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Design Features of Explicit Values Clarification Methods: A Systematic Review

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Abstract (266 words)

Background. Values clarification is a recommended element of patient decision aids. Many different values clarification methods exist but there is little evidence synthesis available to guide design decisions.

Purpose. To describe practices in the field of explicit values clarification methods according to a taxonomy of design features.

Data Sources. MEDLINE, all EBM Reviews, CINAHL, EMBASE, Google Scholar, manual search of reference lists, and expert contacts.

Study Selection. Articles were included if they described one or more explicit values clarification methods.

Data Extraction. We extracted data about decisions addressed, use of theories, frameworks and guidelines, and twelve design features.

Data Synthesis: We identified 110 articles describing 98 explicit values clarification methods. The majority of these addressed decisions in cancer or reproductive health and half addressed a decision between just two options. Most used neither theory nor guidelines to structure their design. 'Pros and Cons' was the most common type of values clarification method. Most methods did not allow users to add their own concerns. Few methods explicitly presented tradeoffs inherent in the decision, supported an iterative process of values exploration, or showed how different options aligned with users' values.

Limitations: Study selection criteria and choice of elements for the taxonomy may have excluded values clarification methods or design features.

Conclusions: Explicit values clarification methods have diverse designs, but can be systematically catalogued within the structure of a taxonomy. Developers of values clarification methods should carefully consider each of the design features in this taxonomy and publish adequate descriptions of their designs. More research is needed to study the effects of different design features.

INTRODUCTION

Individual values are a critical ingredient in high quality decision making, and indeed, in high quality care.[1-4] What is important to one person may not be the same as what is important to others. Thus, a common definition of an informed decision begins with two foundational elements: such a choice must be based on relevant knowledge and it must be congruent with the individual's values.[5,6]

Considerable work has been done on the first element to determine how best to ensure that people have relevant knowledge before making health decisions.[7-10] Although such evidence is not always consistently implemented within decision support tools, researchers and practitioners can look to best practices for guidance on how to present health information.[11,12]

There is considerably less consensus on the second element. Although there is widespread agreement that supporting the process of values clarification is a key step in effective decision making,[4,12-14] to the point that inclusion of such a component has been used as a metric of quality of the decision support tool,[15] there are no established best practices for values clarification.[16,17] This may be attributable at least partly to the fact that activities described as values clarification are extremely varied. They include tasks such as identifying pros and cons of an option,[13] rating[18] or ranking[19] the importance of these specific risks or benefits, indicating whether each piece of information pushes one towards or away from a given choice,[20] viewing a 'soap opera' whose characters are faced with a medical

decision and choosing the character with whom one most identifies,[21] or having an open discussion about attributes of interest.[22]

All of these activities are designed to achieve the goal of helping people clarify their values relevant to a given decision. However, they have vastly different features, which makes it difficult to compare and contrast different designs, draw conclusions about their comparative effectiveness, and thus make decisions about how we can best help people clarify their values relevant to a health decision.

In order to begin to build an evidence base concerning values clarification, we undertook a systematic review of explicit values clarification methods. The aim of this paper is to catalogue the diverse methods that have been described in the literature. The cataloguing scheme – or taxonomy – will also serve to provide structure for the development and reporting of values clarification methods, as well as for studying the effects of different design features.

Values, Values Clarification, and Preferences

The terms values, values clarification, and preferences are used in a number of ways in the literature. *Values* may refer to broad principles such as valuing family, or to more specific concepts such as the extent to which decision attributes matter to an individual. In this review, the term *values* refers to the latter, narrower meaning and we therefore refer to *values clarification* as it is commonly used in the medical decision making literature, meaning the process of sorting out what matters to an individual relevant to a given health decision. Similarly, the term *preferences* refers to an individual's inclination toward or away from a given decision option.

According to these definitions, values clarification methods should help people sort out what matters to them, which should, in turn, help determine preferences. We note that the related terms *values elicitation* and *preference elicitation* refer to processes by which values and preferences, respectively, are drawn out.

METHODS

Inclusion and Exclusion Criteria

Articles were included in this review if they sufficiently described the design of an explicit values clarification method intended to assist someone in making an individual-level health decision. We defined an explicit method as one in which the user of the method explicitly interacted with an interface, for example, by shading in boxes in a booklet or moving a slider in a web-based application. Articles were considered to have described a method sufficiently if screeners deemed that it would be possible to extract data for a minimum of 10 of the 12 design features in our taxonomy, either because the information was contained in the text of the article, in an appendix, or if the article included a URL freely linking to a copy of the values clarification method. An included values clarification method could be part of a decision aid, but could also be an independent intervention or be part of another type of intervention. Additionally, an article could conceivably describe more than one values clarification method. We excluded articles that described a decision aid and mentioned that a values clarification method was included, but did not describe the method in sufficient detail, or used an implicit method.

Search Strategy

With assistance from two medical librarians to develop and deploy our search strategy, we conducted a systematic search to identify published accounts of values clarification methods. We searched MEDLINE, all EBM Reviews, CINAHL and EMBASE for either value or values and clarif* within 5 words of each other in abstracts and titles. For CINAHL, we also used the major subject heading "Values Clarification." In addition, we searched Google Scholar for "values clarification exercise," the term used until recently to describe such interactive tools.[17] We also included all articles that either cited the previous version of the IPDAS guidelines[12] or were included in the most recent published Cochrane review of decision aids at the time of the search.[23] Two searches were conducted: the first on December 17, 2010 and an update using the same search strings and methods on January 29, 2014. We did not use date or language restrictions. This strategy yielded a total of 2629 articles after duplicates were removed (2145 in the initial search and 484 in the update). We also searched references of included articles where the articles referred to previous designs not included in our original set, consulted with experts to identify any articles that might have been missed, and reviewed all articles added in the update to the Cochrane systematic review of decision aids, which was in process at the time of this review.[9] These steps yielded an additional 3, 4, and 23 articles, respectively. Thus, we screened a total of 2659 articles.

Screening Process

Two authors (HW plus one of LS, TG, SCD) independently screened all articles. Discrepancies were resolved by discussion until consensus was reached.

Quality Appraisal

Because we sought descriptive articles, no quality appraisal beyond our inclusion criteria was necessary.

Development of the Taxonomy

The overall structure of the taxonomy was developed collaboratively by all authors. We posed broad questions and iteratively reviewed the data to refine each data element and its categories. The broad questions posed were: 1) For what decision was this values clarification method created? 2) What theory, framework, guidelines and previous work guided its design? 3) What were the design features of the method?

In identifying design features, we aimed to describe a taxonomy of design choices that developers of values clarification methods must make – deliberately or not – that determine how users may interact with a given values clarification method. To develop the taxonomy, we used an iterative method of constant comparison, in which we identified design features that distinguished different values clarification methods from each other, examined those features across methods, discussed the features among data extractors (HW, LS, TG, AP, AFF, SCD), consulted with other authors, revised definitions and categories, and ultimately arrived at the structure described below.

Data Extraction

One author (HW) extracted all data into evidence tables, which were subsequently reviewed in detail by five authors (LS, TG, AP, AFF, SCD), each of whom examined specific columns, identified any data of concern, and resolved any issues together with HW. Items for which further information was deemed necessary were referred for consultation with authors of the original articles.

Data Synthesis

Summary statistics were calculated in Microsoft Excel.[24]

Analysis

We explored whether it would be possible to simplify the taxonomy of design features by examining pairwise comparisons between design features and by applying Latent Class Analysis. Latent Class Analysis is similar to Factor Analysis but is better suited to categorical data. Analyses were performed in R, version 3.0.2[25] using the poLCA package for Latent Class Analysis.[26]

RESULTS

Overview of Included Studies

This review includes 110 articles describing 98 explicit values clarification methods. See Figure 1 for details of the identification, screening and eligibility assessment of articles, Table 1 for a list of included articles and Table 2 for full descriptive statistics of the values clarification methods.

Figure 1: PRISMA Diagram about here

Table 1: Included Articles about here

Methods in this review addressed a wide range of decisions. Cancer was the most common clinical context (49%) followed by reproductive health (19%). Screening and treatment decisions dominated the types of decisions, representing 75% of contexts. Nearly half of methods (46%) were designed to support a decision of whether or not to accept an option while others supported a decision between two or more options (24%) or a combination (28%) in which users would decide whether or not to pursue an option (for example, a screening test) and would then choose from among types of that option (for example, different screening tests). Among included methods, 45% were designed for use by both men and women, 36% only by women, 19% only by men. The difference between these latter two statistics is attributable to differences in the clinical context of reproductive health, in which 17 methods addressed issues relevant to women's reproductive health and 1 addressed an issue (vasectomy) relevant to men's reproductive health.

Table 2: Decision Contexts about here

Foundations

Using a broad, inclusive definition, only 38% of explicit values clarification methods were built upon a foundation such as a theory, framework, model, or theoretically-based approach applicable to values clarification. Among those that did, most (28/38, or 74%) referenced or implied theories or theoretically-based approaches

such as Expected Utility Theory or Conjoint Analysis, which are not descriptive theories of values clarification, meaning they do not describe the details of how people engage in the process of values clarification. Few methods (21%) were based on a previous design of a values clarification method. Considering the full set of published methods, most (64%) cited no relevant guidelines. Of those that did, the International Patient Decision Aid Standards (IPDAS), first published in 2006, were the most frequently used overall (26%). Of the 78 methods described in articles published in 2007 or later, after these standards were published, 56% (44/78) still cited no guideline.

Table 3: Foundations about here

Taxonomy of Design Features

The categories within each design feature are described and illustrated with examples in Table 4. Most categories are mutually exclusive. The distinction between mutually exclusive and non-mutually exclusive frequencies is noted for each entry in the table, and details are provided in the table. Pairwise comparisons revealed that no design feature entirely determined any of the others, and no latent factor was identified.

Table 4: Design Features about here

Type of Values Clarification Method

Prior to data extraction, we drafted a list of possible types, based on previous typology in the literature.[27] This list was then refined through the extraction process by two authors (HW, LS) using iterative discussions and revisions. The final list consists of 7 broad types, and 17 possible subtypes in total. Values clarification methods using a multi-step process may be classified under more than one type. Values clarification methods in this review represented a diverse range. The majority were Pros and Cons (36% of total), Math Model-Based (19%) or Rating (18%) methods.

Position in Decision Aid

For values clarification methods that were contained within a decision aid, we extracted data about where in the decision aid the method was placed, for example, before or after an information section, between information sections, or throughout the intervention. Most methods in the review (79/98, 81%) were contained in a decision aid; of these, most (66/79, 83%) came after a complete information section.

Solo Activity

Most values clarification methods (59%) were designed to be completed independently by the patient or person making the decision. Of methods designed to be completed with others, the most common other person was a research assistant (17%) followed by a health care provider (14%). A small number (2%) were designed to be completed with a spouse, caregiver, friend or family member.

Media

We extracted the medium used for each values clarification method, specifically, whether the method was designed to be completed on paper, a computer or verbally. We note that although the information in a decision aid might be presented via another format such as a DVD, an explicit values clarification method requires an interactive medium. Methods in the review were roughly balanced between paper (39%), computer-based (38%), and verbal (23%).

Tradeoffs

The need for values clarification methods arises out of the challenges of making preference-sensitive decisions in which tradeoffs exist. Thus, an important aspect of the decision making process involves understanding and determining how one feels about the relevant tradeoffs. Tradeoffs were represented explicitly in less than a third of methods (32%).

Visual Metaphors

We examined whether or not each values clarification method used any sort of visual metaphor as part of the design. By visual metaphor, we mean any sort of graphical element that was part of the values clarification method itself, for example, a set of weigh scales to illustrate the concept of a tradeoff.[13] This categorization does not apply to graphics within a decision aid that were not part of the values clarification method, such as an icon array displaying risks. Most values clarification methods (59%) contained no visual metaphor.

Open- or Closed-Ended

We noted whether the sets of attributes presented to users were closed-ended, open-ended, or mixed. Closed-ended means that users could not add concerns that were not already listed, whereas open-ended and mixed allowed people to include additional items of concern. The majority of methods (61%) were closed-ended, meaning that users could not add decision attributes that were not pre-specified by the designers.

Elicitation Process

We examined what process the user of the values clarification method might go through to give responses about her or his values relevant to the decision. For example, the process might involve answering questions, completing standard gamble exercises, or directly rating the importance of each attribute of a decision. The majority of methods (58%) used direct scaling.

Response Measure

The response measure refers to the type of data obtained via the elicitation process. For example, data elicited might be a categorical choice yielding nominal data, or a utility (i.e., a number on the interval [0,1] that represents the value of a health state or outcome) yielding ratio data. This design feature has implications for what can be done with a user's responses. For example, utilities can be used in decision analytic models which might subsequently feed back a recommended option to the user,

whereas verbal statements cannot be as easily integrated into a recommendation by an algorithm. Most methods generated ordinal/interval (39%) or ratio (37%) data.

Values Exploration

Values clarification is often an iterative discovery process[28,29] and it can take time for preferences to stabilize.[4,16] To establish how and whether values clarification methods supported such exploration, we extracted data about whether each design explicitly encouraged an iterative process of revision, implicitly allowed such a process but did not encourage it, or did not support iteration and required users to identify and express their values in a single attempt. Very few methods explicitly encouraged all users (9%) or users who expressed decision intentions that were incongruent with their stated values (2%) to explore their values in an iterative discovery process. Most methods (65%) were designed such that iterative revision was technically possible (for example, users could go back within a website or could complete the paper worksheet in pencil) but not explicitly encouraged.

Implications

We extracted whether or not the design of each values clarification method showed users the implications of their expressed values. For example, a method that explicitly presents implications might give a recommended option or might present scores to show how well or poorly each option fits with the user's responses. Alternatively, a method may not explicitly show implications, but may allow people to infer such information, for example, by roughly comparing the weights they have

assigned to the pros versus the cons of a choice. Less than one third of methods (29%) explicitly presented users with the implications of their stated values.

Decision Intentions

We extracted data about whether or not each method included a step in which the user is asked to indicate his or her decision intentions, whether a clear decision or a direction in which he or she is leaning. This did not include cases in which decision intentions were recorded as an outcome during a study; it refers specifically to cases in which the user was asked to express her or his decision intentions within the values clarification process itself. Slightly more than half of methods in total (54%) asked users about their decision intentions, either by asking for their decision (16%) or toward which decision they are leaning (38%).

DISCUSSION

This review demonstrates that a diverse array of explicit values clarification methods are used across a range of health decisions. It is unknown whether a given values clarification method might be equally effective for different decisions. In other words, are designs and design features specifically suited to particular decisions, or can their use in one context be justified by empirical results in another? Such comparisons are difficult due to structural differences between different decisions. For example, choosing between two options is fundamentally different from choosing between three options[30] and different designs are possible

for two versus three options. Further research is needed regarding how best to support values clarification across different decisions.

Despite our use of an inclusive and generous description of theory, framework, model or theoretically-based approach, we found that few methods built upon such a foundation. The overall low use of theories, frameworks or models may be problematic, as such foundations can help structure hypotheses that might ultimately allow researchers to understand why and how a given values clarification method does or does not work. Similarly, few explicit values clarification methods were specifically based on previous designs. This may be a reflection of the lack of designs that have been demonstrated to be effective, or simply that the field is relatively new. Further research is needed into optimal designs of explicit values clarification methods to identify and advance the use of effective design features.

The twelve design features within the taxonomy describe the heterogeneity of values clarification methods. These design features are sufficiently independent that each one should be considered when designing values clarification methods, and included in reports.

Limitations

While we endeavored to capture all published accounts of explicit values clarification methods, it is possible that some were missed. Similarly, for reasons of scope, we did not search grey literature, nor did we contact authors to request copies of values clarification methods that were insufficiently described in the literature. Second, although our data extraction process was such that each element

was examined by at least two authors and we contacted authors in cases where a description was unclear, it is possible that we misunderstood some descriptions. Finally, although we developed our taxonomy using rigorous methods, our choices of design features in the taxonomy were based on the authors' judgment and may not represent the entirety of important design features.

CONCLUSIONS

This systematic review formally demonstrates that there is a diverse array of explicit values clarification methods in use, most with neither theoretical nor empirical basis for their design. Given the growing social, legislative and policy imperatives to help people make health-related decisions that reflect what is important to them, more research is needed into optimal designs of values clarification methods.

To build an evidence base and help move this emerging field forward, we encourage developers of values clarification methods to design with awareness of relevant theory[14] and previous designs, publish adequate descriptions of the design of their values clarification method using the taxonomy described in this review, and provide clear rationales for their design choices. There is a need for empirical evidence about the different choices for design features in this taxonomy. We advocate for more research to isolate the effects of different design features in order to better equip researchers and practitioners in medical decision making to help people clarify their values and make their best possible health decisions.

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Figure 1: PRISMA Diagram

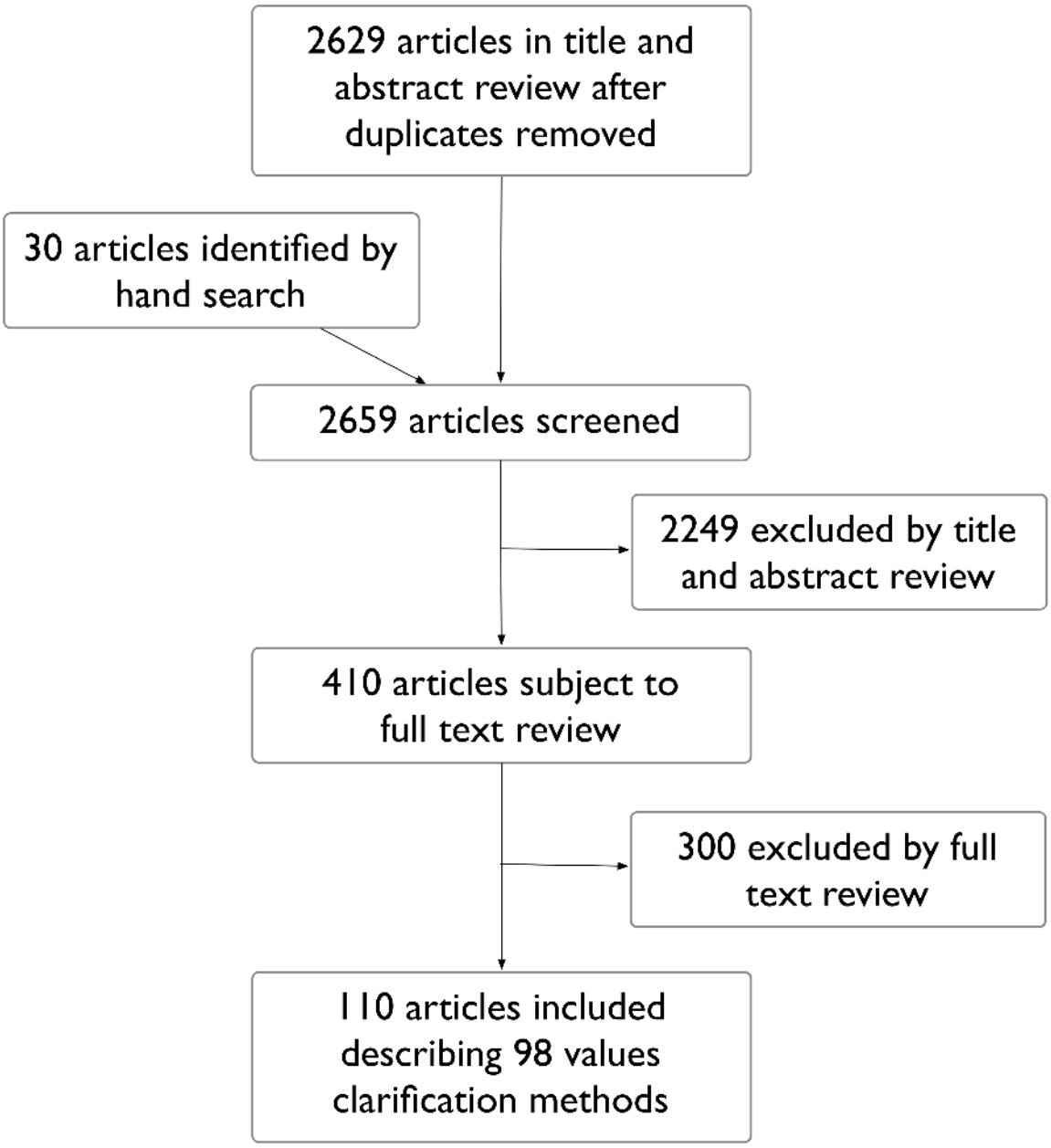

Table 1: Included Articles

Articles are presented alphabetically by the last name of the first author of the first publication in the group of articles.

Article(s)	Number of values clarification methods described in article(s)	Decision
Abhyankar et al.[31]	1	Choice between standard adjuvant chemotherapy for early stage breast cancer and clinical trial testing new chemotherapy.
Abreu et al.[32]	1	Choice between two different treatments (oral and intravenous) for systemic lupus erythematosus (SLE).
Achaval et al.[33]	1	Whether or not to have total knee arthroplasty to treat knee osteoarthritis in cases of pain and disability unresponsive to medical treatment.
Akl et al.[34]	1	Whether or not to take inhaled steroids to treat chronic obstructive pulmonary disease (COPD).
Alfaleh et al.[35]	1	Whether to use prophylactic indomethacin therapy or wait and treat symptomatic patent ductus arteriosus in extremely low birth weight infants.
Allen et al.[36]	1	Whether or not to have prostate specific antigen (PSA) testing to screen for prostate cancer.
Bastian et al.[37]	1	Whether or not to take hormone replacement therapy.
Bekker et al.[38]	1	Whether or not to have a diagnostic test for Down syndrome after receiving a positive screen in maternal serum screening (MSS).
Berger et al.[39]	1	What lifestyle changes to implement in the context for a cardiac condition.
Brenner et al.[40]	2	Whether or not to be screened for colorectal cancer, and, if yes, what screening test to use (4 unlabeled screening tests designed to simulate fecal occult blood testing, sigmoidoscopy, colonoscopy, or a radiological test like CT colonography).
Breslin et al.[41,42]	1	Choice between treatments for type 2 diabetes.
Brundage et al.[43,44]	1	Choice between combined modality treatment or radiation alone for non-small cell lung cancer.
Chiew et al.[45]	1	Whether or not to have chemotherapy in addition to supportive care in the context of advanced breast cancer.
Clancy et al.[46]	1	Choice between being immunized for Hepatitis B, screened for antibodies and immunized if negative, or not immunized unless exposed.
Costanza et al.[47]	1	Whether or not to have prostate specific antigen (PSA) testing to screen for prostate cancer.
Culver et al.[48]	1	Whether to have a risk-reducing mastectomy, risk-reducing salpingo-oopherectomy before age 50, or take tamoxifen for 5 years.
Dolan & Frisina[49]	1	Choice between five active options (annual FOBT, flexible sigmoidoscopy every 5 yr, annual FOBT + flexible sigmoidoscopy every 5 yr, barium enema every 5 yr, colonoscopy every 10 yr) and a wait and see approach to colorectal screening.

Dolan et al.[50]	1	Which medication to use for treatment of knee osteoarthritis pain.
Dorfman et al.[51]	2	Whether or not to have prostate specific antigen (PSA) testing to screen for prostate cancer.
Drake et al.[52]	1	Whether or not to have prenatal screening for major fetal chromosome abnormalities, and if yes, choice between different tests or combinations of tests (maternal serum screening, chorionic villus sampling, amniocentesis).
Durand et al.[53]	2	Whether or not to have amniocentesis after having been identified as high risk via less invasive screening tests.
Emmett et al.[54]	1	Choice between a repeat cesarean or vaginal birth after cesarean (VBAC).
Evans et al.[55]	1	Whether or not to have prostate specific antigen (PSA) testing to screen for prostate cancer.
Feldman-Stewart et al.[56]	1	Choice between watchful waiting, radiation and surgery for treatment of early stage prostate cancer.
Feldman-Stewart et al.[20,57]	2	Choice between four main options for early stage prostate cancer (watchful waiting, surgery, external beam radiation and brachytherapy).
Fraenkel et al.[58]	1	Choice between treatments for knee pain (capsaicin, acetaminophen, anti-inflammatory drugs, intra-articular injections, exercise, exercise + medications).
Fraenkel et al.[59,60]	1	Whether or not to take warfarin, aspirin or neither to prevent stroke.
Frosch et al.[61,62]	1	Whether or not to be screened for prostate cancer.
Garvelink et al.[63]	1	Whether or not to use fertility preservation methods, and if so, which (cryopreservation of embryos, cryopreservation of ovarian tissue and cryopreservation of oocytes).
Gattellari & Ward[64]	1	Whether or not to have prostate specific antigen (PSA) testing to screen for prostate cancer.
Goodlin et al.[65]	1	A variety of decisions relevant to heart failure.
Green & Levi[66]	1	Preferences for end of life care.
Hawley et al.[67]	1	Choice between methods for colorectal screening.
Hunter et al.[22]	1	Whether or not to have prenatal screening for major fetal chromosome abnormalities, and if yes, choice between different tests or combinations of tests (maternal serum screening, chorionic villus sampling, amniocentesis).
Jackson et al.[68,69]	1	Whether or not to immunize one's child with MMR vaccine.
Jibaja-Weiss et al.[70-72]	1	Choices between treatments for early breast cancer.
Karel et al.[73]	1	Preferences (values and goals) for advanced care planning in case of decisional incapacity.
Karel et al.[74]	3	Preferences for advanced care planning in case of decisional incapacity.
Kasper et al.[75]	1	Whether or not to have immunotherapy for MS, and if yes, what kind of therapy to have.
Kennedy et al.[76]	1	Choice between treatment options for menorrhagia (advice and reassurance, addressing possible iatrogenic causes, drug therapy, or surgery such as hysterectomy or endometrial destruction).
Labrecque et al.[77]	1	Whether or not to have a vasectomy.
Lalonde et al.[78,79]	1	Whether or not to start lifestyle changes and antihypertensive or lipid-lowering pharmacotherapy.

Legare et al.[80]	1	Whether or not to use Natural Health Products for menopausal symptoms (and, if so, which one(s)).
Leighl et al.[81]	1	Choice between supportive care only, supportive care plus usual care chemotherapy, or supportive care plus clinical trial participation in the context of metastatic non-small cell lung cancer (NSCLC).
Lepore et al.[82]	1	Whether or not to be screened for prostate cancer.
Lerman et al.[83]	1	Whether or not to have genetic testing for BRCA1.
Lewis et al.[84]	1	Whether or not to be screened for colorectal cancer.
Llewellyn-Thomas et al.[85,86]	1	Choice between watchful waiting, alpha blocker, and transurethral resection of the prostate in the context of benign prostatic hyperplasia (BPH).
Matheis-Kraft & Roberto [87]	1	Preferences for care in case of decisional incapacity.
Mathieu et al.[88]	1	Whether or not to continue or stop mammography screening at age 70.
Mathieu et al.[89]	1	Whether to begin mammography screening at age 40-49 or wait until age 50.
Montgomery et al.[90]	1	Whether or not to start drug therapy for hypertension.
Moumjid et al.[91]	1	Choice between treatments and combinations of treatments for breast cancer (mastectomy or lumpectomy; axillary dissection or sentinel node biopsy; adjuvant chemotherapy or not).
Myers [92]	3	Whether or not to participate in a prostate cancer prevention clinical trial.
Nassar et al.[93,94]	1	Whether or not to have an external cephalic version (ECV) for a breech-presenting baby.
O'Connor et al.[13,95-97]	1	Whether or not to take hormone replacement therapy after menopause.
Peperstraten et al.[18]	1	Choice of how many embryos to transfer during in vitro fertilization (either one or two).
Peshkin et al.[98]	1	Whether or not to disclose BRCA1/2 genetic testing results to one's minor children and if so, how.
Pieterse et al.[99]	1	Whether or not to have preoperative radiotherapy (prior to surgery) for treating rectal cancer.
Pignone et al.[100]	2	Whether or not to be screened for colorectal cancer, and, if yes, what screening test to use (4 unlabeled screening tests designed to simulate fecal occult blood testing, sigmoidoscopy, colonoscopy, or a radiological test like CT colonography).
Pignone et al.[101]	2	Whether or not to be screened for prostate cancer.
Protheroe et al.[102]	1	Whether or not to initiate active treatment for menorrhagia, choice between treatments.
Raats et al.[103]	1	Generic design, not specific to a given decision.
Rimer et al.[104,105]	1	Whether or not to have mammography to screen for breast cancer.
Roosmalen et al.[106]	1	Choice between intensive screening and prophylactic surgery for breasts and/or ovaries.
Rothert et al.[107]	1	Whether or not to take hormone replacement therapy.
Ruffin IV et al.[108]	1	Whether or not to be screened for colorectal cancer, and, if yes, what screening test to use (FOBT, flexible sigmoidoscopy, colonoscopy, or double contrast barium enema).
Sawka et	1	Choice between lumpectomy with radiation and mastectomy

al.[109,110]		for early breast cancer.
Schapira et al.[111]	1	Whether or not to take hormone replacement therapy.
Schonberg et al.[112]	1	Whether or not to have mammography to screen for breast cancer.
Schwalm et al.[113]	1	Whether to use femoral or radial access for coronary angiography.
Segal & Shahar [114]	1	Whether or not to have a triple screen test, amniocentesis, and second trimester ultrasound.
Sheridan et al.[19]	1	Whether or not to initiate behaviours to prevent coronary heart disease (CHD), and, if so, which behaviours.
Shorten et al.[115,116]	1	Choice between a repeat cesarean or vaginal birth after cesarean (VBAC).
Singer [117]	1	Choice between ways to deal with an unplanned pregnancy (abortion, adoption, parenting).
Smith et al.[118,119]	2	Whether or not to have screening for bowel cancer via faecal occult blood test (FOBT) screening every two years.
Sorenson et al.[120]	1	Whether or not to have hemophilia A genetic carrier testing.
Thomson et al.[121]	1	Whether or not to take warfarin to prevent stroke.
Thomson et al.[122]	1	Choice between different treatments for hypertension.
Tiller et al.[123,124]	1	Choice of risk management strategies for ovarian cancer (annual transvaginal ovarian ultrasound then annual CA125 serum testing after menopause, prophylactic surgery, chemoprevention, prophylactic oophorectomy).
Vandemheen et al.[125,126]	1	Whether or not to be screened for prostate cancer.
Volk et al.[21]	1	Whether or not to be screened for prostate cancer.
Wakefield et al.[127-129]	2	Whether to not to undergo genetic testing or defer decision.
Wallace et al.[130]	1	Whether or not to immunize one's child with MMR vaccine.
Wong et al.[131]	1	Whether to have antiestrogens, radiation, both, or neither after lumpectomy.
Wroe et al.[132]	1	Whether or not to immunize one's baby with standard first childhood vaccines (diphtheria, tetanus, pertussis, hepatitis B, haemophilus influenzae type b (HIB) and polio).

Table 2: Decision Contexts (n = 98 Values Clarification Methods)

Types of decisions (not mutually exclusive; see note)	
Treatment	42 (43%)
Screening	31 (32%)
Prevention	19 (19%)
Genetic Testing	6 (6%)
Diagnostic Testing	4 (4%)
Note: 5 methods classified in 2 categories each, 1 method classified in all 5 categories	
Decision structure	
Whether or not to accept an option	45 (46%)
Whether or not to accept an option + choice between options	27 (28%)
Choice between two or more options	24 (24%)
Other	2 (2%)
Number of options	
2	51 (52%)
Between 3 and 6	26 (27%)
More than 6	17 (17%)
Other	4 (4%)
Clinical context	
Cancer	48 (49%)
Reproductive Health	19 (19%)
Cardiovascular Health	9 (9%)
Other Chronic Conditions	8 (8%)
Advanced Care Planning	6 (6%)
Vaccine Preventable Diseases	4 (4%)
Other	4 (4%)
Clinical context: Cancer type	
Prostate	16 (16%)
Breast and/or Ovarian	16 (16%)
Colorectal	13 (13%)
Lung	2 (2%)
Reproductive health	
Female	17 (17%)
Male	1 (1%)
Both	1 (1%)
Designed primarily for use by	
Both Women and Men	44 (45%)
Women	35 (36%)
Men	19 (19%)

Table 3: Foundations (n = 98 Values Clarification Methods)

Theories, models, frameworks used for values clarification method (not mutually exclusive; see note)	
None	61 (62%)
Expected Utility Theory	12 (12%)
Conjoint Analysis	7 (7%)
Analytic Hierarchy Process	4 (4%)
Differentiation and Consolidation Theory	3 (3%)
Fast and Frugal Heuristics	3 (3%)
Multiattribute Utility Theory	2 (2%)
Other (Information Processing Paradigm, Rath's Valuing Process, Treatment Trade-off Approach, Ask-Tell-Ask Model of Communication, Probability-tradeoff technique, Bayes Theory, Active Listening, Decision Conflict Theory)	8 (8%)
Note: 1 method used 2 theories	
Previous work or design (indentations represent subcategories contained within the category)	
Intervention draws on previous work	66 (67%)
Previous work specifically about VCE	26 (27%)
Intervention based on previous design	30 (31%)
Previous design specifically for VCE	21 (21%)
No previous work or design cited	2 (2%)
Guidelines used (not mutually exclusive; see note)	
No guidelines used or cited	63 (64%)
IPDAS	25 (26%)
IPDAS cited, but not used	4 (4%)
CREDIBLE	4 (4%)
National Health and Medical Research Council guidelines on presenting evidence to consumers	2 (2%)
American College of Physicians Guidelines (1992) for counselling postmenopausal women about preventive hormone therapy	1 (1%)
Guidelines for dashboard design (Few S: Information dashboard design. Sebastopol, CA: O'Reilly Media; 2005.)	1 (1%)
Note: 1 method used both CREDIBLE and IPDAS	

Table 4: Design Features (n = 98 Values Clarification Methods; categories are mutually exclusive unless indicated otherwise)

Type of Values Clarification (not mutually exclusive; see note)		
Pros and Cons		35 (36%)
With weighting*	User explicitly weighs pros and cons in some way, e.g., Likert scales, rating likelihood, rating importance, ranking importance, shading of boxes, or other comparative weighing method.	29* (30%)
With binary	User gives a binary response to each pro or con, for example, "Does this sound like you?"	7 (7%)
Viewing or listing only	Involves only listing or viewing pros and cons; no explicit weighing or other response required.	1 (1%)
Math model-based		19 (19%)
Decision Analysis	Involves utility estimation via standard gamble or other methods and a decision analytic model. May include viewing a decision tree.	11 (11%)
Conjoint	User responds to multiple sets of attributes with varying levels, either one set at a time or choosing between sets via discrete choice analysis.	7 (7%)
Analytical Hierarchy Process	Involves decomposing decision into its attributes and weighing attributes against each other.	1 (1%)
Rating	Involves rating attributes or outcomes, for example, using importance ranking scales. (However, does not involve explicit identification of each attribute as a pro or con; in such a case, type is 'pros and cons with weighting'.)	18 (18%)
Prioritization	Involves ranking a full list of concerns and/or selecting the top N concerns	16 (16%)
List of concerns		13 (13%)
List and discuss	Involves discussing concerns from one's own list or from a pre-identified list of concerns, possibly using a semi-structured interview format.	6 (6%)
List only	Involves listing one's concerns or going through a pre-identified list of concerns without discussing them.	4 (4%)
Discuss only	Involves a discussion that takes place without a predefined list or list developed by the individual.	3 (3%)
Threshold†		9 (9%)

Attributes	Involves considering tradeoffs according to individual attributes, for example, comparing medications to treat type 2 diabetes according to their impacts on blood sugar, weight and required frequency of testing.[41]	4 (4%)
Probability	Involves selecting between two or more different probabilities.	2 (2%)
Time	Involves selecting between two or more different lengths of time in given health states.	2 (2%)
Outcomes or Processes	Involves considering tradeoffs according to individual outcomes or processes, for example, choosing between statements, "It is alright if my family or doctor makes medical decisions for me," and, "If I am able, I want to make medical decisions for myself."[74]	1 (1%)
Social Matching	User watches different characters' decisions and/or decision making processes, and identifies one or more characters with whom s/he identifies.	2 (2%)
Other	Any other type not described in above list.	1 (1%)

Note: 11 methods classified as 2 types, 3 methods classified as 3 types, 2 combine two subtypes under pros and cons

Position in Decision Aid (DA)		
After information	Values clarification method placed after information section about the decision.	66 (67%)
Before information	Values clarification method placed before information section about the decision.	2 (2%)
Between information sections	Values clarification method placed between different information sections about the decision.	1 (1%)
Throughout DA as an additional component	Values clarification method placed throughout DA in addition to separate information sections.	5 (5%)
Throughout DA as entirety of intervention	Values clarification method forms entirety of intervention.	5 (5%)
N/A (not a DA)	Not applicable because values clarification method not contained within a DA.	18 (18%)
Unclear from article	Position is not clear from published description.	1 (1%)

Solo activity		
Independently	User completes values clarification independently.	58 (59%)
With research staff	User completes values clarification with research staff, e.g., research assistant.	17 (17%)
With a health care provider	User completes values clarification with a health care provider, e.g., physician, nurse, nurse educator, counselor, etc.	14 (14%)
With family or friends	User completes values clarification with personal contacts, e.g., spouse, caregiver, friend or family member.	2 (2%)

With person not specified	User completes values clarification with someone else, but that person's role or relationship with the user is not clear.	1 (1%)
Combinations (independently and/or with others)	Values clarification is completed partly independently, partly with others.	5 (5%)
Other	Any other set-up not described above.	1 (1%)
Media		
Paper	Paper media describes pamphlets, worksheets, workbooks and the like, and may be accompanied by audiotapes and verbal components, for example, a telephone consultation after completing the paper-based exercise.	38 (39%)
Computer	Values clarification completed on a desktop computer, laptop, smartphone, tablet, or other device with an interface and operating system. This includes online or web-based exercises, those using CD-ROM, and may include multimedia such as audio, video or animation.	37 (38%)
Verbal	Values clarification designed for verbal administration rely primarily on discussion, and may also include paper exercises, technology to perform calculations, or visual aids such as cards or decision boards. Verbal administration may be done in person or by telephone.	23 (23%)
Tradeoffs		
Implied	Design presents tradeoffs implicitly, e.g., a table of pros and cons and asking people to indicate the importance of each by shading in boxes.	42 (43%)
Explicit	Design presents tradeoffs explicitly, e.g., a discrete choice task, ranking task, or a task in which users must choose between a list of pros and cons.	31 (32%)
Neither implied nor shown explicitly	Tradeoffs not presented at all, e.g., the design allows people to rate all factors as ‘very important’ without giving cues about the need to consider competing priorities.	24 (24%)
Other	Any other presentation not described in above list.	1 (1%)
Visual metaphors (not mutually exclusive; see note)		
None	No visual metaphor	58 (59%)
Strength of response	E.g., feeling thermometers, rules, star rating systems	18 (18%)
Tradeoffs	E.g., balance scales, weigh scales	12 (12%)
Proportions	E.g., pie graphs, bar graphs	5 (5%)
Time	E.g., line graphs with time axis	3 (3%)

Other	E.g., jewelry box, cards	3 (3%)

Note: 1 method used proportions and time visual metaphors together.

Open- or Closed-ended		
Closed-ended	All elements (e.g., attributes of options) are pre-set. User cannot add new elements and instead responds to a pre-set list of attributes.	60 (61%)
Open-ended	Values clarification method is entirely open-ended; user defines elements, for example, generates one's own list of attributes.	12 (12%)
Mixed	Some elements are pre-set, but user may add additional elements, for example, starting with a list of pros and cons with the possibility of adding to it.	25 (26%)
Other	Any other setup not described above.	1 (1%)
Elicitation process (not mutually exclusive)		
Direct scaling (all)	User assigns a value on a scale.	57 (58%)
Direct scaling (no shading)	Scaling is performed by some non-shading-related method, e.g., choosing a number on a Likert scale or marking a point on a visual analog scale.	49 (50%)
Direct scaling (shading)	Scaling is performed by shading in a box fully, partially or not at all.	8 (8%)
Ranking	User ranks items, e.g., from most to least important. This can include completely ranking a list of issues, or simply selecting the top three issues from a larger set.	19 (19%)
Discrete choice	User chooses between two or more sets of options. For example, users may be asked whether they would prefer a treatment that requires injections, has minor side effects, and a moderate out of pocket cost or a treatment taken by pill, with moderate side effects and a low out of pocket cost. Or, they may be asked to choose between two cards, one representing a reason to have a screening test, and the other describing a related reason not to take it, and asked to choose which is more important to them.	12 (12%)
Answer questions	User answers open-ended questions verbally or in other ways.	11 (11%)
Standard gamble or similar	User completes a standard gamble or other similar technique that involves iterating values to find a point of indifference.	7 (7%)
Personal relevance	Users respond on the basis of personal relevance, identifying issues that apply to them or statements that, 'feel like me.'	6 (6%)
List items	Users are asked to make a list of items that are relevant to the decision and matter to them.	4 (4%)

Choose character	User chooses a character from a story-based exposition with whom she or he identifies.	1 (1%)
Unclear	Response process is not entirely clear from description.	3 (3%)
Other	Response process is some other type not captured by categories above.	2 (2%)
Response measures (not mutually exclusive)		
Ordinal/Interval	Ordinal or interval data	38 (39%)
Ranking	Results from placing items in an ordered list.	10 (10%)
Likert scale or non-specified "rating scale"	Numeric value on a linear scale.	32 (33%)
Ratio	Ratio data	36 (37%)
Visual weight	Proportion of shading in a box.	8 (8%)
VAS rating	Rating on a visual analog scale.	14 (14%)
Utility-related (Relative preference, Time tradeoff)	E.g., relative preference, time tradeoff.	3 (3%)
Utility	Utility value.	12 (12%)
Non-numeric	Non-numeric data, e.g., open-ended answers to questions.	20 (20%)
Nominal	Nominal data	18 (18%)
Binary	Choice between two items.	15 (15%)
Categorical choice	Choice between three or more items.	3 (3%)
Other	Some other type of data not captured by categories above.	1 (1%)
Values exploration		
Revision technically possible but not explicitly supported or encouraged	User may technically reflect and revise (e.g., may complete paper-based values clarification method in pencil, back button not disabled in computer-based version) but this is not explicitly encouraged.	64 (65%)
No revision, one shot	User may not revise stated values.	21 (21%)
Encouraged to revise	All users encouraged to reflect on and revise stated values.	9 (9%)
Encouraged to revise if decision inconsistent with stated values	Users encouraged to reflect and revise only if decision intentions fail to align with stated values.	2 (2%)
Unclear	Possibility for values exploration unclear from published description.	4 (4%)
Implications		
Not presented explicitly, but implications might be inferred	Implications might be inferred because of the way values are elicited or displayed, e.g., shaded boxes on a weigh scale.	39 (40%)

Not presented	Implications are not presented.	29 (30%)
Presented explicitly	Implications of stated values (e.g., " According to your answers, the best choice for you is …") explicitly presented to user.	28 (29%)
Before indicating decision	Implications presented before user indicates his/her decision intentions.	22 (22%)
After indicating decision	Implications presented after user indicates his/her decision intentions.	4 (4%)
If a given option was selected	Implications presented only if user selects specific option within values clarification method.	2 (2%)
Unclear	Presentation of implications is not clear from published description.	2 (2%)
Decision intentions		
No	User is not asked for her/his decision intentions.	44 (45%)
Yes (leaning)	User is asked which way s/he is leaning. This includes methods that ask for a decision but allow some ambiguity by having an option to indicate 'unsure' or 'uncertain.'	37 (38%)
Yes (decision)	User is asked for her/his decision, with no option for uncertainty.	16 (16%)
Unclear	Presence or absence of this step is not clear from published description.	1 (1%)

* Indentations represent subcategories contained within the category.

† These types may have similar user experiences as decision analysis and conjoint analysis, particularly discrete choice analysis. However, types classified under Threshold do not involve calculating utilities in any way, nor do they involve decision analytic modeling.