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Theories of Medical Decision Making and Health: An Evidence-Based Approach

Valerie F. Reyna, PhD

In this special section of *Medical Decision Making*, 3 developers of evidence-based theories of medical decision making and health present their approaches: Fishbein (theory of reasoned action); Prochaska (transtheoretical model); and Reyna (fuzzy-trace theory). Spring, chair of the Evidence-Based Practice Committee of the Society for Behavioral Medicine, follows with a commentary on the 3 approaches and many other topics of keen interest to researchers concerned with the science of decision making and behavioral change, as applied to both patients and health care providers. Although this special section sprang from a symposium at the Annual Meeting of the Society for Medical Decision Making (SMDM), the authors have gone beyond their addresses to summarize the major findings and rationale for each of their positions. The practical payoff to the reader is a brief introduction to current theories that have evidence behind them, theories that are apt to improve assessments, prevention programs (e.g., risk communication), and intervention efforts in medical decision making and health, including decision aids.

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WHY THEORY MATTERS

Core tasks (e.g., time-tradeoff and standard-gamble tasks to assess utilities), analytical techniques (e.g., estimations of cost effectiveness), and central themes (e.g., patient-centered decision making) of medical decision making research are predicated on assumptions about human judgment and decision making. Surprisingly, however, most medical decision making research is not explicitly motivated by descriptive scientific theory, hampering its validity and generalizability. (By "descriptive" I mean theory that explains real behavior, as opposed to idealizations of behavior.) That is, our tasks, techniques, and themes are insufficiently grounded in evidence-based explanations concerning the underlying mechanisms of actual human judgment and decision making, regardless of whether those humans are patients, providers, or simply members of the public.

Why is this lack of theory important? For more than a quarter century, members of SMDM have been on the cutting edge in researching medical decision making and developing decision support tools to improve the quality of patient care. Society members have produced analytical tools to guide provider decisions for a variety of highly prevalent and costly health problems, for example, to improve clinicians' decisions involving tests and treatments.[1–3] SMDM members have also developed patient-centered decision aids in a variety of formats for a number of preference-sensitive health care problems.[4, 5]

The development and testing of these tools have been reported in medical journals with broad circulation, and the tools have been applied in numerous health care settings. However, several barriers have limited their more widespread adoption and use for real-time decision making. A major impediment has been the lack of coherent and evidence-based predictive scientific theory. Lacking such theory has meant that many clinical approaches and decision tools have been based on assumptions and speculations. Even when use of the tools themselves has

been empirically supported, the mechanisms underlying the results were poorly understood, and thus, the tools are not easily generalized to a range of health care decisions. Results obtained with one disease or in one setting have not necessarily been replicated for other diseases or in other settings, for reasons that have remained unclear.

More fundamentally, some of our most basic assumptions have been challenged by behavioral research. For example, it is now well known that assumptions underlying basic tasks, such as the standard gamble, are debatable. Tversky and Kahneman[6] showed long ago that people respond inconsistently to superficially "different" versions of equivalent standard gambles, violating axioms of expected utility theory. Many persist in eliciting health utilities despite known problems with their validity, ranging from innumeracy of patient populations[7,8] to shifting estimates due to response formats or phrasing of options.[9] Other behavioral research calls into question the validity of QALYs (quality-adjusted life years) and other standard measures related to values and preferences.[10–12]

More recent research strikes at the heart of conventional assumptions about what characterizes good decision making, and how to facilitate it. For example, contrary to conventional wisdom, satisfaction has been shown to be higher when people choose from a smaller set of options, even when a larger set includes the smaller set and the same option is selected in both situations.[13] Decision quality has also been argued to be worse with more options. These results are at odds with some of the driving assumptions of decision support research and patient-centered decision making (i.e., that more options and more information are generally good.) Similarly, expert physicians who processed fewer dimensions of information more crudely performed better (e.g., in diagnosing heart disease) than less expert physicians who processed more dimensions more precisely.[14] Although both utility theory and fuzzy-trace theory indicate that violation of axioms (such as invariance and transitivity of preferences) is bad (cf. Spring[15]), having more options and processing more information does not necessarily produce fewer violations or better outcomes.[16, 17]

These robust reversals, paradoxes, and anomalies should be understood rather than ignored, and that is where theory comes in. The role of a good scientific theory is to make sense of puzzling and counterintuitive findings, and to provide a framework in which to initiate translational research to solve real-world problems. The old saw that "there is nothing so practical as a good theory" must be re-embraced by each generation of researchers. In the next section, I briefly discuss what makes a theory good, and, in particular, the criteria applied in selecting among candidate theories of medical decision making and health.

WHAT MAKES A THEORY GOOD

The goal of this special section is to encourage a greater emphasis on evidence-based, theoretically motivated research in medical decision making. Therefore, the contributors were asked to summarize their approaches, but not to summarize research on medical decision making (although illustrations are given in each article of how the theories can be applied to medical decision making). It is the task of the reader to create those connections between theory and phenomena in subsequent research on medical decision making. When choosing among theories to build on, however, it is worthwhile to consider what makes a theory good, and to choose accordingly.

The following criteria were presented to current and former officers of the SMDM, as well as to other scientists. They were asked to identify good theories and the best spokesperson for each theory. The criteria were

- It must be evidence-based, as opposed to mainly rhetorical.
- It must be explanatory and predictive, not just descriptive (i.e., post hoc).
- It need not cover all areas of SMDM or even most areas; quality is more important than being a catchall (although, all things being equal, breadth is naturally a big plus).
- It need not be psychological (behavioral economics, sociology, and other fields are also germane).
- It must be broader and deeper than a hypothesis.
- It ought to, ideally, encompass relevant data and prior theory, rather than reinvent the wheel or ignore contrary evidence.

These criteria were not designed to include or exclude a particular theory but, rather, are the kinds of criteria that apply to all scientific theories. Additional criteria for inviting contributors included presenting a diversity of perspectives and having a willing volunteer who is the theory's creator. Although the journal has space to accommodate but a few theories, there are many other viable candidates, as illustrated in Table 1.

Table 1 Examples of Additional Nominated Theories

Theory	Illustrative Reference
Appraisal Tendency Theory	Lerner & Keltner (2001)[18]
Behavioral Decision Making Framework	Fischhoff (2008)[19]
Cognitive-Experiential (System 1 vs. 2)	Epstein (1994)[20]
Expected Utility Theory	Edwards (1992)[21]
Illness Script Theory	van Schaik et al. (2005)[22]
MINERVA-DM	Dougherty, Gettys, & Ogden (1999)[23]
Prospect Theory	Tversky & Kahneman (1981)[6]
Support Theory	Tversky & Koehler (1994)[24]
Query Theory	Weber et al. (2007)[25]

Note: Some potentially viable naturalistic and evolutionary theories are not listed because they do not yet make specific, falsifiable predictions or have not been subjected to sufficient empirical tests. Theories advanced mainly in books, which are generally not peer-reviewed, are also not considered (unless they are supported by peer-reviewed evidence).

THREE THEORIES AND FUTURE DIRECTIONS

Although each of the 3 theories (theory of reasoned action, transtheoretical model, and fuzzy-trace theory) is supported by empirical evidence, they present disparate views of risky decision making, behavioral change, health promotion, and medical decision making. Some of these differences are discussed by Spring.[15] However, the theories also share some basic commonalities. For example, in all 3 theories, important aspects of decision making need not be conscious. Fishbein[26] notes that attitudes and norms need not be consciously deliberated to influence intentions, and, subsequently, behavior. Prochaska[27] points out that people in the precontemplative stage are unaware that they are "underestimating the pros of changing and overestimating the cons" relative to perceptions at other stages of change. Reyna[28] emphasizes how decisions are mentally represented (as verbatim and as gist representations), and research has shown that gist representations often operate unconsciously. Thus, in all 3 accounts, subjective perceptions of reality (e.g., perceived gist, perceived risk, or perceived pros and cons) shape decision making, sometimes outside of conscious awareness.

A second commonality is that each theory has a relatively clear position on what is prescriptively desirable. The theory of reasoned action can explain behavior that is reasonable, that emerges from well-ordered intentions. Although decision makers might wrongly perceive the obstacles that they face (or other perceptions might be mistaken), their behavior is assumed to be internally coherent given their perceptions (much like the behavioral decision-making framework).[19] The theory of reasoned action has much evidence to support it; meta-analyses show that behavioral intentions are significant predictors of behavior. Fishbein[26] critiques newer approaches that attempt to explain incoherent behavior, that is, behavior that is unintentional.[29] The transtheoretical model conceives of the stages of change as progress, and that inducing changes such as smoking cessation is desirable. Similarly, fuzzy-trace theory does not claim that gist-based intuition is always superior, but that increases in performance—with the right kind of experience—are generally accompanied by increasing reliance on gist (meaningful) representations as contrasted with verbatim (literal) representations.[30] In fuzzy-trace theory, as in the other approaches, internal coherence and good outcomes (e.g., good health outcomes) are considered generally indicative of better decisions.[31] For all 3 approaches, however, it is important to distinguish predictions about behavior, descriptive predictions, from assumptions about what is normative or prescriptive.

A third commonality across the 3 theories is that they can be applied to both patients and health care providers. Spring[15] provides an excellent summary of the challenges of inducing changes in practitioner behavior in accord with research evidence. Fishbein's[26] (attitudes, norms, and self-efficacy) and Prochaska's[27] (stages of change; perceptions of pros and cons) constructs can be readily mapped onto practitioner behavior to explain, for example, resistance to adoption of practice guidelines and how this problem might be attacked. Prochaska, for instance, would recommend emphasizing pros more than cons in the earlier stages of changing physician behavior. Reyna's[28] constructs of mental representation and of values retrieval have been applied to patients as well as to providers; for example, physicians' difficulties in understanding genetic risks are mirrored in patients' misunderstanding of the same risks.[32] Thus, for research advances to be put into practice, providers must make behavioral changes (e.g., to begin prescribing statin medications to patients), which occasion behavioral changes by patients (e.g., to take the statin medications), and these theories apply in both instances.

Despite these commonalities, the 3 approaches differ in important ways. Although Fishbein[26] argues that the evidence reaffirms the elements of

the theory of reasoned action, and nothing more is needed, Prochaska[27] views the dimension of stage of change as critical. If each stage of change were examined in cross section, Prochaska's constructs would resemble Fishbein's (perceived benefits is an element in both theories; approval of others in the transtheoretical model is akin to social norms in the theory of reasoned action; and so on). Prochaska's key distinguishing claim, however, is that processes of change should "be applied differentially at different stages of change." Ultimately, in this view, progress toward realistic goals, one stage at a time, is facilitated by faculties of reason: The calculus of pros vs. cons (or benefits vs. risks in Fishbein's terms) governs decision making and, thus, behavioral change, within social constraints. Hence, Fishbein's and Prochaska's approaches emphasizing reason contrast with fuzzy-trace theory and other dual-process approaches that add intuition as a central explanatory idea. Despite the success of traditional theories focused on reason, they do not account for 100% of the variance in behavior, and dual-process theories have been able to account for new phenomena, such as effects of emotion and experience, that are inexplicable from traditional perspectives.

In sum, ignoring evidence-based theory is no longer defensible in medical decision making and health, regardless of whether the focus is on research or on practical applications. As these articles illustrate, creating prevention programs or decision aids on the fly, based only on face validity, cannot be justified when there are an array of relevant scientific theories to guide their design. Theory is sometimes confused with opinion. Opinions expressed in popular books, for example, should be eschewed as the basis for applications, unless there is rigorous evidence to support those opinions. However, no one theory is likely to encompass all that is needed to guide applications, and, furthermore, even well-supported theory is merely the first step in designing effective prevention and intervention programs. As populations age and research that can reduce human suffering and death advances, it is essential to make research available to people in ways that they can use. Theories that illuminate underlying decision processes provide the essential bridge between research advances and health outcomes.

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