

SUPPORTING INFORMED CONSUMER HEALTH CARE DECISIONS: Data Presentation Approaches that Facilitate the Use of Information in Choice

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■ **Abstract** To make informed choices and navigate within a complex health care system, consumers must have easily available, accurate, and timely information, and they must use it. Contrary to the consumer-driven approach, however, the evidence demonstrates that having an abundance of information does not always translate into its being used to inform choices. The challenge is not merely to communicate accurate information to consumers, but to understand how to present and target that information so that it is actually used in decision-making. This paper reviews what is known from studies of human judgment and decision-making and discusses their implications for supporting informed consumer choice. We delineate the types of decisions that consumers and patients are making, the barriers to using information effectively in choice, and draw upon the evidence for the efficacy of different presentation strategies to propose an initial framework for evaluating and choosing comparative information presentation approaches.

INTRODUCTION

The success of current health care policy aimed at controlling costs and improving quality rests, to a large extent, on consumers' ability to make informed choices. Increasingly, the policy emphasis is to tap the potential power that informed consumers have in influencing the quality of individual care as well as the efficacy of the health care system itself. When consumers are active participants in their own care and when they understand and demand high-quality clinical care, they can be potent agents for change. Comparative performance data on providers, health plans, nursing homes, and hospitals are available increasingly to the public. Recommended clinical guidelines for treating many conditions are also available to

patients. To a degree never before possible, consumers are in a position to reduce the “knowledge gap” between themselves and providers, and, in the process, increase control over their health care experiences and health outcomes.

Recent health care cost increases are accelerating the move toward consumer-driven approaches. Employers are responding to escalating premiums with a strategy that shifts more costs to employees but also expands their health care options (34, 36). The approach is based on the assumption that, with greater financial responsibility, employees will make better decisions for themselves and their families with respect to health plans, providers, and treatments. Moreover, the assumption is that these new “empowered employees” will feel the impact of their decisions more directly and will be motivated to make choices that maximize value in the form of both quality and cost. Proponents of this market approach are looking to consumers to achieve what managed care and employer purchasing power have failed to do, namely, to control costs and improve quality.

This is a tall order for consumers, and regardless of whether or not they can deliver on the cost and quality improvements, they will be shouldering more of the health care cost burden. In addition, the added choices and information to support those choices, if not well executed, could represent a burden rather than a boon to consumers. The consumer-driven approach raises the stakes for consumers and means that providing usable information to support informed choice is essential.

Supporting Informed Choice

To make informed choices and navigate within a complex health care system, consumers must have easily available, accurate, and timely information, and they must use it. Contrary to the consumer-driven approach, however, the evidence demonstrates that having an abundance of information does not always translate into its being used to inform choices (25). The assumption that the provision of relevant information is sufficient to increase informed decision-making is too simplistic. Information that can help to support informed choice can also be an impediment to this same informed choice. Even when people are highly motivated to make an informed choice, the usability of the information about the available options can create serious barriers that undermine these intentions. Without usable information and an adequate understanding of choices and the implications of choices, consumers can feel dissatisfied and far less than empowered. Medicare beneficiaries, for example, report being overwhelmed by the amount of information they receive about their Medicare choices, and, at the same time, they are confused about the nature of those choices (9, 19, 28).

The challenge is not merely to communicate accurate information to consumers, but to understand how to present and target that information so that it is actually used in decision-making. What formatting, framing, or display strategies increase the likelihood that information will be used for choice? A substantial body of theoretical and empirical work exists on how individuals process and use information when making decisions. This paper reviews what is known from these studies of human judgment and decision-making and discusses their implications

for supporting informed consumer choice. We delineate the types of decisions that consumers and patients are making, the barriers to using information effectively in choice, and draw upon the evidence for the efficacy of different presentation strategies to propose an initial framework for evaluating and choosing comparative information presentation approaches.

CHOICES INFORMED BY COMPARATIVE INFORMATION

Consumers are often faced with choices that require them to compare two or more options on information provided to them. These choices are made in a number of areas including choosing the level and type of their health insurance coverage; selecting among providers, hospitals, nursing homes, and health plans; and deciding among diagnostic and treatment options.

While each of these types of choices is quite distinct, they all make similar demands on the decision-maker. All are consequential choices, and each one requires the use of information that

- includes technical terms and complex ideas;
- compares multiple options on several variables; and
- requires the decision-maker to differentially weight the various factors according to individual values, preferences, and needs.

In each of these choice types, the decision-maker is likely in an arena where the choice is important but the information is unfamiliar, and the amount of information may exceed human information processing skills.

BARRIERS AND COMPLEXITIES IN USING INFORMATION TO INFORM CHOICES

Although the consumer-driven approach assumes that the simple provision of information will be sufficient to affect consumer choice, the process of using data to inform choice is actually quite complex. To use comparative information, consumers must be able to take in and process the information, correctly interpret it, identify the important factors to integrate into a decision, weight those factors in ways that match the individual's needs and values, make trade-offs, and bring all the factors together into a choice. Although these steps may sound easy enough, they tend to be burdensome cognitive tasks.

Consider, for example, the sheer amount of information that is available and should be used in choosing among health plans. It is not uncommon for comparative performance reports of health plans to compare more than 15 plans on 10–12 performance dimensions. Other attributes concerning coverage, benefits, and costs must also be factored into the choice. When faced with this amount of information, consumers often feel overwhelmed. How much information can people reasonably process? How can we inform without overwhelming and bewildering consumers?

Conclusions from a large body of empirical work suggest that we are “boundedly rational.” In other words, although we are capable of great feats of intellect, our intellectual capacity is nonetheless limited. At the time of a decision, we may or may not have the cognitive resources or the motivation available to carefully process every piece of information provided. As it turns out, the integration of different types of information and different types of variables into a decision is a very difficult cognitive process (32, 45). Decision-makers are able to process and use only a limited number of variables in any one choice. As the number of options and information increases, the ability to use all of it in choice declines. Although our market economy assumes that more information is better, evidence from decision-making research demonstrates conclusively that more information does not always improve decision-making; in fact, it can undermine it (44).

Identifying and choosing how to differentially weight factors and make trade-offs in choice are also difficult cognitive processes. Imagine if one were choosing among hospitals: One hospital was rated highly on consumer satisfaction but only average on measures of effectiveness and safety; a second hospital had high scores on effectiveness and low scores on consumer satisfaction and safety. How does one make such a trade-off? Even when people think they are differentially weighting factors in their choices, their actual choices often do not reflect this (12).

The studies from information processing and human judgment studies show that when faced with too much information to process or decisions that involve burdensome cognitive processes like trade-offs, people tend to take shortcuts to reduce the burden (12, 48). One common shortcut is to let a single factor dominate, leaving other important factors out of the decision (27). So, for example, in a situation where a provider is more conveniently located but also has a poorer performance record, the decision-maker might try to resolve this dilemma by deciding that one factor was much more important. The decision-maker might highlight this factor, while at the same time mentally minimizing the importance of the other factors. Convenience, because it is more concrete and understood, may get more weight in this choice over performance, which may be less well understood. This makes the decision easier and resolves the conflicting information. However, these shortcuts can undermine the decision-maker’s own self-interest (8, 32).

Most presentations of comparative information are based on the assumption that consumers know what is important to them and where their self-interest lies. For example, it is usually assumed that people have fixed ideas about what is important in health care quality and they can pick and choose from among different performance indicators displayed in a comparative report. However, both theory and evidence suggest that these assumptions are faulty (45). The theory of constructed preferences posits that when people are in a situation that is both complex and unfamiliar (such as that of consumers using health care information), they likely do not have fixed ideas about what is important to them. When asked about their preferences, consumers will provide an answer, but those answers are constructed or “thought up” at the moment the question is posed. These constructed answers are not stable and will vary depending on how the questions are asked or what information is provided. Findings from focus group studies with healthcare

consumers suggest that preferences are not stable, and preference shifts have been observed within the time frame of a focus group (6, 7, 29, 37, 49).

An important implication of this theory is that when preferences are not stable, information presentation approaches will have a significant effect on what information is attended to and used. That is, when people are in a situation where they must sort through complex, unfamiliar, and important factors to make a choice, how that information is framed and packaged will determine to a large degree what information is actually used in choice. Consumers using comparative health care information appear to be in just such a situation. As a result, how information is presented may be as influential as what information is presented when attempting to inform choice in this arena.

How Information is Processed in Decision-Making

Information in decision-making actually appears to be processed using two different modes of thinking: analytic and experiential (3, 42). Both modes of thought are important to informing choices. The analytic mode is conscious, deliberative, reason-based, verbal, and relatively slow. It is the analytic mode of thinking that we tend to consider in our attempts to inform choices, and as a result, we may ignore the important influences of the experiential mode. The experiential mode is intuitive, automatic, associative, and fast. It is based on affective (or emotional) feelings, and one of its primary functions is to highlight information important enough to warrant further consideration. As shown in a number of studies, these affective feelings provide both meaning and motivation to choice processes (1, 31). Marketers, who well understand the power of affect, aim their ads to evoke an experiential mode of information processing. Ads typically try to associate a product with positive affective images. Try to imagine a car ad without images of freedom, prestige, sex, or power. Both modes of thinking are important, and good choices are most likely to emerge when both experiential and analytic modes work in concert and decision-makers think as well as feel their way through a decision (1). Consumers need to consider information carefully, but they also need to be able to understand and be motivated by the meaning that underlies that information.

Most decision research has focused on the ability to think hard—the analytic mode; we propose that the affective information-processing central to the experiential mode may be critical to helping consumers comprehend health information and make better choices. By engaging the experiential processing system more and/or reducing the analytic processing needed, we may be able to help consumers navigate more quickly and efficiently through complex decisions.

GOALS OF PRESENTATIONS OF COMPARATIVE HEALTH CARE INFORMATION

What goals are appropriate for designing comparative information and presentation formats for consumers? Toward what should we be aiming? Clearly, we want consumers to understand the information and be able to interpret correctly what

is presented. But in most cases we want to go beyond comprehension, to motivate consumers to use the information in choice and to be able to assess the value of the different data elements with regard to their own goals, needs, and preferences. Information presentation techniques need to organize factual information in order to reduce the cognitive burden on consumers. By so doing, we facilitate learning and thereby better enable the participant to use that information as the basis for sound decisions. A second requirement is to encourage active participation in the choice task by making the provided information interesting and relevant to the consumer. The consumer must be motivated to attend to the information for his or her own benefit. A third requirement is that the information should be used and weighted in decisions in a way that is appropriate to the individual’s interests and needs.

WHAT WILL HELP CONSUMERS REACH THESE GOALS?

In this section we discuss three processes to enhance consumer use of comparative information (See Figure 1 for a summary of the conceptual model). First, simply lowering the cognitive effort required to use information in choice can lead to its greater use. This can be done in a number of ways, including just reducing the amount of information necessary to process.

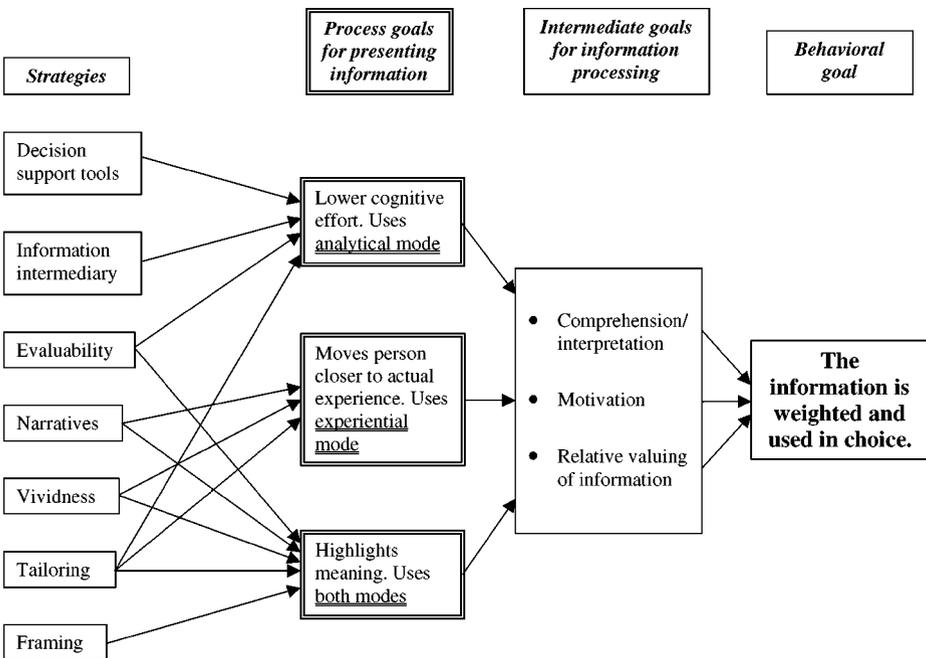


Figure 1 The conceptual model.

Second, consumers may lack an understanding of what a choice might mean to them in real life. For example, a person making a health plan choice may not have experienced difficulty in getting approval to see a specialist, making it difficult to comprehend in any meaningful way what this experience would be like. As a result, this person may not weight differences among health plans on this attribute. By helping people to have a better idea of what the actual experience of a choice might be like, even attributes that are relatively unfamiliar (and therefore less comprehensible) may be weighted in choice.

Finally, because consumers will tend to rely on information that is more salient, information displays can highlight the meaning of the information that is less salient on its own, and thereby make it more salient and available in choices. This highlighting may also increase the perceived meaningfulness (or affective/emotional significance) of the information.

Each of these three process goals (lowering cognitive effort, helping people to understand the experience of a choice, and highlighting the meaning of information) can enhance consumer use of information through specific presentation strategies. We begin with the process of lowering cognitive effort and then continue on to the other two processes. As will become apparent, some information presentation strategies can activate more than one of the three processes.

Process 1: Lowering the Cognitive Effort Required

One of the difficult issues for consumers is the vast quantity of information processing needed to make an informed choice. The amount of information alone can be overwhelming to decision-makers. Faced with too much information, and often conflicting information such as in the risk/benefit trade-offs inherent in many choices among treatment options, some decision-makers may determine that the effort required is not worth it. Other decision-makers may recognize that they are simply not capable of processing the information (11). In either of these cases, the decision-maker may simplify his or her choice by not making it (and relying on the status quo), by relying on the choice advised by a physician or even a nonmedical person, or by relying on only a subset of the available information (8).

Cognitive burden can be reduced in a number of ways, including the use of computer-aided decision tools. Decision tools can ease the burden in decisions by structuring the decision process and by highlighting the important factors for consideration. The decision task can be broken down into smaller decision steps, and the computer can use the decision-maker's own values and preferences to differentially weight variables in a choice. A decision tool that utilizes a multiattribute approach not only elicits the most important dimensions, but it also quantitatively values those dimensions in the choice process based on earlier input from the decision-maker. Thus, a decision tool can carry out some of the burdensome cognitive tasks for the decision-maker.

Alternatively, an information intermediary who is familiar with the information needed to make an informed choice can guide the decision-maker through

the choice process, highlighting important information and trade-offs that must be made while eliciting the consumer's own values in the process. Both of these approaches require substantial resources, either by providing staff to act as intermediaries or by committing resources to develop decision support tools that adequately address the needs of the consumers within the particular domain. At the same time, both approaches also lower the effort required of the analytical mode of thinking.

A third approach, using evaluability, focuses on the visual display of information and is designed to lower cognitive effort by providing cues to transform the information to an evaluative good/bad scale (16, 17). Instead of having to think hard about how to evaluate information about an option, an evaluability display reduces the analytical effort required by providing these evaluations in a simpler form. The concept of evaluability is simple but profound. Information varies in the degree to which it conveys evaluative meaning. Particularly in unfamiliar domains, we may not know what a measure means (e.g., a measure of quality of care, expressed by the percentage of people satisfied with their care). Research on evaluability demonstrates that even if we understand the numbers used (e.g., a medication that has a 2% elevated risk of stroke) at some fundamental level, we may not have an emotional or affective understanding of it (e.g., we do not know how bad this elevated risk is). And when information lacks emotional meaning, it lacks evaluability and is not weighted properly in decision-making (43). We can determine meaning through considerable effort in comparing and contrasting available information. However, it appears that consumers do not always go to this extra effort and may rely instead on information that is *a priori* more evaluable. In health contexts, for example, money may be one of the variables that is most evaluable and easily understood, with other variables such as quality-of-care measures being far less evaluable and, thus, far less weighted in choice. As we will review, however, the evaluability of information can be improved in a variety of ways. By improving evaluability, we can lower the effort required of the analytical system. As we will see later, we can highlight the meaning of the information at the same time.

By changing the evaluability of information, we can help consumers transform data into meaningful information and, by so doing, affect the degree to which the information is actually used in choice (12). These evaluability changes make all of the information about a choice available in a simple good/bad form (so that consumers can compare apples to apples). This simpler information then influences the interpretation and comprehension of information about the choice attributes. By providing information in an explicitly evaluative form, it can be used more easily to evaluate the overall goodness or badness of any one option.

In recent laboratory experiments with consumers, we examined the impact of making information about health plan choices more evaluable in two ways (12). First, we assessed whether providing consumers with health plan performance information using visual cues such as stars (★★★ = above average; ★★ = average; ★ = below average) resulted in a greater weighting of performance in choices.

	Monthly premiums paid by you	Member Ratings of Treatment quality			
		16%	15%	18%	51%
Plan A	\$60	16%	15%	18%	51%
Plan B	\$70	10%	15%	19%	56%
Plan C	\$45	20%	6%	31%	43%
Plan D	\$55	18%	17%	20%	45%
Plan E	\$50	14%	16%	20%	50%

These stars summarize the treatment quality information shown in the bar graphs.

Below average Average Above average

★ ★★ ★★★

	Monthly premiums paid by you		Member Ratings of Treatment quality			
			16%	15%	18%	51%
Plan A	\$60	★★	16%	15%	18%	51%
Plan B	\$70	★★★	10%	15%	19%	56%
Plan C	\$45	★★	20%	6%	31%	43%
Plan D	\$55	★★	18%	17%	20%	45%
Plan E	\$50	★★	14%	16%	20%	50%

Figure 2 Information presentations that are less evaluable (*top*) and made more evaluable with visual cues (*bottom*).

Second, we examined whether ordering health plans by performance within premium cost strata resulted in more choices of higher-performing plans compared with presenting the information unordered. Figures 2 and 3 show different approaches to displaying the data. The more evaluable data displays, ordered by performance and the use of visual stars, resulted more often in the choice of higher-performing options. In the first experiment, the choice of the higher-performing option also meant choosing the most expensive plan. Those consumers viewing the more evaluable data displays were more likely to choose the higher-priced higher-performing option and make the trade-off of higher cost for higher performance. The findings from these and other experiments indicate that evaluable displays of comparative data influence the degree to which information such as quality of care is actually weighted and used in choice.

The evidence for the efficacy of evaluable data displays comes largely from controlled laboratory studies. Evidence about the efficacy of these approaches is also beginning to emerge from real-world applications. A comparative hospital performance report (24 hospitals), designed using evaluable data displays, was

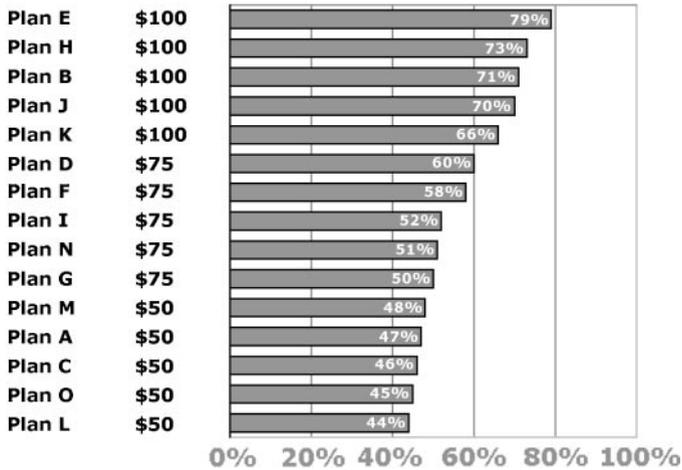
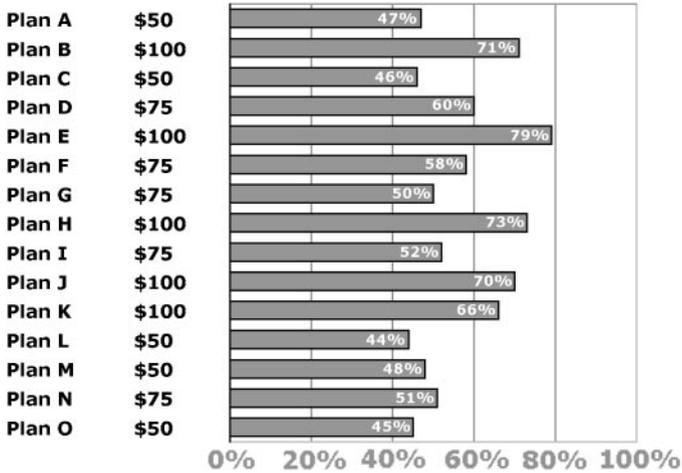


Figure 3 Information presentations that are unordered and less evaluable (*top*) compared to ordered and more evaluable (*bottom*).

recently disseminated widely in south-central Wisconsin. The evaluable data display used in the public report is shown in Figure 4. Four different evaluable data display approaches were used in designing the report. First, the data were aggregated into two summary measures, and then the hospitals were ordered by performance within the two categories of community and regional hospitals. The top tier hospitals in each category were highlighted with a color band. Finally, evaluable symbols were used to denote better (+) and poorer (–) performance.

What the symbols mean:

- ⊕ Fewer mistakes, complications and deaths than expected
- Average number of mistakes, complications and deaths
- ⊖ More mistakes, complications and deaths than expected

Regional Hospitals	Surgery	Non-Surgery	Hip/Knee	Cardiac	Maternity
Hospital A	⊕	⊕	⊕	⊕	○
Hospital B	⊕	⊕	⊕	○	○
Hospital C	⊕	⊕	⊕	○	⊖
Hospital D	⊕	⊖	⊕	⊖	*
Community Hospitals	Surgery	Non-Surgery	Hip/Knee	Cardiac	Maternity
Hospital F	⊕	⊕	⊕	○	⊕
Hospital G	⊕	⊕	⊕	⊕	○
Hospital H	⊕	⊕	⊕	○	○
Hospital I	⊕	⊕	⊕	○	○
Hospital J	⊕	⊕	⊕	○	○
Hospital K	⊕	⊕	⊕	○	○
Hospital L	⊕	⊕	⊕	⊕	⊖
Hospital M	⊕	⊕	○	○	*
Hospital N	⊕	⊕	⊕	○	⊖
Hospital O	⊕	⊕	⊕	⊖	○
Hospital P	○	⊕	⊕	○	*
Hospital Q	⊕	○	○	○	*

Figure 4 A comparative performance report of Wisconsin hospitals was made more evaluable through summary measures, ordering, highlighting in grayscale, and visual cues (+ and -). May the reader note that the original version of the figure used color.

As can be seen in Figure 4, it is easy to discern the higher- and lower-performing hospitals.

Preliminary results of an evaluation of the impact of this public report indicate that the report significantly changed consumer views about the differences among the quality of the hospitals. Those seeing the report were more likely to indicate that they would recommend or choose one of the top tier hospitals than those not seeing the report. Thus, providing an evaluable report appears to have affected consumer views about which are the better and worse hospitals (14).

Process 2: Helping People to Have a Better Idea of What the Actual Experience of a Choice Might Be Like

In choices that are not made frequently, decision-makers are not able to learn from experience and develop an understanding of what differences on some attribute

would actually mean to their lives. For example, what would it feel like to endure a treatment method that required frequent shots and blood tests? As has been shown in previous research in judgment and decision-making, we are not always able to predict how we would feel about experiences even when they are common ones (18). When making an infrequent choice such as a choice among treatment options, the decision-maker who has never experienced the consequences of some choice may not be able to accurately predict its impact on his or her life. Several methods of information presentation can enhance this understanding of experience by providing cues that have been salient to consumers who previously experienced the choice. As a result, good-quality decision processes, in which the consumer comprehends provided information and brings it to bear on choice using his or her own values as a guide, may be more likely to emerge.

Narratives, or stories about someone else's experiences, provide a promising approach to help fulfill the requirements of good-quality decision processes. In one recent experiment, for example, participants were exposed to information about a topic and asked to make a judgment. Half of the participants were exposed to the information in a narrative form while the other half were provided the same information in a more standard non-narrative form. The results indicated that narrative compared to non-narrative participants were more sensitized to the attributes in the situation and were better able to weigh them in their judgments (39). In the narrative condition, participants' responses showed that they understood and used the information; the responses of non-narrative participants did not systematically reflect the provided information in the same way. Thus, the information significantly influenced respondents' choices only in the narrative condition. This finding suggests that participants in the narrative condition were better able to integrate the provided information. Similarly, Sanfey & Hastie (38) found that when respondents were given narrative information, they made more accurate judgments on a task than respondents who were given the same information in bar graphs or data tables.

These results can be explained by considering the literature on the uses of narrative. Narratives may be a beneficial means for presenting information, including complex technical information, for several reasons. First, embedding technical details within a narrative likely triggers or makes use of both modes of information processing that are essential to good decision-making. As Epstein (3) argued, "information processing depends on the interaction of two systems of thought, an experiential system associated with affect that encodes experience in the form of concrete exemplars and narratives and a relatively affect-free, abstract, analytical . . . system" (p. 713). Whereas the use of tables and graphs may rely mostly on the analytical system, the use of narrative may trigger more complex information processing resulting in better decisions that take advantage of both the richness of past experience and the logic of deliberate thought. Second, the evaluability of information is essential to its meaning to the decision-maker (16). Narratives may help render even unfamiliar information evaluable, salient, and easily imaginable through the use of concrete descriptors and images. Third, a growing number of

scholars are finding that information presented in narrative form improves memory retention (33). Finally, reading a narrative may make the task more engaging and by so doing, motivate use in decisions. Oatley (30) has suggested that narratives possess a variety of devices that allow the reader to enter into the story. In the context of judging health-care plans, for example, the reader may see the problem from the narrator's point of view, take it on as his/her own, and understand better what the experience of a choice would be like, providing motivation for that choice.

Consumers, in their own way, have expressed a preference for narratives. In focus groups on health plan choices, participants spontaneously offered that they would prefer a chance to hear the opinions of an individual plan member rather than examining aggregated data. The participants felt more confident of their ability to assess the truthfulness of individuals than to evaluate numerical ratings (4).

In preliminary findings of laboratory experiments on Medicare health plan choices, older consumers receiving narratives along with evaluable data presentation approaches made quality-maximizing choices more often than those consumers viewing data with no narrative and less evaluable data displays (13).

Similar to narratives, more vivid information also can influence judgments and decisions. Hendrickx et al. (5), for example, found that warnings were more effective when they were presented in the form of vivid, affect-laden scenarios and anecdotes rather than as more bland numbers. In another study (20), subjects asked to estimate the probability that they would take a hypothetical vaccine were less likely to take the vaccine when shown pictures, making the rare chance of a severe reaction more vivid compared to subjects who were not shown pictures.

Vivid presentations of information can provide greater emotional interest, and they appear to have a greater impact on judgments relative to more pallid or bland presentations of the same information content. Sherer & Rogers (41) demonstrated that vivid and emotionally interesting information was highly effective in changing intentions to seek protection from the health threats of problem drinking. The impact of the emotionally interesting information also was enhanced with the passage of time while the impact of information of low emotional interest diminished over time. We might expect, therefore, that emotionally interesting information in a comparative choice will maintain a stronger impact in decisions over time. This finding would be important since information in important health choices can be complex and learned over an extended period. By making health information more vivid for all consumers, information producers can help them to comprehend what the actual experience of a choice might be like, thus influencing judgments and choices.

Tailoring, on the other hand, is the process of providing customized information based on characteristics that are unique to that person (21). Tailoring as a strategy could be used to further all three of the process goals for designing information products that support choice. For example, tailoring can reduce cognitive burden. Less information processing is required when the decision-makers need to review only the information most pertinent to their situations. Providing customized information about a decision from "someone" like themselves (e.g., tailoring narratives)

can also highlight meaning and bring people closer to the experience of a choice. Strange & Leung (47), for example, found that people were more likely to generalize from a story when that story sparked a personal memory. Thus, if we assume that an individual from a particular age cohort or ethnic group shares more common memories, tailoring a narrative to that group should lead to greater generalization to the individual's own health decisions. In general, studies have shown that individually tailored health materials are more effective than generic materials in promoting behavioral change (22, 23).

Process 3: Highlighting the Meaning of the Information

Several of the strategies described thus far, while relevant to the first two processes, also highlight the meaning of information, our third process. Narratives, vivid presentations, and evaluable presentations all can make the meaning of information more readily available, and more available information will influence choices and judgments more. For example, a narrative on the health consequences of a vaccine not only may help a consumer better understand the experience of the choice, but it may also highlight the evaluative meaning of the consequences and make that evaluative meaning more available in the choice than it would have been otherwise. Since narratives and vivid presentations enhance the memorability of information, this highlighted meaning may also have a greater effect even after some time has passed from examining information to actually making a choice. Evaluability also highlights the meaning of information by transforming it on to a simple good/bad scale. Research on evaluability has not yet shown whether its impact through highlighting meaning also has a lasting effect. Because making information more evaluable is likely to be easier than writing a narrative, however, testing the lastingness of evaluable versus nonevaluable information will be important to study in the future.

The bias of information producers is to provide more and better information so that consumers can make the best-informed choice. In order to be as "correct" as possible, information on confidence intervals, for example, is often included in data displays to consumers. While intended to be beneficial, this "more complete" information appears to actually undermine the information's evaluability and, therefore, its meaningfulness. As a result, the information receives less weight in choice (16). The research suggests that a precise point estimate (e.g., a score of 8) is more evaluable and carries more affective meaning than a less precise range such as in a confidence interval (e.g., a score that ranges from 7 to 9). As in other examples of evaluability, more evaluable information (in this case through precise point estimates rather than confidence intervals) affects choice more by highlighting meaning more. What the precise estimates lack in completeness, they make up for by providing more complete meaning.

Low-probability information is important to many healthcare decisions such as choices among treatment options that vary in (low likelihoods of) risks and benefits. One way to highlight the meaning of low-probability information, in particular,

is to build on the observation that decision-makers do not optimally process small percentages (e.g., 2%) but are better able to process the same number presented as a frequency (e.g., 2 out of 100) (20). A striking example comes from the work of Hoffrage et al. (15) who found that the diagnostic judgments of faculty and students at the Harvard Medical School were greatly improved by presenting information about diseases and symptoms in the form of frequencies rather than as probabilities. Similarly, Slovic et al. (46) found that forensic psychiatrists and psychologists judged a patient's risk of being violent as much greater when it was communicated as a frequency (e.g., 1 person in 10) as opposed to an "equivalent" probability (e.g., 10%). Similar results were found by Yamagishi (50), whose judges rated a disease that kills 1286 people out of every 10,000 as more dangerous than one that kills 24.14% of the population. Thus, research carried out with both experts and the general public shows that information presented as frequencies rather than probabilities carries more meaning and, as a result, greater weight in decisions (24). Using percentages appears to be a more "bland" way of describing risk, whereas highlighting the number of people who could be at risk appears to be more vivid and more effective in drawing attention to the actual number of people who could be harmed.

A final way to highlight the meaning of information is through framing. Framing may not make information more useable necessarily, but it does provide the decision-maker with alternative ways to think about a decision. Framing tends to "highlight" either the potential loss or the potential gain involved in a choice. Several decades of research have demonstrated conclusively that the way a decision is framed strongly influences people's preferences, in some cases resulting in complete reversals of preference.

Preference reversals due to framing effects have important implications for many health decisions, such as choosing a treatment. For instance, the effect of dying seems to be greater when it is framed as a mortality rate of 10 percent rather than when it is framed as a survival rate of 90 percent. In terms of decision behavior, such as choosing between alternative treatments for lung cancer, McNeil et al. (26) showed that surgery was relatively less attractive than radiation therapy when risk information was presented in terms of mortality rather than survival, despite surgery having better long-term prospects. The effect was demonstrated for lay participants (patients) as well as experts (physicians). Of course, for a 95-year-old, long-term survival prospects may not be important, but an otherwise healthy 65-year-old may not wish to be led astray by the framing effect and reduce his or her life span unintentionally.

Building upon this earlier research, Hibbard and colleagues (10) examined framing effects on the choice of a health plan. In their experiment, one group received comparative CAHPS (Consumer Assessment of Health Plan Study) data framed in the usual way ("get the best quality"). Another group received the same data but the decision was framed as a loss or risk ("protect yourself from problems in health plans"). Framing the health plan decision as a possible loss significantly increased how well the comparative information was understood, how much it was valued, and how much weight it received in decisions.

A recent review examined the findings of studies where health decisions were framed either as a loss or as a gain (2). The seven studies included communications regarding prevention, detection, or treatment options. The six detection and treatment studies showed that a loss frame was more effective than the gain frame. The findings of the seventh study, which focused on prevention, showed that a gain frame was more effective. These findings are similar to those reported by Rothman et al. (35). They found that loss-framed messages were more effective when promoting screening behaviors, whereas gain-framed messages were more effective when promoting prevention behaviors. Thus, framing highlights the meaning of particular information and draws the decision-maker's attention to a potential outcome. What that means is that highlighting loss will be more effective when framing decisions about screening, treatment choice, and/or health plan selections. A gain frame will be more effective with choices around prevention.

DISCUSSION

Thus, the evidence suggests that comprehension, motivation, and the actual use of the information are increased when cognitive effort is reduced, when the decision-maker is moved closer to the actual experience, and when the meaning of information is highlighted for the decision-maker. Health information for consumers has been designed, almost exclusively, to evoke analytic processing. The use of these three processes (Figure 1) as design principles in the creation of consumer information products likely will enhance the successful use of information to inform choice.

When designing ways to increase the usability of information, the information provider should also keep in mind the characteristics of the audience receiving the information. An understanding of audience characteristics can help shape the strategy or strategies used. Hibbard et al. (11), for example, found that many older adults (i.e., Medicare beneficiaries) have more difficulty than younger adults in using information accurately to inform health plan choice. Decision-makers who do not have the analytical skills necessary for the task may need additional assistance in lowering the cognitive burden of health decisions. These decision-makers may include some older adults, decision-makers low in literacy or numeracy (24), or individuals suffering cognitive decline. In recent research, Hibbard et al. (11) documented a simple screening device consisting of age, education, and self-reported health that related strongly to older and younger adults' abilities to comprehend and use comparative information. The use of such a screening device may assist information producers in choosing appropriate strategies, particularly when strategies that lower cognitive burden may be needed.

Whereas the characteristics above relate directly to the analytical information processing mode we discussed earlier, other characteristics such as cultural differences may be equally important but require different strategies. Individuals from different cultural backgrounds may differ in their risk of particular diseases and

their reactions to treatments, suggesting the need to tailor information. In addition, reaching them and motivating them to make good decisions may require strategies such as tailoring narratives to their specific ethnic group.

Consumers differ in their ability to handle different types and quantities of health care information. Knowing this and understanding the elements that underlie the usefulness of particular strategies should help information providers in designing the key ingredients necessary for usable information.

The three design principles for producing usable information hold true for any medium (print, web, etc.), but the web offers the most opportunities for interactivity and the use of multimedia effects, all of which can boost the power of these design elements (e.g., audio, pictures, or video can be used to increase vividness). The inherent interactivity of the web can be used to tailor information or narratives so that the story is more appropriate to the interests of the user. The web also offers the capability of bringing together consumers with similar health conditions for information sharing and emotional support. The ability to embed decision support tools into informational presentations and to provide links to other resources increases the options for supporting choices on the web.

Each of the processes and strategies that we have discussed has the potential to influence health behaviors and choices. These attempts, by definition, bring up important ethical considerations. Because the way health information is presented is very likely to influence how it is used, information producers have a responsibility to be conscious of that influence and direct it in productive and defensible ways. The alternative is to manipulate people in ways that are unknown, are not thought out, or are not defensible, but are no less manipulative.

In our research on health plan choices, we have been clear that the goal is to increase the weight of quality of care in consumer choices. Experts and consumers alike tend to agree that quality should receive considerable weight in health plan choices, but current evidence suggests that it does not. As a result, helping consumers to weight quality more is a defensible choice for information producers. In other types of decisions such as treatment choices, there is frequently a high degree of uncertainty and often no clear “right” answer. In such cases, information providers need to consider the ethical ramifications of how they present information to patients. For highly consequential decisions, they may consider presenting information in multiple ways in order to highlight for the patient the value of different pieces of information.

Thus, three factors should be considered in selecting information presentation strategies: (a) the complexity and amount of the information; (b) the experience, skill, and motivation of the users; and (c) the nature of the choice (e.g., the degree to which there is a right or “best” option). These factors can be used to determine which combination of strategies will facilitate the use of information in choice. The conceptual model and the array of possible strategies discussed here do not represent an exhaustive list. However, by analyzing these three factors, it is possible to determine what processes are needed to support the use of information in choice and to select corresponding strategies. The testing of consumer information

products should focus on three levels: the degree to which the information is comprehended; the degree to which the process goals are achieved (reduce cognitive effort, highlight information, help understand the experience of the choice); and the degree to which information is actually used in choice. This too represents a departure from current testing methods. Most consumer information material, if tested at all, assesses consumer preferences for how information is presented. However, consumer preferences for presentation format may not actually support the use of that information in choice.

The conscious use of information presentation strategies to support choice represents a critical departure from how most health care information producers see their role (i.e., most view their role as providing complete, objective, and accurate information.) To acknowledge that the way information is presented can influence choice is to accept a new level of responsibility. For example, to make information evaluable puts a greater burden on the information producer to summarize or to add “meaning” to the information. However, if the information will be weighted and used in choice, information producers must aim beyond providing more and accurate information to providing information in a way that supports decisions. As the preceding discussion makes clear, supporting decisions will require more strategic and sophisticated efforts. While health care information can be voluminous and complex, there are strategies that increase the likelihood that it will actually be used in choice. Because informed choices are fundamental to both individual health and effective functioning of the system as a whole, it is critical that the processes and approaches described here be widely and strategically used in the design of consumer information products.

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LITERATURE CITED

1. Damasio AR. 1994. *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: Putnam's
2. Edwards A, Elwyn G, Covey J, Matthews E, Pill R. 2001. Presenting risk information—a review of the effects of “framing” and other manipulations on patient outcomes. *J. Health Commun.* 6:61–82
3. Epstein S. 1994. Integration of the cognitive and the psychodynamic unconscious. *Am. Psychol.* 49:709–24
4. Gibbs DA, Sangl JA, Burrus B. 1996.

- Consumer perspectives on information needs for health plan choice. *Health Care Financ. Rev.* 18:55–73
5. Hendrickx L, Vlek C, Oppewal H. 1989. Relative importance of scenario information and frequency information in the judgment of risk. *Acta Psychol.* 72:4–63
 6. Hibbard JH, Jewett JJ. 1996. What type of quality information do consumers want in a health care report card? *Med. Care Res. Rev.* 53:28–47
 7. Hibbard JH, Sofaer S, Jewett JJ. 1996. Condition-specific performance information: assessing salience, comprehension, and approaches for communicating quality. *Health Care Financ. Rev.* 18:95–109
 8. Hibbard JH, Slovic P, Jewett JJ. 1997. Informing consumer decisions in health care: implications from decisionmaking research. *Milbank Q.* 75:395–414
 9. Hibbard JH, Jewett JJ, Engelmann S, Tusler M. 1998. Can Medicare beneficiaries make informed choices? *Health Aff.* 17:181–93
 10. Hibbard JH, Harris-Kojetin L, Mullin P, Lubalin J, Garfinkel S. 2000. Increasing the impact of health plan report cards by addressing consumers' concerns. *Health Aff.* 19:138–43
 11. Hibbard JH, Slovic P, Peters E, Finucane ML, Tusler M. 2001. Is the informed-choice policy approach appropriate for Medicare beneficiaries? *Health Aff.* 20: 199–203
 12. Hibbard JH, Slovic P, Peters E, Finucane ML. 2002. Strategies for reporting health plan performance information to consumers: evidence from controlled studies. *Health Serv. Res.* 37:291–313
 13. Hibbard JH. 2002. *Supporting informed consumer choices*. Presented at Who's in the Driver's Seat? Leading Efforts in Consumer-Centered Health Care. FACCT's Annu. Brief., 4th, Washington, DC
 14. Hibbard JH, Stockard J, Tusler M. 2002. *Does making hospital performance public increase quality improvement efforts? An evaluation using an experimental design in the state of Wisconsin*. Presented at Acad. Health Serv. Res. Health Policy. Annu. Res. Meet., Washington, DC
 15. Hoffrage U, Lindsey S, Hertwig R, Gigerenzer G. 2000. Medicine: Communicating statistical information. *Science* 290:2261–62
 16. Hsee CK. 1996. The evaluability hypothesis: an explanation for preference reversals between joint and separate evaluations of alternatives. *Organ. Behav. Hum. Decis. Process.* 67:247–57
 17. Hsee CK. 1998. Less is better: when low-value options are valued more highly than high value options. *J. Behav. Decis. Mak.* 11:107–21
 18. Kahneman D, Snell JS. 1992. Predicting a changing taste: Do people know what they will like? *J. Behav. Decis. Mak.* 5:187–200
 19. Kaiser Family Found. 1998. *Lessons from the Front Line: Focus Group Study of Medicare Insurance Counselors*. Menlo Park, CA: Kaiser Family Found.
 20. Kaplan RM. 1986. Patient information processing and the decision to accept treatment. *J. Soc. Behav. Personal.* 1:113–20
 21. Kreuter MW, Bull FC, Clark EM. 1999. Understanding how people process health information: a comparison of tailored and nontailored weight-loss materials. *Health Psychol.* 18:487–95
 22. Kreuter MW, Oswald DL, Bull FC, Clark EM. 2000. Are tailored health education materials always more effective than non-tailored materials? *Health Educ. Res.* 15:305–15
 23. Kreuter MW, Holt CL. 2001. How do people process health information? Applications in an age of individualized communication. *Curr. Dir. Psychol. Sci.* 10:206–9
 24. Lipkus IM, Samsa G, Rimer BK. 2001. Decision psychology and risk perception general performance on a numeracy scale among highly educated samples. *Med. Decis. Mak.* 21:37
 25. Marshall MN, Shekelle PG, Leatherman S, Brook RH. 2000. The public release of

- performance data: What do we expect to gain? A review of the evidence. *JAMA* 283:1866–74
26. McNeil BJ, Pauker SG, Sox HCJ, Tversky A. 1986. On the elicitation of preferences for alternative therapies. In *Judgment and Decision Making: An Interdisciplinary Reader*, ed. HR Arker, KR Hammond, pp. 386–93. Cambridge, UK: Cambridge Univ. Press
 27. Montgomery H, Svenson O. 1989. A think-aloud study of dominance structuring in decision processes. In *Process and Structure in Human Decision Making*, ed. H Montgomery, O Svenson, pp. 135–50. Chichester, NY: Wiley
 28. Natl. Acad. Soc. Insur. 1998. *Medicare Choices in California*. Washington, DC: Natl. Acad. Soc. Insur.
 29. Natl. Comm. Qual. Assur. 2001. *Exploring Consumer Perspective of Good Physician Care: A Summary of Focus Group Results*. Washington, DC: NCQA
 30. Oatley K. 1994. A taxonomy of the emotions of literary response and a theory of identification in fictional narrative. *Poetics* 23:53–74
 31. Osgood CE, Suci GJ, Tannenbaum PH. 1957. *The Measurement of Meaning*. Urbana: Univ. Ill.
 32. Payne JW, Bettman JR, Johnson EJ. 1993. *The Adaptive Decision Maker*. New York: Cambridge Univ. Press
 33. Price V, Czilli EJ. 1996. Modeling patterns of news recognition and recall. *J. Commun.* 46:55–79
 34. Robinson JC. 2002. *Renewed emphasis on consumer cost sharing in health insurance benefit design*. http://www.healthaffairs.org/WebExclusives/Robinson_Web_Excl_032002.htm
 35. Rothman AJ, Martino SC, Bedell BT, Detweiler JB, Salovey P. 1999. The systematic influence of gain and loss-framed messages on interest in and use of different types of health behavior. *Personal. Soc. Psychol. Bull.* 25:1355–69
 36. Rybowski L. 2001. *Meeting Employees' Information Needs in an Evolving Health Care Marketplace*. Washington, DC: Natl. Health Policy Forum
 37. Sainfort F, Booske BC. 1996. Role of information in consumer selection of health plans. *Health Care Financ. Rev.* 18:31–54
 38. Sanfey A, Hastie R. 1998. Does evidence presentation format affect judgment? *Psychol. Sci.* 9:99–103
 39. Satterfield T, Slovic P, Gregory R. 2000. Narrative valuation in a policy judgment context. *Ecol. Econ.* 34:315–31
 40. Schapira MM, Nattinger AB, McHorney CA. 2001. Frequency or probability? A qualitative study of risk communication formats used in health care. *Med. Decis. Mak.* 21:459–67
 41. Sherer M, Rogers RW. 1984. The role of vivid information in fear appeals and attitude change. *J. Res. Personal.* 18:321–34
 42. Sloman SA. 1996. The empirical case for two systems of reasoning. *Psychol. Bull.* 119:3–22
 43. Slovic P, Finucane ML, Peters E, MacGregor DG. 2002. The affect heuristic. In *Intuitive Judgment: Heuristics and Biases*, ed. T Gilovich, D Griffin, D Kahneman, pp. 397–420. New York: Cambridge Univ. Press
 44. Slovic P. 1982. Toward understanding and improving decisions. In *Human Performance and Productivity. Vol. 2: Information Processing and Decision Making*, ed. WC Howell, EA Fleishman, pp. 157–83. Hillsdale, NJ: Erlbaum
 45. Slovic P. 1995. The construction of preference. *Am. Psychol.* 50:364–71
 46. Slovic P, Monahan J, MacGregor DG. 2000. Violence risk assessment and risk communication: the effects of using actual cases, providing instruction, and employing probability versus frequency formats. *Law Hum. Behav.* 24:271–96
 47. Strange JJ, Leung CC. 1999. How anecdotal accounts in news and fiction can influence judgments of a social problem's

-
- urgency, causes, and cures. *Personal. Soc. Psychol. Bull.* 25:436–49
48. Tversky A, Sattath S, Slovic P. 1988. Contingent weighting in judgment and choice. *Psychol. Rev.* 95:371–84
49. Slovic VHA. 2000. *Consumer Demand for Clinical Quality: The Giant Awakens*. Irving, TX: VHA
50. Yamagishi K. 1997. When a 12.86% mortality is more dangerous than 24.14%: implications for risk communication. *Appl. Cogn. Psychol.* 11:495–506