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Providing Balanced Information about Options in Patient Decision Aids: An Update from the International Patient Decision Aid Standards

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Background. The objective of this International Patient Decision Aids Standard (IPDAS) review is to update and synthesize theoretical and empirical evidence on how balanced information can be presented and measured in patient decision aids (PtDAs). **Methods.** A multidisciplinary team conducted a scoping review using 2 search strategies in multiple electronic databases evaluating the ways investigators defined and measured the balance of information provided about options in PtDAs. The first strategy combined a search informed by the Cochrane Review of the Effectiveness of Decision Aids with a search on balanced information. The second strategy repeated the search published in the 2013 IPDAS update on balanced presentation. **Results.** Of 2450 unique citations reviewed, the full text of 168 articles was screened for eligibility. Sixty-four articles were included in the review, of which 13 provided definitions of balanced presentation, 8 evaluated mechanisms that may introduce bias, and 42 quantitatively measured balanced with methods consistent with the IPDAS criteria in PtDAs. The revised definition of balanced information is, "Objective, complete, salient, transparent, evidence-informed, and unbiased presentation of text and visual information about the condition and all relevant options (with important elements including the features, benefits, harms and procedures of those options) in a way that does not favor one option over another and enables individuals to focus attention on important elements and process this information." **Conclusions**. Developers can increase the balance of information in PtDAs by informing their structure and design elements using the IPDAS checklist. We suggest that new PtDA components pertaining to balance be evaluated for cognitive bias with experimental methods as well by objectively evaluating patients' and content experts' beliefs from multiple perspectives.

Keywords
patient decision aids, risk communication, balance, framing, bias, choice bracketing, shared decision making, user-centered design

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Background

Patient decision aids assist patients in acquiring necessary knowledge and evaluating its importance when engaging in a health care decision. They support informed or reasoned decision making between health care options, which tend to have risky or uncertain outcomes. They are helpful in preference-sensitive decisions, that is, when a single most appropriate option cannot be decided based on evidence or professional knowledge alone and may differ from patient to patient depending on the patients'

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preferences and life situation. One of the key requirements for patient decision aids (PtDAs) is to provide balanced information about the characteristics of the options and their outcomes (including benefits and harms). This is to avoid or minimize introducing bias into the decision-making process and to enable patients and health professionals to reach decisions that reflect the patients' values and preferences. The process of organizing and evaluating informational clues[1–3] has been termed *mental accounting*.[4] When considering patients' mental accounting in making a health care choice, PtDA developers must strive to minimize framing effects[5] that could unconsciously influence the option chosen.[6] Thus, a balanced presentation of options and their attributes should be organized, as much as possible, in a manner that is objective, is nondirective, and does not favor one option over another, so that patients can make an informed and value-driven decision. A key goal of this review is to provide context from current science to guide PtDA developers in designing effective component parts of PtDAs related to a balanced presentation of options.[7]

The International Patient Decision Aids Standards (IPDAS) is a collaboration between decision scientists, health professionals, patients, and health service researchers, whose goal is to establish a shared database of information that supports the creation of effective PtDAs. In 2005, the IPDAS Collaboration developed a set of evaluative criteria for assessing the quality of PtDAs.[8] The criteria, and its derivative IPDAS checklist, were offered as a guide defining the essential content of PtDA components as well as a valid development process.[9,10] As part of this process, the IPDAS collaboration identified "providing information about options" and "balancing the presentation of options" as 2 of 12 domains (Table 1). They assessed PtDAs available at the time and randomized controlled trials of the effects of the aids on patients' actual choices. The 2005 IPDAS consensus resulted in 7 criteria for providing information on options and 2 criteria for balanced presentation of information on options. In 2013, the IPDAS collaboration conducted a modified Delphi consensus process to identify IPDASi (v3.0) criteria items that should be considered as minimum standards for PtDA certification.[11] Five of the original IPDAS criteria for "presenting information" plus a new criterion "explicitly states the decision to be considered" were selected. When the criteria were applied by the Washington State Health Care Authority to create PtDA certification for clinical use,[12]"identifying the target audience" was added and "listing the option of doing nothing" was incorporated into the list of options. The only original criterion not retained was "describing procedures," which is often included as part of the description of the option and/or features of the option.

For providing information about options, the original IPDAS background document[13] summarized information used in PtDAs and contrasted this with research exploring what patients wanted, as well as legal and ethical obligations. A systematic review[14] on decision aid effectiveness summarized key outcomes: 1) higher knowledge test scores with PtDAs compared with usual practice, 2) reduced feeling uninformed with PtDAs compared with usual practice, and 3) increased patient involvement in decision making. In the 2013 update of evidence informing the IPDAS criteria, these findings remained consistent. The 2017 update of the Cochrane review of PtDAs[15] reported high-quality evidence for the outcomes of improved knowledge and feeling informed and moderate-quality evidence for more active involvement in the decision-making process. This confirms the importance of these 2013 proposed minimal IPDAS criteria in defining a patient decision aid.

For "balancing the presentation of options," results[13] in 2005 focused on the findings of 4 randomized trials[16–19] that assessed whether patients perceived the presentation of benefits and harms as "slanted" toward the intervention. Between 60% and 79% of respondents reported they felt the information presented in the PtDAs was completely balanced. The 2013 update of the "balancing the presentation of information and options" chapter[20] expanded and refined the definition with the core attributes of "complete," "unbalanced," "neutral," and "balanced" (Figure 1). This enabled formulation of an operational definition. In addition, the update highlighted the challenge that patients face

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Table 1 Changes and Proposed International Patient Decision Aids Standard (IPDAS) Criteria for Presenting Balanced Information about Options

IPDAS Criteria (The patient decision aid . . .)	Original (2005)	Minimal (2013)	Washington State (2016)	Proposed (2020)
Describes the health condition	+	+ (defining)	+	+
Explicitly states decision to be considered	0	+ (defining)	+	NEW
Identifies the target audience	0	0	+	NEW
~~Lists the healthcare options~~	+	+ (defining)	0	0
~~Lists the option of making no change in your current health related activities and not adopting any new medical interventions~~	+	0	0	0
List options and, if relevant, choosing none of the health care options	0	0	+	Revised
Describes the natural course of the health condition if no health care option is chosen	+	+ (quality)	0	+
~~Describes procedures involved~~	+	0	0	0
Describes positive features (benefits)	+	+ (defining)	+	+
Describes negative features of options (harms)	+	+ (defining)	+	+
Makes it possible to compare positive/negative features of available options	+	+ (quality)	+	+
Shows negative/positive features with equal detail (e.g., fonts, order, display of statistics)	+	+ (certifying)	0	0
~~Shows negative/positive features in a balanced and unbiased manner (e.g., fonts, order, display of statistics)~~	0	0	+	Revised
Criteria specific to screening or testing decision aids				
Describes what test is supposed to measure	+	+ (certifying)	+	+
Includes information about the chances of receiving a true positive, true negative, false positive and false negative test result	+	0	0	0
Provides information about chances of:		+ (quality)	+	Revised
• True-positive test result		+ (quality)	+	Revised
• True-negative test result		+ (quality)	+	Revised
• False-positive test result		+ (quality)	+	Revised
• False-negative test result				
~~Describes possible next steps based on the test results~~	+	0	0	0
REVISE: Describes possible next steps based on:	**0**	+ (certifying)	+	Revised
• Positive test results	**0**	+ (certifying)	+	Revised
• Negative test results				
Describes the chances of disease being found with and without screening	+	+ (quality)	0	+
Describes consequences of detection that would not have caused problems if screening had not been done	+	+ (certifying)	+	+

+ = present; 0 = absent. Struck-out items were deleted from prior versions of the IPDAS criteria.

in balancing cognitive resources and effort when acquiring, storing, processing, and retrieving decision-making information. The article discussed how heuristic (system 1) or systematic (system 2) processing may be favored and that subtle clues in the context (rather than content) of information could influence patients' decisions. The 2013 update concluded that information about options should be presented in a complete, unbiased, and neutral manner—in content, format, and display.[21] Based on the 10 studies included in the 2013 update, results showed that PtDAs including any side-by-side display of information received the highest ratings as being "balanced," compared with PtDAs that did not include a side-by-side display, $F(2, 7) = 21.18$, $P = 0.001$. Those that presented information side by side were rated as balanced (range, 70%–96%).[21]

In this 2021 update, "providing information about options" and "balancing the presentation of options" were merged into a single article titled "providing balanced information about options." Given that the key IPDAS criteria for "providing information about options" is now required as part of the definition of PtDAs, the primary objective of this article was to systematically review theoretical and empirical evidence on how balanced information can be presented and evaluated in PtDAs. The secondary objectives were to merge the 2 IPDAS domains and to update 1) the definition of balanced presentation of information on options as well as 2) related theoretical

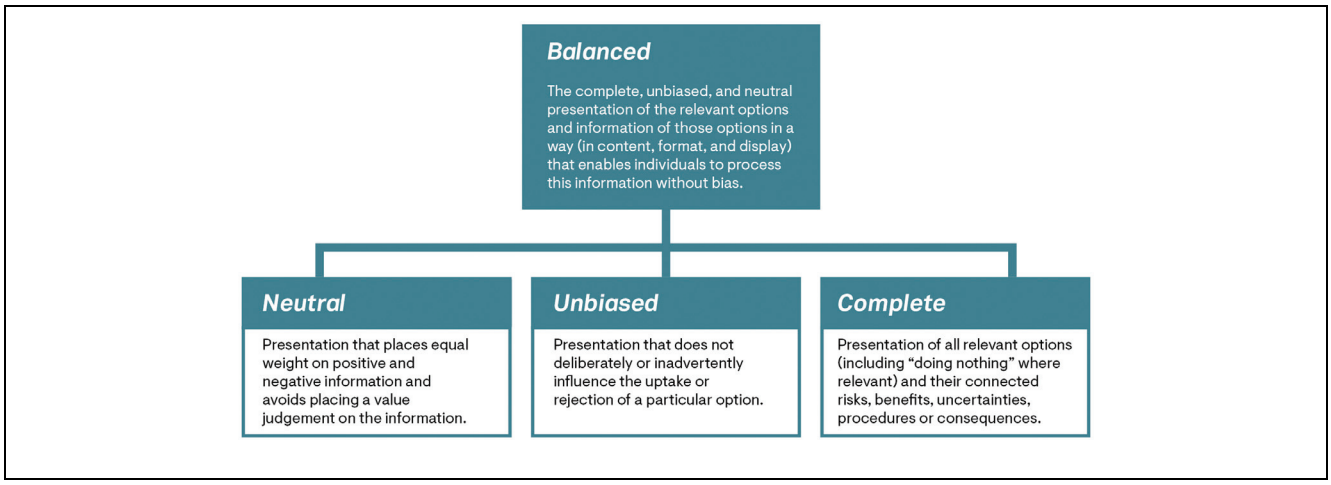

Figure 1 International Patient Decision Aids Standard 2013 definition of balanced presentation of information and options.

rationale, emerging issues, and research opportunities. Finally, we suggest changes to the IPDAS criteria based on our update.

Methods

We conducted a scoping review of the literature to identify high-quality studies about developers' balanced information in PtDAs. The scoping review provided an opportunity to include a wider breadth of information and studies that would be excluded in a traditional systematic review.[22] The protocol was approved a priori by the IPDAS Steering Committee (March 2019). A multidisciplinary team of 10 researchers working within the area of shared decision making and PtDAs was established to perform the scoping review. Reporting of this review follow the PRISMA extension for scoping reviews (PRISMA-ScR).[23]

Search Strategy

There were 2 search strategies designed with guidance from health science librarians. The first, performed in August 2019 without limits by year, combined a search block informed by the Cochrane review of the effectiveness of decision aids[15] with a search block on balanced information and included all study designs (see Appendix 1). Multiple electronic databases (CINAHL, Cochrane, Embase, Medline, PsycINFO, Scopus) were searched for relevant articles. The second search was performed on November 24, 2020, and repeated the search published in the 2013 IPDAS update on balanced presentation[21] limited by year from 2011 to present. The second update search used the same free-text keywords as the original search with minor revisions to improve specificity and decrease recall. It was completed in the PubMed interface and included both Medline and PubMed Central citations (see Appendix 2). In addition, the Cochrane Review of Patient Decision Aids[14] was searched for eligible studies.

Inclusion and Exclusion Criteria

Articles were included if they described how balanced (unbiased) information was defined or how it could be presented in PtDAs or if either clinicians or patients had evaluated whether the information presented in a PtDA was balanced. All types of PtDAs and all health care settings were eligible. Articles written in any language spoken by the authors were included (i.e., English, French, Danish, German, Portuguese, and Spanish). There was no eligibility restriction on study design. Our team also included studies that specifically addressed framing effects even if no PtDA was involved. We excluded non–peer-reviewed publications, conference proceedings, dissertations, and articles only relevant to clinician-targeted decision support (as opposed to patient decision support).

Selection of Articles

Figure 2 illustrates each step of the study selection process. The titles and abstracts identified by the 2 search strategies were uploaded to Covidence.[24] All titles and abstracts were initially screened for eligibility by 2 independent reviewers. Articles were coded as "accept for full-text review" (clearly addressed providing balanced information about options/bias of PtDAs) or "reject for

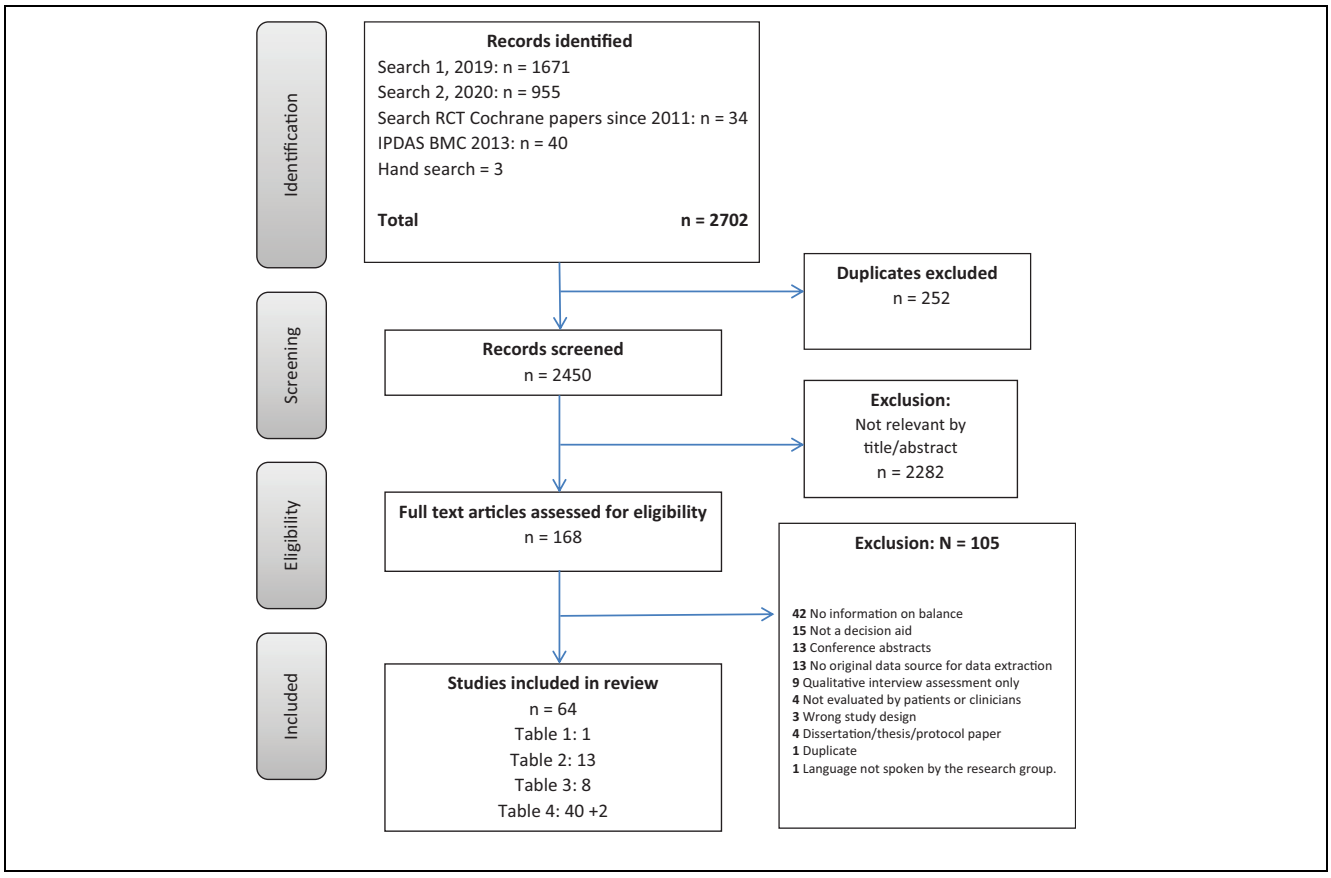

Figure 2 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

full-text review" (did not contain information about providing balanced information about options/bias of PtDAs). In the case of disagreement, a third reviewer evaluated the title and abstract. All articles accepted for full-text review were screened by a team member to ensure that they fulfilled the inclusion criteria.

Data Extraction

We extracted data from each eligible study into a standardized data template including study characteristics (year published, authors, country, publication type, health care setting), research design, participant characteristics, aim of the study, and PtDA description. For the articles that addressed balanced information, the following details were extracted: 1) characteristics of articles; 2) definition of balanced information presentation; 3) consideration of whether the information is balanced; 4) testing for cognitive bias from the manner in which options, benefits, and harms were presented; 5) measures of balanced information; and 6) whether a side-by-side display of attributes was used to compare options.

Data Synthesis

After selecting articles and before distributing selected manuscripts to the entire research group, 4 authors held a meeting in which they discussed data synthesis. They identified topics related to the primary objective and how balanced information can be presented and evaluated in PtDAs to systematically review.

The 5 main topics selected were 1) proposed changes in the IPDAS criteria for presenting balanced information about options in PtDA; 2) How is balanced information defined and in what ways it can be enhanced? 3) What lessons were learned from experimental design studies about the types of cognitive biases that might be introduced in PtDA?, 4) How was balance measured in studies that reported the stakeholder views about balance in PtDAs and whether side-by-side display of attributes was used to aid comparison of options? and 5) Were any emerging issues and research opportunities identified?

We classified articles according to our objectives and they are reported in 1 of 3 tables.

Results

The search identified 2450 unique titles and abstracts, resulting in the full-text review of 168 articles and final inclusion of 64 studies in this scoping review (Figure 2). The 64 studies were from 6 countries: Australia, Canada, United States, Netherlands, United Kingdom, and Germany (Tables 2–4). Twelve articles provided background describing the definition or rationale related to presenting balanced information about options (Table 2).[7,21,25–35] Eight articles were experimental studies evaluating the balance or bias in the information presentation (Table 3),[36–43] and 42 articles quantitatively reported the views of patients, family, carers, and health care professionals who rated the patient decision aid as a balanced presentation (Table 4).[29,44–82]

Providing Information

Providing salient and accessible information about options is fundamental for PtDAs,[85–87] and new research continues to highlight its importance.[37–39,68,88] Patients are often unaware of essential facts to make a decision, and these include knowledge gaps of basic information about their health concern, what options were available for treatment, as well as their features and expected outcome.[43,89,90] Patient beliefs about their options can also be influenced by visuals, testimonials, and other peripheral information clues that do not address informational gaps but still have a substantial biasing effect on choice.[91] Those with lower health literacy may be disproportionally impacted as they may be less likely to evaluate a presentation of information to be balanced compared with those with higher literacy.[92] This emphasizes the continuing importance of the IPDAS criteria specific to presenting information (see Table 2).

Theoretical Rationale for Balanced Presentation of Information and Options

The theoretical rationale from the 2013 updates was based on 1) ethical and legal obligations of informed consent, 2) decision-making theories, and 3) cognitive processes that affect the way in which information is understood (Table 2).[21] Authors on our team confirm that these theoretical rationales continue to be relevant. From our review, a new theoretical consideration is related to being aware of and avoiding introducing cognitive bias, including framing effects. Framing is the presentation in informationally equivalent ways that highlights different information clues.[6] For example, presenting an option as an opportunity was found to be associated with an increased willingness to choose that option and a reduction in questions about other alternatives compared with when the option was presented as a choice.[36] This reinforces IPDAS criteria for PtDAs, in that patients should be given the choice of all medically reasonable options rather than being asked to agree to one proposed option.[21] When PtDA developers evaluate balance, they should ensure evidence-based information about all options is presented equally, emphasizing their potential benefits and harms, while ensuring the way information is presented does not create unintended effects on the way it is attended to, perceived, and processed.[26]

How Balanced Information Is Presented in PtDAs

We identified additional investigations that evaluated possible mechanisms that could introduce cognitive bias and interfere with patient decision making (Table 3). We summarize our findings in the following 5 subsections: Format of Information Delivery, Perceptions of Balance in Description of Attributes, Framing Effects, Ordering Effects, and Biased Information (Incomplete, Nontransparent, and Actively Persuasive).

Format of information delivery

Video v. text. Two articles compared the effectiveness of format of information delivery. Frosch and colleagues[39] compared a physician discussion to a video. Prostate cancer screening rates differed based on patient participation in a physician discussion alone (82%), if they viewed an instructional video (60%), or the combination of video followed by physician discussion (50%). A second study[68] compared a booklet to a video format. Women considering chemical induction of labor versus expectant management were primed with similar content delivered by booklet or a video presentation followed by booklet. The video was more frequently perceived by women as unbiased (95% v. 71%) and based on facts (95% v. 84%) as compared with the booklet.

Side-by-side display. The 2013 review described the use of side-by-side display format to contrast the options.[21] Of the articles included in this update that reported the views of stakeholders on the balance of information in the PtDA, 28 of 40 used a side display of option attributes (Table 4). In 27 of the 28 PtDAs that used a side-by-side display of option attributes, most participants rated the information about options as balanced.

Table 2 Background Studies Describing Definitions and/or Rationale (n = 13)

First Author, Year	Terms Used for Balanced	Definition of Balance	Theoretical Rationale for Balance	Ways of Enhancing Balance
Abhyankar, 2013[21]	Balanced, unbiased	Balance refers to complete and unbiased presentation of all the relevant options and the information about those options—in content and in format—in a way that enables individuals to process this information without their choices being influenced by the presentational aspects.	There are 2 types of opportunity frames. Both make only 1 option (rather than all options) explicit. The default option may be presented as an opportunity to pursue an option (opt-in) or as an opportunity not to pursue an option (opt-out). The study altered participants initial preference to participate in a clinical trial. Framing bias arose from presenting trial participation as an opportunity, whether opt-in or opt-out, compared with as a choice.	Presenting the decision as a choice is less likely to bias people's preferences. Further, encouraging people to view balanced and comprehensive information presented in a parallel, option-by-attribute format before eliciting preferences can de-bias the decision frame, removing its effect on choice.
Blumenthal-Barby, 2013[25]	Neutral, unbiased, nondirective	Balance is to ensure each PtDA is as neutral, unbiased, and nondirective as possible.	The authors state that PtDA designers in some cases may not be capable of developing an unbiased, neutral presentation of options.	The authors propose sometimes it is ethically appropriate for decision aids not to be balanced so that they can counter existing bias and bring the patient to a balanced decision. They believe such decision aids would meet legal and ethical guidelines for informed consent—if they present all medically reasonable options, along with the risks and benefits of each and that a patient understands the consequences of the various alternatives.
Edwards, 2001[26]	Bias, manipulation of information, framing	None	In a systematic review of risk communication, the authors identified 9 effects of framing and other manipulations of logically equivalent choices that may influence patient perception of outcomes: 1. Negative versus positive framing of risk information 2. Loss framing versus gain framing 3. Numerical and graphical presentation of information versus numerical information only 4. More versus fewer data points 5. Numerical versus verbal presentation of risk information 6. Relative risk data versus absolute risk or numbers needed to treat information 7. Vivid portrayal of risk information 8. Lay terminology to present risk information versus usual medical terminology 9. Manipulating base rate (absolute risk) and anchoring points (denominators) for frequencies	Recognize and honestly consider the effects of framing and other manipulations of logically equivalent information on patient perceptions of considered options and choice. Clinicians and researcher have the responsibility to show they have avoided manipulation of patient choices.

(continued)

Table 2 (continued)

First Author, Year	Terms Used for Balanced	Definition of Balance	Theoretical Rationale for Balance	Ways of Enhancing Balance
Elwyn, 2006[7]	Unbiased	Provide the same level of detail and degree of prominence when displaying information in favor of and against the options or consequences (FDA Fair Balance Prescription Drug Advertising Act of 2001). Balanced depends on format, sequencing, and framing.	Unbalanced information may influence patients' understanding, expectations, and value judgments about the options. As a result, patients may select options that would not be acceptable if they had been presented in a balanced way. It is dishonest and unethical to create false expectations or make it difficult for patients to understand the probabilities (or chances) of positive or negative features of options.	Use of patient stories in PtDAs is best avoided until their impact is better understood, as these could introduce bias due to self-identification.
Evans, 2007[27]	Balance of information	Equal emphasis on positive and negative information	None	Presenting contracting information, opinions, and experiences
Feldman-Stewart, 2007[28]	Accuracy, balance, imbalance	Information must be relevant, accurate updated, and complete	None	Describe treatment procedures for each option. Give equal emphasis to false positives and false negatives. Labeling numeric values as estimates and providing further information about uncertainty upon patients' request. Providing citations to information. Patient narratives to be avoided until the potential biasing effect is better understood.
Griffith, 2008[29]	Clarity, balance	Subjective measurement of PtDAs, which avoids inclination to one decision	None	For screening PtDAs, including a no-screen option.
Read, 1999[30]	Broad or narrow bracketing	Broad bracketing of decisions encourages the consideration of choice factors that are either not perceived or given relatively less weight in narrow bracketing.	Bracketing effects are central to understanding decision making. When making a choice, one can broadly bracket by assessing the consequences of all options together or narrowly bracket by considering each option in isolation. However, attention, memory, and information processing do regulate bracketing because of our limited ability to consider multiple options in a decision simultaneously.	Presenting options in a broad bracket is generally preferred as it allows people to consider all the consequences of all options and leads to choices with higher utility.
Ubel, 2010[31]	Neutrality	Absence of cognitive biases; neutrality means avoiding value judgments in the information; placing equal weight on equally important information	Cognitive biases resulting from the order in which information is presented negatively affect knowledge, comprehension, perception of benefits, and anxiety about side effects; neutrality of information is essential to minimize such cognitive biases.	Present contextual risk information (e.g., risks of experiencing colon cancer, a heart attack).

(continued)

Table 2 (continued)

First Author, Year	Terms Used for Balanced	Definition of Balance	Theoretical Rationale for Balance	Ways of Enhancing Balance
Wills and Holmes-Rovner, 2003[32]	Complete, balanced information	Not defined	Creating realistic expectations about choice, consequences, improving understanding of probability information and clarity about personal values are goals of balanced information provision. When information is not complete and balanced, people may ignore missing information, devalue a treatment option partially or completely, or make inferences about unavailable information based on the information they do have. Some aspects of comprehension may be influenced by information processing tendencies that are naturally associated with the central nervous system structure.	Present probabilities as natural frequencies. Use of absolute risk descriptions and by provision of contextual risk information. Tailor the format of risk communication to patients' level of numeracy. Present information in both positive and negative frames. Use of graphics to present numerical probability information (but test to ensure they do not result in misunderstanding). Place information in context (e.g., use risk ladders and action standards as reference points).
Winterbottom, 2008[34]	Balanced information about advantages and disadvantages of all options	Presentation of information in a way that enables individuals to process this information without bias.	Heuristic/systematic information processing model. Patient narratives are likely to encourage the use of heuristic processing. The context of the message, such as who is delivering the information, becomes more influential than the message content.	Use of patient narratives should be treated cautiously until their impact is better understood.
Zapka, 2006[33]	Complete and clear information; bias in selection and presentation of information	Not defined	No rationale was provided other than stating "what facts are presented to women about screening and how information is presented, is basic to informed decision making."	None
Zikmund-Fisher, 2008[35]	Balanced presentation of risks and benefits	Presenting specific probability information regarding both good and bad health outcomes of their decisions and by describing these outcomes in imaginable and identifiable formats	Patients have a natural inclination to focus on the benefits of potential treatments. Balanced presentation of risks and benefits is essential as it leads to better comprehension and guards against undesirable biases.	Present risk information in graphic format (pictographs)

PtDA, patient decision aid.

Table 3 Studies Using an Experimental Design to Measure Balance or Evaluate Bias in the Presentation of Information ($n = 9$)

First Author, Year	Decision	Sample size	Participants	Type of Methods	Main Findings
Abhyankar, 2014[36]	Breast cancer; participation in a clinical trial v. usual care	124	Students and university faculty	Randomized factorial experimental survey. Framing options as choice or opportunity: does frame influence decision?	Opportunity frames, whether opt-in or opt-out, introduced a bias compared with a complete choice frame of treatments. The framing bias was not present once the patient was informed with an option-by attribute decision aid. Presenting the decision as a choice is less likely to bias people's preferences. Further, encouraging people to view balanced and comprehensive information presented in a parallel, option-by-attribute format before eliciting preferences can de-bias the decision frame, removing its effect on choice.
Bansback, 2014[37]	Treatments for obstructive sleep apnea	510	Amazon MTurk online survey panel	Randomized factorial experimental survey. Evaluation of ordering effects to improve quality of decisions.	Participants made value-congruent treatment choices when information was ordered by first presenting information about the attributes they felt were personally important (primacy effect).
Brandhof, 2018[38]	Colon cancer screening	436	Dutch online research panel	Randomized factorial experimental design	There was no bias in screening participation based on the order of presenting information about colon rectal cancer mortality: its mortality rate compared with its asymptomatic presentation did not affect attitudes or intended screening participation.
Frosch, 2001[39]	Prostate-specific antigen cancer screening	130	Male patients considering prostate cancer screening	Randomized controlled trial. Evaluation of 2 methods to facilitate shared decision making for men considering the prostate-specific antigen test.	Prostate cancer screening participation decreased with greater amount of information: discussion > video > video + discussion.
Gurich, 2019[40]	Limb salvage procedure v. amputation	404	Amazon MTurk online survey panel	Randomized factorial experimental survey. Survey of evaluating whether framing the benefit of amputation to avoid functional loss v. limb salvage framed to gain function led to a biased subject preference for treatment.	Framing the benefit of amputation to avoid functional loss v. limb salvage framed to gain function led to a preference for amputation. There was evidence of cognitive bias related to affect, anchoring, or bandwagon effect.
Martin, 2012[41]	Rheumatoid arthritis disease-modifying drug therapy.	182	Students, patients, support persons	Randomized factorial experimental survey. Impact of information formats (narrative, natural frequency pictogram, speedometer, and vivid graphic) on verbatim and gist recall of a medication's power to slow the rate of disease progression.	Information formats that supported the rate of disease progression with a reinforcing graphic (N + pictograph and N + speedometer) resulted in recall closest to the true value. The least accurate (most biased) verbatim recall was in participants who viewed narrative information coupled with a vivid graphic showing disease progression.

(continued)

Table 3 (continued)

First Author, Year	Decision	Sample size	Participants	Type of Methods	Main Findings
Tong, 2016[42]	Oral cardiovascular medication therapy	18	Consumers	Qualitative interviews. Presentation of medication information	Consumers preferred presentation of side effects according to severity and with natural frequency of risk. Positive framing appeared to increase willingness to take medication.
Wegwarth, 2014[43]	HPV vaccine participation	225	Girl-parent pairs	Randomized controlled trial Evaluating HPV vaccine leaflets on understanding, intension, actual vaccination	The balanced leaflet improved participants' knowledge about HPV vaccine's efficacy. The leaflet with unbalance information led to overestimation of cervical cancer risk and overestimation of the effectiveness and intention to use HPV vaccine.

HPV, human papillomavirus.

Volume of information. Of the articles we reviewed, 1 explored if presenting essential content of a PtDA alone influenced decisional outcomes. Munro et al.[75] compared a long (1565 words) versus a short (846 words) version of a PtDA. Although underpowered ($N = 40$), there was no significant difference in pre–post knowledge change.[75]

Perceptions of balance in the description of attributes of options. Of 42 studies that quantitatively measured balanced or nonbiased presentation of information in the PtDAs, 40 measured it with more than 10 participants (range, 12–3722) for 32 different types of decisions (Table 4). Fourteen studies used the Ottawa Acceptability Questionnaire. "I found the presentation (of information) slanted towards taking: <option A>, <option B>, balanced."[93] Five used the item for testing PtDAs developed by the Foundation for Informed Medical Decision Making,[29,59–62] 1 used an item adapted from the German e-mental health portal,[63] 3 created their own item,[71,73,78] and 16 did not report on the item used. The 2 most frequently used items were the 3-point (Ottawa)[93] and the 5-point response scale (Barry et al.[16]). For those that did not provide a reference to the item used, 7 used a similar item and the others used a variety of items (e.g., yes/no, agree/disagree). Of the 40 studies, 28 studies rated balanced presentation >66% (range of decisions) and 12 rated it as less balanced (e.g., 7 cancer screening, 2 left ventricular device therapy, palliative chemotherapy, prophylactic breast surgery, and low-back pain).

Framing effects. Three studies measured framing effects. Abhyankar et al.[36] evaluated the effect of framing treatment options as an opportunity to participate. Participants were randomized to 1 of 3 experimental conditions related to participating in a cancer clinical trial: 1) "opportunity to participate (opt-in)," 2) "opportunity to be removed from consideration of participation (opt-out)," and 3) "choice between having standard treatment or taking part in a clinical trial." Opportunity frames initially introduced a bias against selecting standard treatment. However, once subjects were presented with detailed information on the options, there was no difference in knowledge or choice.

Gurich et al.[40] compared the effect of loss to gain framing in clinical vignettes simulating choice of amputation or limb preservation as options to treat limb sarcoma. Amputation was preferred when presented as a method to increase function or when participants were exposed to a bandwagon effect. These were decisions based primarily on other individual's choices rather than on one's own beliefs. This highlights the competing

Table 4 Studies Reporting Views of Patients, Family, Carers, Health Care Professionals (HCP) who Rated the Patient Decision Aid as Balanced Presentation (n = 40 studies + 2 <10 participants)[a]

First Author, Year	Decision	Sample size*	Balanced DA n (%)	DA side by side display	Measure of balance
Betz, 2019[44]	Gun storage	64 people	50 (78%)	Yes	Ottawa Acceptability questionnaire:
deJesus, 2017[45]	Knee replacement	45 patients	38 (84%)	Yes	I found the presentation (check one): a) slanted toward [option] A;
Drake, 1999[47]	Genetic testing	38 patients	27 (71%)	Yes	b) slanted toward [option] B;
Greenhawt, 2020[46]	Allergy treatment	24 patients	18 (75%)	Unclear	c) balanced‘1
Lalonde, 2004[48]	Heart disease prevention	15 patients	12 (80%)	Yes	
McAlpine, 2019[49]	Localized renal mass	10 patients 11 HCPs, 1 DA expert	20 (91%)	Yes	
McAlpine, 2020[50]	Small renal mass	22 patients 10 HCPs, 1 PtDA expert	27 (82%)	Yes	
McAlpine, 2019[51]	Urinary diversion	9 patients, 9 HCPs	15 (83%)	Yes	
Reuland, 2018[52]	Lung cancer screening	50 patients	29 (58%)	Yes	
Sajeev, 2017[53]	Nutrition in pediatrics	29 parents	28 (97%)	Yes	
Smith, 2010[54]	Bowel cancer screening	334 patients	160 (48%)	No	
Thompson, 2015[55]	Left ventricular assist therapy	24 patients 20 carers 24 HCP	43 (62.5%)	Yes	
Wood, 2019[56]	Cervical cancer screening	25 women	17 (68%)	Yes	
Wu, 2016[57]	Rectal cancer treatment	32 patients	25 (78%)	Yes	
Carmody, 2014[58]	Driving a car with dementia	12 patients	10 (83%)	Yes	Adapted Ottawa acceptability (3 options): Was the booklet balanced? Slanted toward [option] A, slanted away from [option] A, balanced
Gramlich, 1995[59]	Breast cancer treatment	103 women	79 (77%)	Unclear	FIMDM balance item[16]:
Griffith, 2008[29]	Colon cancer screening	106 patients	17(16%)	Unclear	Do you think the video was (5-point response): a) strongly in favor of screening;
Kapell Brown, 2018[60]	End-stage renal disease	49 patients	38 (77.6%)	Unclear	b) somewhat in favor of screening; c) neither in favor of nor against
McIlvennan, 2018[61]	Left ventricular assist therapy	71 carers	43 (60%)	Yes	screening; d) somewhat against screening;
Spunt, 1996[62]	Low-back pain	239 patients	133 (56%)	Unclear	e) strongly against screening.
Fisher, 2018[63]	Bipolar II disorder	31 patients 11 family	30 (97%) patient, 11 (100%) family	Yes	Adapted measure of acceptability studies (German e-mental health portal) “Equal emphasis placed on each of the medication options”
Anderson, 2011[64]	Ovarian ca treatment	20 women	17 (85%)	Yes	Purpose-designed to elicit feedback on DA: balanced way, equally on downsides and benefits
Buchhorn-White, 2020[65]	Nutrition in pediatrics	18 parents; 12 HCP	15 (94%) parents 12 (100%) HCP	Yes	Item based on previous research for balance of information: 4-point scale (*not at all* to *quite a bit*)

(continued)

Table 4 (continued)

First Author, Year	Decision	Sample size*	Balanced DA n (%)	DA side by side display	Measure of balance
Lim, 2017[66]	Renal stones treatment	43 patients	24 (56%) strongly agree 19 (44%) agree	Yes	Investigator designed: information was presented in balanced manner? 5-point response: *strongly agree* to *strongly disagree*
Ahmed, 2007[67]	Antenatal screening	9 parents 15 HCPs	8 (89%) parents 7 (47%) HCP	Yes	DA provided balanced information (yes, no, not sure)
Beckman, 2015[68]	Induction of labor	76	72 (95%)	Unclear	5-point scale = reported unbiased information
Hajizade, 2017[69]	COPD life-sustaining treatments	13 patients 5 carers 8 HCPs	8 (62%) patients 4 (80%) carers 2 (25%) HCPs	Unclear	Perception of biased results: a) completely balanced, b) bias toward option A, c) bias toward option B
Harmsen, 2018[70]	Surgery for genetic mutation	19 women 10 HCPs	15 (79%) women 9 (90%) HCPs	Unclear	Coulter (2013) suggested measuring balanced: a) yes, b) slanted toward [option A]; c) slanted toward [option B]
Hersch, 2014[71]	Breast cancer screening	16 women	6 (38%)	Unclear	Used Mathieu et al.[73]; How balanced did you find the booklet? 5-point response: clearly slanted or slanted to A; balanced; slanted or clearly slanted to B
Manne, 2020[72]	Prophylactic breast surgery	46 women	28 (61%)	Yes	Degree to which DA presented balanced information
Mathieu, 2010[73]	Breast cancer screening	117 women, 38–45 y	57 (49%)	Yes	5-point response: clearly to A; a little toward [option] A; balanced; a little against [option] A; clearly against A.
Mathieu, 2007[74]	Breast cancer screening	29 women, 70+ y	15 (52%)	Yes	DA was perceived to be balanced and fair?
Munro, 2018[75]	Epidural analgesic	40 women	30 (75%) longer 21(53%) shorter	No	The information provided was balanced?
Oostendorp, 2017[76]	Palliative chemotherapy	83 patients	Mean 2.7 (SD 0.7) balance	Yes	5-point response balanced presentation (clearly in favor of [option] A, balanced, clearly in favor of [option] B)
Pickles, 2020[77]	Prostate cancer screening	1851 long, 1871 brief DA for men	944 (51%) long, 992 (53%) brief	Yes	5-point response: clearly slanted toward [option] A, a little slanted toward [option] A, balanced, slanted toward [option] B, clearly slanted toward [option] B
Smith, 2018[78]	Prenatal screening	29 women 18 GPs	21 (72%) women 16 (89%) GPs	Yes	"How balanced did you find the information?" using Likert-type rating scales
Trenaman, 2016[79]	Sleep apnea	80 patients	54 (66%)	Yes	"Was the DA balanced?" 3-point scale slanted toward [option] A, balanced, slanted toward [option] B
van Tol-Geerdink, 2006[80]	Prostate cancer	150 males	142 (95%)	Yes	Information balanced? 5-point scale: clearly in favor of [option] A, balanced, clearly in favor of [option] B
Washington, 2015[81]	Knee osteoarthritis	12 patients	9 (75%)	Unclear	"I felt the information given to me was biased towards a particular treatment": 5-point scale: *strongly agree* to *strongly disagree*
Watson, 2006[82]	Prostate cancer screening	468 men	439 (94%)	Yes	Information presented in a "balanced way"

COPD, chronic obstructive pulmonary disease; DA, decision aid; GP, general practitioner; HCP, health care professional; PtDA, patient decision aid.

[a]Studies with a sample size <10 participants: Gagne et al.[83] and Vandemheen et al.[84]

power of facts versus perceived social norms during patient deliberation.[40]

Tong and colleagues[42] compared versions of the Australian Consumer Medical Information for ramipril (an angiotensin-converting enzyme inhibitor) and clopidogrel (an antiplatelet medication) in a qualitative study. Positive framing of numerical side-effect risk information appeared to increase consumer willingness to take a medicine.[42]

Ordering effects. Two studies measured ordering effects. The effect of ordering in the presentation of treatment attributes was evaluated by Bansback.[37] Participants were presented tailored information in the order of elicited preference: most valued attributes were listed first (primacy group) or last (recency group) as compared with conventional ordering of attributes of options (efficacy, side effects, practicality, costs). The optimal choice, a treatment concordant with expressed values, was made for 70% of those using the conventional order, 90% for those using the first-order primacy group, and 78% using the last-order recency group. The authors concluded that individuals are more likely to make treatment choices that reflect their values when the information presented in a PtDA is ordered with the information they consider most important to them is viewed first.

The effect of the order of presentation of mortality information about cancer on intention to participate in colorectal cancer screening was evaluated by Brandhof et al.[38] There was no effect on attitudes or intentions to participate in cancer screening when subjects were randomized to review a PtDA starting with neutral information about colorectal cancer compared with an alternative format that started with information about the mortality of colorectal cancer.

Biased information (unbalanced, incomplete, nontransparent, or actively persuasive information). One of the 18 studies, by Wegwarth et al.,[43] evaluated the influence of balanced versus unbalanced information on child and parental knowledge, perception of risk, intention, and actions related to human papilloma virus (HPV) vaccination. The unbalanced information leaflet decreased the number of girls who correctly estimated the incidence and increased the number who overestimated the risk of dying of cervical carcinoma. Intention to receive HPV vaccination was increased by unbalanced information and decreased with balanced information in both parents and daughters. Actual vaccination at 14 mo did not differ between groups.[43]

Measures of the Balance of Presentations of Options

This review evaluated the ways in which investigators defined and measured the balance of information provided about options. Of the 68 studies included in this review only, only 3 studies[36,43,67] provided a definition of balanced information, although all articles listed in Tables 3 and 4 addressed how balance of information presented about options was assessed. Most studies used a semi-qualitative rating by patients using questionnaires or focus groups. Most of the papers reviewed did not include a discussion about the measurement of balanced information but seemed to accept an implied definition of balanced (e.g., "patients found the aid balanced").[45] Ahmed et al.[67] however, argued for a more nuanced approach. In respect to terminating an affected pregnancy, they point to influential aspects such as values, experiences, and situations that inform what "balanced" information really means.

> The findings also show that delivering balanced information is difficult, given that 'balance' is in the eye of the beholder. . . . The balance has to come from the presentation of a range of subjective experiences and the reader (or website user) then has to identify the story or stories that resonate with their own values, experiences and situation and use these to inform their own decisions. The method for selecting a representative range of experiences is not straightforward and requires an evidence-based approach. This will help strengthen the validity of the resource and address criticisms of selection bias.

Discussion

There has been a substantial increase in the number articles describing the development of PtDA since the 2013 review. Most developers acknowledge the IPDAS criteria and use the Ottawa Acceptability Questionnaire's single-item patient-reported assessment of the balance of information presented about options in decision aids.[93] This represents significant progress toward the goal of making more high-quality PtDA available for consumers. We believe that future research could be accelerated by 1) a refined operational definition of balanced information, 2) implementing a more formal approach to measuring the degree to which information about options is balanced, and 3) a broader adoption of experimental methods to evaluate of the impact of information elements in decision aids.

The 2013 IPDAS update defined balanced presentation of information and options as "complete and unbiased presentation of the relevant options and the information about those options—in content and in

Table 5 Patient-Reported Indicators of Balanced Presentation of Information about Options

Patient-Reported Indicators	Sample Questionnaire Items
Balanced information	
Broad choice bracketing	The PtDA discussed all reasonable options, including making no decision or change.
Objectivity	The information in the PtDA seemed true, objective, and based on generally accepted scientific evidence.
Complete and salient	The PtDA contained all the information I need to make a choice.
Reduction of cognitive load to support information processing	The PtDA text and visual information were presented in a way that made it easy for me organize my thoughts and compare the details between options.
Nondirective information	The PtDA presentation of information was neutral, not slanted, and did not emphasize one option over another.
Transparency	I have no doubt the information in the PtDA was trustworthy and do not feel it held back any important details.
Unbalanced information	
Persuasion	I felt like the PtDA tried to scare or convince me that one option was the best.
Evaluative conditioning	There were elements in the PtDA (i.e., photos, images, or testimonials) included that did not add information but showed one of the options in a more positive or negative way.
Social norms	The PtDA made it seem like most people would choose one option over the others.

PtDA, patient decision aid.

format—in a way that enables individuals to process this information without bias."[21] This elaborated specific details on information presented in PtDAs to include the condition, procedures involved in each option, potential benefits, side effects and potential harms, and other information based on assessing individual patients' needs.[21] The findings of our scoping review underscore the importance of avoiding framing effects that could negatively influence the patients' interpretation of the information[36,40,42] as well as a need for elaboration of the attributes and indicators by which balanced information can be more fully assessed.

Based on merged IPDAS topics and findings from the included studies from the scoping review, we revised the definition to the following:

> Objective, complete, salient, transparent, evidence-informed, and unbiased presentation of text and visual information about the condition and all relevant options (with important elements including the features, benefits, harms, and procedures of those options) in a way that does not favor one option over another and enables individuals to focus attention on important elements and process this information.

This definition highlights that balanced presentation of information (and its complement unbalanced, slanted, or biased information) is a concept that has multiple attributes and, to be measured accurately, needs to be operationalized more fully. The accurate assessment of balance and bias of information requires content experts to grade the information to be objective, complete, salient, transparent, and based on generally accepted evidence. The revised IPDAS checklist[9] is a valuable guide for developers to judge whether information is accurate, complete, unbiased, and understandable and supports decision making. In addition, PtDA designers with expertise in social and cognitive psychology and behavioral economics have unique viewpoints to assess whether the construction of the information presentation and choice architecture might lead to cognitive bias that could unconsciously influence patient decision making. Finally, the balance of information should be evaluated from the perspective of the patients making decisions.

In Table 5, we list 9 attributes that are potential indicators of balanced presentation of information about options. With each indicator of balance, we offer a questionnaire item as an example of how it might be operationalized in the field. Six are indicators of balance and 3 are indictors of unbalanced information. Choice bracketing occurs when the available choices are grouped in sets, that are viewed in isolation from one another, or do not include all possible choices. If all choices are not considered, it is termed a *narrow choice bracketing*.[30] Presenting a broad choice set includes all reasonable options. Objective, complete, nondirective, and salient information are described or implied in previous IPDAS criteria and checklist. Salience is linked to an individual's motivation to work toward a goal.[1,87,94] Their beliefs about the

value, relevance, and attainability of completing a learning or decision task drives the motivation to focus attention and expend mental effort.[95] Thus, it is particularly important that decision aids contain information that will answer the questions that consumers believe are important.[90] Part of this is presenting information in a way that directs attention, leverages prior knowledge, reduces cognitive load, and supports information processing.[96,97] Side-by-side presentation of option attributes is one example of this. The need for salience is a key justification for user-centered design of PtDA. As trust in the source information is central to decision quality and satisfaction with risk communication,[98] patients must have confidence that the information presented in a PtDA is transparent and offered without an undisclosed motive. The revised IPDAS checklist encourages the disclosure of potential conflict of interest, which in part addresses this potential concern.

In addition, PtDA developers must make judgments regarding how much information should be included in a decision aid.[90] Learners have the tendency to save time and effort on information processing by simplifying decision tasks. The Cognitive Miser Model described by psychologists Fiske and Taylor,[87] satisficing decision making strategy described by economist Herbert Simon,[1,4] as well as the synthesis of Barry Schwartz in his book *The Paradox of Choice: Why More Is Less*[99] unpack this principle at different levels. Their work predicts that the volume of information presented may affect uptake and use of a PtDA. Both Munro et al.[75] and Martin[91] in a second larger ($N = 272$) head-to-head comparison of a complete information, long-format (24-page) versus an essential content, short-format (2-page) PtDA also detected no difference in the change in knowledge or patients' intention to intensify therapy.[91] This supports the premise that patients should be able to choose the format (including volume) of information they desire to support their decision making. As patients have insight into their information needs and the cognitive effort they are willing to expend to fulfill them, clinicians should, if possible, try to match their requests for information. This poses a challenge for decision aid developers to create decision aids that are scalable and that highlight essential content, with the option for patients to explore more comprehensive information they find salient.

Unbalanced or biased information may take multiple forms and be presented intentionally or unintentionally. The principle of social proof underlies a number of methods of persuasion. It suggests that under conditions of uncertainty, people look to the actions of others to guide their actions. This could be in observing "people similar to us." However, this decision heuristic is prone to error if social evidence is manipulated (e.g., in testimonials or images that accompany text content).[100] *Evaluative conditioning* is a psychological term for constructing a persuasive message aimed to induce a positive attitude about an option by pairing it with another object to which the patient already has a positive attitude.[101] By presenting a limited choice set (narrow choice bracketing), irrelevant information, images, anchors, framing, or content that could overload or be persuasive, an unbalanced decision aid could lead decision makers to make cognitive errors and a choice that is not necessarily informed or values congruent. The conclusion by Ahmed and colleagues[68] that perception of balance is in some instances subjective and dependent on the perspective of the decision makers is helpful. It reminds us of humans' tendency to interpret new evidence in a manner that is biased toward supporting our initial beliefs: confirmation bias. This occurs more frequently when information is ambiguous and may have multiple interpretations.[94] These forces are certainly in action when patients use decision aids to make preference-sensitive decisions and could be manipulated by unbalanced information.

The potential for unintended bias underscores the importance of using a user-centered design approach to evaluate new information elements in PtDAs with factorial design clinical trials.[42] Several studies cited in this review[36,37,41,54] are exemplars of good practice in the evaluation of balance in PtDA design. In addition, Scalia et al.[102] presented a model of web-based PtDA delivery in which options are presented and information is incrementally disclosed. Patients were queried after each step to evaluate how influential the new information was and whether it changed their current preferred option. This type of experimental approach enables decision aid developers to evaluate the impact of the addition of a new piece of information on an outcome of interest (e.g., patient beliefs about options or intention regarding choice). This could identify particularly influential content of a PtDA to emphasize or information that is less salient to decision makers. Scalia's experimental approach also enables investigators to isolate the chunks of information that introduce bias to decision making.

In our review, we explicitly sought to identify pertinent information on providing balanced options in PtDAs. It is possible that we did not identify potentially relevant articles that reported on alternative information delivery formats. In addition, although we conducted 2 complementary search strategies, as well as hand searched the Cochrane Review of PtDAs for articles evaluating balanced presentation of information, it is possible that we did not identify articles indexed under other alternative keywords.

Our research team suggests the following changes to the IPDAS criteria for providing balanced information about options (see Table 1); they are not yet endorsed by IPDAS. We suggest adding "explicitly stated decision" as one of the minimal criteria to be defined as a PtDA, given it is required in the Cochrane Review of PtDAs and it is typically not included in patient education materials.[16] Furthermore, when using the Decisional Conflict Scale as an instrument for assessing patients' decisional needs, the patient is first prompted to identify the decision being considered.[103] Second, we suggest adding "identifying the target audience" as part of the IPDAS criteria, given that it is critical that PtDAs indicate who is eligible to consider the information being presented. This criterion was part of the IPDAS criterion under communicating probabilities of outcomes but is not necessary for all PtDAs to include.[9] Third, given that the focus of this chapter is on presenting balanced information that is not biased, we suggest revising one of the original criteria from "shows negative/positive features in equal detail" to "shows negative/positive features in balanced and unbiased manner." Equal detail is difficult to measure, and as discussed above, several PtDA developers measured users' perception of balanced presentation. Furthermore, our findings identified multiple ways that framing effects can bias the interpretation of information, and we have included "unbiased' as part of the changes to this IPDAS criterion. Fourth, our scoping review findings support the need to "present a list of options, including if relevant, the option of doing nothing." This is necessary for patients to understand the potential benefits and potential harms in view of the "reference" class.[44] Fifth, we suggest removing "describing the procedures" given that this is often included in the description of the options and/or their features. Finally, we have split 2 items that included multiple items to make it easier to apply the criterion.

Conclusion

This scoping review validated and refined the original criteria for IPDAS for the topic of providing balanced information. It describes the ways in which investigators defined and measured the balance of information provided about options in PtDAs. This guided us in revising the operational definition of presenting balanced information about options. Through this process, we consider how balance in the presentation of information could be increased by evaluation from the perspectives of subject matter experts, decision aid designers, and patients. In addition, we highlight exemplars of good experimental design for evaluating the presentation of information about options.

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Supplemental Material

Supplementary material for this article is available on the *Medical Decision Making* website at http://journals.sagepub.com/home/mdm.

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