Introduction to EBM

Interest in EBM has grown exponentially since the coining of the term in 1992 by a group led by Gordon Guyatt at McMaster University, Hamilton, Canada, from one Medline citation in 1992 to over 170,000 in June 2019. A search using the term "evidence-based medicine" retrieves almost 790 million hits and more than 2 million hits in Google and Google Scholar, respectively. This [updated] sentence comes from Dr. Straus’s book whose first edition was by Dr. Sacket and now in its fifth edition. I recommend this book as one of the best EBM references, so if you write an essay (3000 words) on this book that will suffice as your EBM requirement to graduate. Needless to state that I am heavily using this book to develop the core curriculum for this course. In addition to this book, I am using the work of Dr. M. Ebell with his permission while he was at Michigan State University. Other references will be noted as needed. I cannot take any credit for the content of such references, just for the organization and initiative of putting this curriculum together. Although on occasions, I interject my biases, in those instances, I will try to separate them from the original citations.

The question is why the interest in EBM has grown so fast and the prefix evidence-based has permeated not only medicine but many other disciplines including education, social work, and even chaplaincy. Also, EBM is now part of the academic milestones in medical education and residency training programs. I am not sure that there is a single answer to this question. I will limit the focus of this course to EBM instead of evidence-based health care (EBHC) to try to distinguish our practice as clinicians. EBHC encompass many other areas of clinical and non-clinical areas, but my interest (one of my biases) is that we should invest in the learning of EBM to have a critical approach to clinical issues. Policy, economics, and other disciplines evidence-based approach are beyond the scope of this curriculum.

Contrasting a practice without the principles of EBM and a practice adopting those principles may show some of the arguments used to justify EBM. Of course, it is ultimately up to you to adopt these principles or not. If you reject these principles and adopt a different way to practice medicine, I would encourage you to articulate the arguments you used to base your decision and compared with the ones presented. If rationally yours are better, I will change my mind, and I will follow you.

Let us base the contrast of two practice on the following topics:

1. Use of evidence
   a. Practice without EBM
      Every medical decision is based on some level of evidence. This is a central theme that we will continue to explore in this course. Now the term evidence in EBM is confusing, since it may imply that before the introduction of EBM physicians practiced without evidence. Of course, this is not true. One of the main contributions of EBM is that it is a tool kit that allows us to grade the evidence. Evidence a term that comes from our legal system can be an opinion, experience, a random observation, or derived by careful experimentation. We may have diverse ways to define and apply evidence, but something evident is that evidence is not equal, there is a gradation of evidence from weak to strong. Not everything that is learned in school or it is published is evidence that benefits our patients. It is the critical appraisal of the evidence that I consider is the main contribution of the EBM movement. We constantly hear “science has demonstrated…”, “scientists using fMRI have proven…” “There is data that shows…” “Doctors at Harvard have proved … “An article published in the NEJM demonstrated that …” I think you get the idea. Just appealing to authority (fallacy) is
not enough for our patients. So, practice without the principles of EBM would not be supported by reliable external evidence, be it from randomized trials, systematic evaluation of a diagnostic test, or careful follow-up of large numbers of patients. Consider these well-known examples:

i. Back to sleep

Physicians in western countries traditionally recommended that babies sleep on their stomachs. It was thought that by sleeping on their backs, infants were at risk for regurgitation and aspiration, leading to sudden infant death syndrome (SIDS). In other words, the conventional wisdom was that infants behaved much like drunken rock stars! In the 1980s, some physicians asked the question, "Is there any evidence to support the practice of sleeping babies on their stomachs?" As it turned out, case-control and ecologic studies found a dramatic decrease in SIDS deaths among children sleeping on their backs, leading to the national "Back to Sleep" program. Had someone asked the question 20 years earlier, tens of thousands of lives might have been saved.

ii. Eyepatches for corneal abrasion

The standard practice of both family physicians and ophthalmologists has always been to patch the eyes of patients who present with a simple, uncomplicated corneal abrasion, as well as provide a mydriatic agent and antibiotic eye drops. However, no one ever asked if patching was beneficial - it was just "common sense." There have been at least five randomized controlled trials of patch vs. no patch, and each has come up with the same answer: patches offer no benefit, and may even slow healing and increase patient discomfort.

iii. Anti-arrhythmic agents

In the late 1980s, encainide and flecainide were marketed as anti-arrhythmic agents based on their ability to suppress ventricular arrhythmias. However, a large randomized controlled trial (CAST) showed that mortality was considerably higher among treated patients than among controls, not an ideal outcome! This especially demonstrates the problem of relying on "intermediate" or "disease-oriented" outcomes such as arrhythmia suppression, rather than looking at more important measures such as mortality, morbidity, and quality of life.

iv. Steroids in prematurity

In 1973, a small study demonstrated that steroids given to women expected to deliver prematurely reduced the likelihood of death in their infants. Six further studies in the next 10 years had mixed results, primarily because they were all quite small. Had a meta-analysis been done in 1983, it would have shown that the overall results of all the trials combined supported a beneficial effect of steroids. However, it took another decade and seven more studies before these results were accepted and began to change practice. Had a systematic review of the literature been performed in 1983, it might have changed practice much sooner and saved thousands of lives.

The results of the first seven studies of steroids in prematurity, and the summary results (the diamond at the bottom of the diagram) are memorialized in the logo of the Cochrane Collaboration. The bars represent the confidence interval of the odds ratio of infant death, and the vertical line is an odds ratio of 1.0. Thus, lines completely to the left of the vertical bar represent a statistically significant benefit of steroids in preventing death.
The Cochrane Collaboration supports the evidence-based practice of medicine by performing systematic reviews of the literature to answer important clinical questions.

v. A more recent example is the use of aspirin for primary prevention of cardiovascular disease in the elderly.

b. EBM practice

The premise is that medicine is probabilistic. Diseases are not ontogenic entities on their own that follow a defined course waiting to be discovered by us. Uncertainty is the only certainty in medicine. Every patient is different, and outcomes are determined by multiple factors, including genetics, biological, social, psychological, and contextual issues. A sodium level of 143 mg/dL is not the absolute concentration, is just an approximation to the true value at that time.

Let us start with the definition of EBM. I will provide two definitions: the first one is from Dr. Sacket and has changed little in time:

Evidence-based medicine (EBM) requires the integration of the best research evidence with our clinical expertise and our patient’s unique values and circumstances.

- By best research evidence, we mean clinically relevant research, sometimes from the basic sciences of medicine, but especially from patient-centered clinical research into the accuracy and precision of diagnostic tests (including the clinical examination), the power of prognostic markers, and the efficacy and safety of therapeutic, rehabilitative, and preventive strategies.
- By clinical expertise, we mean the ability to use our clinical skills and past experience to rapidly identify each patient’s unique health state and diagnosis, his or her individual risks and benefits of potential interventions/exposures/diagnostic tests, and his or her personal values and expectations. Moreover, clinical expertise is required to integrate evidence with patient values and circumstances.
- By patient values, we mean the unique preferences, concerns, and expectations that each patient brings to a clinical encounter and that must be integrated into shared clinical decisions if they are to serve the patient; by patient circumstances, we mean the patient’s individual clinical state and the clinical setting.

This definition is the more accepted one. However, it may imply a moral imperative that physicians not practicing EBM may be using not the best evidence, and practicing non-consciously and non-judiciously. To contrast, this definition Greenhalgh alternatively defines EBM as:

The use of mathematical estimates of the chance of benefit and the risk of harm, derived from high-quality research on population samples, to inform clinical decision-making

The goal of this definition is to expose three underlying assumptions according to the author:

1. Clinical practice equates more or less with clinical decisions
2. Clinical decisions are best made using mathematical predictions
3. Evidence from population samples maps more or less directly to decisions on individual patients.

In practice, I favor Greenhalgh’s definition of pure clinical EBM. Clinical practice is about making decisions on diagnosis, treatment, and prognosis. Where do we get the evidence? Is the evidence applicable to my population? Incorporating this line of thoughts seems daunting, and mathematics is
always intimidating. However, consciously practicing under these premises makes the process progressively easier and quite rewarding. You need an inquisitive and skeptical mind, but most of all, curiosity. As a native American saying goes, curiosity is the mother of wisdom.

The practice of EBM follows repetitive steps referred to as the 5A’s (Ask, Acquire, Appraise, Apply, Assess). The first one is the most difficult one, asking an answerable question. This is what we do every time we see a patient or decipher what a study is about; therefore, the objective is to practice on how to ask clinical questions consistently. An EPA is dedicated to this activity, using the PICO format. Once that the question is formulated then acquiring and appraising the evidence will help to apply that information to the patient. To complete the cycle, patient outcomes need to be frequently assessed to ensure that diagnosis or interventions are working.

Consider the example of patching eyes for a corneal abrasion. Identifying the best way to manage corneal abrasions begins when you ask the question, "Is there any evidence that patching eyes improve outcomes for my patients with a corneal abrasion." Learning how to ask these questions is a skill, and also a habit for lifelong learning.

Next, you (or a colleague) must search all the existing literature, to see if anyone has attempted to answer the question. Note, I said, "all of the literature." An evidence-based approach requires that you systematically and exhaustively search the medical literature to identify all the relevant evidence. Finding one or two recent and conveniently available articles that happen to support your thesis is not evidence-based medicine!

Once you have found some articles that attempt to answer your clinical question, you have to appraise their validity. Validity can be internal or external. A study with good internal validity has used the right study design and appropriate methods to answer the question. External validity can be thought of as generalizability - the results can be generalized to your patients, practice, or community. Assessing validity is an important skill, and completing the EPAs will help you develop it.

Finally, you must decide whether the results can be applied to your practice. We all operate within constraints imposed by economics, health systems, patient preferences, culture, and availability of resources. Remember, external evidence requires context.

An evidence-based approach is sometimes confused with cost-effectiveness. Not necessarily although an evidence-based approach should increase effectiveness, it may also result in higher costs.

2. Heuristic instincts
   a. Practice without EBM

As stated before, we as clinicians face clinical decisions in every patient encounter. How sick is the patient? Do we start treatment? Which one? What happens if we do not intervene? Is a test appropriate? What to do with the results? And the list goes to all areas of diagnosis, interventions, prognosis, and screening. How do we diagnose a condition? Is there a one hundred percent certainty of the diagnosis at all times? A prevalent theory about clinical decisions is from Kahneman that describes two systems. System 1 operates automatically and quickly, with little or no effort and no sense of voluntary control. The system is heuristic best defined as simple guides to action or rules of thumb that allow us to act or make a decision without calculation or deliberation. In contrast, System 2 allocates attention to the effortful mental activities that demand it, including complex computations. System 1 decisions are important in clinical practice but frequently fail us.
There are many, many more examples of "obvious" interventions which fail to help our patients live longer or better lives. How can common sense fail us so badly? As human beings, we are "wired" to respond to cues from the environment in certain, predictable ways. In particular, it has been very successful from an evolutionary perspective to look for causality in our environment:

I shook the tree, and a coconut fell on my head. Hmm....maybe shaking the tree caused the coconut to fall on my head! Better not shake trees without first watching for falling coconuts...

Consider a similar example from the medical realm:
I gave my patient who has had bronchitis for 4 or 5 days an antibiotic, and 3 days later she felt better. Hmm...maybe giving the patient the antibiotic caused her to feel better! I better give all of my patients with bronchitis an antibiotic...

This "causality heuristic" is driven by our belief in ourselves as physicians, our belief in the value of pharmaceutical interventions (which have been so successful for other conditions), and our patients' desire to see their decision to visit the physician validated. A lawyer (or a Latin teacher) would say post hoc ergo propter hoc, or "after this, therefore because of this".

There are many other heuristics or "rules of thumb" which guide, and sometimes mislead, clinical decision-making. I advise reading Trowbridge article on Twelve tips for teaching avoidance of diagnostic errors. This is an excellent resource on how to deal with heuristics.

Physicians can also be led astray by ignoring the prior probability of disease. For example, the likelihood that chest pain is caused by coronary artery disease is vanishingly small in an otherwise healthy 20-year-old but may exceed 50% in an older patient with multiple risk factors. The youth may require only a careful history and reassurance; while for the older patient catheterization may be an appropriate initial study. While having a single diagnostic strategy for all patients with chest pain would be convenient, it would not be good practice.

"Regression to the mean" is often unrecognized and can lead to inappropriate diagnoses and interventions. Consider a patient with a slightly elevated liver function test on the first measurement: Clearly, it is much more likely, just given random variation, that the second measurement will be lower than higher. There is much more of the curve to the left than to the right of the initial measurement! For another example, pretend the above numbers represent rookie batting averages. Any baseball fan can tell you about the "sophomore jinx": A player who has a great rookie season (hitting .320, for example) is unlikely to do as well or better their second year. That is a regression to the mean at work.

b. EBM Practice

Taking an evidence-based approach gives you a solid framework for evaluating new evidence from the literature, critically appraising existing practices, and effectively using the clinical information you gather from your patients. For example, by understanding how much a test result should change the probability of disease (you will learn about this after completing the EPAs), you can avoid common errors of overtreatment or undertreatment. A better understanding of study designs will help you to understand the importance of randomization and systematic evaluation, rather than relying too much on anecdote and personal experience. EBM practice provides an approach for System 2 decision making, particularly for complex conditions. The automatic operations of System 1 generate surprisingly complex patterns of ideas, but only the slower System 2 can construct thoughts in an orderly series of steps, which is reflected in the 5A’s steps of EBM.
3. Practice Variability
   a. Practicing without EBM

   As new tests and therapies are developed, how do physicians decide which to adopt? Without a clear, consistent framework, these decisions are typically driven by the practice patterns of local "opinion leaders," advertising, pharmaceutical representatives, specialists who may see a different spectrum of patients and other potentially biased sources. The result is a huge variation in practice patterns among regions, states, and even cities in the same state.

   b. EBM Practice

   As more physicians practice in an evidence-based manner and use the same skills and criteria to answer clinical questions, we should see less variation in practice. Evidence-based practice guidelines take into account differences between populations and allow flexibility for patient and physician decision-making. They are an efficient way to disseminate recommendations based on the best evidence without requiring each physician to do literature searches and validity assessments. However, much more research is needed on the best way to change physician practice.

4. Medical Information
   a. Practice without EBM

   Each month, thousands of medical journals publish tens of thousands of articles. Even if you only consider the 90 or so clinically oriented journals of most interest to primary care physicians, they publish over 15,000 articles per year. If you read 40 articles every day of the year, you would still fall woefully behind!

   Clearly, physicians cannot read everything. Also, much of the literature is in apparent conflict with a sort of "ping-pong" game played as issues are debated in the pages of journals. Results are often presented which are premature, use inappropriate outcomes, or represent communications to other researchers, not clinicians. Most importantly, many published studies suffer from serious flaws which invalidate their results. Unless specially trained in critical appraisal, physicians may be misled by these invalid results. A systematic, rational strategy is needed to deal with this information overload

   b. EBM Practice

   A common misperception about EBM is that you need to be a biostatistician or epidemiologist to master current medical information. As a busy clinician, you do not have the time to analyze primary publications, meaning abstracting and validating methodology and findings. Currently, there are many sources that they do this for you, “pre-digested” in a user-friendly format.

   If you are interested in being a primary reviewer, there are numerous schools that offer a master level in EBM, and I can help you apply to any of these schools. For the vast majority, my advise is to become an information master, and they are many ways to achieve this objective. Select a few sources (See table below) and adhere to these sources reviewing them at least once a week.

5. Medical Knowledge
   a. Practicing without EBM
Although medical knowledge declines as physicians get further from medical school, their ability to practice the "art" of medicine improves. Physicians get to know their patients, hone their diagnostic skills, and are exposed to an ever-increasing number of patients and problems. Wouldn't it be great if our medical knowledge also improved as we moved through our careers?

b. EBM practice

So, is there any evidence for evidence-based medicine? Sackett describes observations of McMasters University graduates (who have been trained in evidence-based medicine) and graduates of other Canadian medical schools (who were not) over 10 years. The McMasters graduates maintained their knowledge of the management of hypertension while the other graduates experienced a statistically significant decline. More work is needed in this area, though, and it remains an important area for future research.

Information Mastery

To be useful, medical information should be relevant to everyday practice, correct (valid), and easy to obtain. Slawson and Shaughnessy describe a formula which relates these three factors in a "Usefulness equation":

\[
Usefulness \text{ of Medical Information} = \frac{Relevance \times Validity}{Work}
\]

Let's consider each of the elements of this equation. Validity is the hardest part of information mastery, and it is the element on which the Evidence-Based Medicine Working Group at McMasters University and other pioneers of evidence-based medicine have focused. Their work has focused on evaluating the validity of original research articles in the primary medical literature. However, physicians seek and get information from a wide variety of sources, not just journal articles. In fact, journal articles are used quite infrequently to answer clinical questions. Much more commonly, we ask colleagues, talk to pharmaceutical representatives, read review articles, and consult textbooks and other references. As cited earlier the central theme of this discussion is that we make a decision based on evidence; the EBM contribution is to ascertain the validity of that evidence establishing different levels of evidence.

Currently, many professional associations and more and more review articles give you reference on the quality of the evidence. SORT strength of the recommendations is now a staple in many medical publications. The Grading Recommendations Assessment, Development, and Evaluation (GRADE) working began in the year 2000 as an informal collaboration of people with interest in addressing the shortcomings of grading systems in health care. The working group has developed a common, sensible, and transparent approach to grading quality (or certainty) of evidence and strength of recommendations. Many international organizations have provided input into the development of the GRADE approach, which is now considered the standard in guideline development. It is important to understand how the evidence presented to you has been sorted; there is a parallel with the concept of levels of evidence and levels of recommendation’s strength. Not because a particular journal classified a piece of evidence as A the highest level of evidence it means that is the highest; you still need to discern if that is acceptable or not. GRADE brings an extra tool that you can rely on to make your work easier.

Relevance is based on the frequency that we are exposed to the clinical question in our practice, and the type of evidence presented. Medical information can be categorized as either disease-oriented (e.g., pathophysiology, pharmacology, etiology) or patient-oriented (e.g., symptoms, mortality, days in the hospital, cost). Relevant information is, therefore, patient-oriented evidence, and it focuses on medical problems common to our practice.
One of the basic laws of human behavior is that we want to do the least amount of work we can get away with. That applies to search for the answers to clinical questions. It is, therefore, important when considering the usefulness of medical information to balance the relevance and validity with the work needed. The most useful information is therefore very relevant to our practice, has high validity, and doesn’t much work to access. Let’s apply this equation to some common sources of medical information:

**Another physician**

My partner is likely to see the same patients as I do, so his or her relevance is good. Work is low; all I have to do is catch them in the hallway. Validity is likely to be variable, though, depending on their training in evidence-based medicine and their ability to critically appraise their own practice.

**A pharmaceutical representative**

While the work is usually low (too low, some might argue!), relevance and validity are questionable. Pharmaceutical reps often present disease-oriented evidence, and they may be more comfortable with a specialty rather than primary care perspective.

**An article in the latest New England Journal of Medicine**

This source of information generally has pretty good validity. However, the results may have been obtained in a carefully selected sample of patients in a tertiary care setting and may not have much relevance for our primary care practice. Also, the work needed to find and read such an article, and assess its validity, is considerable.

Based on a BM J publication⁶ the following table is useful to select different sources of medical information using the usefulness equation.

<table>
<thead>
<tr>
<th>Information Source</th>
<th>Description</th>
<th>Relevance</th>
<th>Validity</th>
<th>Work</th>
<th>Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Essential Evidence Plus – POEMS</strong> <a href="https://www.essentialevidenceplus.com">https://www.essentialevidenceplus.com</a></td>
<td>An evidence-based clinical decision support tool featuring summaries, guidelines, literature reviews, and calculators. Patient-Oriented Evidence that Matters (POEMs) research summaries may be emailed daily</td>
<td>Low</td>
<td>High</td>
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<tr>
<td><strong>DynaMed Plus</strong></td>
<td>An evidence-based point-of-care tool that provides overviews and recommendations for diseases and conditions. It includes integrated Micromedex drug content, integrated American College of Physicians (ACP) content and images, and calculators for decision support.</td>
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<td><strong>NEJM Journal Watch</strong></td>
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<tr>
<td><strong>Evidence Alerts from McMaster PLUS and DynaMed Plus</strong> <a href="https://www.evidencealerts.com">https://www.evidencealerts.com</a> (free)</td>
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<td><strong>Read by QX</strong> <a href="https://read.qxmd.com">https://read.qxmd.com</a></td>
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<tr>
<td><strong>Cochrane Database of Systematic Reviews</strong></td>
<td>Collection of EBM databases, including the full text of Cochrane systematic reviews with references and search information</td>
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<tr>
<td><strong>PEPID</strong></td>
<td>Portable Emergency and Primary-care Information Database. Includes adult and pediatric clinical rotations with disease diagnostics and treatment information, lab values, an extensive drug database (including</td>
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<tr>
<td>Information Source</td>
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<tr>
<td>Trip Database</td>
<td>A meta-search engine for sources of high-quality internet information, including PubMed's clinical queries and government guidelines. It has EBM-based features such as a PICO search, evidence filters, and rapid review</td>
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<td>Low</td>
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<tr>
<td>Epistemonikos</td>
<td>Collaborative, multilingual database of health evidence. It is the largest source of systematic reviews relevant for health-decision making, and a large source of other types of scientific evidence</td>
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<td></td>
<td>Low</td>
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<tr>
<td>UpToDate</td>
<td>Evidence-based, peer-reviewed clinical information</td>
<td></td>
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<td></td>
<td>Low</td>
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<tr>
<td>USPSTF ePSS Tool</td>
<td>Electronic Preventive Services Selector: search and browse U.S. Preventive Services Task Force (USPSTF) recommendations and guidelines.</td>
<td></td>
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<td></td>
<td>Moderate</td>
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<tr>
<td>ACP Journal Club</td>
<td>ACP Journal Club is a monthly feature of Annals of Internal Medicine that summarizes the best new evidence for internal medicine from over 130 clinical journals.</td>
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<td>Low</td>
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<tr>
<td>ECRI Guidelines Trust (free)</td>
<td>Repository of objective, evidence-based clinical practice guidelines for patient care; includes current evidence-based guidance developed by nationally- and internationally-recognized medical organizations and medical specialty societies</td>
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<td></td>
<td>Low</td>
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<tr>
<td>NNT</td>
<td>The NNT (Number Needed to Treat) contains quick summaries of evidence-based medicine. Contains evaluations of therapies based on patient-important benefits and harms, and of diagnostics by patient sign, symptom, lab test or study</td>
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<td>Low</td>
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<tr>
<td>PubMed Clinical Queries</td>
<td>Specialized PubMed evidence-based medicine search. Narrows your search results by clinical study category, the systematic review subset, and by medical genetics topics</td>
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<td>Low</td>
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<tr>
<td>Epocrates</td>
<td>Contains the respected disease information from BMJ Best Practice</td>
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<td>Low</td>
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<tr>
<td>Medscape</td>
<td>Popular free physicians reference contains the disease reference formerly known as eMedicine</td>
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<td>Low</td>
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<tr>
<td>uCentral</td>
<td>A platform for mobile and online medical references: Washington Manual, 5-Minute Clinical Consult, Harriet Lane Handbook, Johns Hopkins ABX, Diabetes, and HIV Guides. Clinical calculators are also featured</td>
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<td>Low</td>
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<tr>
<td>Clinical Practice Guidelines in Oncology</td>
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<td>Low</td>
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<td>Google or Google Scholar</td>
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<td>Low</td>
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<tr>
<td>Wikipedia</td>
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<td>Low</td>
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<tr>
<td>Mass media</td>
<td></td>
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<td></td>
<td></td>
<td>Low</td>
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<tr>
<td>CME lectures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Standard textbooks</td>
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<td>High</td>
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</table>

**Becoming a Medical Information Master**
This is your goal, this way, you learn to emphasize sources of information that are high in relevance and validity, and low in work. It doesn’t mean working harder – it means working smarter and making the best use of your limited time to get the information that matters for you and your patients.

Knowing where to look to answer clinical questions is an important skill. A somewhat different set of skills is needed to keep up with the literature. While "foraging" every month in the literature, you should look for POEMs and avoid DOE. POEMs and DOE. The term POEM stands for "Patient-Oriented Evidence that Matters," and refers to the kind of article that:

- addresses a clinical problem or clinical question that primary care physicians will encounter in their practice
- uses patient-oriented outcomes
- has the potential to change our practice if the results are valid and applicable

An example of a POEM is a randomized controlled trial that demonstrates that not patching corneal abrasions leads to less pain and faster healing than patching. Why? Let's consider each element. First, corneal abrasion is a problem encountered often by primary care physicians. Second, the article considers pain, healing rate, and complications as the primary outcomes. Clearly, these are outcomes that our patients and we care about. Third, since the traditional practice has been to patch corneal abrasions, this is a "practice-changer."

DOE stands for "Disease-Oriented Evidence." DOE are all too common in the medical literature, and they are often brought to our attention by pharmaceutical representatives eager to change our practice. However, this kind of evidence is often misleading and generally should be considered premature. For example, early studies of the drug finasteride showed promise, based on the effect on the urinary flow rate. Many patients were put on the drug, at great cost. However, further randomized trials showed that symptom scores did not improve any more than placebo. What do your patients care about - whether their urinary flow rate improved, or whether they are sleeping through the night? When POEMs exist, forget the DOE.

The following table divides POEMs and DOE into "common" and "uncommon" categories. Common conditions are those encountered at least every two weeks in the typical primary care physician's office, while uncommon conditions are those encountered less often:

<table>
<thead>
<tr>
<th></th>
<th>POEM</th>
<th>DOE</th>
</tr>
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<tbody>
<tr>
<td>Common</td>
<td>Read these</td>
<td>Dangerous</td>
</tr>
<tr>
<td>Uncommon</td>
<td>Read if you have time</td>
<td>Worthless</td>
</tr>
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The third kind of article fills the medical literature: POE's. These studies use patient-oriented outcomes, but the findings don't have the potential to change practice. They confirm what we already do and, while important, are not a priority for our reading.

As a physician caring for patients, you must provide the best possible care. You also have a moral obligation to stay up to date. Since time is limited, your efforts should focus on identifying, validating, and applying common POEMs to practice. Focusing your work on POEMs frees you from reading most of the medical literature since over 97% of it is DOE and other material. This figure comes from a six-month survey of 90 journals, which identified 8047 articles and only 213 POEMs (2.6%). This figure includes both common POEMs (encountered at least once every 2 weeks) and uncommon POEMs (encountered less often than every 2 weeks, but at least once over six months).

What about all those DOE? First, ignore the rare DOE about "zebra" conditions that occur so rarely that a typical primary physician may encounter them only once or twice in a career, if at all. When you have such a case, you can always look it up! Common DOE, because they do not use patient-oriented outcomes, should not change
practice. The medical literature is full of examples where preliminary data were promising, or intermediate results looked good, but disappointing when real patients and real outcomes were measured. Have the confidence to reject these findings as premature. Even "obvious" intermediate outcomes such as blood pressure or cholesterol can be misleading. For example, there has never been a randomized, controlled trial which demonstrated that calcium channel blockers reduce cardiovascular or all-cause mortality. Now, some case-control studies suggest that there may even be harmful. In fact, among diabetic hypertensives, two randomized trials have now demonstrated increased mortality for calcium channel blockers compared with ACE inhibitors. Similarly, while some antihyperlipidemic reduce cardiovascular mortality, they raise all-cause mortality. I don't know about your patients, but mine doesn't care which category their mortality was in, they just want to avoid it!

2. Ebell M, Barry H. Introduction to Evidence-Based Medicine. In: University MS, ed. Primary Care Faculty Development Fellowship Program. MSU2003.