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Evidence-based Medicine for the Pediatrician

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Introduction

A 12-year-old boy presents with a 4-day history of a limp associated with a fever. Notable findings on the physical examination are a temperature of 102°F (38.5°C), minimal weight bearing, and localized tenderness on palpation of the lateral right thigh and hip. There are no signs of abrasion or soft-tissue infection. The erythrocyte sedimentation rate and white blood cell count are significantly elevated.

Pediatric review literature helps to guide the clinician through approaches to patients who present with a limp. With each unique case, several questions likely arise. How should the physician address different presentations of a child who has the same primary complaint? What is the next step to consider in proceeding from a medical review that introduces a perspective to the problem? When should reviews or guidelines be followed? What is the disease probability for disorders that present with a limp? How should tests be conducted to determine the most likely medical condition on a case-by-case basis?

The purpose of this article is to introduce an effective approach toward answering the questions generated from our practice experiences. This approach centers on the concept of evidence-based medicine (EBM), which will be defined, demonstrated by using the previous clinical scenario, and introduced as a decision-making model. Finally, several common concerns about EBM will be addressed.

The concept that “a new paradigm for medical practice is emerging” initially was introduced in the general medical literature in 1992 (1). This new paradigm, referred to as EBM, most recently was defined as the integration of best research evidence with clinical expertise and patient values (2). This paradigm is entered each time a clinical question relating to an individual patient is asked. How often are these questions asked? Clinical questions are incorporated into the practice skills of internists and applied to 1 in every 1.5 patient encounters (3) and in every 15 patient encounters by family physicians (4). Although such comparisons have not been reported in pediatrics, integrating clinical questions into the practice of daily pediatrics likely is within these reported ranges. Throughout this series, we will attempt to educate pediatricians about the *process* of an evidence-based practice (Table).

Articles and guidelines touted as being evidence-based are increasing overall interest in this topic, and this trend is likely to continue. The natural evolution from this trend, and the basic principle behind EBM, is that we should be using practices that are supported by evidence and not using practices that have been disproved. EBM should decrease time from release of clinically useful evidence to application into general practice, increase the number of patients who are being treated with the current best therapy, and keep us up-to-date as more evidence becomes apparent, allowing our practice to grow and change with time. The question then becomes not *if* EBM, but *how*.

Finding the Evidence: EBM Database Collection

Following the steps outlined in the Table and applying them to the previously cited case will illustrate how EBM can be used in clinical practice. This example will not be exhaustive; each step in this process will be detailed further in subsequent articles.

Asking an answerable clinical question is the first and sometimes most difficult step in practicing EBM. One answerable clinical question could be: *What are the most helpful diagnostic criteria to differentiate between septic arthritis and toxic synovitis among patients who have a painful hip and fever?* Given the differing treatments and morbidities, this is an important distinction. Answerable questions are devised specifically to include the patient

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Table. The Five Steps of EBM

- 1) Ask answerable clinical questions.
- 2) Search relevant literature efficiently.
- 3) Appraise found data critically.
- 4) Apply valid evidence into clinical decision-making.
- 5) Evaluate and improve the process for future use.

population of interest (patients presenting with a painful hip), an intervention (comparing diagnostic criteria), and an outcome that is clinically relevant (disease probability). A well-developed question helps focus the search.

Prior to initiating an EBM literature search, how good is intuition at estimating the chance of a septic hip in this patient? Would the estimate be closest to 10%, 40%, 80%, or 100%? On what would this estimate be based? Examining the literature can fill in these knowledge gaps. For example, in one series, irritable hip/transient synovitis comprised the final diagnosis in 40% of cases versus infectious disease in only 3.6% of cases (5). For the cited case, a search was initiated with the available previously researched resources, which include journals or websites that already have researched common questions and published results for clinical use. It is important to note that these sites require explicit search criteria and validation to provide a useful outcome. Examples include publications such as *AAP Grand Rounds*, the *ACP Journal Club*, the Cochrane collaboration for therapeutic trials, and some reviews published in a few of the pediatric journals. Nothing of significance was found in a quick review of these sites.

The next source consulted was PubMed (available at no charge through the Internet). Using selected search terms from our question, a few filters, and limiting for the search to the population represented by our patient yielded a manageable number of citations. Reviewing these abstracts revealed several articles that were directly pertinent to our question, one of which was available as "full-text" (6) and was printed from the office computer. Of course, not every article we find will be available to us in our office. However, this question was searched, and the article was found and in our hands in fewer than 10 minutes. This approach will find a few relevant articles in an otherwise vast sea of hundreds (sometimes thousands) of articles that may cover the topic of interest.

Once we have found evidence that is pertinent to our patient, two questions should be answered: Is this article valid? Is it important to our decision-making? This process is referred to as critical appraisal. Over the past decade, a series of articles has been published in the

Journal of the American Medical Association under the title of the *Users' Guide to the Medical Literature* that covers nearly every type of article encountered. These articles have been published in various formats in several textbooks and are available via the Internet. The retrospective review by Kocher et al (6) satisfied most of the suggested validity criteria. Using the author's algorithm (an easy-to-use table), we found that our patient's clinical data significantly raised the probability of septic arthritis. In fact, for patients presenting with an acutely irritable hip, history of fever, elevated white blood cell count, and erythrocyte sedimentation rate of greater than 40 mm/h, the predicted probability for septic arthritis is 99.6%. This number is surprisingly high but convincingly more valid than intuition and will play a major role in the next step in the evidence-based process, which is applying the evidence to the clinical decision.

Integrating the Evidence: The EBM Decision-making Model

This series of articles about EBM in *Pediatrics in Review* will expand on the previously noted concepts and illustrate incorporation of decision-making skills. Application of EBM is illustrated in the Figure (7). Reading the literature, participating in continuing medical education, and experiencing years of continued clinical exposure to a diverse spectrum of patient care build clinical expertise. When these elements are integrated with patients' values, a strong partnership is created that has the goal of improving clinical outcomes and enriching quality of life. Similar to learning how to take a history and perform a physical examination, the skills necessary for establishing an evidence-based practice need to be learned, and the clinician will become more efficient over time. The intent of this series is to provide pediatricians with the simple, basic tools required to succeed in conducting an evidence-based practice.

Prior to the medical literature search, the chance of a septic hip being present, as determined by intuitive estimate, would find the pediatrician working out of area A in the Figure. Research evidence allows the pediatrician to work out of Area E. Of course, if clinical expertise does not allow an estimate prior to testing and skills have not been developed in finding these answers in the literature, clinicians are forced to work out of area O (ie, referring the patient). In this case, valid reports demonstrate that negative findings on radiography, ultrasonography, or magnetic resonance imaging may not have the power to move the probability of a septic hip at 99.6% below a threshold at which surgical intervention is indicated. Knowing these data could influence which test

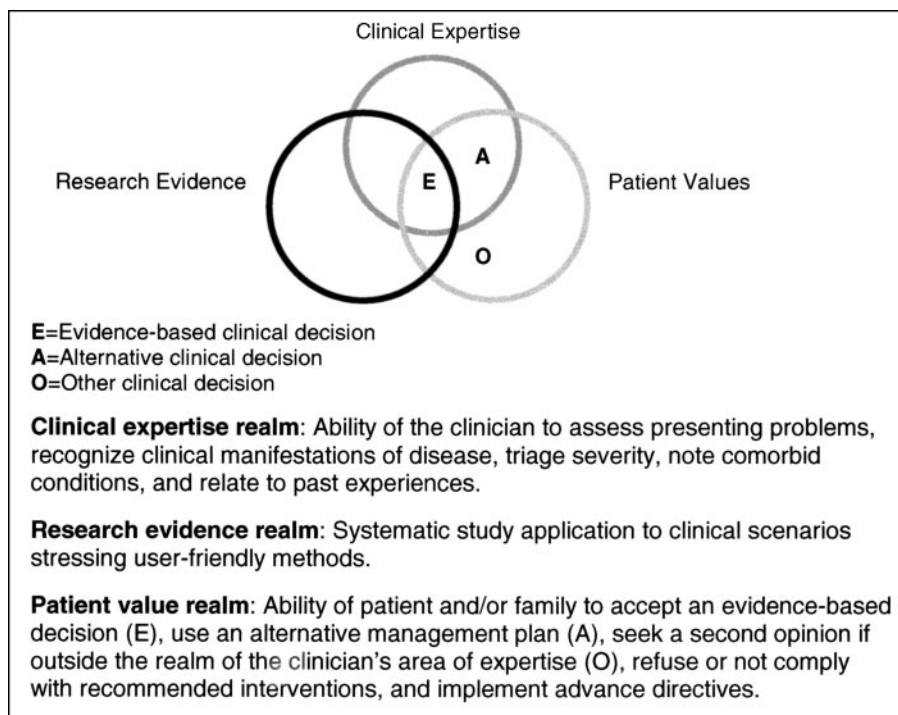


Figure. Integrating research evidence into clinical experience.

should be ordered or how such data are presented to the patient and family. Additionally, not performing surgery because of the false sense of security engendered by negative test results places this patient at significantly higher risk of morbidity and mortality (8).

Challenging the Process: Apprehensions Surrounding EBM

To appreciate the quality of information that allows the clinician to arrive at a starting point in medical decision-making, it is important to explore the debate in the medical literature that expresses apprehension about the EBM approach in the daily practice of medicine. Enumerated below are a few of the more common arguments against EBM.

1. *EBM is “cookbook” medicine, relying blindly on guidelines and practice parameters.* Relying on and incorporating clinical expertise into the EBM clinical decision-making model separates EBM from “cookbook” medicine. Explicit and conscientious consideration of all available resources in caring for children actually may use a cookbook (clinical guideline) as one tool. However, the recommendations in the guideline are tailored by clinical expertise and patient values that fit the specific clinical

problem. EBM decision-making applied to individual patients guards against the “cookbook” medicine temptation to proceed blindly down a clinical practice guideline into which a patient does not quite fit. Such a course might be called practicing *medicine that is evidence-based*, which is not the same process as practicing *evidence-based medicine*. It is our intent throughout this series to point out these distinctions.

2. *What do you think we’ve been doing all these years?* A major component of a physician’s clinical expertise is learned during training and through interactions with colleagues. Slow uptake into practice of new and effective therapies, continuation of practices that have been discounted, and the wide variation of approaches to a given clinical situation make it seem as if we have not always been applying the core aspects of EBM into everyday practice. One of the differences between EBM and “the way we’ve always done this” is in advancing the skills to evaluate clinical research critically. This process allows physicians to filter and refine the quality of the clinical expertise “tradition” and enables physicians to apply clinical data more directly to the relevant values of an individual patient. Techniques will be detailed in this series that will demonstrate how literature searches can

be conducted with time-saving efficiency through the use of convenient tools. Tools also will be presented that allow effective and critical evaluation of the evidence.

3. *EBM takes too much time.* Time-consuming methods can be problematic in a busy clinical practice where there is constant pressure to see more patients. Contributing to this problem is the large volume of new medical information available to today's practitioner. Also, it seems that the rate at which these data are supplied is accelerating. Individual attempts to review a significant portion of the data would be nearly futile. Making this point, 40% to 60% of the best evidence in pediatrics would be found by reviewing "only" 10 journals. (9) Reviewing these journals is no small task and still would miss 50% of available and possibly relevant evidence. Aids for evidence-based reporting are being used in several publications that review, validate, and summarize pertinent data for practitioners. Methods will be detailed in this series to reduce the time required to use these resources.

4. *There isn't enough good evidence out there.* As noted previously, the lack of evidence is not nearly as troubling as the volume of available data. In fact, there is ample evidence available for daily patient encounters. Roughly 50% of clinical actions by community pediatricians have been found to have valid, supporting evidence (10). This series will demonstrate methods that will allow the busy practitioner to navigate this vast sea of information and stay on course to arrive quickly at the desired destination.

5. *EBM has no evidence showing it to be useful.* There have been sparse data until recently regarding the "evidence behind EBM." Preliminary data suggest that the critical appraisal skills used to practice EBM can be taught through a seminar format (11) and that, in contrast to traditional continuing medical education, this approach can provide point-of-care evidence that can alter physician behavior (12). Not only can the EBM approach be effective, but it can be learned. You, too, will learn this through this series.

6. *The evidence could be used against us.* Health care systems may use evidence in attempts to influence our practice. Ideally, this influence is exerted with the primary goal of improving patient care. Skepticism remains that health care administrators are simply looking for the cheapest route to deliver care, and it must be remembered that the "best" care may not always be the least expensive. In fact, many new medications and treatments can be more costly. The concepts that follow in this series actually can be used to influence health care vendors to accept and use your evidence-based approach rather than their population-based guidelines.

Conclusion

What if we decide to stick with what we know? At that final moment when all the evidence has been collected and the ultimate medical decision is about to be made, how good is the intuition accumulated through years of clinical expertise in making the optimal decision? Intuition fails in more than 50% of decisions made by full-time clinical faculty (13), yet only 3% of clinicians use formal decision making through the methods discussed here. (14) EBM provides the ability to crosscheck the universe of medical information to go beyond intuition. Integrating EBM into medical decision-making is a dynamic process that uses tools to enhance the efficiency of the process for busy pediatricians.

Physicians relying on intuition who do not use recent, relevant evidence risk employing outdated or unnecessary tests and treatments. This approach could result in suboptimal outcomes for patients. EBM has been designed specifically to address this issue. In future articles, we will describe these methods by using case presentations. We hope to show EBM "at work" and offer specific, user-friendly tools that allow the general pediatrician to incorporate these techniques into a busy practice.

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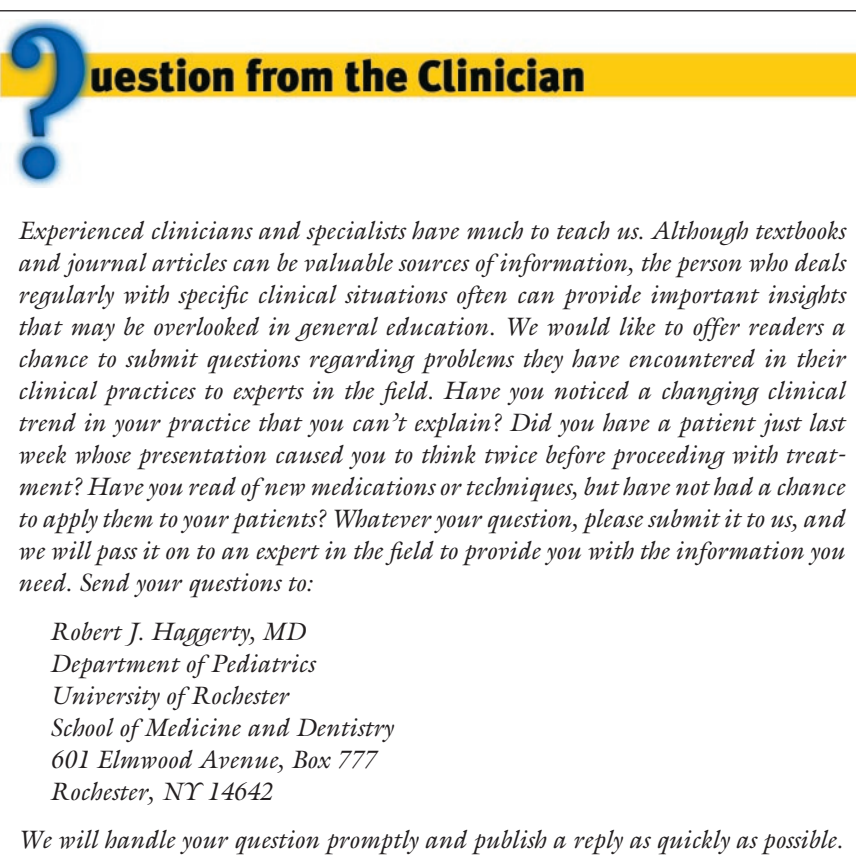
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A graphic titled "Question from the Clinician" featuring a large blue question mark on the left. The title is in bold black text on a yellow background. Below the title is a paragraph of italicized text inviting clinicians to submit questions. At the bottom, contact information for Robert J. Haggerty, MD, is provided, along with a promise to handle questions promptly.

Question from the Clinician

Experienced clinicians and specialists have much to teach us. Although textbooks and journal articles can be valuable sources of information, the person who deals regularly with specific clinical situations often can provide important insights that may be overlooked in general education. We would like to offer readers a chance to submit questions regarding problems they have encountered in their clinical practices to experts in the field. Have you noticed a changing clinical trend in your practice that you can't explain? Did you have a patient just last week whose presentation caused you to think twice before proceeding with treatment? Have you read of new medications or techniques, but have not had a chance to apply them to your patients? Whatever your question, please submit it to us, and we will pass it on to an expert in the field to provide you with the information you need. Send your questions to:

*Robert J. Haggerty, MD
Department of Pediatrics
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School of Medicine and Dentistry
601 Elmwood Avenue, Box 777
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We will handle your question promptly and publish a reply as quickly as possible.

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