowledge on important clinical questions.[11] By the end of the 1990s, guidelines were expected to be based on clinical evidence, and consensus-based reports were used only if insufficient or inadequate evidence existed to document an evidence-based approach.

EVIDENCE-BASED INDIVIDUAL DECISION-MAKING

The concept of *evidence-based individual decision-making* appeared soon after that of evidence-based guidelines with an editorial by Guyatt[12] and a paper authored by the Evidence-Based Medicine Working Group.[13] These publications explained how, when using this concept in the care of a patient, there would be a computerized literature search for: (1) the specificity and sensitivity of the tests to be done; (2) the selection of the tests; (3) assigning a pretest probability; (4) calculating a posttest probability; and (5) formulating a treatment plan. Rather than *evidence-based guidelines*, these authors introduced the term *evidence-based medicine*. As already cited above in the definition of EBM, the current best evidence gleaned from guidelines is applied to the care of the individual patient by the patient's physician.

While EBM refers to the decision-making and not the guidelines, Eddy argues that both the decision-making and the guidelines equally comprise the essence of EBM.[3] Therefore, the authors of guidelines should make sure that the guidelines are applicable not only to patients in general but to individual cases as well.

RANKING THE QUALITY OF EVIDENCE

With EBM, different types of clinical evidence are analyzed and ranked according to their relative strengths. The strongest data are considered to come from randomized, double-blind, placebo-controlled trials involving a homogeneous patient population with a specific medical condition. Case reports, retrospective case-control studies, and expert opinion have less value as proof because of biases inherent in observation and the reporting of cases.

Transparency as used in EBM refers to the process of creating clinical practice guidelines that are simply described and available with the document when it is published. These guidelines must include the review of the clinical evidence, the addition of subjective factors, the reporting of levels of consensus, and the final grades assigned to recommendations.

The US Preventive Services Task Force

The USPSTF has developed a system to stratify clinical evidence by the quality of evidence obtained.[10] The levels of quality are shown below.

Level I: Evidence obtained from at least one properly designed randomized controlled trial.
Level II-1: Evidence obtained from well-designed controlled trials without randomization.
Level II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from >1 center or research group.
Level II-3: Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled trials might also be regarded as this type of evidence.
Level III: Opinions of respected authorities based on clinical experience, descriptive studies, or reports of expert committees.

GRADE Working Group

With the system developed by the GRADE Working Group,[14] there is a grading of: (1) the quality of evidence for each outcome; (2) the relative importance of outcomes; (3) the overall quality of evidence; (4) the balance of benefits and harms; (5) the balance of net benefits and costs; and (6) the strength of the recommendation.

This grading system has been used by The Endocrine Society [15–17] and the Society for Vascular Surgery[18] in the development of clinical practice guidelines. In The Endocrine Society's clinical guidelines for the evaluation and management of adult hypoglycemic disorders,[17] there is a description of the method of development of evidence-based recommendations. Briefly, *strong recommendations* are accompanied by the phrase "we recommend" and the number 1, and *weak recommendations* are accompanied by the phrase "we suggest" and the number 2. The Society's task force believes that care based on either strong or weak recommendations will derive more good than harm. However, suggestions require more careful consideration of the patient's circumstances, values, and preferences. Cross-filled circles (⊕) indicate the quality of the evidence: ⊕○○○ denotes very-low-quality evidence; ⊕⊕○○, low-quality evidence; ⊕⊕⊕○, moderate-quality evidence; and ⊕⊕⊕⊕, high-quality evidence. The quality of the evidence indicates the panel's confidence that the estimate of risks and benefits associated with the recommended course of action compared with an alternative course of action are correct and unlikely to change importantly with new research.

Linked to each recommendation is a description of the *evidence*; the *values* that panelists considered in making the recommendation, when making these values explicit was necessary; and *remarks*, a section in which panelists offer technical suggestions for testing conditions. Remarks come from the unsystematic observations of the panelists and, therefore, should be considered only as suggestions.

STANDARDIZATION OF AACE CLINICAL PRACTICE GUIDELINES

In 2004, the American Association of Clinical Endocrinologists (AACE) published a methodology for the standardization of its clinical practice guidelines (the 2004 AACE Protocol).[19] This document considers the importance of evidence-based methods but recognizes that there is no consensus on which of the current strength-of-evidence scales is best; therefore, the organization created 6 principles for the development of its own evidence-based clinical practice guidelines. AACE determined that this publication was necessary, as there was a need to differentiate AACE clinical practice guidelines from other AACE publications, such as consensus reports and position papers. A new AACE protocol is currently in preparation.

CONSTANT IMPROVEMENT IS REQUIRED

Now that some of the basics of EBM have been described, one must realize that this area of medicine is in need of constant upgrading and improvement to be as effective as possible.[20] There must be no conflicts of interest and no industry involvement in the review process. Guidelines must be written by adequately credentialed authors, and financial resources must be available to realize the necessary recommendations generated from new guidelines.