



Where is the wisdom? I – A conceptual history of evidence-based medicine

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Abstract

Rationale Evidence-based medicine (EBM) has been acclaimed as a major advance in medical science, but criticized as a proposed alternative model for the practice and teaching of medicine. Ambiguity regarding the proper role of the contributions of EBM within the fabric of medicine and health care has contributed to this discrepancy.

Aims and objectives We undertook a critical review of the history of the EBM movement, beginning with its origins in the 1970s and continuing through this century. We drew upon the results of an independent project that rationalized the EBM domain from the perspective of educational evaluation and assessment. We considered the content of EBM in relationship to the propositions and promises embodied in advocacy publications.

Results EBM emerged in the context of the explosion of biomedical information in the decade preceding public access to the Internet in the mid-1990s and drew upon the independently derived 'information literacy' formula developed by information scientists during the 1980s. The critically important content and achievements of EBM are fully explained within the confines of the information literacy model. The thesis that EBM offers an alternative paradigm for individualized health care, asserted in the advocacy literature, is not supported by published models of evidence-based clinical practice.

Conclusion A critical historical review of the origins, content and development of the EBM movement proposes that full integration of the fruits of the movement into routine clinical care remains a conceptual and practical challenge.

Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?

T.S. Eliot 'The Rock' 1934

'Milestone or millstone'

Across the millennia, the volumes and chapters of medical history have recorded many achievements, some obviously momentous, some barely noticed, all culminating in today's complex world of health care systems and technology, a world unimaginable to even the most informed and sophisticated observers as recently as 100 years ago. Along the way, some of the most important innovations have been initially regarded as controversial and have encountered resistance over considerable periods of time prior to their ultimate acceptance [1–3]. In 2007, the editors of the *British Medical Journal* accepted nominations from readers for the leading milestones in medicine since the journal's first year of publication, 1840 [4]. They proceeded to hone a list of 70 candidates to 15, which were referred back to *British Medical Journal* readers for a formal vote.

From these, sanitation, antibiotics, anaesthesia, vaccines and the discovery of the DNA structure emerged as the victors [5]. Among the 10 candidates left behind by the readers were the germ theory of disease, immunology and evidence-based medicine (EBM). What starkly distinguished the editors' inclusion of EBM from the other candidates on the original short list was a climate of surrounding controversy, acknowledged in the lead editorial of the journal supplement [4], reinforced through a slightly defensive title and tone of the supplement's discussion of EBM [6], and confirmed by several contentious 'rapid responses' to that discussion from readers (one of whom pronounced EBM to be a 'millstone' rather than a 'milestone'). Is the unabated controversy surrounding EBM [7] to be understood as yet another example of the resistance that frequently confronts frontier concepts that are ahead of their time? In this discussion we will locate the basis of principled dissent regarding EBM within the historical process that led to and included its canonization in the early 1990s and the relative haste with which several features of EBM, as a model for practice, were formulated at that time and codified since.

EBM is characterized both by concepts and accomplishments. Of these, the latter are objective and of undisputed value. First, EBM spawned original electronic resources [8], search filters for existing large databases [9,10] and new databases, including those developed by the Cochrane Collaboration [11], all aimed, in different ways, at making information from clinical research available to clinicians and to health policy makers in appropriately synthesized, pre-digested and conveniently accessible form. Second, EBM elaborated a unique perspective on the evaluation of clinical research, different from that of researchers and characterized by tools that facilitate interpretation of the validity and importance of such research for purposes of clinical application [12,13]. Fruits of this unique perspective have in turn been instilled in many venues and have affected the way research reports are formulated and presented in peer-reviewed journals [14], as well as in more clinically framed approaches to the grading of health care recommendations [15]. Far from the least important of EBM's contributions to clinically oriented evaluation of original research is the elucidation of many aspects of trial design and reporting on the part of pharmaceutical interests and zealous trialists, which serve to inflate the apparent clinical importance of trial results in the eyes of the unwary [16].

Although the objective accomplishments of EBM might not make everyone's list of 'major milestones', few would likely dispute their value. They reflect the efforts of a large array of individuals, institutions and collaborations operating across a very broad spectrum of application, ranging from the level of public policy and health care guideline development to the domain of medical education and instruction [17]. Indeed, it has not been these achievements that have drawn or fed the flames of controversy surrounding EBM. It is on the level of concepts, not of concrete deliverables, that EBM has sparked the ire of its detractors. In 1991 [18], and again before a wider audience in 1992 [19], an official christening took place as the word 'medicine' was positioned after an already existent phrase, 'evidence-based' [17], and 'evidence-based medicine' was announced to the world as both 'A new approach to teaching the practice of medicine' and 'A new paradigm of medical practice' [19]. The 1992 *Journal of the American Medical Association* piece, and perhaps implicitly the very phrase 'evidence-based' [20], proposed a hierarchy of knowledge in which clinical evidence, particularly that stemming from randomized trials and meta-analyses, was placed at the top of an apparently linear ordering in which pathophysiological understanding of disease process and 'clinical experience' occupied successively lower positions. The *Journal of the American Medical Association* authors themselves acknowledged that this assertion was likely to provoke antagonistic responses [19], and indeed such began to appear almost immediately in published commentaries and critiques [21].

The newly coined term 'evidence-based medicine' was widely embraced and led to a plethora of instructional series' in leading medical journals [22–24], educational mandates [25,26] and practice initiatives [27]. However, even as the EBM movement rapidly expanded, a limitation in the 1992 pilot article, evident immediately to some [21], and to others over time [20], seemed to provide increasing grounds for dissent. The 1992 authors, largely made up of individuals trained in clinical epidemiology, did not elucidate their proposed 'new model for the practice and teaching of medicine' beyond their generic prescription for a new hierarchy of

medical knowledge. Exhortations that compassionate concern for patients' values, pathophysiological knowledge of disease and clinical experience are all valuable components of the development of expertise in the practice of the new medicine stopped short of an elaborated alternative model of medical practice that could be directly taught and disseminated [19,28]. Nor did the Evidence-Based Medicine Working Group [19] encompass the full spectrum of expertise required for such a sweeping undertaking. Importantly absent were social scientists, philosophers, experts in education research, evaluation and measurement, and individuals with expertise in studying and understanding the relational and interpretive aspects of individualized patient care. One might characterize the 1992 initiative as analogous to a decision to occupy a territory without the involvement of relevant military. Ultimately the initiators of EBM found themselves faced with modalities of resistance with which they were little prepared to contend, such as challenges to the philosophical, epistemological and educational premises underlying the movement [28].

In the remainder of this article, we will revisit the relevant history of the origins and development of EBM and, in so doing, will attempt to illuminate the nature of the conceptual limitations inherent in EBM within the context in which it first evolved. Extended and detailed histories of EBM have been published, notably that of Daly [29]. We will make no attempt to reproduce or supersede them here. Nor will we attempt to address the development of all of the trends and efforts that contributed to the understanding of health services in relationship to clinical evidence, such as the evolution of evidence-based practice guidelines [17], and the Cochrane Collaboration [11]. Rather we offer a critical historical summary restricted to elements that appear most important in defining not only what EBM, as announced in 1992, is and is not [30], but what it has and has not yet become.

EBM – a child of destiny

The historical backdrop of 'evidence-based *medicine*' as it emerged over more than a decade beginning in the late 1970s is comprised of elements of the stuff of which destiny is made. On the one hand came the rise of biomedical informatics, driven by the explosion of published information related to health care. On the other came the advent of the era of clinical trials and of clinical research in general. When David Durack put all current volumes of Cumulative Index Medicus on a scale in 1977 and compared the result with that of previous decades [31], he found that the extrapolated weight would increase within 10 years from around 20 kg at the time of his measurement to 1000 kg. Interestingly, and apparently unknown to Durack, an electronic version of Index Medicus, ultimately to become MEDLINE, had existed at the National Library of Medicine since 1964 [32], and what ultimately became the Internet and the World Wide Web were in advanced stages of development. The dye was cast for an entirely new relationship between the world of medical practice, health care and the biomedical literature.

Concomitantly, a new class of medical literature, which we now know as 'clinical research', had emerged, perhaps beginning with federal regulations in the US mandating proof of efficacy via controlled trials as a condition for approval of new drugs [33]. Such mandates brought a growing sense of urgency around the

idea that clinical research, particularly randomized trials, needed to be used clinically by clinicians [34], and within the resulting environment emerged what some termed 'a new basic science for medicine', that is, clinical epidemiology [35]. Controversy regarding the relative importance of randomized trials notwithstanding [36], there was suddenly a need for even non-academic clinicians to be able to digest primary research reports [13]. Within 10 years, Antman *et al.* [37] would demonstrate that thousands of patients with myocardial infarction had died unnecessarily as a result of failure to adequately summarize the trial evidence on efficacy of thrombolytic therapy.

Hence, the impetus for something fitting the description of what in 1991 would be dubbed 'evidence-based medicine' was driven by these two related but distinct imperatives: the need to harness and codify the explosion of clinically relevant published research, and the need to develop rubrics for the evaluation of such research that would facilitate literacy and informed consumption on the part of clinicians, and even the lay public. The pursuit of these imperatives ultimately generated the aforementioned unchallengeable accomplishments of EBM. What interests us here is how the details and nuances of the development of these efforts, and of the forms that they took, also set the stage for the limitations, and to some extent misrepresentations, of EBM, and for adversarial relationships that subsequently emerged between the proponents of the new proposition and a good portion of the world of medicine.

Information literacy and biomedical informatics

With the information age on the horizon and the explosion of medical information already at hand, a number of visionaries rapidly recognized the necessity of equipping practitioners and teachers of medicine with both well-designed resources and the conceptual tools necessary to harness them [38]. Importantly, the emerging biomedical informatics community also included individuals who spawned the nascent field of clinical epidemiology, including the group assembled under the leadership of David Sackett at McMaster University in Ontario Canada. Haynes *et al.* developed and validated streamlined approaches to searching large biomedical databases [10] and designed new clinically specialized electronic resources [8] as part of Sackett's thriving Department. That department would soon be joined by Gordon Guyatt, who would, in turn, add a unique ability to distil and reconceptualize methodological concepts from an entirely new perspective, that of clinical application.

Relevant to our historical review is the conceptual framework that was adopted as a way of approaching the use of electronic medical resources and databases. That framework, which became known as 'information literacy' [39], is defined as an ordered sequence of tasks that begins with the identification of an information need and extends through the process of performing a search, evaluating the quality of the information found and, finally, integrating it with independent pre-existing information, a process that can be summarized as 'ask', 'acquire', 'appraise' and 'apply.' This task cycle became the instructional model for EBM [40,41]. The information literacy principles were extensively elaborated outside of the field of medicine [42], soon weaved their way into the medical literature [43], and from there emerged into the centre stage of efforts to bring electronic resources to bear on clinical

practice [44]. With the advent of public access to the Internet via the World Wide Web in 1995, the door was opened to expanded proliferation of electronic biomedical resources. It was within the resulting environment that Haynes and others developed a rich array of products aimed at facilitating access to quality filtered synopses and summaries of clinical research [8,45].

'Let's call it therapy'

The development of an application-oriented approach to methodological evaluation of clinical research began in the late 1970s. This became known as structured critical appraisal of the medical literature [46,47]. An early highlight of the McMaster effort in this area was the 'Readers' Guides' series published in the *Canadian Medical Association Journal* beginning in 1981 [13]. The approach to evaluation drew on well-established criteria for assessing the internal validity of specific study designs. With an eye on physicians in training as well as on working practitioners, the emphasis was simplicity. Only a small number of criteria were entertained for each study design. Most importantly, a strategic simplification was adopted, which would later become an important point of vulnerability of EBM. The appraisal criteria advanced by the 'Readers' Guides' were uniquely applicable to specific study designs. However, Sackett and his collaborators believed that presenting them this way would alienate the very clinical trainees and practitioners who constituted the intended constituency of the initiative. They therefore elected to introduce a simplified equation of specific study designs to clinical categories. Hence, 'randomized trials' were understood as 'therapy', 'analytical studies of test performance' as 'diagnosis', 'cohort studies' as 'prognosis' and 'case control studies' as 'etiology' (eventually redefined as 'harm') [13]. Despite important voices of opposition to this equation [36], the formula endured and is to be found in the current editions of leading EBM textbooks [48,49]. Furthermore, it governed Haynes's streamlined search strategies for finding clinically relevant studies within biomedical databases [10], and the design of second-level resources such as ACP Journal Club [50]. Indeed, an end user must be acquainted with the original linear formulae to use these resources in a maximally informed fashion.

Sackett's equation of each question type to a specific study design, if compelling as a pedagogical ruse at the dawn of the age of clinical research, appears less so today in a setting in which randomized trials of diagnostic tests and strategies [51], and even of the utility of prognostic information [52,53], have become almost commonplace. It limits the kinds of questions that can be asked and the ways that potential answers found in research literature can be interpreted. It ultimately impedes the ability of EBM, as an instructional method, to fully empower clinicians to be 'evidence literate' within the richness of today's clinical research environment.

The users' guides

Sackett's 'Readers' Guides' were limited to a single component of the information literacy formula: critical appraisal of clinical research studies conforming to one of a small number of study designs. The underlying premise was that clinicians and clinical learners would become aware of the studies of potential impact upon their practices through a process of 'keeping up to date with

the medical literature', that is, through browsing [13]. With the explosion of medical knowledge that had been forecast by Durack [31] in full swing, the notion of 'keeping up to date' rapidly became antiquated, even as the need for skills conforming to those described by the information literacy visionaries came to the fore. The Users' Guides series [12], under the conceptual leadership of Gordon Guyatt, reflected the heritage of the efforts of the 1980s. It was based upon the premise that clinicians must be able to seek and find information from clinical research to be able to practise the highest quality of medicine in the emerging era. Each instalment began with a simplified clinical scenario and reported an electronic search of MEDLINE as a prelude to selecting an article for the purpose of demonstrating the critical appraisal criteria. The latter had also undergone transformation. The earlier 'Readers' Guides' appraisal criteria had not distinguished between *systematic error*, such as may be introduced by prognostic imbalances between study groups in a clinical trial, and *random error*, such as is reflected in wide confidence intervals around observed effects and corresponding lack of statistical significance. The Users' Guides enforced a rigorous distinction between these two categories [54]. This distinction became the basis of a standardized approach to critical appraisal [12]. The internal validity of the study was now defined as systematic error, or bias, whereas assessment of the results addressed precision, that is, the range of plausible random error around estimated outcomes, as well as their clinical importance. With this insight came a number of clarifications pertaining to the difference between a researcher's perspective and those of a clinician or patient on aspects of design. For example, it became clear that issues such as the 'power' of a study to find a statistically significant effect, although important to a researcher engaged in planning a study, are entirely moot once the results are analysed and published. The clinician evaluating such a study on behalf of her patients is meaningfully interested in the observed result and the confidence interval around it, and is advised to use clinical, not statistical, criteria to determine whether the study was big enough [55]. The third component of critical appraisal was defined as assessment of the applicability of information drawn from the evidence at hand to clinical practice. These components of evaluation, 'validity', 'results' and 'applicability', were anointed the '3 pillars' of critical appraisal [56].

Their important advances over the earlier 'Readers' Guides' notwithstanding, inconsistencies within the Users' Guides approach are identifiable on multiple levels. The pursuit of a practice-based approach encompassing the full range of information literacy skills was incomplete. A review of the chapter headings of the Users' Guides compendium [56] reveals an array of elements that do not belong to an identifiable set. Early chapters address the approach to asking questions and to searching electronic databases for the purpose of identifying research that might inform answers to them. However, these 'skill chapters' are then succeeded by chapters on clinical actions, for example, 'therapy' and 'diagnosis', and later by chapters addressing specific research designs, for example, systematic reviews and economic evaluation. Neither the information literacy categories nor Sackett's design specific categories of clinical action govern the Users' Guides in a consistent fashion. Therefore, despite methodological advances and richness of useful content, and despite a unique and innovative 'user's' orientation to the content of clinical epidemiology, a consistent and coherent elaboration of clinical

practice is neither attempted by nor to be found within the Users' Guides.

An unbalanced emphasis within the Users' Guides on randomized trials of effectiveness further reflects the lack of a well-conceptualized construct and corresponds to an early and recurrent criticism of EBM [36,57]. The 2002 edition of the Users' Guides compendium [56] treats 'therapy' and 'harm' as aspects of a single clinical category, notwithstanding the fact that clinical harm may also ensue from non-therapeutic exposures. Eleven out of 19 sections and 477 out of 659 pages (72%) deal with issues of therapy. The same imbalance is carried forward in the second edition [48]. The implications of this apparent lack of balance and proportion will be explored below.

The '3-pillar' approach of the Users' Guides also reflects the absence of a consistent practice model. Critical appraisal, the central focus of the Users' Guides, constitutes a single element, distinct from 'acquire' and 'apply' within the information literacy sequence from which EBM itself arose. Suddenly 'applicability', an independent component skill within the information literacy formula, has appeared as a component of the skill set belonging to a preceding stage in the cycle, that is, 'appraise'. In other words, 'applicability' has become an attribute of the process of evaluating a research report, a component of the appraisal process. Parenthetically, we may note that this inconsistency of composition, 'appraise = apply', mirrors the original pragmatic heuristic, 'therapy = randomized trials', that is, 'action = study design'. These incongruities do not necessarily reflect design or intent on the part of the progenitors of EBM, but rather the lack of a unified and coherent construct governing their efforts.

The applicability of research to practice is a sentinel indicator of inherent dilemmas within the published descriptions of EBM. The Users' Guides approach to such applicability embodies a distinctive and clinically helpful concept. Conventionally, 'generalizability' or 'external validity' may be narrowly or broadly defined. However, it has to do with whether the results of a study derived from a particular population would be the same were the study to be performed on a different population from that actually included [58]. The Users' Guides restrict the definition of the applicability of a study to the extent to which the subjects of a study are comparable to a practitioner's own patient(s) [59].

So far so good. However, the levels of analytical and discerning gaze that the Users' Guides applied to the assessment of internal validity (systematic error) and to the interpretation of the results of clinical studies (clinical significance vs. precision) are no longer in evidence when the assessment of relevance of a study and its results to decisions regarding care of a practitioner's own patients is concerned. Rather, discordances between study population and the patients within a practitioner's practice, contextual impediments to implementation and consideration of patient values, patient preferences and experiences of disease all become elements of a poorly differentiated array that ultimately resides within a single level, an antechamber within a two-dimensional domicile [60]. These and other factors relevant to decision, action and thought are implicitly understood within the Users' Guides framework as 'pieces of information' to be considered together with other information fragments ensuing from the review of a research report. They are predicates of an implied process, a process never explicitly conceptualized or elaborated, but which must,

by default, take place within the mind of the reader, that is, the practitioner. Missing are the patient as an independent and autonomous being and the relationship between the patient and the practitioner. Despite explicit efforts to remedy these omissions [61], the otherwise rich conceptual fabric and landscape of the Users' Guides ultimately ends at the very doorstep of the interface between the information literacy skills and what would otherwise strive to become an integrated model of scientifically informed, individualized, care; the very point at which information cries out to be transformed into knowledge, if not wisdom. This leads us to the threshold of our implied existential question: apart from its undeniable accomplishments, does 'evidence-based medicine' exist?

The phantom model

If the outstanding strength of the EBM movement constitutes the potential empowerment of clinicians to contend with the overwhelming complexity of the Information Age, its weaknesses are embodied in its attempts to portray itself as a comprehensive revision of, or 'paradigm shift' in, clinical reasoning and action [19]. Our inquiry has helpfully led us to an understanding of the language and content of EBM as manifestations of 'information literacy,' a systematic approach to harnessing an expanding world of electronic information relevant to a specific area of complex problem solving [39]. But, as we have seen, 'evidence-based medicine' promised more than adjuncts to the clinical practice of medicine, it proposed a new model for such practice itself.

The quest for an elaborated model of practice conforming to EBM finds its protagonists struggling against the linear chains of the world of information (Fig. 1). An early attempt represents three categories, 'clinical expertise', 'research evidence'

and 'patient preferences' on a simple two-dimensional plane as a Boolean diagram of concentric circles [62]. It is, in fact, presented as a model for clinical decisions, not of practice. The process through which the content of the three information categories is harvested and interpreted is not defined, nor is the identity of the 'decider'.

A later version of evidence-based decision making revises and broadens the categories of the concentric circles and superimposes a second ellipse labelled 'clinical expertise' on top of the Boolean formula [63,64]. The identity of the 'decider' within the model is now revealed to be the practitioner. The resulting model implies that the practitioner is required to perform a higher-order integrative function and poses a redefined concept of 'clinical expertise'. It is once more a model of decisions not of clinical practice. And yet, is it such? It avowedly is a 'prescription' regarding the kinds of information that are relevant to health care decisions. However, the concentric circles still tell us little about the process through which information from these and other sources become transformed into decisions, value and better health for patients. The prescription merely mandates that multiple sources need be considered, not how a balanced determination is to be achieved [63].

Patients are not directly part of either version of the model. Rather patient attributes, clinical and attitudinal, are included as facts to be considered by the practitioner in the process of coming to decisions, decisions certainly on behalf of the patient and for the patient's benefit, but still to be formulated within the framework of expertise and understanding of the practitioner and, ultimately, to be sold or 'marketed' to the patient by the practitioner. Patient compliance with practitioner recommendations is the principal outcome of the model and, as such, does not inherently move beyond the linear prescriptive framework of Parsons [65].

What the foregoing attempts to describe EBM as a model for clinical practice usefully illustrate is that the very term 'evidence-

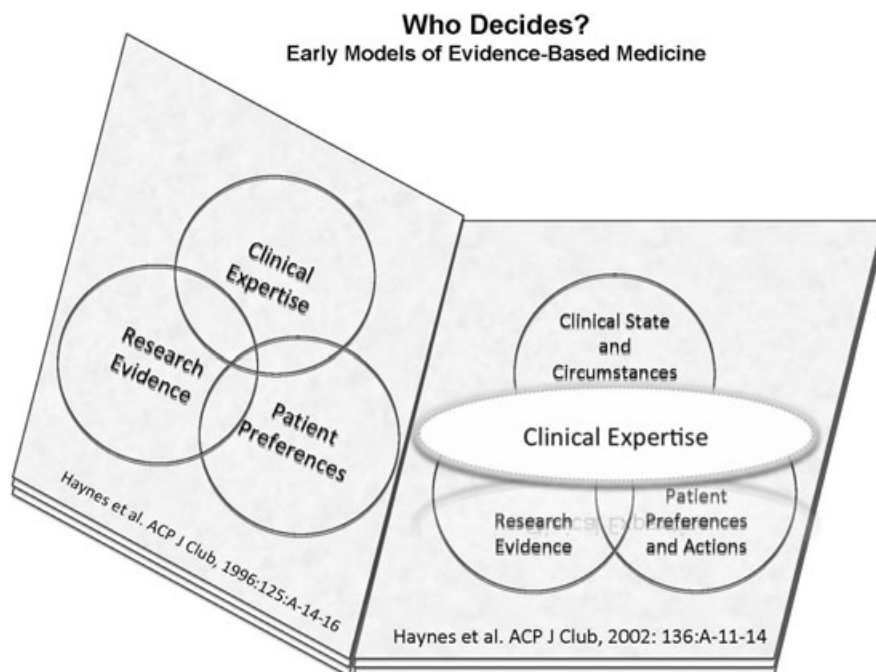


Figure 1 Successive versions of a model of evidence-based decision making published in the evidence-based medicine literature.

based' necessarily conforms to an implicit construct in which, first, the practitioner is the ultimate arbiter of medical decisions [20] and, second, such decisions are determined by information. What has changed between the two iterations of the Boolean model of EBM is therefore merely the source of the information upon which health care decisions are predicated. Relative to the worldview of Parsons, the generosity of the EBM model extends only to the point that patients' lives, concerns, values, fears and circumstances are themselves transformed into information bits to be considered alongside other bits originating from the domains of clinical research and external circumstance.

The preliminary attempts at 'evidence-based medicine' model building may shed light on the previously identified preponderant emphasis on therapy over other modes of clinical action. 'Therapy' is very much at the centre of a practitioner's world. It is what doctors do, and certainly is high on the list of what patients want them to do. However, a patient seeking medical attention for either a new or established condition is likely to be as concerned about issues such as 'what is wrong with me', 'what is going to happen as a result', 'why me, why now', 'what have I done wrong', as about different approaches to modifying the likelihood of outcomes. Indeed, even the best therapies lead to avoidance of bad outcomes in fewer than half of the patients treated [66]. However, the meaning of having or not having a disease pertains to all patients for whom the question is relevant.

The 'overemphasis' on therapy within the EBM literature may be best seen as reflecting errors of omission rather than 'inappropriate emphasis', and thereby the above-described implicit limitation of the underlying model. A perspective that started with and was determined by a patient's world of concerns would likely feel compelled to develop those aspects of clinical evidence having to do with the 'meaning' of disease, that is, diagnosis and prognosis, and their application to practice, much further than is reflected in the User's Guides and in other EBM literature.

In line with this interpretation, the ubiquitous criticism of EBM referred to above, that is, that it 'overly emphasizes' randomized trials, as opposed to non-randomized designs [67], may partly reflect a misplaced insight, perhaps fed by the original, but now historically antiquated, Sackett formula ('therapy' = 'randomized trials'). Is it not perhaps the overemphasis on *therapy*, that is, the *underdevelopment* of equally patient value laden action modes, within the EBM literature, rather than on randomized trials, that many EBM critics are striving to identify?

There are additional reasons to challenge EBM as a model for practice and they return us to the principal theme and title of our review and to the distinctions between information, knowledge and wisdom. The issues relevant to these distinctions have been addressed abundantly in the literature and merit an independent discussion which we offer as a companion piece to this one [68].

Summary points

This critical history of 'Evidence-Based Medicine' has worked backwards and forwards from the latter's sentinel announcement and christening in 1992 [19]. We have located the crowning achievements of the EBM movement as pertaining to the necessity of 'medical information literacy' within the knowledge and information explosion of the 1980s. The information literacy model

emphasizes the need to critically review and evaluate the quality of information located in the course of electronic searches. From this standpoint, EBM has provided us with a complete package that combines clinically framed concepts of critical appraisal together with streamlined electronic resources and databases required for judicious access to new research information as it emerges. We can imagine how extreme our plight would be had not these achievements been realized and the nightmare envisioned by Durack been allowed to unfold. Surely they are justifiably claimed by EBM as towering accomplishments.

At the same time, we have been forced to recognize that, as a purported revolutionary model for the practice and teaching of medicine, EBM is, at best, incomplete, and at worst, a misnomer. Although it has created crucially important adjuncts to clinical practice, EBM has not itself elaborated the process through which such adjuncts are effectively integrated and incorporated into the fabric of individualized care together with evidence that stems from sources other than clinical research, including narrative evidence [69,70]. Such an elaboration would need to traverse the boundaries separating the realms of information and information literacy from those within which knowledge, truth and wisdom abide and within which patients actual needs are met, or not met. We would further suggest that an integrated and satisfying model of individualized practice in the age of information will need to cede primary authority to a domain of shared interpretation, rendering subsidiary, if crucial, the domain of external information drawn from populations [70,71].

Undoubtedly reacting to its incompleteness as a model and representation of clinical practice, some have portrayed the limitations of EBM as a direct threat to the integrity of individualized care [57]. We find such hyperbole less than compelling. Considering the plethora of such threats that abound within today's world of health care, EBM, precisely because it offers so little as an elaborated guide to clinical practice, certainly must comprise one of the very least toxic culprits. The sheer complexity of clinical practice amidst multiple levels of scientific uncertainty [72], conflicting influences and agendas, and the many exigencies facing the health care system itself in the context of global economic crisis, render EBM a meek adversary, if not indeed, potentially, a 'straw dog', with respect to the defenders of the relational and scientific integrity of individualized care.

Rather, EBM, as a proposed but not elaborated model for practice, might better be taken as a useful metaphor for a vision of critically informed individualized care, freed from the constraints of blind obeisance to tradition, which our patients more than ever before need. Bringing this vision beyond the realm of metaphor and developing and elaborating it in an articulated, observable and teachable form constitute the urgent task of our time, and the true frontier.

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