Does Evidence-Based Medicine Help the Development of Clinical Practice Guidelines?

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Formal methods for the development of clinical practice guidelines have emerged to address societal needs to decrease physician practice variation, slow the rise of health-care costs, monitor inappropriate care, assist clinicians to stay abreast of new clinical information, set research priorities, and promote better health-care outcomes. Evidence-based methods ensure that guidelines provide valid recommendations based on a critical appraisal of the best available evidence rather than informal, opinion-based processes. (CHEST 1998; 113:172S-178S)

It would appear at first glance self-evident that good clinical practice would derive its fundamental justification from high-quality investigative evidence. The traditional training of physicians in the scientific method and the pathophysiologic approach to disease management seem to provide an affirmative answer to the question in this article’s title: evidence-based medicine helps the development of clinical practice guidelines, insofar as we would like to think that scientific data drive most physician decisions.

But whether recognized or not, the harsh reality of medicine is that many, if not most, daily clinical decisions are not based on valid scientific fact. Despite extensive clinical investigations into the management of pneumonia, for instance, uncertainties remain regarding the ideal antibiotics for community-acquired pneumonia, when to switch patients from IV to oral antibiotics, and the role of diagnostic bronchoscopy with quantitative cultures for patients with suspected ventilator-associated pneumonia. A shortage of randomized clinical studies and high-quality epidemiologic investigations to address the innumerable clinical problems that physicians face would seem to limit an evidence-based approach to health-care decisions. Moreover, where good scientific evidence does exist, clinicians often delay accepting the evidence and altering their patient care practices. Delay may partially result from a slow dissemination of investigative findings into clinical practice, but may also occur to a degree from physician concerns that general recommendations from scientific investigations may not apply to a particular patient’s unique clinical settings.

It is not surprising, therefore, that questions arise regarding the utility of evidence-based medicine in the development of clinical practice guidelines. Do enough high-quality data exist to develop guideline recommendations for a significant proportion of the important clinical questions? Does evidence-based medicine require that guidelines only address questions for which sound evidence exists? And most importantly, does an emphasis on evidence-based medicine minimize and devalue the role of clinician experience and expert opinion in guideline development? If so, evidence-based medicine may constrain rather than promote the development of clinical practice guidelines.

This article begins with the bias that all valid patient care guidelines derive more or less from the scientific evidence and that following their recommendations will increase the probability of producing the desired patient outcome. The article ends with the conclusion that concerns about using evidence-based medicine in guideline development result from a less-than-clear understanding of the nature of clinical practice guidelines and evidence-based medicine. These two processes for assisting clinical decision-making are well suited for each other and produce the most valid therapeutic and diagnostic recommendations that are possible at any particular time to ensure high-quality patient care.

**CLINICAL PRACTICE GUIDELINES—EMERGING GOALS AND METHODS**

In order to understand the role of clinical practice guidelines in patient care, one should first recognize
that guidelines designed to communicate diagnostic and therapeutic recommendations on the basis of scientifically valid observations have been a part of medicine for a very long time. Medical textbooks, journal reviews, and consensus conference reports have provided patient care recommendations based on scientific evidence for >100 years. One of the risks of this observation, however, is the assumption that present-day guidelines do not represent a meaningful departure from the past.

Two factors, however, distinguish clinical practice guidelines from their less formal predecessors. First, emerging societal interests have accelerated the development of clinical practice guidelines and created specific goals that these documents are now designed to fulfill. These forces include a perceived need to decrease practice variation among physicians, opinions that the rise in health-care costs should be slowed, interests in monitoring inappropriate care, emphasis from the federal government on outcomes studies, professional concern that guidelines are needed to counter measurable health-care goals that these documents are now designed to fulfill. These forces include a perceived need to decrease practice variation among physicians, opinions that the rise in health-care costs should be slowed, interests in monitoring inappropriate care, emphasis from the federal government on outcomes studies, professional concern that guidelines are needed to counter managerial recommendations primarily directed at cutting costs, and realities that physicians are finding it difficult to stay abreast of the mass of new investigative information relevant to their clinical practices. Consequently, clinical practice guidelines have developed goals beyond the traditional interests of communicating recent advances in medical care. These goals include the following: (1) the promotion of measurable health-care quality, effectiveness, and appropriateness; (2) the maintenance of access to care; and (3) the identification of gaps in our medical knowledge to set research priorities.

The second factor that distinguishes clinical practice guidelines from earlier documents that guide clinical practice is a reliance on a formal method that explicitly outlines the guideline's developmental process. Ideally, clinical practice guidelines provide within their text documentation of the process by which recommendations emerge from an interaction between scientific data and professional judgment. Much as a methods section in a basic science or clinical research paper provides accountability and reproducibility for the scientific method, the methods section of a clinical practice guideline fulfills the reader's expectations that the guideline contains more well-constructed and valid recommendations than can be generated through an informal, opinion-based process. This formal method has been emphasized by the Institute of Medicine in its definition of clinical practice guidelines, which are systematically developed statements to assist practitioners and patient decisions about appropriate health care for specific clinical circumstances.

**Promoting Guideline Effectiveness**

Emphasis on a specific method derives at least in part from the recognition that clinical practice guidelines are designed to alter clinical practices and affect patient outcomes. As occurs with any intervention intended to alter outcomes, clinical practice guidelines have a capacity to improve patient well-being but also have a potential, if the recommendations are flawed or incorrectly used in inappropriate clinical situations, to have a negative impact on patient care. In this way, clinical practice guidelines are similar to other interventions, such as a new drug, medical device, or surgical technique, that can harm patients if poorly developed, instituted before having undergone comprehensive testing, or if misapplied. There is an emerging logical if not yet entirely validated belief that systematically constructed clinical practice guidelines have the greatest opportunity to achieve their goals and minimize potential for patient harm. A formal method of guideline development creates an explicit linkage between the final recommendations and the evidence on which they are based. This linkage of investigative data with pharmacotherapeutic recommendations is the minimal requirement expected by clinicians before they would introduce a new drug into their clinical practice.

What are the goals of this method in shaping the final form of guidelines through the development process? The Institute of Medicine and the Agency for Health Care Policy and Research have described the attributes of clinical practice guidelines that should emerge from a systemic approach to guideline development.

**Attributes of Systematically Developed Clinical Practice Guidelines**

As drugs should have certain demonstrated safety, efficacy, and pharmacokinetic profiles before they are introduced into clinical practice, so should clinical practice guidelines have attributes that ensure their safety, efficacy, and likelihood of adoption by practicing physicians (Table 1). Foremost among these attributes is validity, which is defined by the probability that a guideline will produce its desired health-care goals if patients and physicians follow the guideline's recommendations. Because most guidelines are not "tested" in patient care settings before their publication (like a drug would be before its approval and release), validity is best defined by an analysis of how closely linked the recommendations are to the scientific and clinical evidence on which they are based. To support this analysis of "content validity," readers of guidelines require an
Table 1—Attributes of Clinical Practice Guidelines

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<td>Validity—Will the guideline produce its intended health-care outcomes?</td>
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<td>Reliability and reproducibility—Would another group of experts derive similar guidelines if provided the same evidence and methodology? Would different caregivers interpret and apply the guidelines similarly in identical clinical circumstances?</td>
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<tr>
<td>Clinical applicability—Does the document describe the clinical settings and the population to which the guidelines apply?</td>
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<tr>
<td>Clinical flexibility—Are the recommendations sufficiently flexible to promote their judicious use to greater or lesser degrees depending on the clinical circumstances? Are alternatives and exceptions explicitly stated?</td>
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<td>Clarity—Are the guidelines stated in unambiguous and precise terms?</td>
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<td>Multidisciplinary process—Were stakeholders included at various stages of guideline development allowing their comment and participation?</td>
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<td>Scheduled review—Is a schedule for update and revision provided?</td>
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<tr>
<td>Documentation—Is the method used for developing the guidelines explicitly stated?</td>
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opportunity to review the guideline developers’ analysis of the quality of the evidence that supports the strength of the recommendations made. Because of the importance of guideline validity, some guideline developers have included in the guideline text specific plans for validating clinical recommendations after they are published.30

Clinical practice guidelines must also have attributes of reliability and reproducibility. If the guidelines are based on a systematic analysis of the existing scientific data, different groups of experts provided with the same evidence should construct similar guidelines in a reproducible manner. Furthermore, the guidelines should result in reliably similar interpretations and applications when independently reviewed by different practicing clinicians.

To avoid misapplication of clinical recommendations to the wrong patient populations or clinical settings, clinical practice guidelines should clearly state the specific patients and circumstances to which they apply. Appropriate clinical applicability is primarily determined by the scientific and clinical evidence. Guidelines may recommend, for instance, the use of fibrinolytic agents in patients with acute myocardial infarctions but avoid misuse of these agents by explicitly stating exceptions to their use and acceptable alternatives in various clinical settings.

To avoid functioning as “cookbook” medicine, clinical practice guidelines require careful crafting of language to provide clinical flexibility that allows physicians to judiciously interpret the recommendations in light of an individual patient’s unique clinical problems.11 This flexibility derives from a recognition of the limitations of scientific evidence. In applying scientific data, clinicians must extrapolate the results of clinical studies making the assumption that the findings apply not only to the study population but also to the patient who sits before them in their examining room. The complexity of clinical medicine, however, allows any patient to be an “exception to the rule.” Therefore, guidelines provide physicians with opportunities to tailor the recommendations to their patients’ individual needs. The degree of flexibility is determined by the strength of the supporting evidence. Little flexibility is offered by guidelines if the evidence is so overwhelming and incontrovertible that few exceptions exist (eg, influenza vaccination of the elderly). Conversely, guidelines may become “options” providing considerable flexibility if the recommendations are based on weak evidence, such as expert opinion alone.7

The Guideline Development Process

Application of a formal guideline development process to produce guidelines with the above-described attributes requires a methodologic approach. The first step centers on selection of an appropriate topic amendable to guideline development. Topics may pertain to a specific health condition (eg, pneumonia), a procedure (eg, bronchoscopy with BAL), or a process (eg, isolation techniques for multiresistant pathogens). Ideally, sufficient investigative or clinical evidence should exist regarding the topic to allow the development of strong recommendations. If the topic is sufficiently important, however, guideline developers may proceed using expert opinion to formulate recommendations as long as readers are warned to exercise considerable flexibility in following the guidelines, considering the subjective, and probably biased, nature of the method.21

Selection of an expert panel for guideline development also requires a methodologic approach.22 The panel will be called on to provide an interpretation of the objective scientific evidence, which means that subjective biases will be inevitably introduced into the process. Selection of members from a varied background limits this bias,23,24 especially if members are known to have differing opinions about the subject at the outset.25 Inclusion of patients or patient advocates is recognized as important to add patient-centered values onto the objective evidence.55,56 Selection of a chairman who is familiar with the guideline topic but not necessarily a recognized expert (with preconceived biases) assists the guideline process.
DETERMINING THE STRENGTH OF THE EVIDENCE AND APPLYING EXPERT OPINION

Guideline panels eventually meet and begin their assigned task of developing valid, reproducible, and reliable clinical recommendations to guide, and hopefully enhance, patient care. The implicit intention of such groups is to canvass the existing scientific literature pertaining to the guideline topic, cull well-designed studies with valid conclusions, and construct solidly conceived guidelines. In reality, many groups begin their process with a haphazard collection of clinical studies, apply their personal interpretations to the study results, and end with recommendations of uncertain validity that are derived from an informal literature review.27

Following a formal method retains the link between the evidence and the final recommendations. A systematic and comprehensive literature search is the initial step for the members of the guideline panel. The literature search methods should be described in the final document to defend its reproducibility and completeness. The collected evidence is graded using one of several available systems that categorize the strength of evidence on the basis of study design, severity of study flaws, homogeneity of results between studies, and magnitude and precision of the study results.28-33 Like the collection and quality analysis of scientific data from an experimental study, collection and grading of the evidence for guideline development allow conclusions (ie, guideline recommendations) to be developed in a manner that is supportable by the data (ie, scientific evidence in the literature).

Emphasis on a comprehensive search and analysis of the evidence may create a misimpression that expert opinion is devalued as a part of the process. Although evidence derived from expert opinion alone, devoid of investigative data, is the weakest form of evidence in all grading systems, expert opinion remains a central and unavoidable component of guideline development. First, experts—physicians, other caregivers, payers, or patients themselves—must apply a “value” structure to the evidence to allow the development of clinical recommendations.34 High-grade evidence may demonstrate only a minor health-care advantage for a small sector of the population at high economic expense. Such evidence may be downgraded to relatively weak guidelines. Conversely, weaker evidence may demonstrate a profound health-care advantage at marginal costs to a large number of patients justifying the formulation of stronger clinical practice guidelines.32 All along the spectrum of evidence strength and relative economic and health outcomes, expert opinions apply such value structures to develop valid patient care recommendations.

Expert opinion is also required to grade the evidence; grading methodologies are designed to minimize the opportunity for bias but cannot totally eliminate the role of expert judgments in applying the grading systems, weighting the relative limitations of different types of study design flaws, and resolving opinion differences in interpreting the strength of the data.29 Moreover, more questions exist in clinical medicine than answers derived from high-quality investigations, which requires the application of expert opinion to bridge our knowledge gaps. Most clinical recommendations for important patient care topics cannot await the completion of clinical trials or epidemiologic studies. In such circumstances, expert opinion becomes a form of clinical evidence.35,36 Guideline developers, however, should identify within guideline texts the recommendations that are based largely on expert judgments so as to demarcate the limits of our knowledge, avoid overstating guideline recommendations and thereby promote appropriate degrees of clinical flexibility, and point out research opportunities.37

APPLYING A METHOD FOR APPLICATION OF EXPERT OPINION

Well-intended physician groups often meet to develop consensus for guideline development but fail to initiate “rules of the road” regarding the application of their consensus processes. These informal group techniques tend to lose sight of the objective details of the evidence, overemphasize their subjective interpretation of the scientific data, and create biased and potentially invalid guidelines.35,38 Consensus processes can go awry because of the influence of a single dominant member of the group or the development of group dynamics such as groupthink, polarization effects, focusing effects, and “consensus” achieved because the group runs out of time or energy after lengthy discussions.39

Realization that “expert opinion” is a form of “evidence” requires application of a formal consensus development method—as is done with the generation of other forms of scientific evidence—to guarantee that the final opinions will be valid, reproducible, and reliable. In this instance, the safeguards of a group process should be initiated so as to ensure that the consensus achieved by the guideline development experts will reflect the consensus of the larger group of experts on the topic around the world. These safeguards are similar in purpose to efforts applied to a clinical investigation to ensure that findings in a study population are representative.
of what would be found in a larger population of patients with the same clinical condition.

The first step in establishing a group methodology is developing an a priori definition of consensus, which may be majority rule, two thirds agreement, unanimity for high-grade recommendations, or some other objective definition.36,40

Group processes for achieving valid consensus of expert opinion have not been studied extensively in physician groups. In general, however, informal group discussions have the lowest validity and greatest potential for bias.35,38 Consensus conferences,8,41,42 Delphi techniques,35,36,43,44 nominal group techniques,39 evidence juries, and other methods have relative strengths and weaknesses depending on the questions posed to the consensus group and the strength of the existing evidence available.35,36,45,46 Regardless of the method used, the nature of good scientific writing would direct the guideline developers to describe the methods used to achieve consensus of expert opinion within the text of the final guidelines.

**HOW DOES EVIDENCE-BASED MEDICINE FIT INTO GUIDELINE DEVELOPMENT?**

Throughout this discussion of guideline development, I have emphasized the importance of basing recommendations that guide clinical practice as much as possible on high-quality investigative evidence. When evidence does not exist, guideline developers can apply their expert judgments to bridge knowledge gaps as long as the subjective nature of such recommendations is explicitly stated in the final guideline document. As stated in the introduction, physicians may not consider that these requirements for an evidence-based process represent much of a departure from past approaches to writing statements—consensus reports, expert reviews, or textbook chapters—intended to guide clinical practice.

The difference, however, is in the understanding of evidence-based medicine and what it has to offer to patient care. Although the definition is undergoing evolution, evidence based medicine is the conscientious and judicious use of current best evidence from clinical care research in the management of individual patients.47 Conscientious use describes a clinician’s practice of consistently applying the evidence to all patients for whom the evidence applies.48 To provide clinicians with the ability to apply guideline recommendations conscientiously, guideline developers must explicitly develop their guidelines, paying attention to attributes of clinical applicability. Judicious use of the evidence requires practitioners to blend their clinical expertise in weighing an individual patient’s unique clinical circumstances against a clinical practice guideline’s general recommendations for patient care.48 To allow clinicians to consider the risks and benefits of guideline recommendations relevant to the patient before them, guideline developers must explicitly define the limits of a guideline’s attribute of flexibility. What are the alternative approaches available with their relative risks and benefits in health and economic terms and relative probabilities of outcome? What are the patient factors that indicate a higher likelihood of a better outcome with one alternative intervention compared with another?

The premise of evidence-based medicine that clinicians should use the current best evidence from clinical care research assumes that clinicians will be able to discern high-quality data from the mass of information of varying quality that exists in the literature. Unfortunately, this need to critically appraise the literature is overwhelmed by the vastness of the literature (and its variable quality) and the limited time available to most practicing physicians. Therein lies the greatest responsibility of guideline developers to rigorously analyze the evidence and base their recommendations on a grading system that explicitly describes the strength of the developed guidelines. In this way, clinicians can be provided with the least biased and most valid clinical recommendations achievable to allow them to apply selectively published guidelines and to practice evidence-based medicine.

In the final analysis, what is the most cogent argument for a role for evidence-based medicine in the development of clinical practice guidelines? Evidence-based medicine’s emphasis on caregiver expertise in judiciously applying guideline recommendations to individual patients with their unique health-care problems prevents guidelines from being used for cookbook medicine. Evidence-based medicine recognizes that one shoe does not fit all and that guidelines cannot substitute for experienced, appropriately trained, and expert health-care providers.49 Moreover, emphasis on an explicit statement of the underlying best evidence on which guidelines are based counters the trend to misuse clinical practice guidelines through the development of poorly conceived, cost-cutting managerial tools. Such tools are usually developed with proprietal “black box” methodologies and analyses of nonvalidated data banks or low-quality evidence. An explicit evidence-based method increases the likelihood that we will achieve the goals of clinical practice guidelines, which are as follows: (1) to promote quality, effectiveness, and appropriateness of health care; (2) to improve access to quality care; and (3) to identify our knowledge
gaps to which expert judgments must be applied and therein set research priorities. 11

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