

**Evidence-Based
Medicine:**

“The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.”¹

Evidence-Based Medicine

The emergence of “evidence-based medicine” as a buzz-phrase happened right about the same time as my birth is a doctor. My medical school gave me a little black doctors bag that had my stethoscope, my blood pressure cuff, my ophthalmoscope, and a big peripheral brain full of “evidence-based medicine”. I wanted to provide the pinnacle of care using research as my guide. Born into medicine as an EBM enthusiast, I remain so today.

As coined in 1996, the definition of evidence-based medicine is:

“The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.”¹

Practicing evidence-based medicine begins with a patient care question and a review of the best evidence available. A commonly utilized structure for this process includes:

Step 1: Define the problem:

Beginning with turning the clinical issue into an answerable, relevant question that will help the patient, this process guides investigation and prompts review of useful resources as well as

anticipation and comparison of possible outcomes. PICO serves as a useful acronym:

P: Patient and Problem

--We must consider the patient's history, prior treatments, what their preferences are as we begin to guide treatment. This will help inform our search for options that may be acceptable.

I: Intervention:

--evidence based medicine seeks to compare interventions in the framework of an individual's preferences and resources to identify the best choices.

C: Comparison

- Comparing proposed interventions to other strategies, using the research as a guide.

O: Outcomes.

- The goal is to use the evidence-based to plan courses of action for our patients that fit within their value system that have favorable outcomes,

Step 2: Investigate the Best Research

After defining the problem, one explores the pertinent research, identifying the best evidence in a systematic manner. Pubmed.gov remains the primary site where physicians may go to access the most current research. Other useful sites include:

- Cochrane Library
- UpToDate
- DynaMed

Step 3: Evaluate the Evidence

Determination of the quality of the evidence follows the gathering phase. It is important to look carefully at methods used, type of study, randomization, blinding, population studied, statistical interpretation of the study, possible biases, and applicability. Many use the AAFP's SORT taxonomy² which divides the research into 3 groups based on strength of evidence,

considering a successful, adequately-powered “randomized, controlled, double-blind trial” to be the strongest type of evidence.

- Type A Evidence: Consistent and good-quality patient-oriented evidence
- Type B Evidence: Inconsistent or limited-quality patient-oriented evidence
- Type C Evidence: Based on consensus, usual practice, opinion, treatment, prevention, or screening. Using a combination of strength of evidence ratings combined with risk/benefit ratios, patient preference, their beliefs and resources, the provider collaborates with the patient to determine the best course of action.

To analyze the evidence, the provider must also consider:

The Who?

- Who *carried out* the study and how does the outcome affect that entity, determining conflicts of interest.
- Who *funded* the study and how does the outcome affect that entity.
- Who is being studied? Does the population studied have similar characteristics to the patient?

The Why?

- Why was the study performed? Are there any hidden agendas at play?

The How

- Methods must be scrutinized to determine whether the study designers:
 - used logical thought process.
 - applied appropriate understanding of the pertinent basic science and used the scientific method.
 - designed a valid study with enough power to test the hypothesis.
 - used correct and honest statistical analysis to report findings and interpretation.
 - made adequate effort to limit bias as much as possible.

The What?

- What are the results and are they applicable to my patient?
- What are my patient's desires, preferences, and needs; how does the information fit into their lives?
- What are the options available to the patient-clinician team?
- What are secondary, unintended outcomes of available treatments such as side effects?

Step 4: Apply the Evidence to Patient Care

In this step the physician and patient co-create a treatment plan with the understanding of these factors and clear patient-oriented goals.

Step 5: Determine Outcome Efficacy

As a group of people who have devoted our life to helping people feel better, this final step is critical. Understanding how the plan affected the person and reflecting on whole process allows us to grow as healers. It is also how we may cultivate a "prepared mind" following the results of daily practice and intervention.

My career as a family doctor developed in tandem with growing a family; the time came when I took a few years off to be a full-time mom. Upon returning to the practice of medicine, I worried if taking a couple of years off would affect my ability to provide the thorough, educated care I wanted to give. I appreciated sources such as Up-To-Date, the Cochran report, and publications that guided me through my busy day as my patient volume climbed, my appointments grew shorter, more boxes had to be checked, and the insurance companies were a little devil on my shoulder.

I became a heavy user of what I call "algorithmic care", I found comfort knowing I practiced "evidence-based medicine", following guidelines

created by committees of well-respected thought leaders in medicine and research, based on large placebo-controlled, randomized clinical trials. I imagined these were drafted to help those of us in the trenches, seeing 25 people a day, too busy to cull the literature, so that we could live our lives with sanity, enjoy our families, and provide quality medical guidance.

Large volume primary care tends to wear people down a bit. It certainly wore me down, and I found myself opting for something different. In a rogue move, I left a busy family practice, opening a small micropractice. Me, a room, a patient. simplicity. It was nice. Office visit lasting anywhere from 60 to 90 minutes. What a dream. And time to actually dive into pub med for myself? That's a luxurious fantasy impossible for most doctors because of the time constraints of medical practice. Huge kudos to my husband who made this possible as he supported my "volunteer job".

I found myself with long office visits and the ability to be the medical detective I have dreamed of being. Having time to do a literature search for each patient and read the research brings a doc to some eye-opening conclusions as well as some thoughts on how we currently practice medicine. Conflicts of interest, greed, bias and politics intrude into the world of research so significantly that virtually every bit of what we presume to be correct must be evaluated. Honestly, it brings me back to a statement by my medical school dean as 120 wide-eyed freshman listened intently. We were told, "Fifty percent of what you learn over these four years will turn out to be wrong. Its up to you to figure out which 50 percent". The message: stay current, stay sharp, stay in the game and evolve with the times. Put all you think you know through the "fifty percent" mill of your updated knowledge base before you believe what you read or have been told.

Driven by the principal of treating my patients based on the best evidence available, I have grown in my understanding of what it means to be conscientious (thoughtful, thorough and careful), explicit (clear and transparent) and judicious (using good judgment and common sense) in evaluating the current evidence, finding that determining who and what information to trust is more complex than I had previously believed.

Perhaps the rose-colored glasses have fallen to the ground. Certainly, I've grown up a little bit, reevaluating my naïve belief that medical research consistently works for the higher good and not the higher dollar, the truth rather than maintenance of the comfortable status quo, and that analysis of cold hard data carries more weight than the ivory tower opinions of industry or self-proclaimed experts.

Points to Consider Using EBM

Individuality of the Patient

With the advent of genomic, epigenetic and transcriptomic testing, it becomes clear that finding a “matched cohort” becomes harder and harder due to each unique metabolic fingerprint. Throw in biotoxin susceptibility and genetic variants, such as liver functions that change the speed of detoxification, and the water muddies, clouding the assumption that people of a similar age, demographic, and health status are truly close enough metabolically to be studied together.

How can we study such a complex system by moving a single variable and measuring the response? This presents the next challenge to those doing research. We already have complex intelligence systems in play in the areas of technology; the analysis of human systems must follow suit. Imagine the algorithmic controls necessary for plane flight, or the running of a high-speed train; these sorts of systems need to be in play in analyzing the research of the future. Complex systems analysis for the complex system that is the human being. Using the power of technology, we may even be able to find “matched cohorts”, which I would argue are currently virtually non-existent when one considers the unique metabolic, genomic, and epigenomic expression of each person.

Internet Noise and patient care

I continually have clients who have consulted the internet for their symptoms. Thoughts for the healthcare consumer desiring evidence-based medicine in the age of the internet:

- The loudest, most compelling voice does not always give the best evidence. True in politics...true in medicine.
- Conflicts of interest color health care advice online in both subtle and blatant ways.
- Much of the information on the internet is unresearched, regurgitated from someone else's website.
- A charismatic physician may deeply believe what they tell you, and may seem so sure of themselves that you absolutely believe them, **and** their facts may be wrong-- based on old information, biased studies, something their mentor believed and passed on, etc...

Infusing the Discovery Game Back into the Practice of Medicine

On Medical Education and Career Development

Current medical education and subsequent medical practice takes a whole bunch of bright, independent people, and subsequently boxes them by specialty. After the "specialty box" has been created for a doctor, there remains the illusion of free will. Then physicians are slowly and subtly shackled over years of practice by a combination of insurance companies' requirements, time constraints, increasing productivity requirements, more sick patients, and -forgive me on this one--cognitive decline due to lack of self care--so that sometimes there is only enough time, energy, and brain power to go to UptoDate or the Cochrane Review and look up the algorithm of care for their patient's diagnosis.

How to respond to what is happening in medicine? We must find our way back to fascination, exploration, curiosity, and engagement. Recalibrate and tune our senses, rekindle the possibility of “making our mark” that we gave up on when we decided not to go the MD/PhD route. Pattern recognizer. Sleuth. Discoverer. Healer.

Do we have tools that will allow the regular family doc or internist to connect obscure dots or deeply change medicine? We do, and they are entering into medical practice sneakily, through our EMRs, in spreadsheets, in algorithms that only our computer can understand but will become standard process for the next wave of physician. Being able to collate and process hundreds of data points using statistical medicine, much in the way a computer manages to autopilot a plane, taking many variables and making sense of them in a way incapable to the human mind, will allow huge leaps in true evidence-based medicine. Until then, as Louis Pasteur said, “Chance favors the prepared mind” and our minds must remain poised and ready to recognize the patterns...

We can find inspiration in stories of those who have seen clues and patterns and then doggedly pursued revealing the truth despite significant professional resistance:

- Ignaz Semmelweis a Hungarian physician in Vienna: understanding that handwashing saved the lives of women giving childbirth, was committed to an asylum for his “crazy” ideas that are part of basic understanding of disease transmission.
- Ritchie Shoemaker: Modern-day family physician and medical sleuth connecting the dots of biotoxin illness. Seeing patterns in his patients exposed to Pfiesteria, identifying treatment, recognizing symptom clusters in other similar biotoxin based illnesses such as exposure to water damaged buildings, mold, and Lyme disease, taking this information upstream against a raging political tide with all heart and no financing, from bedside to bench, finally seeing the facts taught in medical schools after 20 plus years of effort.

- Louis Pasteur: French chemist who worked to develop experiments supporting the germ theory of disease despite constant flak from scientific contemporaries.
- Barry Marshall, the Australian physician who won the Nobel prize for identifying the link between H. pylori and gastric pathology. He had to actually drink a culture of H. pylori to prove his point!

As we move past the dated “one disease-one drug” reductionist paradigm, treatment systems will be defined and evaluated. It will become evident that there are better, safer ways to treat people; we will let go of practices that are based on “herd medicine” mentality. One day research results could be instantaneously evaluated and internationally pooled, rigorously evaluated by non-biased (i.e. computerized) means and moved into application and use much earlier than the current lag of 17-20 years that it takes to bring the “new” science in application and treatment.

Remaining in the game as a provider of true evidence-based medicine requires the ability to evaluate the research in a thoughtful way, then consider your patient’s unique circumstances, draw upon clinical experience and expertise, and then find the mode of treatment that provides the best outcome with the fewest ill effects. It is more than checking off the boxes on the insurance-based tic sheet. It requires considering the outliers to whom the large RCTs may not apply. It keeps medicine interesting, challenging, and fun.

“I am on the edge of mysteries and the veil is getting thinner and thinner.”

- Louis Pasteur

¹ Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS (1996). "Evidence-Based Medicine: what it is and what it isn't". *BMJ* 312 (7023): 71-2.

² Ebell MH, Siwek J, Weiss BD, Woolf SH, Susman J, Ewigman B, Bowman M. (2004) Strength of recommendation taxonomy (SORT): a patient-centered approach to grading evidence in the medical literature. 2004 Feb. *Am Fam Physician*. Feb 1;69(3):548-56.