R.E.G. UPSHUR and ERROL COLAK

ARGUMENTATION AND EVIDENCE

ABSTRACT. This essay explores the role of informal logic and its application in the context of current debates regarding evidence-based medicine. This aim is achieved through a discussion of the goals and objectives of evidence-based medicine and a review of the criticisms raised against evidence-based medicine. The contributions to informal logic by Stephen Toulmin and Douglas Walton are explicated and their relevance for evidence-based medicine is discussed in relation to a common clinical scenario: hypertension management. This essay concludes with a discussion on the relationship between clinical reasoning, rationality, and evidence. It is argued that informal logic has the virtue of bringing explicitness to the role of evidence in clinical reasoning, and brings sensitivity to understanding the role of dialogical context in the need for evidence in clinical decision making.

KEY WORDS: argumentation, evidence-based medicine, informal logic, medical epistemology

> It cannot indeed be required that everything should be proved, since that is impossible; but one can see to it that all propositions which are used without being proved, are expressly stated as such, so that it is clearly known on what the whole structure rests.[1]
>
> Gottlob Frege

INTRODUCTION

Medicine and health care are not traditionally associated with concerns for argumentation and its evaluation. The strongest contribution of philosophy to medicine has been in the domain of bioethics. The advent of evidence-based medicine (EBM) has raised issues relating to epistemology, philosophy of science, and informal logic.

It has been argued that advances in informal logic have much to offer in clarifying the role of evidence in health care. Informal logic consists of the study of sound and unsound reasoning in natural language. Originally concerned with the detection of fallacies, modern informal logic consists of a diverse and complex set of techniques used to analyze argumentation as it arises in practical life. Informal logic is concerned with the adequacy and sufficiency of reasons put forth to justify beliefs and actions.[2]

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The potential contribution of informal logic to EBM has attracted scant scholarly attention. EBM provides a rationale and justification for the use of clinical research evidence in medical practice. A critical examination of this process clearly entails the domain of informal logic. In this paper we will outline two ways in which argumentation theory can contribute to the understanding of the use of evidence in health care contexts. We will draw from both traditional approaches in informal logic, in particular, Stephen Toulmin's diagrams, and more recent developments as represented by Douglas Walton's description of dialogical contexts. The analysis will illustrate the potential contributions of informal logic to understanding evidence-based medicine through the analysis of a common clinical case scenario, the management of hypertension. Finally we will conclude with a discussion of the relationship between informal logic, rationality, and evidence-based medicine.

BACKGROUND: WHAT IS EVIDENCE-BASED MEDICINE?

Unveiled in 1992, EBM was bold in its proclamations:

> A new paradigm for medical practice is emerging. Evidence-based medicine de-emphasizes intuition, unsystematic clinical experience and pathophysiologic rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research. Evidence-based medicine requires new skills of the physician, including efficient literature searching and the application of formal rules of evidence evaluating the clinical literature.[3]

The use of evidence in medicine intends to introduce a more rational and foundational approach to the practice of medicine. Using the best available research evidence would place clinical decision-making on a more objective basis. Furthermore, the use of research evidence in practice would reduce unnecessary variations in practice, lessen arbitrariness in the use of prescription medication and diagnostic testing, and eliminate the influence of values in decision making. As a consequence of this, better patient outcomes would result. As Haynes recently wrote:

> A fundamental assumption of EBM is that practitioners whose practice is based on an understanding of evidence from applied health care research will provide superior patient care compared with practitioners who rely on understanding of basic mechanisms and their own clinical experience.[4]

EBM is committed to explicit rules and definitions. There is a clearly articulated hierarchy of scientific evidence based upon study design. Preference and greater credibility is given to studies with less apparent bias such as systematic reviews, randomized control trials, and meta-analysis.

Evidence-based approaches have clearly grown in popularity and are now mainstays in the curricula of most undergraduate and post-graduate medical curricula.

CRITICISMS AND LIMITATIONS OF EBM

However, despite the success and spread of the concept, EBM has not met with universal approval. Critics of EBM have questioned its clinical applicability arguing that the approach ignores clinical judgement and experience. Some argue that evidence-based approaches foster an inappropriate reliance on epidemiology and statistical methodology, particularly a dogmatic adherence to the randomized control trial (RCT). Others argue that evidence-based approaches neglect the true underlying issue that relates to what and how physicians and health care workers know. That empirical studies have not shown conclusively the superiority of evidence-based approaches is regarded as an important and telling fault for a theory based on the primacy of research evidence. Straus and McAllister have summarized the misperceptions and limitations of EBM, arguing that many of the limitations of EBM are limitations inherent to the practice of medicine.

THE PROBLEM OF EVIDENCE

Arguments have been directed at the very concept of evidence as articulated by EBM, suggesting that it is restrictive, stipulative, and overly reliant on quantitative methods. A more inclusive model of evidence has been proposed that stresses the importance of context in the creation of evidence and places equal weight on qualitative and quantitative sources of evidence as the priority given to research-based evidence over clinical knowledge in practice, and the limitation of what constitutes evidence, in the current evidence-based paradigm, to that which can be expressed as a probability statement are problematic. Who defines evidence and the interrelationships between the power of those defining evidence and the range of interests and practices excluded by this process raises critical issues related to the sociopolitical context of evidence-based practice. Finally, how values, either explicitly or tacitly stated, are to be integrated and evaluated in the process of the practice of EBM is unclear.

Values are crucial components of effective and appropriate health care and are elements of virtually every clinical decision. The existence of large grey zones in clinical practice underscores the importance of eliciting and

respecting patient values and openly acknowledging uncertainty. Recent writings by leading advocates of EBM have emphasized the importance of integrating patient values and clinical expertise in evidence-based decision-making. Despite acknowledging their importance, proponents of EBM have provided few methods to determine how patient values and the experience of clinicians are to be integrated with research evidence. In contrast, a large volume of literature has been created to assess the validity of a wide variety of study designs and creating decision algorithms for rational diagnosis.

THE ROLE OF ARGUMENTATION

The epistemological and ethical tensions raised by EBM, then, are not inconsiderable. Advancing EBM requires the elaboration of a theory of evidence. Edmund Pellegrino has noted that evidence enters any discourse in health care as a means of testing assertions and providing support for arguments. Since there is a dimension of persuasion inherent in the use of evidence, it has an inescapable moral dimension. Therefore, Pellegrino recognizes the need to develop a theory of evidence that inquires into the existence, nature, and kinds of evidence that exist. This theory of evidence, though, also must take into account concepts of rationality and argumentation, which are assumed and not analyzed by current models of EBM.

Evidence has a justificatory role. It is offered as a means of supporting conclusions or recommendations to act. The traditional concern for the critical analysis of the adequacy of the relationship between justifications and the conclusions they support arises from logic. Empirical studies suggest that physicians require improvement in their reasoning skills. Auclair et al. studied the ability of medical residents to detect fallacies present in discursive arguments. They found that 36–42% of fallacies went undetected. This illustrative example may represent a biased picture and paint a far bleaker portrait of medical reasoning skills than necessary. However, it does provide grounds for reflecting on how argumentation theory can contribute to medicine.

Recent commentators have pointed out the relevance of argument analysis, particularly the method of Toulmin diagramming, to the application of evidence-based practice. Horton argues that "the skill that physicians lack above all is the ability to reason successfully. By to reason I mean interrogating a clinical argument to discover its weakness or the basis of its validity."[5] He concludes that: "The argument is the fundamental unit of medical thought."[6] Horton and Dickinson point out the important

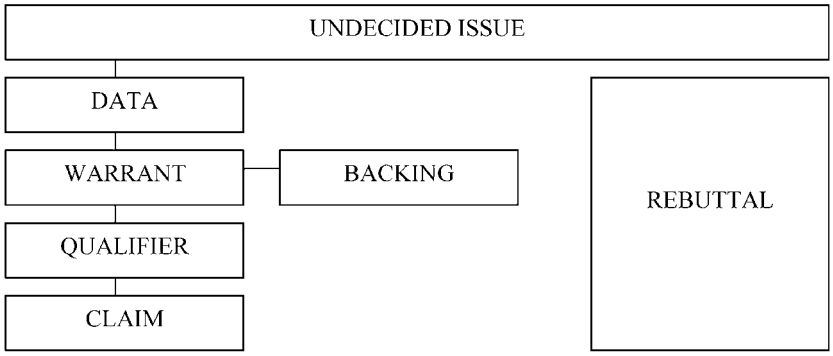

Figure 1. Adapted from Dickinson, H.D., 1998.[11]

role of a structured approach to the analysis of evidence and the way it is employed in argumentation. The methodology set out by Stephen Toulmin is used by both to exemplify the logical structure of how evidence enters into medical reasoning.

TOULMIN MODEL OF ARGUMENTATION

In his book, *The Uses of Argument*, Stephen Toulmin outlines a practical approach to the analysis of everyday arguments. His structural model involves identifying and separating the various components of an argument into a specific order and structure (as shown in Figure 1) so that an argument may be perspicuously appraised. The elements of this model, how they relate to each other and how this model can clarify the use of research evidence in medical reasoning will be illustrated through the use of a clinical scenario.

Mrs. Smith visits her physician seeking advice about the best way to manage her hypertension. After performing a detailed history, physical examination, and lab work her physician decides that Mrs. Smith's treatment will consist of hydrochlorothiazide, an anti-hypertensive medication.

In terms of the Toulmin model, the undecided issue is how to best treat her illness while the claim is that it should be treated with hydrochlorothiazide. In its most simple form, an argument consists of a claim or conclusion to be established by the argument. Claims, on their own, lack any reasoned support to determine whether they are true or false despite the fact that they may be true or false. When attempting to demonstrate the truth or probability of an argument's claim, one may be asked: "What information have you got to go on?" Claims are usually supported by appeal to some facts or other considerations. Broadly considered these can

be called data. Data can be a direct observation (e.g., the measurement of elevated blood pressure), appeal to published literature, or any other form of positive or negative information.

Is there a way to justify the leap from the provided data to the claim? Supporting the step between data and the claim is the warrant. A warrant is distinct from the data and the claim and acts as a bridge between them. Warrants are often implicit in arguments. With regards to Mrs. Smith, the warrant supporting the decision to prescribe hydrochlorothiazide is that it is effective in controlling blood pressure and preventing its long-term complications.

You've told Mrs. Smith that hydrochlorothiazide will lower her blood pressure. But she may respond "How do you know?" The range of possible answers available to you as her physician include the following:

1. Because I'm a doctor (intuition/authority)
2. Because in my experience it works (experience)
3. Because it interferes with a specific biochemical process that will lower blood pressure (basic science)
4. Because many well designed studies have shown that the drug is effective in lowering blood pressure (clinical science)

Clearly, there is a wide variety of available warrants for use in an argument with some being stronger than others. EBM seeks to reinforce the need for type 4 warrants. When using evidence obtained from a study as backing to a warrant, we are improving our confidence in using a particular warrant and thus using a stronger qualifier. Since taking hydrochlorothiazide does not necessarily guarantee adequate blood pressure control, there is a need to qualify the warrant by stating that hydrochlorothiazide is usually effective.

Arguments are liable to rebuttal, which may be stated to indicate conditions in which the warrant is not applicable and consequently the claim can be overturned. Mrs. Smith may have allergies or contraindications to hydrochlorothiazide; a more efficacious medication or treatment may exist, or her particular set of values, whatever they may be, prevent her from using the medication.

Dickinson argues that, when introduced in argument, information can either be "warrant-using" or "warrant-establishing."[7] Warrant-using information acts as the basis for a claim and attempts to answer "What information do you have to go on?" In the clinical context, warrant-using information relates to the individual patient and is obtained through the patient interview, physical examination and investigative tests. In the case of Mrs. Smith, warrant-using information would include the measurement of high blood pressure and findings from the physical examination.

Warrant-establishing information serves as the backing or justification of the warrant used to make the leap from the data to the claim. Essentially, this form of information is used to answer "How did you get there?" In relation to evidence-based medicine, warrant-establishing information is typically derived from systematic research such as randomized controlled trials and meta-analysis. In the case of Mrs. Smith, warrant-establishing information would include randomized controlled trials that demonstrate the effectiveness of hydrochlorothiazide in controlling blood pressure levels and preventing the long-term complications of diabetes.

According to the Toulmin model of argumentation, clinical decisions require warrants even in the absence of research data that may certify the warrant. Clinicians often find themselves in situations where there is little, if any, research data available, or substantive disagreement about the interpretation of the research data. This makes explicit the fact that in such situations a physician's experience and intuition may potentially serve as the backing of a warrant. For example, a clinician may argue that, even though hydrochlorothiazide is an effective medication, it is not an appropriate choice in their experience as it poses concerns for potassium balance or bothersome urinary frequency (noted adverse effects of the medication).

The Toulmin method can neither adjudicate conflicting interpretations of evidence, nor determine when claims derived from experience trump those of clinical research. The virtue of the Toulmin model is that it makes explicit the relationship between evidence and inferences based on the evidence and therefore permits the existence of conflicts to be made clear to parties in dialogue.

WALTON AND DIALOGIC CONTEXTS

The Toulmin model is a structural model, concerned with illuminating the architecture of arguments. However, medical decisions are acted out in context, often with practical decisions as the goal of the interaction. The Toulmin model aims to be context independent. Recent scholarship in argumentation, however, modifies this aim.

In his book *The New Dialectic: Conversational Contexts of Argument*, Walton outlines a typology of argument contexts. In Walton's view, argumentation is dialectical, that is, a fundamentally social process conducted in diverse contexts between individuals with potentially differing interests. The New Dialectic, as described by Walton, pays close attention to the pragmatic dimensions of reasoning, and is particularly concerned with describing and explicating presumptive and defeasible reasoning.

The need for the new approach stems from the recognition that the context of argumentation strongly influences the adjudication of argument adequacy and soundness. Previously, in the assessment of arguments, the presence of a fallacious inference was regarded as invalid universally. This, though, neglects the fact that argumentation, in real life, occurs to serve a variety of goals. What is warranted in one context can be regarded as unwarranted in another. Furthermore, dialogues are linked to communicative purposes that are largely concrete and practical in nature. Hence there may not be a universal standard of adjudication of the sufficiency of evidence.

Walton describes six essential contexts for dialogue and argumentation. Table I summarizes the type of dialogue and the situation and goal of the dialogue. In what follows the application of these types of dialogue to clinical situations, the requirement of research evidence in that context, and the role of values will be explored utilizing simple illustrative examples. For the purposes of this analysis, eristic argument will not be discussed in detail.

Persuasion Dialogue

Persuasion dialogue is likely ubiquitous in clinical practice. The process is dyadic and can involve a patient attempting to persuade the health care provider or vice versa. However, there will also be a set of value commitments that are not reducible to empirical data and may not be expressed. To return to our blood pressure example, suppose Mrs. Smith is reluctant to take medication while her physician believes it is in her best interest. They each proffer their reasons for their perspective. Research evidence will likely be offered in support of the disparate views, and likely will serve as the basis of the legitimacy of the physician's standpoint.

It is easy to recognize that value issues are intimately entangled with empirical issues in this context. A patient can trump even a sophisticated and compelling meta-analysis by declining to initiate therapy. The standard of adjudication is reasonable persuasion. The debate has a maieutic function, that is, the opposition of perspectives is meant to elicit greater explicitness concerning the shortcomings of the rival perspective. Research evidence is important for persuasive dialogue, but is neither necessary nor sufficient.

Inquiry

The goal of an inquiry is to produce solid inferences, with clear concepts of burden of proof articulated *a priori.* This context of argumentation maps

TABLE I

Type of dialogue*

Type of dialogue	Initial situation	Participant's goal	Goal of dialogue	Evidential standard	Example
Persuasion	Conflict of opinion	Persuade other party	Resolve or clarify issue	Variable: may not require or be influenced by empirical evidence	Clinician wishes patient to accept treatment for blood pressure
Inquiry	Need to have proof	Find and verify evidence	(Dis)prove hypothesis	High: requires evidence from studies	Original conception of EBM Meta-analysis and Systematic Research
Negotiation	Conflict of interests	Get what you want most	Reasonable settlements that both can live with	Variable: may be resolved reasonably without recourse to empirical evidence	Patient and physician negotiate trade offs between medical and conservative therapy.
Information seeking	Need information	Acquire or give information	Exchange information	Variable: may require detailed empirical evidence, or could be resolved by expert opinion	Advice from clinician regarding health issue
Deliberation	Dilemma or practical choice	Coordinate goals and actions	Decide best available course of action	Variable: may require detailed empirical evidence, or could be resolved by expert opinion or patient preference	How to proceed in the face of a possible diagnosis
Eristic	Personal conflict	Verbally hit out at opponent	Reveal deeper basis of conflict	No role of research evidence	Not illustrated

*Adapted from: Walton, D., 2000.[10]

well to that of systematic reviews, (and of the Cochrane collaboration in particular) and the original conception of evidence-based practice. The effort is collective, exhaustive with clearly specified questions and criteria stipulated in advance to determine the acceptability of evidence. Considerable effort is made to ensure that all acceptable evidence is included and evaluated according to the pre-established standards. It is the dialogic context where research evidence is necessary. In our example of hypertension it may start with a physician asking a clinical question about the appropriateness of prescribing a particular therapy to Mrs. Smith; conducting a literature review and determining whether the results of this inquiry apply to her situation. Another illustration would be a collaborating group systematically reviewing the literature and pooling eligible randomized trials to determine the effectiveness of an anti-hypertensive agent, either in comparison to a placebo or another anti-hypertensive medication. The value commitments in this dialogue relate to the value commitments of good empirical inquiry.

Negotiation

In negotiation, commitment to the truth or falsity of premises is subordinate to the exchange, purchase, or movement of items of value. The concept of value has several meanings, but the most commonly understood connotation involves exchange value with some form of commensurable token such as money. Rather than the marshalling and adjudication of the burden of evidence, negotiation involves trade-offs and bargaining. Negotiation is rooted in interests and not in the pursuit of truth per se. It is important to recognize how evidence functions in a different role in this context and does not assume a hierarchy or trump. The question in assessing evidence in this dialogue context is the reasonableness, fairness and justice of the trade-off's.

This type of trade off is illustrated by recent developments in concordance research. In this vision of the physician-patient relationship, a dialogue is established and a process of partnership develops through discussion. Negotiation is an important element of this as there may be tradeoffs between the goals of the provider and the patient. Evidence of the effectiveness of a drug may be subordinated to the self-perception or lifestyle needs of the patient. For example, Mrs Smith and her physician may agree to a trial of weight loss, increase in aerobic exercise, or salt restriction in exchange for forestalling the initiation of medical therapy. Mrs Smith is willing to bear an increase of potential risks in order not to initiate medication. Her physician can agree to this trade off if the patient is willing to contemplate the use of medication if her blood pressure exceeds

a certain value or if the self care measures fail to achieve therapeutic goals. In this context, the decisions reached are arguably reasonable.

Information Seeking Dialogue

In information seeking dialogue one of the parties has a repository of skills or information that the other party or parties does not possess. By definition this context is asymmetrical in that the roles are unequal. This context is familiar in health care and examples abound: physician-patient relationship, physician-physician relationships particularly between specialist and generalist physicians, student-teacher, administrator-administrated, expert consultations, etc. Walton stresses that these relationships are usually collaborative and non-adversarial which may not always be the case in health care.

The main characteristic of this dialogue is that it is not necessarily truth seeking. The goal may not be the truth per se, but a reasonable enough exchange of information to support a decision. The evidence involved in the exchange is required to solve a problem or carry out a task. Consequently, the evidential standard is highly contextual and variable as opposed to the context of inquiry which is exhaustive and authoritative. The information is determined to be satisfactory by mutual agreement rather than established criteria. Narrative evidence may be of more significance in this context than quantitative. In the sense that individuals seek health care information for their own purposes the context is also interest based.

Using our hypertension example, a patient may simply come and consult a physician wondering whether they have high blood pressure. A simple measurement, if normal, may reassure the patient and physician that all is well and no further information is required.

Deliberation

Deliberation relates to the considerations and use of evidence in the pursuit of a solution to a practical problem. It is aimed at coming to agreement on a course of action for joint implementation or decision making. Hence a great deal of reasoning in health care is deliberative, from deciding on a diagnostic strategy, through treatment decisions, purchasing, and policy. Deliberative reasoning occurs, then, at every level of health care. Evidence is used as a means of assisting in deliberations about what steps to take.

The main characteristics of deliberative dialogue are the need to take action to solve some particular problem. In our example so far, instead as in the last scenario, the patient is revealed to have a high blood pressure reading. The patient and physician will then deliberate on what is the best

course of action. The physician may recommend further sequential blood pressure readings and inform the patient on the meaning and significance of high blood pressure. The patient will deliberate and ask questions about this course of action and together they come to an agreement about the plan for diagnosis and management.

ARGUMENTATION AND RATIONALITY

Toulmin's diagrams are effective in illustrating the warrant establishing nature of research evidence in argumentation and in making explicit the relationship between claims, their evidential support and highlights the sources of conflicting evidence claims. The typology of argument contexts established by Walton is useful in that it directs attention to the type of dialogue in question and establishes that the need for evidence is relative to that context of application. As a consequence, there is no invariant hierarchy of evidence that can be applied in each context, and the need to pursue research evidence will therefore vary accordingly. Taken together, the role of research evidence in the logic of clinical decision making becomes more explicit. It also follows from this account that research evidence is neither necessary nor sufficient for decision making as many health care decisions, when regarded in the form of an argument, require weighing normative as well as factual claims. An argumentation model can be used for evaluating the strength of such arguments.

These models, particularly Walton's approach, are well adapted to considering how research evidence, values, and professional experience have probative weight in decision-making. Most discussions of medical diagnosis and reasoning have examined its relationship to models of scientific inference. Hence medical reasoning is regarded as analogous to induction, the hypothetico-deductive method, or Popperian falsificationism. However, it is clear that medical evidence has a restricted life span. It is the transience of medical facts that makes the need for elements of evidence-based approaches, such as consulting the research literature, so pressing. The inherent fallibility of medical knowledge indicates that the type of reasoning employed by physicians is more provisional in nature, pragmatic in orientation and probabilistic in its expression.

Judgements and decisions in clinical medicine rest more on plausibility than certainty, that is, what seems to be true or appropriate in a given set of circumstances. Plausible inferences can carry probative weight that may be quantitative (like probability statements and subject to the probability calculus), or be expressed in qualitative or narrative terms (and hence not subject to the probability calculus). Plausible inferences intend to provide

a reasonable guide for sustaining a belief or justifying an action, but may in fact turn out to be erroneous, and in need of revision (think of estrogen and cardioprotection in this regard). This is consistent with the nature of medical evidence. As demonstrated in the discussion of the Walton model above, what is plausible and reasonable to do in a clinical encounter is determined by the context of that clinical encounter, not by the existence of research evidence.

The Walton model also emphasizes reasoning as a form of dialogue and hence a social undertaking. Walton, following Anscombe, identifies four contrasting types of reasoning:

- Monolectical (critical appraisal searching)/dialectical (clinical situation with patients and families, other views and priorities)
- alethic (truth values)/epistemic (related to a knowledge base)
- static/dynamic
- practical based on goals and situation, context bound based on uncertainty or incomplete knowledge of one's changing situation/ theoretical: cognitive orientation/finding reasons for accepting truth or falsity of claims

The process of evidence-based medicine so far, is monolectical, alethic, theoretical, and cognitive. It is to be carried out by the health care provider seeking to apply evidence in the clinical context, and is most likely to be conducted outside the clinical encounter. The overarching concern is for validity and the veracity of claims derived from the empirical clinical literature. However, this stringent concern for validity, as follows from the above discussion, is most appropriate in one dialogic context. Much of the process of the practice of medicine is dialectical, dynamic, pragmatic and context bound. These reasoning approaches are not necessarily antithetical, but the role and status of research evidence is different in each context. What is reasonable and justifiable in clinical practice may not always turn out to be "evidence based." The differences between the types of reasoning and the standards appropriate to the adjudication of evidence within them has not been fully explored or acknowledged by proponents of EBM. Conflating the two, though, is likely responsible for differences in perspectives about the applicability of evidence-based approaches in practice and a source of some of the criticisms leveled at EBM.

Explicitness is an essential element of the definition of EBM. It is important to be as explicit about the context and purpose of dialogue as it is to understand the type of evidence produced by research studies. An argumentation framework can make explicit the stated assertions that link premises to conclusions as well as provide the grounds for the analysis of

unexpressed assumptions. Critical appraisal provides a method to assess the strength of claims arising from the empirical research literature.

The explication of context moves away from the original conception of evidence-based medicine. This model is more in keeping with the vision of "research enhanced health care."[8] It is also consistent with the move towards recommending digested evidence sources and the existence of "evidence users,"[9] as acting on the basis of a pre-assessed account of a study is precisely to act on plausible grounds. Where the strong rhetoric of evidence-based medicine incited debate, polemic and rancor, the more pragmatic vision of the clinical encounter expressed by informal logic may resonate with clinicians' experience as it places patient values, clinical experience, and clinical research on equal grounds.

The account provided here will help to dispel notions that randomized trials or systematic reviews are required for each clinical decision. Clinical research should be paid due respect, and in other contexts we have argued that such consideration is an integral component of virtuous practice. However, there are contexts and decisions in which research evidence plays very little or no role. In such circumstances physicians and patients should not fear that they are falling below standard.

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Sunnybrook and Women's Health
Sciences Centre
Joint Centre for Bioethics
University of Toronto
Room E349B
2075 Bayview Avenue
Toronto, Ontario
Canada M4N 3M5
E-mail: rupshur@idirect.com