Theory–informed design of values clarification methods: A cognitive psychological perspective on patient treatment decision making

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Review

Theory-informed design of values clarification methods: A cognitive psychological perspective on patient health-related decision making

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Abstract

Healthcare decisions, particularly those involving weighing benefits and harms that may significantly affect quality and/or length of life, should reflect patients’ preferences. To support patients in making choices, patient decision aids and values clarification methods (VCM) in particular have been developed. VCM intend to help patients to determine the aspects of the choices that are important to their selection of a preferred option. Several types of VCM exist. However, they are often designed without clear reference to theory, which makes it difficult for their development to be systematic and internally coherent. Our goal was to provide theory-informed recommendations for the design of VCM. Process theories of decision making specify components of decision processes, thus, identify particular processes that VCM could aim to facilitate. We conducted a review of the MEDLINE and PsycINFO databases and of references to theories included in retrieved papers, to identify process theories of decision making. We selected a theory if (a) it fulfilled criteria for a process theory; (b) provided a coherent description of the whole process of decision making; and (c) empirical evidence supports at least some of its postulates. Four theories met our criteria: Image Theory, Differentiation and Consolidation theory, Parallel Constraint Satisfaction theory, and Fuzzy-trace Theory. Based on these, we propose that VCM should: help optimize mental representations; encourage considering all potentially appropriate options; delay selection of an initially favoured option; facilitate the retrieval of relevant values from memory; facilitate the comparison of options and their attributes; and offer time to decide. In conclusion, our theory-based design recommendations are explicit and transparent, providing an opportunity to test each in a systematic manner.

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Introduction

Making decisions about one’s healthcare can be challenging for patients. This is especially true when decisions involve tradeoffs between quality of life and length of life (i.e., increasing length at the expense of good quality, or having good quality but decreasing length). These healthcare decisions, ought to reflect patients’ preferences (Kassirer, 1994; Sackett, Straus, & Richardson, 2000). To help patients, researchers have developed patient decision aids (PtDAs or simply aids): tools designed to support patient decision making.

Despite the development of aids, there is little evidence suggesting how patients clarify the personal value they associate with different options or features of options, such as how they may trade off pro’s and con’s within a decision. “Values clarification” describes the process(es) by which patients become clearer about how much they value options and why. Aids may include components to help clarify values, or “values clarification methods” (VCM). In line with the recent International Patient Decision Aids Standards (IPDAS) collaboration update (http://ipdas.ohri.ca/IPDAS-Chapter-D.pdf) we define VCM as methods “to help patients evaluate the desirability of options or attributes of options within a specific decision context, in order to identify which option he/she prefers”.

The process of values clarification can be viewed in at least two ways: health-related preferences are seen as pre-existing and only
in need of being uncovered (Gregory, Lichtenstein, & Slovic, 1993), or as being constructed from basic values at the time decision makers need to determine their preference (Gregory et al., 1993; Payne, Bettman, & Schkade, 1999). In either view, and because consequences are often high-stake, not fully imaginable, and serve conflicting goals (e.g., reducing pain versus minimizing side effects), clarifying values may be challenging (Fischhoff, 1991; O’Rourke & Germino, 1998; Simon, Krawczyk, Bleicher, & Holyoak, 2008).

We formulated recommendations based on their commonalities. Decision making processes that VCM could support and have mental operations, occurring between the presentation of the process of valuation. We selected theories regardless of whether or as being constructed from basic values at the time decision making (Brownstein, 2003). The evidence that attributes are re-evaluated before the point of commitment, without new information becoming available, is consistent with changing internal representation as being integral to decision making (Brownstein, Ostrove, & Mills, 1979; Brownstein, 2003; Mann, Janis, & Chaplin, 1969). The mental restructuring stands in contrast to structural theories of decision making, including normative expected utility theories (Fishburn, 1981) and Prospect Theory (Kahneman & Tversky, 1979), which relate decisions to structural characteristics of decision problems and do not suggest re-evaluation of information as part of decision making. Third, a decision maker is viewed as adaptively applying one or more decision ‘rules’ or strategies to reach decisions. The selection and application of decision strategies can result from conscious consideration of information (Glöckner & Betsch, 2008a) or from automatic processes such as recognition (Dougherty, Gettys, & Ogden, 1999). Decision strategies can consider multiple options at a time, leading to quick, integrated assessments of the attractiveness of options. Other strategies directly compare attributes across options, and include two classes: compensatory and non-compensatory strategies. In compensatory decision strategies, information is weighed so that positive attributes can counterbalance negative attributes. In non-compensatory decision strategies, information is not weighed but typically thresholds are used to decide if an option remains under consideration. To illustrate the two types of strategies, consider for example a prostate cancer patient, who places a high value on getting rid of the cancer and is choosing between active surveillance and surgery. With a compensatory strategy, surgery, seen to get rid of the cancer but with side effects, is compared to active surveillance, which does not get rid of the cancer but also has no side effects. The desire to eliminate cancer can outweigh not enduring side effects; with a non-compensatory strategy the high value placed on eliminating the cancer can mean that active surveillance is not even being considered.

We searched for theories published in English peer-reviewed journals, indexed in MEDLINE or PsycINFO databases, using broad terms ("decision making theory" OR "decision making model" OR "decision processes") AND ("valuation" OR "values clarification" OR "preference clarification" OR "preference construction" OR "incomplete preference" OR "evaluation"). We further used a snowball technique, inspecting the reference list of those papers. We aimed to select theories that describe decision processes when faced with a new decision (as opposed to “expert” decision making that comes with repeatedly making the same decision), including valuation. Each theory was required to meet the following criteria: (a) fit the criteria for process theories as proposed by Crozier and Raynard outlined above; (b) provide a coherent description of the whole process of making a decision, including processes where values clarification is addressed; and (c) be supported by empirical evidence for at least some of its proposed mechanisms.

We identified nine theories of naïve decision making with potential relevance: Image Theory (Beach & Mitchell, 1987); Differentiation and Consolidation theory (Svenson, 2003; Svenson & Jakobsson, 2010); Search for Dominance Structure theory (Montgomery, 1994); Behavioural Decision Framework (Payne,
Bettman, & Johnson, 1992); Prospect Theory (Kahneman & Tversky, 1979); Parallel Constraint Satisfaction theory (Glöckner & Betsch, 2008a); Query Theory (Weber et al., 2007); Construal-level theory (Trope & Liberman, 2010); and Fuzzy-trace Theory (Reyna, 2008).

From those nine, four theories met our criteria: Image Theory; Differentiation and Consolidation (Diff Con) theory; Fuzzy-trace Theory; and Parallel Constraint Satisfaction theory. A brief description of the suggested processes of valuation in each of the selected theories, including relevant empirical evidence, follows.

**Processes of valuation in the selected theories**

**Image Theory**

Image Theory posits that decision makers rely on three information representations, called images, that organize decision makers’ values and knowledge: (1) The value image encompasses decision makers’ principles, including values, ethics, and guiding beliefs (it typically explains why a decision was made). (2) The trajectory image consists of decision makers’ goals, or agenda of what they hope to achieve (i.e., what needs to be done to satisfy the value image). (3) The strategic image is the decision maker’s set of plans of how to attain the goal. Evidence supports decision processes in terms of the three images (Nelson, 2004). Image Theory suggests two phases: a screening phase to narrow the pool of options, followed by choice (Beach & Mitchell, 1987). In screening, unacceptable options are eliminated based on their incompatibility with value images. Screening, accomplished by compatibility tests, is a rapid, simple, emotionally mediated and usually, but not exclusively, non-compensatory strategy (Potter & Beach, 1994; Seidl & Traub, 1998) that does not necessarily take place consciously. As predicted by the compatibility test, findings support the idea that natural processes tend to involve screening out bad options rather than screening in good options (Ordonez, Benson, & Beach, 1999). Choice of the final option (in case more than one remains after screening) is accomplished by the profitability test. This is a more complex, deliberative, and more often compensatory strategy than the compatibility test, to select the option which potentially offers the most attractive consequences (Mitchell & Beach, 1990; Potter & Beach, 1994).

**Differentiation and consolidation**

“Diff Con” theory views decision making as a process in which one option is gradually differentiated from competing alternatives until one alternative is sufficiently superior (Svenson, 2003). The theory suggests, with supporting evidence, that differentiation of the chosen option continues following the final decision, in what is then called consolidation, to secure its superiority (Svenson, Salo, & Lindholm, 2009).

Decision making starts with the detection of a choice opportunity and a screening process to identify options. A preliminary preferred option is selected, which has a greater chance of becoming the final choice than other equally attractive options, because differentiation processes are biased towards favouring it (Brownstein, 2003). The differentiation of alternatives subsequently occurs through structural differentiation, changing mental representations of options in support of the preliminary choice, and process differentiation, applying one or more compensatory or non-compensatory decision strategies. Empirical evidence of differentiation comes from early-stage prostate cancer patients using a decision aid: 82% of the patients changed which attributes affected their decision and 72% changed how much they valued the treatment options as a whole (Feldman-Stewart, Brundage, Van Manen, & Svenson, 2004). Differentiation and consolidation aim to achieve coherence within alternatives (reasons supporting the (to be) chosen option tend to become more positive and reasons against non-chosen options more negative over time), as well as between alternatives (that is, coherence in how individuals think about the chosen and non-chosen options). Evidence supports these claims (Svenson & Jakobsson, 2010).

**Fuzzy-trace Theory**

Fuzzy-trace Theory proposes that people simultaneously and independently encode mental “traces”, or representations, of information that vary in precision (Kuhberger & Tanner, 2010; Reyna, 2008). Verbatim representations are literal, preserving precise detail and capturing the exact surface form of information (e.g., having at least a 30% risk of impotence). ‘Gist’ representations preserve basic or bottom-line meaning of information and reflect understanding — the gist is only as good as the understanding of the decision maker. Gists are subjective interpretations of information based on emotion, education, culture, experience, worldview, and level of development (Reyna, 2008). Empirical evidence that the interpretation of gist information is coloured by context was demonstrated when women, who had first estimated the average woman’s lifetime risk of developing breast cancer (mean estimate: 46%), next perceived the actual risk (13%) to be lower and felt more relieved when learning about it than women who had not provided the earlier estimate (Fagerlin, Zikmund-Fisher, & Ubel, 2005).

After information is represented, people retrieve their values (e.g., “being impotent is bad”), principles, and knowledge and apply them to the representation. According to the theory, people prefer to operate on the least precise gist representation that will allow them to accomplish the task. People can retrieve reasoning principles and apply them to representations to derive judgements. Or they can retrieve factual knowledge to further interpret/elaborate representations. The decision is the result of integrating what is perceived and what is retrieved from memory, including knowledge and values. Retrieved values can compete, but the priority of values in long-term memory and the cuing of values in the context that the person faces are assumed to jointly determine the accessibility of values at a given point in time. Importantly, the retrieval of values from long-term memory was shown to be highly sensitive to reminders in the immediate environment, even when values and principles are strongly endorsed (Reyna & Casillas, 2009).

**Parallel Constraint Satisfaction theory**

This theory proposes that decision processes start with the spontaneous installation of a primary network of information, consisting of all salient external and currently activated internal information (e.g., decision options such as surgery and radiation and goals at stake, such as minimizing risk of harm and maximizing probability of survival; Glöckner & Betsch, 2008a). Decision problems are actively constructed, using different deliberate decision strategies for search, editing, and changing information.

Next, Parallel Constraint Satisfaction theory argues that the automatic system selects an initial option. Decision makers structure and integrate information using an automatic decision strategy, the parallel constraint satisfaction rule. The rule aims to maximize consistency and allows for the integration of a number of different sources of information in parallel (Read, Vanman, & Miller, 1997; Simon & Holyoak, 2002). Evidence suggests that these automatic processes towards consistency consist of holistically weighing information, emphasizing the dominant structure in decision tasks (Glöckner & Betsch, 2008a). Dominance structuring operates in favour of the initial option. That is, information is modified so that one option clearly stands out compared to the others and a consistent
representation can be reached. Notably, the theory predicts that information is processed such that cues for or against an option are modified iteratively, to coherently support the favoured option. Such coherence shifts were indeed found in hypothetical choices (Simon, Krawczyk, & Holyoak, 2004), in environments involving real-world knowledge (weather forecasts; Glöckner & Betsch, 2010), and in tasks involving city-size guesses (Glöckner et al., 2010). If the initially favoured option does not demonstrate acceptable levels of consistency and reach the threshold for selection, then one or more decision strategies are applied. The decision maker finally encounters the dominant option because it produces the most coherent and sufficiently consistent mental representation in the context of all information being considered.

Evidence shows that decision time increases with increased inconsistency and that confidence judgements decrease with increasing inconsistency (Glöckner & Betsch, 2008a; Glöckner & Hodges, 2011). Eye-tracking showed decreased decision time and less information search with increased superiority of one option over the other (Glöckner & Herbold, 2011). Decision times may even be shorter with more information if the additional information increases in overall coherence (Glöckner & Betsch, 2012). In line with the theory, a predominant usage of compensatory strategies was observed even under time pressure (Glöckner & Hodges, 2011).

**Commonalities between the selected theories**

The identified theories generally agree that a preference emerges through stages in decision processes: an initial mental representation of the decision situation, information acquisition and interpretation, including the generation of one or more gist representations, information integration into an evaluation, and the declaration of a preference. Also, a commonality across these theories is that difficult decisions tend to be made using compensatory strategies, as was evidenced when people face decisions that are now (Dieckmann & Rieskamp, 2007; Shanteau, 1992); when they are personally involved in decisions (Gensch & Javalgi, 1987); or when they make decisions under uncertainty (Glöckner & Betsch, 2008b; Johnson, Schulte–Mecklenbeck, & Willemsen, 2008).

Decision making has long been viewed as a matter of reason and control and involving the deliberate analysis of expected utility (e.g., Kahneman & Tversky, 1979). The theories described here propose alternate views in which large parts of processing are automatic. In creating guidelines for designing VCM, one inevitably runs into the challenges that some decision processes cannot be directly observed or measured without interfering with decision processes (Glöckner & Betsch, 2008a), aspects of internal representations cannot all be readily reported verbally, and that capturing individuals’ internal representation of a decision (i.e., beliefs, associations and emotional reactions) at the point of decision making requires techniques which are likely to interfere with decision processes (Maule & Villejoubert, 2007). Despite the shortcomings in tools to test theories empirically, the theories that we selected suggest potential parts in the process of values clarification that VCM could aim to support and there is empirical evidence for at least some of their postulates.

**Implications of the theories for the design of VCM**

Fig. 1 provides a schematic overview of naïve decision making processes over time based on the selected theories, from the point when potentially appropriate options are presented (Representation, Fig. 1) until after a preference is declared (Post-choice, Fig. 1). Fig. 1 further identifies potential processes of values clarification as derived from the theories that VCM could target in order to lower the burden of decision making. For the sake of clarity, we represent the values clarification processes in Fig. 1 as if being serial. Building on Fig. 1, we present recommendations on how to support patient values clarification, through support to particular clarification-related processes that we have identified. The recommendations extend beyond addressing just the direct values-related processes to include earlier processes that also could limit patients’ ability to make decisions consistent with their values.

**Help optimize mental representations (Representation)**

A basic assumption of the theories selected is that mental representations constitute a core element of decision processes (Representation, Fig. 1). Mental representations affect what information is attended to and what information is ignored (Payne et al., 1999). Parallel Constraint Satisfaction theory postulates that any presented information can be included in the representation of options regardless of its relevance. Diff Con theory suggests that salient affective, cognitive or perceptual aspects of options at the start of a decision process partly determine its course and the mental representation of the decision (i.e., where decision making processes begin and what is emphasized). Mental representations may then affect judgements. For example, stereotypes can be part of that early representation and, thus, affect decision processes without decision makers’ awareness, even in situations when they would prefer to avoid that influence if they were aware of it (Wilson & Brekke, 1994). Similarly, choices may be affected by information that individuals in fact identify as irrelevant to the decision (Ubel, Jepron, & Baron, 2001).

Mental representations of decisions can also be compromised because individuals do not understand available information correctly (Fischhoff et al., 1993), which may especially be true for probability information (for reviews, see e.g., Gigerenzer & Edwards, 2003; Lipkus, 2007). Decision makers will tend to give less weight in their decisions to attributes that they feel they do not understand well (Hsee, Loewenstein, Blount, & Bazerman, 1999). In terms of Fuzzy-trace Theory, decision makers need to understand the essential meaning of the information for their situation which will be stored as gist representations and will in turn cue which values will be retrieved from memory.

VCM should be offered in contexts in which the relevance, comprehensibility, and meaning of the information for one’s situation is ensured as much as possible. Of note, the aim of presenting information that is deemed relevant to patients represents a major challenge as clinicians do not agree on what information is critical (Capirci et al., 2005), clinicians and patients differ in their information priorities (Capirci et al., 2005; Feldman-Stewart & Brundage, 2004), patients differ in their information priorities (Capirci et al., 2005; Feldman-Stewart et al., 2000; Jenkins, Fallowfield, & Saul, 2001), and patients’ information needs change during the decision making process (Feldman-Stewart et al., 2004). What content most patients consider relevant to their decision will need to be determined empirically, and users should be enabled to receive information on additional topics if they wish to.

Include all potentially appropriate options and their attributes (Representation)

Image Theory, Diff Con theory, and Parallel Constraint Satisfaction theory all claim that we typically screen initially available options when many are offered in order to focus on fewer relevant options. Individuals may discard options early in the process without considering all relevant information, to narrow the pool of options which they will consider for final selection. This may lead to suboptimal choices. Also, as Image Theory and Diff Con theory suggest, early processing often relies on non-compensatory
processes. This may result in individuals focussing on only one or a few attributes of options which may, in turn, lead them to discard options early. Image Theory postulates that our natural screening processes aim to exclude bad options rather than to include good options. Prompting decision makers to include potentially appropriate options was shown to result in a larger pool of options retained (Ordonez et al., 1999). To address this screening inclination, therefore, VCM should encourage individuals to include all potentially appropriate options in their consideration set (Pre-selection, Fig. 1).

More generally, VCM should encourage patients to develop a multi-dimensional representation of decision situations by helping them to consider multiple options, multiple attributes, multiple states of nature, and multiple goals (Payne et al., 1999). Indeed, research outside of healthcare has shown higher consistency between attitudes and decisions when multiple alternatives are made explicit at the outset (Posavac, Sanbonmatsu, & Fazio, 1997).

**Suspend the selection of an initially favoured option (Pre-selection)**

Once we have encouraged representation of all options, Diff Con theory and Parallel Constraint Satisfaction theory suggest that we naturally tend to select an initially favoured option early in the decision making process. This strategy helps anchor incoming information to understand and integrate it into the representation more readily. Also, selecting an initially favoured option at an early stage saves effort because each competitor has to be compared only with that preliminary choice (Svenson & Jakobsson, 2010). The existence of an early favourite, however, tends to result in subsequent information being interpreted or mental representations of options being restructured in ways that support that favourite, thereby bolstering its chances of being chosen ultimately (Bond, Carlson, Meloy, Russo, & Tanner, 2007; Maule & Villejoubert, 2007; Simon et al., 2004). Decision makers may select an initially favoured option too soon, for example before they have considered all potentially relevant information. They may select an early preference based on irrelevant attributes, for example because a significant other who is not knowledgeable but nevertheless trusted on the issue recommends it. Diff Con theory acknowledges that in this process preference may change and that the final choice need not necessarily be the same as the initially favoured option. In general, both the reported values of the attributes (e.g., how often one has to go to hospital to undergo radiation therapy) and their weights (e.g., how important travelling to the hospital is for the patient) have been shown to shift to make one option dominate competitors (Feldman-Stewart et al., 2004). Considering options increasingly positively or negatively before receiving all relevant information could be counterproductive in reaching “good” decisions. VCM should facilitate and encourage the appraisal of all

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**Fig. 1.** Schematic overview of decision making processes based on the selected theories, processing parts relating to values clarification processes, and potential points at which these processes may be supported.
relevant information about offered options as this is expected to result in a more informed selection of an early favourite.

Remind patients of their array of values (Integration)

Fuzzy-trace Theory proposes that decision makers integrate their gist representations of information and knowledge with values that they retrieve from their long-term memory (Reyna, 2008). Importantly, Fuzzy-trace Theory suggests that the retrieval of values is context-dependent. In effect, even strongly-held and relevant values may not be retrieved at the time of decision making (Reyna & Casillas, 2009). The priority of values in long-term memory and the cuing of values in the context that the decision maker faces will jointly determine the accessibility of the value at the time of decision making.

VCM should encourage patients to consider the array of values they hold in long-term memory and that are relevant to the decision. This may be done, for example, by helping them identify each value that is important to their choice under conditions of low cognitive burden, a strategy that should encourage the patient to be comprehensive.

Facilitate the weighing of attributes of options (Integration)

The selected theories share the view that complex decisions tend to be made using compensatory strategies. Image Theory suggests that high-quality decision making processes entail explicitly weighing pros and cons of options. Diff Con theory proposes that in the processes of both differentiation and consolidation the evaluation of attributes will often be central, with the evaluation of both positive and of negative attributes frequently shifting. Parallel Constraint Satisfaction theory postulates that the integration of information occurs automatically but also that integration is a result of a largely compensatory decision strategy.

VCM should facilitate the weighing of pros and cons of options, regardless of whether the actual weighing should take place deliberately or not. Weighing may be facilitated, for example, by presenting options side-by-side in table format (Feldman-Stewart & Brundage, 2004; Sundström, 1989). Simultaneous display of options facilitates attribute-wise comparisons between alternatives and thus compensatory decision strategies (Dhar, 1996; Nowlis & Simonson, 1997). The consideration of all relevant information is expected to require time. When done deliberately, it is expected to require cognitive effort, and may be emotionally demanding (Luce, Bettman, & Payne, 1997; Luce, Payne, & Bettman, 1999). We expect that additional time and cognitive effort will mostly be limited to making tradeoffs and will not typically include information search because aids should by definition provide complete information as much as possible.

Offer time to decide (Representation, Pre-selection, Integration)

The theories reviewed suggest that we naturally restructure our mental representations to reach a decision. Evidence suggests that the extent to which mental representations are restructured to support the initially favoured option is moderated by perceived time pressure (Brownstein, 2003). When facing a health-related decision, often actual time pressure is not at stake and individuals can take at least days before committing to an option.

Patient decision aids should encourage patients to take time before committing to a final preference. Providing time for making decisions is expected to encourage unbiased processing of information and thorough integration of pros and cons. There is little evidence regarding what specific period of time to recommend. Patients may, for example, be invited to think about their options and/or discuss them with others and to come back and see their clinician a day or a week later, before making the final decision.

Evaluating the effects of these theory-based design recommendations

We argue that VCM should aim to facilitate the process of determining what is most important to patients because that will assist them to arrive at decisions that are consistent with their values. Assessing the effectiveness of the theory-based design recommendations that we have formulated may be carried out in several ways, either early or long after the decision is made.

For assessments soon after the decision is made, one may identify difficulties that patients have with the decision making process and whether using the VCM alleviates these. For example, one may use the Preparation for Decision Making scale (Bennett et al., 2010) or the Decisional Conflict Scale (O’Connor, 1995) before and after using the VCM. Alternatively, one may assess difficulties in becoming clear about what is most important after the decision was made in a randomized controlled trial comparing patients who were versus were not offered the VCM.

In the longer term, the choice of outcome measure to evaluate decision quality should be guided by theory. Most theories stipulate goals for the decision, and of those goals, some theories focus only on the situation (e.g., Utility Theory) while others also have goals for the process (e.g., Diff Con theory). One process goal is to reduce the likelihood of post-decision regret. That is, high compared to low-quality decisions will better guard decision makers against actual adverse events following the decision and low levels of regret are seen as a critical indicator of high quality decision making. While regret related to outcome can complicate the ability to determine regret related to decision processes, study design (e.g., randomized controlled trials that result in the same distribution of choices, hence side effects, and disease stages, hence benefits) can be used to help clarify the situation so that the impact of VCM can be evaluated directly (Feldman-Stewart et al., 2012). Additionally, regret theories that clarify different sources of regret (Connolly & Reb, 2005) and evaluation tools based on such theory may help clarify regret due to decision processing.

Limitations and future directions

This paper offers several theory-based recommendations for VCM-design. These recommendations aim to help patients to better identify values that are relevant to them, in order to help them make better decisions. Limitations to our overview should be noted. First, we made a purposeful selection of process theories, which reflects naïve decision making and this has affected the resulting recommendations. This focus followed from our assumption that in order to help people best, we need to address specific processes that can be supported in order to make the values clarification process more effective. Second, most selected theories have not been tested very extensively in healthcare contexts. We therefore do not yet know how well evidence would support their propositions in health-related decision making. We expect that many decision processes will be similar across settings when decisions are new, personally relevant, consequential, and dependent on individuals’ values, but more evidence is needed to show how well these theories fit health-related decision making.

The next step will involve empirical tests of theory-informed VCM. Importantly, to test the value of the recommendations, appropriate evaluation criteria should be developed that draw upon the hypothesized effects in the decision process. We have made some suggestions but the specific design of the VCM should lead these choices. Furthermore, the relative importance of the
recommendations in effectively aiding individuals facing health-related decisions should be investigated. Finally, more fundamentally, empirical findings relating to health-related decision making should be used to assess the theories to assess how they can be improved generally or specified for a healthcare context.

**Conclusion**

Our search for theories to guide VCM-design has led us to four process theories of decision making. Based on these, we propose that VCM should: help optimize mental representations; encourage consideration of all potentially appropriate options and their attributes; delay selection of an initially favoured option; encourage the consideration of relevant values; facilitate the comparison of options and their attributes; and offer time to decide. These theory-based design recommendations are explicit and transparent, providing a basis to test each in a systematic manner. We advise use of comprehensive strategies (i.e., consideration of information, options, attributes, and values) because we suggest these strategies are more likely to lead to decisions that fit the patient’s values, needs and goals. Further empirical studies of these recommendations will offer insight in actual patient values clarification and in how high-quality values clarification processes may be achieved.

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**Conflict of interest**

None.

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