

Do We Need Another Discipline in Medicine? From Epidemiology and Evidence-Based Medicine to Evidence-Grounded Cognitive Medicine and Medical Thinking?

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Abstract

Quo Vadis Medicine? the medicine and all producing, evaluating, and grading evidence remain fundamental focuses of evidence-based medicine. Determining how to subsequently use the best evidence is equally important: Even the best evidence can be misused in reasoning, decision making and communication in health sciences and other professions, both in research and practice.

In addition, medicine as an art and a science must constantly consider health problems through informal logic, argumentation, critical thinking, and rational decision making. Descriptions, analyses and experimentations based on a scientific method are now advanced, developed and methodologically diversified.

Coincidentally, but logically, fundamental and clinical epidemiology and biostatistics have expanded into evidence-based medicine. The best evidence and experience must be assessed through the best possible reasoning for critical thinking and decision making. We still do not know enough about how EBM and its critical uses do really contribute to the improvement of individual and community health. Let us work on enhancing our knowledge in this area.

Keywords: *Medicine; Evidence-Based Medicine; Cognitive Medicine; Medical Thinking*

Introduction

Medical reasoning starts with clinical judgment, but it ends with decision-making. It also requires a way of thinking, arguing, and reasoning to manage health questions and ultimately reach decisions. Shouldn't evidence-based scientific theory and cognitive approaches to medical thinking be integrated? This integration could lead to a necessary mastery of clinical and community care training and practice both at the undergraduate and graduate levels.

Also, is it not time to develop, interconnect, structure, apply, and use such evidence-grounded 'medical thinking' or 'iatrosophy' as an underlying element of everything we do in health sciences and professions? Or, should we understand and develop medicine today as a structured and integrated set and web of topics and activities to identify them, describe them, understand them, prevent and/or control

them? What thinking lies behind such activities in today's developing trends? What does it take to do all this based on past and present experience in research and practice?

How can all this be said both in plain, easy-to-understand language and in more specialized language within the large array of research and practice experience, acquired or to be acquired? In such a context, here is a proposal, however challenging it might be, for novices or curious veterans of relevant professions eager to understand better, do better, and evaluate better their success.

Looking at history and current trends in development both for research and practice of medicine in the past three generations, a period that approximately coincides the Author's lifetime, where are we and what might we expect in the future? This essay outlines some points to think about.

References in this essay are not exhaustive and stem from a broader systematic search. They are provided to illustrate phenomena of interest and to lead readers and potential future authors in the best possible directions based on the author's modest personal experience.

In the past two generations, there have been three important periods and a remarkable evolution of medicine

Starting with classical developments such as Hippocratic medicine and continuing over the most recent elapsed century, medicine has greatly benefitted from developments in epidemiology, biostatistics, clinical epidemiology, and other initiatives. In fact, in the past century, medicine has changed in three stages connected to how we think in practice and research:

1. The first stage was the creation, appearance and implementation of fundamental field epidemiology and clinical epidemiology.
2. The second stage was the development and spread of evidence-based medicine.
3. The third and most recent stage was the development and spread within modern philosophy, i.e. reasoning, critical thinking, informal logic, and argumentation from less traditional fields of philosophy, and the use as an integrated pragmatic tool on how to "do" medicine, understand it, and make decisions about increasingly frequent questions and problems in working with others in practice and research.

Each stage includes the preceding ones.

N.B. References in the above section are not exhaustive. They are meant to be historical, and more recent valuable entities are for illustrative purposes only and to further expand reading.

The references that follow date largely from three periods: From a more historical past, towards the end of past millennium (second part of the past century), and during the first decades of the current century. They are not exhaustive.

Epidemiology

Over the past century, epidemiology established itself as a fundamental way to study, understand and control health phenomena.

Epidemiological experience may be seen across three time periods. The first is historical, from Hippocratic times to the middle of the past century [1]. The second is John Snow's experience with cholera, methodological developments of epidemiology in the middle and the second part of the past century [2-6]. Applying them to major health problems [7,8] also occurred at that time. The third is when traditional attention to communicable disease [9] broadens and includes non-communicable phenomena and activities as well.

In 'classical' or 'fundamental' epidemiology [9-11], the study of mass health phenomena in the community, disease occurrence, causes, and ways of control were and are in focus [12]. Its target populations were originally mainly outside the hospital. Today, rates, ratios, absolute and relative risks are among the numerical expressions which abound in the epidemiological approach.

In clinical epidemiology [13-16], denominators of health events as a focus of interest in a hospital or clinical environment include examining patients, their care and care results in individuals and groups. As classical epidemiology proceeds from individuals to groups, clinical epidemiology focusses mainly on individual patients based on some hospital and extra-hospital clinical experience at any level of prevention whether primary, secondary, or tertiary. The opposite direction of thinking to classical epidemiology must be considered. Opposite directions of thinking are more distinct than adjectives such as 'classical' or 'clinical'.

Biostatistics are, historically and traditionally, the basis of quantification in both epidemiologies. Multiple definitions of biostatistics overlap across the literature with varying frequencies of health phenomena in focus [17-20]:

- Through fundamental and field epidemiology, a health professional studies health phenomena in the community to understand, control and manage them in well defined groups of individuals. The direction of thinking is from individuals and individual events in a given setting to understanding them as denominators in their rates. Humorously, "epidemiologists are individuals in an eternal search for good denominators"!
- Through biostatistics [17-20], a numerical quantitative dimension is applied to health phenomena.
- Through clinical epidemiology [13-15], which is essentially the opposite of the above approaches, health experience is applied in groups to individuals with patients as individual cases. Humorously, "clinical epidemiologists are also in an eternal search for past and other experience in groups of other patients".

What are some important current and past topics in epidemiology?

Historically and at present, disease frequency and causality are two major entities of interest:

- a. Frequency of health phenomena, rates of health phenomena, as well as their ratios from descriptions, provide an indication of the magnitude of health observations. They lead to the domain causality.
- b. Bradford Hill's criteria for causality [21], such as
 1. Strength of association,
 2. Consistency,
 3. Specificity,
 4. Temporality,
 5. Biological gradient,
 6. Plausibility,
 7. Coherence,

8. Experiment, and

9. Analogy

Have been, for half a century, crucial referential considerations of cause-effect relationships across the health phenomena [21-24].

Evidence-based medicine (EBM)

As EBM enters a second generation of medical thinking, are there more questions than answers?

Evidence-based medicine, or EBM, is a relatively new and attractive term, fashionable for some, as well as a presumably new domain and way of further improving our practice and research. It is about one generation old.

What should we do better? What should we refine for the best benefit of the patient and the satisfactory work of their doctors and other health professionals? Do we have supportive evidence for such kind of evidence? This essay contains a series of questions and possible answers. What is good, what is bad, and what is still missing?

Quo Vadis Medicina ex Testimoniis? In biblical terms, it is hoped that this does not lead to being asked Domine, quo vadis? (Where do you go, Master, i.e. to be crucified again?). We think EBM is more promising.

How old and how original is EBM?

Medicine is, and has always been, evidence-based. Only the meaning of 'evidence' changed. As well as its uses and practice from one health domain and profession to another.

Let us define evidence itself within a more composite entity of EBM.

EBM, as a term, domain, and content, was first coined and defined by the McMaster Evidence-Based Medicine Working Group in 1992 and by Sackett., *et al.* in 1996 [25]. Wikipedia [26] states that EBM (and the term itself) originated in 1987, as proposed by DM Eddy, and was known as clinical judgment before then (in 1967 by Alvan Feinstein [27]).

Since its inception, EBM has appeared in monographs, articles, and other references, several of which are quoted in the comments that follow.

Today, do we have one or more definitions of EBM?

Numerous definitions listed in the Medical Dictionary fall into two major categories:

1. Those based on three axes and elements constituting original definitions, i.e.
 - a. Individual clinical expertise,
 - b. Clinically relevant research and its findings and
 - c. Patient values, preferences, and personal choices, and

2. Other elements beyond the three above, plus all relevant medical ethic subjects.

A balance between the above has not yet been established.

What are some of the best current definitions of EBM?

In chronological order, they abound. For example,

- EBM is about integrating individual clinical expertise and the best external evidence: ...Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise, we mean the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice.... By best available external clinical evidence, we mean clinically relevant research, often 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 regimens [25].
- EBM is “The practice of medicine in which physicians find, assess, and implement methods of the best available risk assessment, diagnosis, and treatment and prognosis; on the basis of the best available current research, health professionals’ expertise, and needs, values, and preferences of the patient; in line with medical ethics consideration within a specific setting of practice and society” [28].
- In its broadest form and definition, evidence-based medicine is the application of the scientific method in healthcare decision making.... “Evidence-based medicine (EBM) is an approach to medical practice intended to optimize decision-making by emphasizing the use of evidence from well-designed and well-conducted research. Although all medicine based on science has some degree of empirical support, EBM goes further, classifying evidence by its epistemologic strength and requiring that only the strongest types (coming from meta-analyses, systematic reviews, and randomized controlled trials) can yield strong recommendations; weaker types (such as from case-control studies) can yield only weak recommendations [26].

How is evidence itself within EBM defined today and how should it be?

We may consider evidence as “any data or information needed to understand the health problem, as well as to make decisions about the health problem in general and in a given patient and community setting under the care of medical or other health professionals”.

Or,

- “Any data or information, whether solid or weak, obtained through experience, observational research or experimental work. This data or information must be relevant and convincing to some degree either to the understanding of the problem (case) or to the clinical decisions (diagnostic, therapeutic or care oriented) made about the case. ‘Evidence’ is not automatically correct, complete, satisfactory and useful. It must be first evaluated, graded and based on its own merit” [29].
- “A fact or body of facts on which a proof, belief or judgment is based. Evidence does not mean certainty. Rather, it represents an available proof with varying degrees of certainty” [30].

- “... In medicine, evidence itself is a broad entity encompassing any data or information, whether solid or weak, obtained through experience, observational research or experimental work (trials). This data or information must be relevant and convincing to some (best possible) degree either to the understanding of the problem (case) or the diagnostic, therapeutic, or otherwise care oriented clinical decisions made about the case” [31].

But how can we define the elements that form such definitions?

And do we need to do so? Yes, through orismology in action.

For example, if we define EBM itself as ‘the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients’ [25], what do ‘conscientious’, ‘explicit’, or ‘judicious’ mean in operational and usable terms? Moreover, if we operationalize EBM, does this lead to better health and health care for all concerned? If we examine this definition itself, is it not remarkably motivational? And if we examine this definition, substantive and adjective, term by term, what is the operational meaning of ‘conscientious’, ‘explicit’ or ‘judicious’? Finally, what is ‘evidence’ itself? Shouldn’t we know? A similar and worthy assessment of definitions and meanings can be found elsewhere.

Are definitions important?

They are important since the uses and definitions of all phenomena of interest in health are largely based on their meaning and the reproducibility of the entities they are supposed to represent. They are the subject of orismology, a term proposed for the domain of definitions (from orismos, definition in Greek), detailed elsewhere [28-30].

Summarizing from various sources [28-30,32-34] definitions may be stipulative (delineating new phenomena), lexical or reportive (how the word is actually used), theoretical (formulating an adequate characterization), ostensive (by giving an example), motivational or persuasive (influencing attitudes), operational (as decision making tools), by synonym (like pneumoconiosis is a lung disorder due to the dust inhalation), or essentialist (presenting a theory about the fundamental nature of the phenomenon to which the term refers, sometimes circular). We may most often prefer operational definitions, which are essential for decision making both in practice and research.

What should we define? We suggest the domains of our activities, subjects of research and activity, interacting variables in causalities of interest, what was or must be done, target populations, recipients of information and care, setting of research and practice experience.

If we establish better definitions as composite terms, how can we better understand their components? As ‘evidence’ itself again? Its practice includes five original steps [32-34] (reworded):

1. Convert clinical information of interest (about prevention, prognosis, therapy, causation, etc.) into answerable questions; define the problem; (what kind of evidence are we interested in?)
2. Search for wanted sources of information; track down, with maximum efficiency, the best evidence with which to answer them (whether from clinical examination, diagnostic laboratory, research evidence, or other sources; (get the best evidence to fit our needs and interest);
3. Critically appraise the evidence for its validity (closeness to the truth) and usefulness (clinical applicability); critically evaluate the information; (what is such evidence worth?)
4. Apply the results of this appraisal in our clinical practice to the patient; integrate the critical appraisal without our clinical expertise and with our patient’s unique biology, values, and circumstances; (using valid and useful evidence obtained) and

5. Evaluate our performance, efficacy, effectiveness, and efficiency in executing steps 1 - 4; evaluate this as it applies to patients and seek improvements for next time (was it worth it?).

These steps may be expanded in parallel directions of thought by following loosely with modifications [30] such as:

The steps of the scientific method in general:

1. Converting the need for information into an answerable question; formulating the question concerning the problem, patient, or community that has to be answered (identifying the need for evidence);
2. Tracking down the best evidence with which to answer that question; searching for evidence (producing the evidence);
3. Critically appraising the evidence for its validity, impact, and applicability;
4. Integrating the critical appraisal with our clinical expertise, and with our patient's unique biology, values, and circumstances (linking the evidence);
5. Selecting the best evidence available for clinical and community health-decision making (using the evidence);
6. Linking the evidence with clinical and community health knowledge, experience, and practice with the patient's and/or community values and preferences (integrated uses of evidence);
7. Implementing useful findings in clinical (clinical care) and community (public health policies and programs) medicine decisions and practice (implementation of evidence);
8. Using the evidence in clinical and/or community care to solve the patient's or community problem (uses of evidence in specific settings);
9. Evaluating the effectiveness of uses of evidence in this case and situation (weighing the impact); evaluating our effectiveness and efficiency in executing steps 1 - 8 and seeking ways to improve them both for next time.
10. Evaluating the implementations and the overall performance of evidence-based medicine and/or evidence-based public health practitioner and activity (evaluating structure, process and impact of evidence-based actions, economical, and managerial real and desired characteristics); and
11. Teaching and expanding EBM practice and research (going beyond what was already achieved).

What would be the best and most relevant approach now? None of the following propositions are based on the systematic review of medical experience; systematic reviews will certainly follow.

Back to EBM: Based on the above considerations, how can EBM be summarily characterised?

Evidence-based medicine (EBM) is a practice of medicine based on the integration of the best research evidence with clinical expertise and patient values. Its components are identifying the need for evidence through a specific question, producing the evidence, appraising the evidence, selecting the best evidence, linking the evidence with clinical knowledge, experience and practice as well with patient values and preferences (integrated uses of evidence, using evidence in patient problem solving (uses in specific settings), weighing such use(s) of evidence (weighing the impact) and teaching and expanding EBM practice and research (going beyond what was already achieved). The

increasing number of “evidence-based” initiatives [25,34-41] today includes clinical case reporting [34-36], health communication [37], public health [38], or even more clinical practice [39].

EBM is still a young and evolving field [25,34-36,40-43]. Even the list of its basic definitions is still growing.

In summary, in its broadest form, in our context, evidence-based medicine is the application of the scientific method in healthcare decision making... “Evidence-based medicine (EBM) is an approach to medical practice intended to optimize decision-making by emphasizing the use of evidence from well-designed and well-conducted research. Although all medicine based on science has some degree of empirical support, EBM goes further, classifying evidence by its epistemological strength and requiring that only the strongest types (coming from meta-analyses, systematic reviews, and randomized controlled trials) can yield strong recommendations; weaker types (such as from case-control studies) can yield only weak recommendations” [26].

Philosophy of medicine and philosophy in medicine

Philosophy of medicine and philosophy in medicine are two contrasting views: Philosophy of medicine means a formal inquiry into the structure of medical thought. It is an inquiry on the nature of medicine in building a theory of medicine and of its activities. Philosophy in medicine is the use and application of philosophy in health, disease, and medical health. We have detailed them both elsewhere [44-49].

Within new trends and initiatives in health care, in philosophy in medicine [48-64], we evolve from classical branches of philosophy, such as ethics, epistemology and others, to methodology, uses, and experiences in increasingly operational thinking, critical thinking, and mainly informal logic in the health domain [45-62].

In the broadest scope of thinking, mental action if verbalized is a matter of combining words in propositions. Reasoning, as a way of thinking, is the mental cognitive process of looking for reasons for beliefs, reasons for conclusions, leading to actions or feelings. (Patient care, from working diagnostic ‘impression’ to treatment orders and prognosis, is such a medical reasoning in practice). One way of reasoning is argumentation consisting of various statements and propositions (premises) from which we infer another statement or conclusion. Such a resulting position may, for example, be diagnosis, patient admission, or treatment decisions including errors.

In health sciences [48-68], philosophical thinking may go from its classical, more historical domains like ethics, epistemology, or informal and formal logic to even more pragmatic philosophical reasoning, today’s critical thinking, in dealing with desirable phenomena as well as undesirable ones like medical error and harm.⁶⁸ More general and health specific settings may also be examined.

Some references in this reading about clinical argumentation recall the broader general readership while others focus more on applications in health sciences and professions.

The development, uses, and experience of classical argumentation have expanded.

Let us look at an example in the health domain:

From a more classical three-component model of an argument (two premises leading to a conclusion), here are six components of today’s modern argument as generated by Toulmin., *et al.* [51,52,60-62]. They are:

- Grounds like relevant clinical and paraclinical data and information needed, (“... we admitted an elderly patient with chest pain with a history of heart problems...”),
- A warrant as general rule, accepted understanding of evidence across the past experience, (“... we now have clinical and paraclinical, ECG and other information, indicative of the patient’s state ...”),

- Backing as supporting research findings, graded evidence from past clinical experience as “external evidence” or “what the literature tells us”, (“... our own and others’ clinical experience as well as what has successfully been done so far for the patient and for us too...”),
- A qualifier as quantification of the certainty or probability that our ensuing claims are correct, (“... this situation is compatible with our experience and others reported in the literature, it gives us a high level of confidence, if not certainty, that this kind of care works and should also work for our patient...”),
- Conclusions or argument claims as a synthesis of the above argument building blocks, (“... yes, this is a case of myocardial infarction that required the clinical and paraclinical management you proposed, ordered, and performed. ...”),
- Rebuttals in terms of exclusionary circumstances and other criteria, (“... we are also aware and ready to act appropriately in the case of pericarditis, pulmonary embolism, or aortic dissection among others, which might cause some similar manifestations and states...”).

Such components, often implicit, lie behind our discussion and presentation of clinical cases or in research. They allow us to understand and better determine the validity of our views of health problems. Clinical case reporting is here to stay [34-36].

What do we usually want to do?

- We observe and describe: descriptive studies give us a picture of health phenomena and what is being done with them.
- We analyze: analytical studies tell us “why” or reasons why they are as they are. They may be purely observational, or interventional (we actively do something with them).
- We actively manipulate what we see and do: experimental studies and their results test and suggest what can be done to prevent and implement, use and evaluate the most desirable phenomena like treatment, or avoid and eliminate the undesirable ones.
- We want to evaluate three distinct aspects of our practices and research as well as their structure, process, and impact.

What is our own (personal) purpose for this?

- Seizing (what it is and its magnitude)
- Understanding (causes, mechanisms of interactions)
- Decision making (what to do)
- Action (implementing our decision in the best possible way)
- Getting results (good or bad)
- Evaluation of what we did
- Communication (what should we know and do)

- Adjustments (what to do and doing it better next time).

What can we conclude then and what should we do now, based on the above?

What should we improve? How should we refine our approach to better support patients and the work of their doctors and other health professionals? This essay contains a series of such questions and possible answers. What is good, what is bad, and what is still missing?

The practice and effects of EBM, as well as its teaching, are still awaiting a systematic evaluation.

The natural size of our experience until now

Our knowledge and understanding of three major generational initiatives and accomplishments in medicine and other health sciences and professions, i.e. epidemiology, evidence-based medicine and their critical thinking and uses of both in research and practice, appear logically in decreasing chronological order. We know:

- More about epidemiology,
- Less about evidence-based medicine, and
- Even less about the uses of modern pragmatic philosophy, thinking and reasoning in epidemiology and EBM.

About three generations developed the methodology and practice of epidemiology, two initiated EBM, and one or so built a workable pragmatic modern philosophy.

Even if EBM is appreciated superficially, its structured evaluation should be expanded. Current information does not specify, in other qualitative and quantitative terms, how the practices of EBM professionals improved, or how the lives (and health status) of millions of patients improved.

The balance and complementarity of clinician judgment and experience as well as the degree of compatibility between personal and research assessment of the theory and practice of evidence-based models in medical decision making (and its effect) have their antecedents, prospects and challenges [45,59].

Ioannidis [63] explains how “evidence-based medicine (EBM) was hijacked to serve vested interests: major randomized controlled trials are largely done by and for the benefit of the industry, meta-analyses and guidelines are flooded with conflicts of interest, national and federal research funds are unable to address basic clinical questions. Nonetheless, EBM would remain a worthwhile goal....” He proposes, that “EBM does not represent the scientific approach to medicine: It is only a restrictive interpretation of the scientific approach to clinical practice. EBM drives the prescribing clinician to an overestimated consideration of potential benefits, paying little attention to the likelihood of responsiveness and to potential vulnerabilities in relation to the adverse effects of treatment. It is time to substitute the fashionable popularity of a strategy developed outside of clinical medicine with models and research based on the insights of clinical judgment and patient-doctor interaction”.

Let us understand the best evidence and use it accordingly. A balance between EBM experience and physicians experience with an individual patient depends on how we understand and specify “best available evidence”: ours or our patient’s?

Let us continue to make sense of all this across our experience by meta-analysis and other types of research synthesis and integration, should the nature and completeness of our topic(s) permit it. Gathering [65-67], analyzing, and making sense of various studies, experi-

ences and their reporting started late in the 1970s. The first book on methodology and experience stemming from the “epidemiology of research results of a given health problem” appeared in 1987.

Conclusion

Let us conclude in a reflective way. Many of us would certainly prefer to reach conclusions based on the best available research formulation, synthesis, analysis, and evaluation, but whenever this information is missing, a reflective approach should serve as an opening for all of the considerations above.

Those of us who were privileged to live over the past three generations, approximately seventy-five years, may think the following way or otherwise about these three trends:

1. Epidemiology and clinical epidemiology are the longest rooted and there is no need to question their contribution to medicine today.

If we apply epidemiology in its classical way, to clinical phenomena both as dependent and independent variables of health phenomena of interest, that’s where today’s contributions and experiences are the broadest. Let us continue this way.

If we study health phenomena in the opposite reasoning direction, i.e., from a broader clinical-epidemiological experience to the care of individual patients and individual cases, our experience and knowledge are more limited. They should not be.

2. Evidence-based medicine is a “physiological/natural overgrowth of mostly clinical epidemiology”. EBM, as assembled by so many exceptional and highly competent minds, simply “makes sense”. However, we still do not know enough about the nature, extent, and context of its practice from one continent, medical culture, specialty and other nature of care.

In terms of “evaluative medicine”, how much do we know about EBM as a specific health program and activity, its functioning, and results? Do we know enough about its best possible actual alternatives in function and practice, and to which of them EBM should be compared? This remains a very open field.

3. Philosophy of medicine and philosophy in medicine.

We know even less, although we should know more and better, about epidemiology and EBM as facts and elements of critical thinking, reasoning and argumentation in medical research and practice.

Summarizing this point, it might reflect our positions as more broadly covered elsewhere.

Philosophical experience both in general and closer to medicine and health sciences is expanding.

How do we use such experience based on practical and pragmatic philosophy? Do we do so in a logical way? And in what context? Through which philosophical process?

Do we have specific training on such ways and uses for a pragmatic medical philosophy? At the undergraduate or graduate level? In specific programs or integrated in a broader framework of training in health professions and specialties? Does such training focus more on practice, research, both, or none?

How is all of this done in other health professions and sciences?

All these questions may appear too precocious, but their relevance will increase with time and with our growing practice and experience.

What may be then our “Conclusions to Conclusions” for today?

Are we evolving towards a kind of “Evidence-grounded Cognitive Medicine and Medical Thinking”? (Too long? Some shorter term for broader uses?)

What about beneficial and noxious factors and phenomena of interest?

As for the study of beneficial factors and noxious factors and their consequences, do we still pay more attention to the beneficial ones? Medical error and harm merit as much attention as treatment and its positive effects.

We still do not know enough about undesirable phenomena, especially compared to desirable ones.

Do we evaluate our actions sufficiently?

There is still an unbalance between our evaluation of three major subjects:

1. Structure
2. Process
3. Impact.

If any action on the impact (good or bad) of medical, clinical, or community interventions (including control of harm caused by medical errors) is evaluated, health economists (and all of us in the health domain) may raise questions and seek answers to the triad of effectiveness, efficacy, and efficiency:

1. Effectiveness, actions, and effects under “prevailing” and customary conditions for “ordinary”, prevailing or customary patients, answering the question “Does it work?” Specific groups are in focus.
2. Efficacy, an inquiry about the result of actions under ideal conditions, a “Can it work?” question and answer, and
3. Efficiency, in terms of the effect of end results in proportion to the effort (human and material resources, and time) invested in a healthcare activity. It is an answer to the “What does it cost for what it gives?” question.

A balance between human and material investments in research and practice and the resulting impact or outcome within a given inquiry or activity.

Depending on the questions asked, these kinds of triads are not always considered although they should be.

So far, we know more about all three subjects above in clinical and field epidemiology than in EBM and philosophy in and of medicine.

However, this feeling and conviction is not based on systematic reviews and comprehensive studies from clinical and community problems and related activities. Do we need such evaluations? Definitely.

Where and how may we do all this? Special courses, insertions in broader preclinical and clinical training, continuing education, specialty programs? Future experience will be enriching and exciting.

Much has been done so far. Expanding our knowledge will help answer our Quo Vadis Medicina query.

Bibliography

1. Snow on Cholera. Intr. by Richardson BW, WH Frost. New York: Commonwealth Fund (1936).
2. Doll R and Hill AB. "Smoking and carcinoma of the lung". *BMJ* 2 (1950).
3. Surgeon General's Advisory Committee on Smoking and Health. Washington: Publ. Health Serv 1003 (1969).
4. MacMahon B., *et al.* "Epidemiologic Methods. Boston: Little, Brown (1960).
5. Morris JN. "Uses of Epidemiology. Edinburgh and London: Livingstone (1967).
6. Mausner JS and Bahn AK. "Epidemiology. An Introductory Text. Philadelphia: Saunders (1974).
7. Lilienfeld AM., *et al.* "Cancer Epidemiology: Methods of Study. Baltimore: The Johns Hopkins Press (1967).
8. Cooper B and Morgan HG. "Epidemiological Psychiatry". Springfield: CC Thomas (1973).
9. Jenicek M. "Introduction à l'épidémiologie. (Introduction to Epidemiology.) St.Hyacinthe et Paris: EDISEM et Maloine Éditeurs (1975).
10. Jenicek M and Cléroux R. "Épidémiologie. Principes, techniques, applications. (Epidemiology. Principles, Techniques, Applications.). St.Hyacinthe et Paris: EDISEM et Maloine Éditeurs, 1982. In Spanish: Jenicek M, Cléroux R. Epidemiología. Principios. Técnicas. Aplicaciones. Barcelona: Salvat Editores, (1987).
11. Jenicek M. "Epidemiology. The Logic of Modern Medicine. Montréal: EPIMED International, 1995. In Japanese: Jenicek M. – the same title -, Osaka Roppo Shuppan Publishing, 1997. In Spanish: Jenicek M. Epidemiología. La lógica de la medicina moderna. Barcelona: Masson, S.A (1996).
12. Control of Communicable Diseases Manual. 18th Edition. Edited by DL Heyman. Washington, DC: American Public Health Association (2004).
13. Feinstein AR. "Clinical Epidemiology. The Architecture of Clinical Research. Philadelphia and London: WB Saunders Comp (1985).
14. Jenicek M and Cléroux R. "Épidémiologie clinique. Clinimétrie. (Clinical Epidemiology. Clinimetrics.) St.Hyacinthe et Paris: EDISEM et Maloine Éditeurs (1985).
15. Fletcher RH., *et al.* "Clinical Epidemiology. The Essentials. Third Edition. Baltimore/Philadelphia/London: Williams and Wilkins (1996).
16. A Dictionary of Epidemiology. Edited by M. Porta, S. Greenland and JM Last, Associate Editors. An IEA Sponsored Handbook. Fifth Edition. Oxford and New York: Oxford University Press (2008).
17. Armitage P. "Statistical Methods in Medical Research. New York. J. Wiley (1971).
18. Hill AB. "Principles of Medical Statistics. 9th edition. New York: Oxford University Press (1971).
19. Feinstein AR. "Clinimetrics. New Haven and London: Yale University Press (1987).
20. Dawson B and Trapp RG. "Basic and Clinical Biostatistics. Third Edition. New York and Toronto: Lange Medical Books/McGraw Hill (2001).

21. Hill AB. "The environment and disease: association or causation?" *Journal of the Royal Society of Medicine* 58 (1965): 295-300.
22. Wikipedia. Bradford Hill criteria (2019): 4.
23. Fedak KM., *et al.* "Applying the Bradford Hill criteria in the 21st century: how data integration has changed causal inference in molecular epidemiology (2015).
24. Höfler M. "The Bradford Hill considerations on causality: a counterfactual perspective (2005).
25. Sackett DL., *et al.* "Evidence based medicine: what it is and what it isn't". *BMJ* 312 (1996): 71-72.
26. Wikipedia, the Free Encyclopedia. Evidence-based medicine (2019): 14.
27. Feinstein AR. "Clinical Judgment. Baltimore: Williams and Wilkins, and Washington and New York: RE Krieger (1967).
28. Jenicek M. "Writing, Reading, and Understanding in Modern Health Sciences. Medical Articles and Other Forms of Communication. Boca Raton, London, New York, CRC Press / Taylor and Francis Group, (2014).
29. Jenicek M. "Foundations of Evidence-Based Medicine. Boca Raton, London, New York, Washington: Parthenon Publishing/CRC Press (2003).
30. Jenicek M. "How to Think in Medicine. Reasoning, Decision Making, and Communication in Health Sciences and Professions. Abingdon and New York: Routledge, a Taylor and Francis Group (2018).
31. Sackett DL., *et al.* "Evidence-Based Medicine. How to Practice and Teach EBM. New York and Edinburgh: Churchill Livingstone (1997).
32. Strauss SE., *et al.* "Evidence-based Medicine. How to Practice and Teach EBM. Third Edition. Edinburgh/London/New York: Elsevier/Churchill Livingstone (2005).
33. Swanson JA., *et al.* "How to Practice Evidence-Based Medicine". *Plastic and Reconstructive Surgery* 121.1 (2010): 286-294.
34. Jenicek M. "Casuistique médicale. Bien présenter un cas clinique. (Medical Casuistics. Presenting Well Clinical Case Reports.) St. Hyacinthe et Paris : EDISEM et Maloine Éditeurs (1997).
35. Jenicek M. "Clinical Case Reporting in Evidence-Based Medicine. Second edition (1999 first edition reworked, expanded, rewritten). London and New York: Arnold / Hodder Headline, and Oxford University Press (2001): 36.
36. Jenicek M. "Clinical Case Reports, Case Series, Clinical Vignettes: Where Are We Today?" *Japanese Journal of Gastroenterology and Hepatology* V5.3 (2020): 1-5.
37. Brown B., *et al.* "Evidence-Based Health Communication. Maidenhead and New York: Open University Press/McGraw-Hill Education (2006).
38. Brownson RC., *et al.* "Evidence-Based Public Health. Oxford and New York: Oxford University Press (2003).
39. User's Guides to the Medical Literature. Essentials of Evidence-Based Clinical Practice. Edited by G. Guyatt and D. Rennie. Chicago: AMA Press (2002).
40. Dewey J. "How We Think. Boston: D.C, Heath, 1910. (reprinted by Dover Publications, Mineola, NY, (1997).
41. Jenicek M. "Quo Vadis Medicina Ex Testimoniis? A Quarter Century after its Inception, Where is Evidence-Based Medicine Now? More Questions than Answers". *Japanese Journal of Gastroenterology and Hepatology* V5.2 (2020): 1-10.

42. Jenicek M. "Quo Vadis Medicina Ex Testimoniis? Part 1. A Quarter Century after Its Inception, where is Evidence-Based Medicine (EBM) Today? More Questions than answers". *Japanese Journal of Gastroenterology and Hepatology* V5.3 (2020): 1-8.
43. Jenicek M. "Quo Vadis Medicina Ex Testimoniis? Part 2. After a Quarter of Century, What Now? Some Questions and Answers". *Japanese Journal of Gastroenterology and Hepatology* V5.3 (2020): 1-7.
44. Jenicek M. "Fallacy-Free Reasoning in Medicine. Improving Communication and Decision Making in Research and Practice. Chicago, IL: American Medical Association (AMA Press) (2009).
45. Jenicek M. "A Primer on Clinical Experience in Medicine. Reasoning, Decision Making, and Communication in Health Sciences. Boca Raton, London and New York: CRC Press/Taylor and Francis/ Productivity Press (2013).
46. Jenicek M. "Writing, Reading, and Understanding in Modern Health Sciences. Medical Articles and Other Ways of Communication. Boca Raton, London, and New York: CRC Press/Taylor and Francis/Productivity Press (2014).
47. Jenicek M. "Fallacy-Free Reasoning in Medicine. Improving Communication and Decision Making in Research and Practice. Chicago, IL: American Medical Association (AMA Press) (2009).
48. Jenicek M and Hitchcock DL. "Evidence-Based Practice. Logic and Critical Thinking in Medicine. Chicago: American Medical Association (AMA Press) (2005).
49. Jenicek M. "A Physician's Self-Paced Guide to Critical Thinking. Chicago: American Medical Association (AMA Press) (2006).
50. Toulmin S. "Knowledge and art in the practice of medicine: Clinical Judgment and Historical Reconstruction. in: Science, Technology, and Art of Medicine. Edited by C. Delkeskamp-Hayes and MA Gardell Cutter. Dordrecht: Kluwer (1993): 231-249.
51. Toulmin SE. Uses of Argument. Cambridge: Cambridge University Press (1958).
52. Toulmin SE., et al. "An Introduction to Reasoning. Second Edition. New York: Macmillan, London: Collier Macmillan (1984).
53. Bowell T and Kemp G. "Critical Thinking. A Concise Guide. London and New York: Routledge (2002).
54. Vorobej M. "A Theory of Argument. Cambridge and New York: Cambridge University Press (2006).
55. Hughes W., et al. "Critical Thinking. An Introduction to the Basic Skills. Seventh Edition. Peterborough, ON, London, UK, Moorebank, NSW: Broadview Press (2015).
56. Montgomery K. "How Doctors Think. Clinical Judgment and the Practice of Medicine. Oxford and New York (2006).
57. Murphy EA. "The Logic of Medicine". Baltimore and London: The Johns Hopkins University Press, (1976).
58. Patel VL., et al. "Thinking and Reasoning in Medicine". Chapter 30, in: The Cambridge Handbook of Thinking and Reasoning. Edited by KJ Holyoak and RG Morrison. Cambridge and New York: Cambridge University Press (2005): 727-750.
59. Lulin Z., et al. "Complementarity of Clinician Judgment and Evidence Bases Models in Medical Decision Making: Antecedents, Prospects, and Challenges (2016): 6.
60. Groopman J. "How Doctors Think. Boston and New York: Houghton Mifflin (2007).
61. Wulf HR and Götzsche PC. "Rational Diagnosis and Treatment. Evidence-Based Clinical Decision Making. Third Edition. Oxford/London/Malden: Blackwell Science, 2000. Fourth edition (2007).

62. Higgs J, *et al.* "Clinical Reasoning in the Health Professions. Third Edition. Amsterdam/Boston/Heidelberg/London: Elsevier/Butterworth Heinemann (2008).
63. Ioannidis J. "Evidence-based medicine was bound to fail: a report to Alvan Feinstein". *Journal of Clinical Epidemiology* 84 (2017): 3-7.
64. Feinstein AR and Horwitz RI. "Problems in the 'evidence' of 'evidence-based medicine". *The American Journal of Medicine* 103.6 (1997): 529-535.
65. Jenicek M with Editorial Introduction by Sir Iain Chalmers. Méta-analyse en médecine: the first book on systematic reviews in medicine". *Journal of the Royal Society of Medicine* 108.1 (2015): 28-31.
66. Jenicek M. "Méta-analyse en médecine. Évaluation et synthèse de l'information clinique et épidémiologique. St.Hyacinthe, Qué. et Paris, Fr.: EDISEM et Maloine Éditeurs (1987).
67. Jenicek M. "Meta-analysis in medicine: where we are and where we want to go". *Journal of Clinical Epidemiology* 42 (1989): 35-44.
68. Jenicek M. "Medical Error and Harm. Understanding, Prevention, and Control". Boca Raton, London and New York: CRC Press/Taylor and Francis/Productivity Press (2011).

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