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“Scientific” Decision Making: Decision Analysis and Evidence-Based Medicine

Abstract:

Formal methods of decision analysis play a critical role in Evidence-Based Medicine (EBM), where they are supposed to help doctors move from the best scientific evidence available and the patient’s particular values and goals to the course of action that will be best *from the patient’s perspective*. This is generally thought to involve making use of the patient’s (the decision-maker in this case) pre-existing values and preferences, and in that sense the decision-process is supposed to neutral with respect to the possible values a patient have. Insofar as the decisions that emerge from EBM are supposed to have a special epistemological status, it must be because of the combination of high-quality data and this neutrality. I argue here, however, that this neutrality is in fact unobtainable by formal methods of decision-analyses used in EBM, and hence that EBM *cannot* claim to help patients (with the help of their doctors) make decisions that simply reflect the combination of the best scientific evidence and the patients pre-existing values and preferences. This forces decision-analysis to reinterpret its goals with respect to helping patients make decisions, and reveals that it cannot lay claim to any special epistemological status (such as helping patient’s make decisions that are uniquely ‘rational’ or ‘scientific’). Other than partially undermining attempts to make medical practice more properly ‘scientific,’ these difficulties may have serious implications for such arenas as microeconomic expected utility analyses, and perhaps broader implications for the relationship between science and society as a whole.

“Scientific” Decision Making: Decision Analysis and Evidence-Based Medicine

I. Introduction: Evidence-Based Medicine and Medical Decision Making

Evidence-Based Medicine (EBM) has billed itself as an attempt to make the practice of medicine more properly scientific and rational (see for example various in Perkins, Simnett and Wright 1999, Rosser and Shafir 1998, and Grayson 1997) Part of EBM involves viewing the relationship between doctors and patients as a partnership that makes decisions together; these decisions will incorporate the best scientific evidence available but will also respect the patients’s preferences and values (see esp. Rosser and Shafir 1998 chapter 6, and Grayson 1997 chapter 5). The physician brings to the process the best science to explain the options available and the likely outcomes, and the patient brings what they want to achieve¹. For this to work, the techniques used by EBM must be neutral with respect to the patient’s preferences and values. Insofar as this is possible, EBM can enjoy a special epistemological status – the decisions made using the EBM methodology are uniquely good in that any technique which yields a different decision either relied upon inaccurate information or failed to fully respect the patient’s own values and preferences. However, insofar as EBM cannot in fact be neutral with respect to a patient’s own values and preferences, its claims to generating decisions with a unique epistemological status will be undermined. I argue here that EBM is either forced to accept a vastly implausible set of assumptions about the ease of correctly eliciting patient’s preferences and values, or that it is forced to give up on its claims to value-neutrality with respect to patient’s decisions, and hence its claims to possessing a unique epistemological status.

There are, then, two main elements to EBM. The first is to encourage doctors to gather the

best available data from contemporary research in thinking through treatment options and likely outcomes. Proponents of EBM claim that medical decisions are too often made by medical practitioners on the basis of anecdotal evidence, outdated information, and ‘standard practices’ with little empirical evidence that supports their effectiveness. EBM proponents encourage reliance upon random clinical trials (RCT) as the ‘gold standard’ of medical evidence, and a focus on meaningful measures of patient outcomes rather than more theoretical attention to disease states.

The second main element of EBM involves *using* the data gathered, when possible, to help patients make the best decisions regarding the course of treatment, *given* the particular values, preferences, and goals of those patients; this is often referred to as Physician-Patient Partnership (PPP) oriented decision-making. The physician brings to the decision process information about the available options, and the ranges of possible outcomes associated with the various available options, the patient brings information about what outcomes they want to achieve (and what outcomes they want to avoid). This second element is necessary because different patients will have different values and preferences regarding possible outcomes, as well as for example different attitudes towards risks. For example, for some patients, the side-effects of a particular treatment option (say, mild dizziness or minor sexual dysfunction) may be perfect tolerable; for another patient, physically identical side-effects may represent an intolerable state of affairs. What course of treatment will be best for a patient, then, depends not only on what the likely outcomes will actually be, but on how the patient *values* those outcomes. For EBM to be more successful in helping patients achieve their goals, it must take account of those differences, and ideally be neutral with respect to the different values and preferences patients really have.

II. Decision Analysis: Combining the best evidence with the patient's values

It is the techniques of decision analysis that combine the data the physician brings to the process with the preferences and values of the agent in order to help the patient (or the PPP) make the 'best' decision. In general, formal methods of decision-analysis claim to enable agents to make better quality decisions by permitting more complex calculations to be carried out more accurately. Once it is clear what an agent wants to achieve (what the agent's preferences are), and once one knows the conditional probabilities of the various possible events given the agent's possible actions, and the various other dependencies events might have on each other, the best action (or actions) simply emerges from the formal analysis. A higher-quality decision is simply one which maximizes the expected utility of the agent in question, given that agent's preferences and the available information about the state of the world.

In practice, a major difficulty is encountered when attempts are made to elicit an agent's preferences so that a decision-analysis can be done. Generally speaking, for example, in order for a formal decision-analysis to be successfully done, an agent's preferences will have to obey the axioms of rational choice; however, it is generally admitted that successfully eliciting a set of preferences that are consistent with the axioms of rational choice can be quite difficult. So a primary job of the decision-analyst is to successfully elicit the relevant set of pre-existing preferences, preferences which obey the axioms of rational choice and basic probability theory.

If patients went into medical situations with pre-existing preferences consistent with the axioms of rational choice, and if it were possible for these preferences to be elicited in the context of making medical decisions, the claim that all decision-analysis did was to help patients (or PPPs) make higher

quality decisions would be on fairly firm ground. Further, the claim that decision-analysis was neutral with respect to the values of the patients involved would seem sound. Given both these, formal decision-analysis as used in EBM might have a legitimate claim to be able to generate the medical decision that is *really* best from the patient's perspective; insofar as other ways of reaching decisions yield different answers, they are either empirically wrong (have used poor data, etc.) or have failed to respect the patient's true values and preferences. It is on the basis that EBM is able to claim to be the most 'rational' and 'scientific' approach to medical decision making.

III. Can EBM really be value-neutral?

The model just described, however, relies upon the ability of the physician-patient partnership (PPP) to correctly elicit the patient's preferences and values. It assumes, in other words, that patients actually have particular preferences and values, that these are reasonably stable, and that they can be elicited in a fairly direct way. None of these assumptions, though, are well supported empirically.

If one takes seriously the sorts of difficulties in eliciting preferences from decision-makers that e.g. Tversky has drawn attention to, it seems likely that various sorts of framing effects, representation problems, and information availability issues will likely make it very difficult to elicit preferences that are consistent with the axioms of rational choice and probability, or indeed, are even self-consistent (see various in Kahneman, Slovic, and Tversky 1982 and various in Bell, Raiffa, and Tversky 19188).

Attempts at dealing with these difficulties in the health-care arena have met with at best mixed success (see Froberg and Kane 1989a-d); despite efforts to alleviate these difficulties, it remains clear that *how* questions are phrased, as well as when they are asked, will influence the preferences and

values elicited. That is to say, any set of preferences that are eventually elicited by contemporary methods will be in part the creation of the process by which they were elicited. Since how the questions eliciting preferences are phrased, and indeed, when those questions are presented, can influence the preferences and values a patient will support, different ways of describing possible situations and events may result in different values being used in the decision analysis, and hence in different decisions emerging from the process as 'best'. For example, McNeil, Pauker and Tversky found that the preferences of participants varied according to *how* equivalent information was phrased (e.g. whether a procedure was associated with a chance of death or with a chance of surviving) (McNeil Pauker and Tversky, in Bell Raiffa and Tversky 1988, 562-3). Further, it is important to note that the patient's interpretation of the 'facts' presented in EBM, and of the application of those facts to the patient's values, will depend upon the patient's particular preconceptions. No one goes into a medical decision without *any* experience, and the particular experiences that a patient has had will influence the way they interpret their physician's descriptions of conditions, likelihoods, and the like. How easy it is for a particular patient to imagine a particular scenario will tend to influence their judgement of it (see Kahneman, Slovic and Tversky 1982).

Decision analysis, then, *cannot* be value neutral, if value neutrality means respecting a patient's *pre-existing* preferences and values. The form the decision-making process takes will inevitably influence the preferences and values the patient will support. And this process cannot be made objective: how the physician asks questions, how the physician describes situations, what alternatives are actively considered, and the like, are not aspects of the decision process which can be presented in a way that guarantees 'neutrality' with respect to the different possible preferences and values that

might get affirmed in the process.

IV. Giving up on preferences, giving up on neutrality?

Some forms of decision-analysis accept, and even embrace, the claim that the agents involved in decisions (including patients in context of medical decisions) do not have well-formed pre-existing preferences that can simply be elicited in the decision process (see Holtzman et al 1999, Holtzman and Kornman 1992, Seiver and Holtzman 1989). These forms of decision analysis (the so-called “Stanford School” – McConnell and Goldstein 1999) stress that *part* of what makes difficult decisions difficult for the agents involved is that the preferences and values of the agents are often not well formed. Helping agents to think through what they hope to achieve given the situation they find themselves in and their broader goals, it is claimed, will involve several ‘cycles’ in which various possible sets of preferences and dependencies are used in decision-analyses, and then critiqued by the participants. Eventually, proponents of these methods suggest, the agents will settle upon a set of values and preferences they are comfortable in affirming, and settle upon a course of action they feel confident in committing to.

Of course, if the goal of decision-analysis in EBM is to enable patients to make decisions that respect their pre-existing values and preferences and simply take account of more factors than can be incorporated informally, adopting this view of decision-analysis is an admission of failure. But practitioners of the so-called Stanford School stress that insofar as making important decisions (including medical decisions!) often involves important ‘breaks’ (radical changes) in the continuity of the decision-maker’s life, it is unreasonable to suggest that the decision-maker will have pre-existing values and preferences relevant to these new situations that are fully coherent and well thought through. On

this view, the goal of helping patients (or PPPs) make “higher quality decisions” through EBM must be *reinterpreted*. Rather than stressing the ability of EBM to incorporate better data (via physicians’s attention to contemporary research) while respecting the pre-existing values and preferences of the patient, these methods claim that the goal of medical decision making should be to enable the decision-makers to achieve the ‘clarity’ necessary to commit to particular courses of actions (to irrevocably commit resources to a course of action with confidence), having *come to* embrace certain preferences, values, and goals during the process (just as the goal should be in the case of any other decision analysis).

But notice that this re-articulation of the goal of decision analysis implicitly rejects the value-neutrality of EBM, as well. Since the preference and values that will eventually be embraced by the patient can be influenced by the exact pathways by which the decision is made, there is no good sense in which the process can be said to be neutral between different preferences. For example, the possible outcomes must be presented to the patient in *some form or other* (or perhaps in a few different form), and *how* they are presented can influence the way a patient ranks them. This in turn can influence the decision that actually gets made.

Obviously, part of the physician patient partnership is the physician, and in clinical practice, the options, possible outcomes, probabilities, and dependencies will likely be presented to the patient by the physician. Since the way these are presented will all but invariably influence the recommendations that emerge from the EBM/PPP process, the physician’s role in the process is *not* just providing the best information available. Rather, the physician will, perhaps unwittingly, play a key role in shaping the preferences and values of the patient as well. It is in this sense that the EBM/PPP process must fail to

be value-neutral; it is likely that the particular values and preferences of the physician, or of the medical community more generally, will continue to influence the decisions made in ‘partnership’ with patients.

V. So what’s wrong with not being neutral?

In order for the recommendations that emerge from the practice of EBM to have a special epistemological status, it must be the case that the evidence upon which the recommendations are based is the best available, *and* that EBM shows a special respect for the values and preferences of the patients involved. Insofar as the decision-procedures employed by EBM are forced to violate the second criteria, the recommendations that emerge from the practice of EBM may not be of a *uniquely* high quality with respect to the patient’s preferences and values. It is possible that, based on different ways of presenting options and outcomes, various different preferences and values could be generated during the process, and hence, various different recommendations might emerge. The recommendations, then, while they might be of high-quality by the so-called Stanford School’s criteria of generating the clarity necessary for taking confident committing action, cannot be said to be the *only* recommendations that would be of ‘high-quality’ in that sense, nor does the EBM/PPP paradigm give us any reason to think that it will be the only methodology that can produce decisions of that sort.

While the goal of making medical recommendations that respect a patient’s own pre-existing values and preferences while taking full account of the best information available may seem laudable, if it is in fact impossible to achieve by any method, EBM/PPP can hardly be blamed for that failure. Of course, the impossibility of fully respecting a patient’s own pre-existing values and preferences, which in part emerges from the fact that the patient will often lack pre-existing well-formed values and

preferences, cannot excuse the *willful* manipulation of a patient's values and preferences. By presenting alternative courses of action and possible outcomes in a particular way, for example, by stressing the possible benefits and down-playing the side-effects of a treatment option, the physician is in a position to encourage certain recommendations rather than others, while being strictly honest (if not neutral). Such an approach can hardly claim to respect the patient's values and preferences in any meaningful way.

Oddly, perhaps, some EBM proponents have in fact embraced this result, as well. As Grayson puts it, often the PPP methodology is "a largely cosmetic device designed to promote the appearance of partnership" which is used "for legitimizing decisions already made by health care professionals" (Grayson 1997 103). Since Grayson argues that the goal of EBM is to help patients make "'rational,' scientifically determined decisions" rather than "non-rational" decisions, the persuasive force of the physician's recommendations in shaping the eventual decision made by the PPP may well be nothing to worry about (Grayson 1997 103).

But again, even if a physician tries to respect the patient's own values and preferences, and tries to be not merely technically honest in her presentation of the alternatives, possible outcomes, and the like, but actually as fully open about the options, etc., as she can be, the process of deciding upon a course of treatment, and the course chosen, cannot be fully neutral with respect to the patient's preferences and values. There cannot be a complete distinction made between the *facts* that the physician brings to the table and the *desires* of the patient; rather, the patient's preconceptions regarding 'factual' information, and the physician's preconceptions regarding plausible values, will both influence the decisions actually made.

The real difficulty here is not the failure of EBM/PPP to have entirely divorced the process of data gathering from the process of making the best use of data; as we have seen, achieving that goal is impossible. The difficulty is that EBM/PPP *bills itself* as able to achieve that goal, and takes the achievement of that goal as central to making the medical decision making process properly ‘rational’ and ‘scientific.’ If we accept the contention of the ‘Stanford School’ that high-quality decisions are *not* necessarily unique and have more to do with achieving a certain kind of psychological confidence than with maximizing utility via the application of the best data to pre-existing preferences, this result shouldn’t be surprising. On this account, EBM/PPP’s ability to help patient’s (or PPPs) make high-quality decisions is a *contingent* fact about the world, not a given. Also, even if it should turn out that the EBM/PPP protocols *do* help patients (or PPPs) make high-quality decisions in this sense, there is no guarantee that other systems wouldn’t do the same, nor that these other systems might generate different decisions, that were yet of similarly ‘high-quality’ in this re-interpreted sense. The problem with an EBM/PPP approach that fails to recognize the contingency of its ability to help patients make high-quality decisions in this sense and *believes itself* to have achieved uniquely ‘objective,’ ‘rational’ and ‘scientific’ decisions is just that other forms of decision-making that might better reflect the patient’s broader values and life-choices may be ignored, especially insofar as they are at odds (either methodologically or with respect to the suggested outcomes) with the approach recommended by EBM.

This same difficulty plagues other fields as well. For example, microeconomics takes itself to be a science precisely because it can treat the preferences and values of the agents it describes as fully endogenous with respect to those agents, and macroeconomics takes itself to be a science because it

can treat the preferences and values of the systems it describes as endogenous (what the right level of economic “growth” might be is a value - how to *achieve* that level of ‘growth’ given the state of the world is the purview of macroeconomics). But we can see that the same difficulties will apply to treating these decision-making systems as having a separable fact-gathering (scientific/rational) component and a component in which the values and preferences are then applied to the facts gathered. Indeed, this difficulty seems quite general, and it points towards the likelihood of similar problems arising with any scientific domains that interact in important ways with the values and preferences of agents or embodied in particular systems.

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Notes:

1. Notice the similarity between this description of the decision-making process and views that take science to be ‘value-neutral’ with respect to social policies – the scientist says what is possible, political society uses that information however it so chooses. The science, ideally, simply puts forward the best available data, and it is up to the particular social and political values embodied in the social practice to make whatever *use* of that data it so chooses. Longino 1990 chapter 1 discusses several possible articulations of this idea; it is critiqued in chapter 4, among other places.