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Review Article

Communicative aspects of decision aids for localized prostate cancer treatment – A systematic review

Ruben D. Vromans, M.A.[a,b,*], Mies C. van Eenbergen, M.A.[c], Steffen C. Pauws, Ph.D.[a,b,d], Gijs Geleijnse, Ph.D.[c,**], Henk G. van der Poel, Ph.D.[e], Lonneke V. van de Poll-Franse, Ph.D.[c,f,g], Emiel J. Krahmer, Ph.D.[a,b]

[a] *Department of Communication and Cognition, Tilburg University, Tilburg, the Netherlands*
[b] *Tilburg Center for Cognition and Communication, Tilburg University, Tilburg, the Netherlands*
[c] *Department of Research, Netherlands Comprehensive Cancer Organisation (IKNL), Utrecht, the Netherlands*
[d] *Chronic Disease Management, Philips Research, Eindhoven, the Netherlands*
[e] *Department of Urology, The Netherlands Cancer Institute, Antoni van Leeuwenhoek Hospital, Amsterdam, the Netherlands*
[f] *Division of Psychosocial Research & Epidemiology, The Netherlands Cancer Institute, Amsterdam, the Netherlands*
[g] *Department of Medical and Clinical Psychology, Tilburg University, Tilburg, the Netherlands*

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Abstract

Context: Despite increasing interest in the development and use of decision aids (DAs) for patients with localized prostate cancer (LPC), little attention has been paid to communicative aspects (CAs) of such tools.

Objective: To identify DAs for LPC treatment, and review these tools for various CAs.

Materials and methods: DAs were identified through both published literature (MEDLINE, Embase, CINAHL, CENTRAL, and PsycINFO; 1990–2018) and online sources, in compliance with the Preferred Reporting Items for Systematic Review and Meta-Analyses guidelines. Identified DAs were reviewed for the International Patient Decision Aid Standards criteria, and analyzed on CAs, including information presentation, personalization, interaction, information control, accessibility, suitability, and source of information. Nineteen DAs were identified.

Results: International Patient Decision Aid Standards scores varied greatly among DAs. Crucially, substantial variations in use of CAs by DAs were identified: (1) few DAs used visual aids to communicate statistical information, (2) none were personalized in terms of outcome probabilities or mode of communication, (3) a minority used interactive methods to elicit patients' values and preferences, (4) most included biased cross tables to compare treatment options, and (5) issues were observed in suitability and accessibility that could hinder implementation in clinical practice.

Conclusions: Our review suggests that DAs for LPC treatment could be further improved by adding CAs such as personalized outcome predictions and interaction methods to the DAs. Clinicians who are using or developing such tools might therefore consider these CAs in order to enhance patient participation in treatment decision-making.

Keywords: Decision support techniques; Decision aids; Health communication; Patient education; Prostatic neoplasms; Shared decision-making

1. Introduction

Men newly diagnosed with localized prostate cancer (LPC) are facing difficult decisions regarding treatment. They need to choose from a range of treatment options (e.g., surgery, external beam radiotherapy, brachytherapy, or active surveillance) [1], which have equivalent survival outcomes but differ in the risk of adverse outcomes [2,3].

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*Corresponding author. Tel.: + 31 13 466 3584.
**Co-Corresponding author.
E-mail addresses: r.d.vromans@uvt.nl (R.D. Vromans), g.geleijnse@iknl.nl (G. Geleijnse).

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This scenario calls for shared decision-making (SDM), a 3-step process by which clinician and patient (1) discuss treatment options, (2) compare risks and benefits, and (3) make sure that the final decision is preference based [4,5]. SDM may involve decision aids (DAs), which are tools (e.g., booklets or websites) that provide balanced information about options and the associated risks and benefits, and help patients to clarify values and preferences and how to communicate these with their clinician [6]. Today, there are hundreds of patient DAs in various health domains, ranging from cancer to heart disease [7]. Even though DAs have potential [7], systematic reviews have shown variability in the effects of DAs for LPC treatment on decisional outcomes (including decisional conflict and knowledge) and treatment choice [8–10].

An explanation for the inconsistent effects may be that DAs have been developed and implemented without taking into account the *communicative process* in which SDM occurs [11]. Classic models of this process assume that communication requires a *sender* and a *receiver* who are exchanging *information* through a certain *channel* [12]. In addition, this communication process can involve aspects such as *feedback* (i.e., the receiver's response to a message) or *noise* (i.e., anything not intended by the sender). Seen from this perspective, SDM is a similar 2-way communicative process in which both clinician and patient convey and receive messages through available channels in order to reach a decision regarding treatment [13]. Indeed, communication models of SDM also acknowledge the role of DAs in this communication process [14]. Therefore, it is important to look into communicative aspects (CAs) of DAs that could potentially influence elements of the communication process between clinician and patient.

These CAs include, first of all, the *channels* through which DAs communicate to patients, which can either be unimodal (e.g., using text or pictures alone) or multimodal (e.g., using text with pictures or audiovisual information) [15–17]. The latter is particularly important for complex topics such as explaining surgical procedures or statistical information [18,19]. Another aspect is that DAs can signal information based on *interactions* with the patient, for instance, by clarifying values or preferences, or by providing *personalized information* for a specific receiver based on input of that receiver [20,21]. Moreover, information provided by DAs may also be less *suitable* or *accessible* because of various forms of *noise* such as complex language use (e.g., jargon), or biased presentations of risks and benefits of treatments [22]. Despite the importance of communication characteristics of DAs, no research exists that has systematically reviewed such patient tools for LPC treatment from a communication point of view.

When reviewing the quality of DAs, researchers often make use of a standardized quality checklist developed by the International Patient Decision Aids Standards (IPDAS) Collaboration [6,23]. Nevertheless, even though the IPDAS checklist is seen as the golden standard for developing and evaluating DAs [24], it is also important to consider other aspects of the communication process that are not covered by the IPDAS. Until now, only one systematic review by Adsul et al. has reviewed the quality of DAs for LPC treatment by using additional items related to implementation (e.g., health literacy) [25]. Although their results lead to a global understanding of the variability in characteristics and quality of DAs, more in-depth analyses of some CAs are still required to get a more complete understanding of DAs as a communicative tool in the context of SDM.

The objectives of this review are to (1) systematically identify currently available DAs for LPC treatment through both academic and online sources, (2) review these tools for IPDAS criteria and, crucially, (3) assess them on a range of aspects deemed to be important for the communication process. By doing so, this review will both update and extend previous work [25], and will also take a closer look at various CAs of DAs.

2. Materials and methods

This systematic review was reported in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [26].

2.1. Data sources and search strategy

A systematic search of *published literature* and *online sources* was performed in order to identify and obtain DAs for LPC treatment. To identify DAs through published literature, we searched the following databases: MEDLINE (via PubMed), EMBASE, Cochrane Library, The Cumulative Index to Nursing and Allied Health Literature (CINAHL), and PsycINFO. Databases were searched from 1990 to 2018. Reference lists and author names were searched to identify additional publications that met the eligibility criteria. The search strategy was developed in collaboration with an experienced research librarian, and included a combination of keywords, synonyms, and MeSH headings relating to the concepts of LPC, DAs, SDM, and treatments (Appendix A). To identify DAs through online sources, we searched 2 international web repositories: The Ottowa Decision Aid Library Inventory and The International Database for Support in Medical Choices (Med-Decs). An additional Internet search using Google was conducted in both Dutch and English for which the first 100 hits were analyzed.

2.2. Study and DA eligibility

Studies were included if the research was reported in a scientific journal (peer reviewed), published between 1990 and 2018, and written in English or Dutch. Study types eligible for inclusion were (protocols of) randomized controlled trials or (quasi) experimental studies that addressed the impact of DAs as intervention on a variety of decisional

outcomes or treatment choice. In addition, studies that described the developmental and/or evaluation of DAs (e.g., developmental studies, evaluation/usability testing studies, and observational studies) were also included. Target audiences of studies included newly diagnosed patients with LPC facing treatment decision-making, as well as patients with early-stage or low/intermediate-risk prostate cancer. DAs developed for men with advanced prostate cancer or prostate-specific antigen screening were excluded. DA formats included paper-based (e.g., hardcopy booklets or pamphlets), web-based (e.g., Internet websites), computer-based (e.g., computer programs and CD-ROMs), or video-based (e.g., video-tape or DVD). However, DAs in the format of phone calls, online support groups, interviews, nomograms, or audiotapes were excluded, since such formats could not be analyzed. Finally, only DAs that were (publicly) accessible, referred to at least 2 treatments, and were written in English or Dutch were included.

2.3. Study and DA selection

A first reviewer (R.V.) screened all retrieved articles for relevance based on title and abstract for initial eligibility, after which a second reviewer (G.G.) screened a package of 10% of the articles that consisted of a mix of included/excluded studies judged by the first reviewer (R.V.). The overall kappa score for inter-rate agreement was strong ($\kappa = 0.90$) [27]. Afterwards, disagreements were resolved through discussion or adjudication by a third person. Subsequently, 2 reviewers (R.V. and M.E.) independently evaluated the articles that passed the previous screening phase based on the eligibility criteria using a predefined criteria form ($\kappa = 0.96$), and disagreements were resolved through discussion and consensus between the 2 reviewers. Once a study had been included, one reviewer (R.V.) contacted the study authors for obtaining permission to request and review a copy of the DA (or to get full access to the DA).

2.4. Assessment of DAs

The assessment of the identified DAs consisted of 2 parts. DAs were first reviewed for the IPDAS criteria, after which they were critically analyzed on a range of CAs. For both checklists, we carried out extensive pilot testing and discussions in order to make sure that every reviewer interpreted the items in the same way. Six teams of 2 coders each were responsible for reviewing one-sixth of the DAs. Thus, each DA was independently assessed by 2 coders. Inter-rate agreements (κ) achieved by the teams ranged from 0.80 to 0.82 for the IPDAS checklist, and from 0.81 to 0.93 for the assessment of CAs.

2.4.1. IPDAS

The IPDAS instrument [23] consisted of 36 items divided into 8 dimensions (Appendix B): information about options, outcome probabilities, clarifying values, decision guidance, development process, using evidence, disclosure and transparency, and plain language. Since not all DAs had associated studies, we decided to exclude the items related to the evaluation dimension. Response options for each criteria item were "yes" and "no" (coded as 1 and 0, respectively). For each DA, the number of IPDAS items met was converted to percentages of the total number of items.

2.4.2. Communicative aspects

Given that there was no validated CA checklist available for DAs, we developed a new checklist. We first selected aspects from the communication model by Shannon and Weaver [12] in order to determine the following 7 CAs: (1) information presentation (derived from *channel*), (2) personalization (derived from *message*), (3) interaction (derived from *interaction*), (4) information control (derived from *feedback*), (5) accessibility (derived from *noise*), (6) suitability (derived from *noise*), and (7) source of information (derived from *source of information*). We then generated a list of 76 items, which were partly derived from an existing checklist [25], and were supplemented with items from reviews about (communicative) features of DAs [28,29] and from the Suitability Assessment of Materials checklist [30]. These items were subsequently divided into the 7 CAs (Appendix C).

Information presentation contained items that focused on the channels used to communicate different types of information (e.g., verbal descriptors, numbers, or visual aids), but also on how treatment comparison was realized. *Personalization* comprised items related to how the information was tailored towards the patient (e.g., tailoring outcome probabilities or content). *Interaction* contained items that concerned how the interaction between the DA and the patient was established (e.g., interaction methods used to clarify personal values and preferences), for which a distinction was made between passive (e.g., methods that did not require active participation) and active (e.g., exercises that did require active participation) interaction methods. Items relating to *information control* dealt with how the patient had control over access to information (e.g., option to only view information of interest), but also how feedback was established (e.g., summary of a patient's preferences). *Accessibility* involved items that focused on how accessible the DA was (e.g., whether the DA required login information), and *suitability* focused on how suitable the content of the DA was (e.g., presence of irrelevant illustrations). Finally, *source of information* yielded items that concerned whether and how the source of probability information was given (e.g., information about patients involved in the reported trials).

Response options for each item were "yes" and "no" (coded as 1 and 0, respectively; 7 items needed to be recoded). Since 6 items were only applicable to web-based DA, the total number of items for paper-based DAs was 70,

and for web-based 76. For each DA, the number of CA items was converted to percentages of the total number of items. Note that a higher CA score does not necessarily indicate a higher quality DA; it merely suggests that more items from the CA checklist were taken into account.

3. Results

3.1. Search results and general characteristics

Fig. 1 illustrates the flow chart of this systematic review. A search through databases resulted in 8,501 records, and

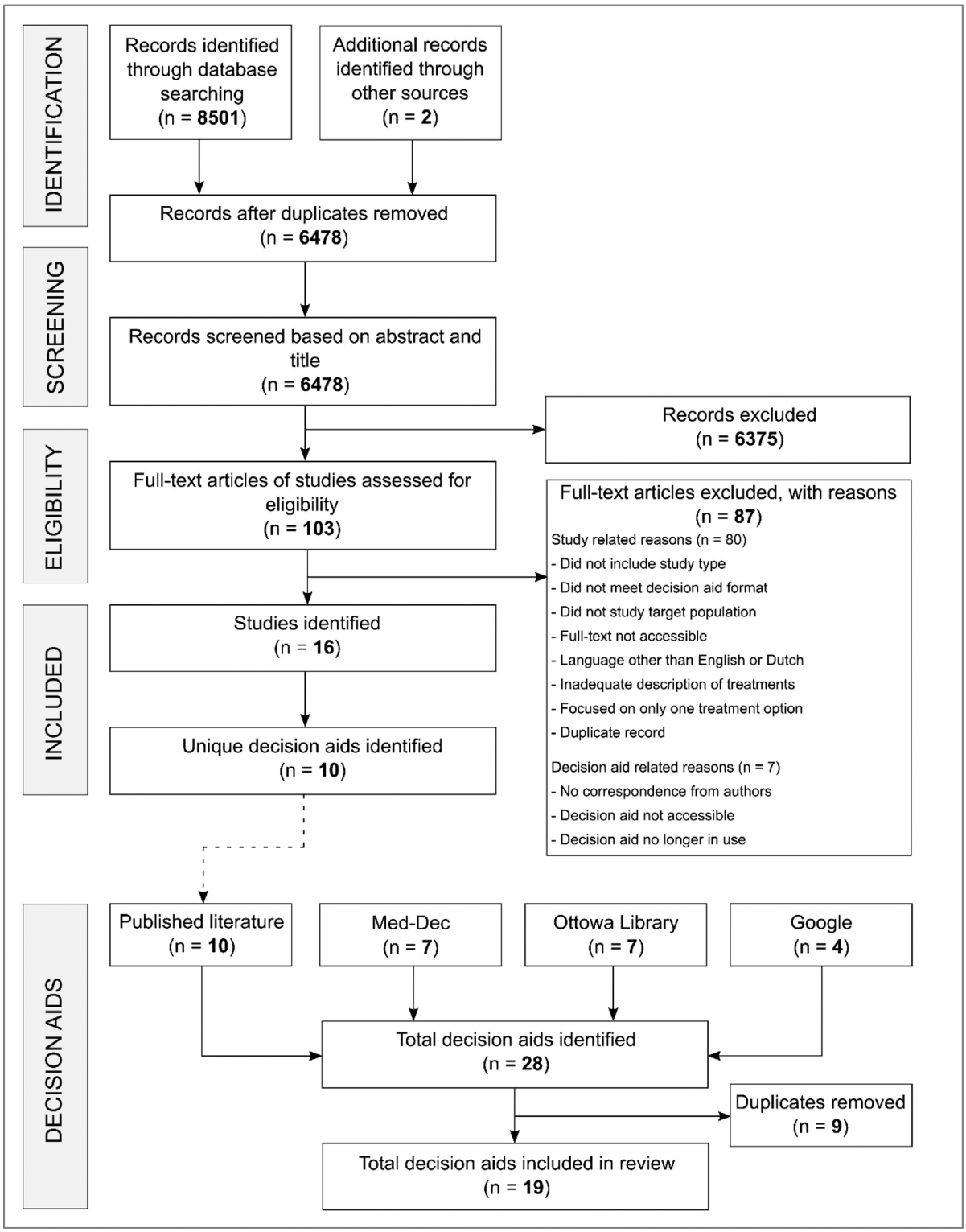

Fig. 1. Flowchart of study and decision aid selection process.

an additional 2 records through other sources. After removing 2,025 duplicates, 6,478 unique records were identified. Titles and abstracts were screened to identify 103 potentially eligible records. Initially, full text review of these records resulted in 25 articles that met eligibility criteria, including 17 unique DAs through published literature. However, given that full access to the DAs was required for inclusion in this review, we eventually included 16 articles including 10 unique and accessible DAs. An additional search through online sources resulted in another 18 DAs, leading to a total of 28 potential eligible DAs. After removing 9 duplicates, a total of 19 DAs was included in this review.

General characteristics of the included DAs are shown in Table 1. Ten aids originated from the United States, 8 from Europe, and 1 from Canada. Thirteen aids were written in English, and 6 in Dutch. Twelve of the DAs were web-based, and 7 were paper-based. Year of publication/last update ranged from 2007 to 2018, and almost all DAs contained the most common contemporary treatment options for LPC (active surveillance, radical prostatectomy, external beam radiotherapy, and brachytherapy). Nine DAs were obtained through online sources, and 10 DAs through published literature and had 1 or 2 associated studies [31–46], of which 7 were randomized controlled trials, 6 evaluation and/or usability studies, 2 protocols of randomized controlled trials, and 1 cross-sectional study. Methods and narrative descriptions of each study are shown in Table 2.

3.2. IPDAS

A summary of the results on the IPDAS checklist can be found in Appendix B. The percentage of IPDAS criteria met by the DAs ranged from 36% to 84% ($M = 59\%$, $SD = 12\%$). Ten of the 19 DAs included comparisons between positive and negative features of treatment options (53%), and 5 (26%) showed both features with equal detail. Regarding probabilities, 10 DAs (53%) did not define the reference class, 11 (58%) did not mention the specified time period, and 15 (79%) did not provide balanced information about outcome probabilities. Only 2 DAs (11%) mentioned the readability levels of their aid, and most had low scores on items related to the development process (5 out of 6 items were below 50%). Fig. 2 shows the IPDAS scores for each DAs, and Fig. 3A displays the variation of the IPDAS scores for each dimension.

3.3. Communicative aspects

A full summary of the results on the CA checklist can be found in Appendix C. The percentage of CA items met by the DAs ranged from 32% to 64% ($M = 51\%$, $SD = 9\%$). Fig. 2 shows the CA scores for each DA, and Fig. 3B displays the variation of the CA scores for each aspect.

3.3.1. Information presentation

All 19 DAs used absolute verbal expressions, of which 15 (79%) also used relative verbal expressions; 18 (95%) also used numerical information to convey probabilities, of which natural frequencies were most common (16; 84%) followed by absolute risks (13; 68%), percentages (10; 53%), and relative risks and number needed to treat (both 1; 5%). A minority (6; 32%) used visual aids, of which icon arrays were most frequently used (5; 26%), followed by pie and bar charts (2 and 1, respectively; 11% and 5%). The majority of the included DAs described uncertainties around probability information (15; 79%), of which all used verbal descriptions, 11 numerical ranges (73%), while only 1 communicated this visually (7%). Of the 16 DAs that explained disease-related factors, 4 (25%) used text-only, while the majority used both text and illustrations (75%). All DAs communicated the procedures of treatments verbally, of which 7 (37%) added illustrations and 3 (16%) included video clips. Furthermore, only 2 DAs (11%) presented the information in a balanced and unbiased way, 10 (53%) used roughly the same amount of text for each option, and 7 (37%) used language that was biased in favor of a specific treatment. Finally, of the 16 aids that contained positive features of treatment options, 6 (38%) provided an equal number of those features across options; whereas all aids contained negative features of options, of which 4 (21%) had an equal number of those features across options.

3.3.2. Personalization

The majority of the DAs (17; 89%) were tailored toward the specific stage of the prostate cancer. Tailoring toward the type of treatment, specific populations, or other prostate cancer-related factors (e.g., Prostate-specific antigen (PSA) value) only occurred in 3 (16%), 1 (5%), and 3 DAs (16%), respectively. Seven of the aids allowed (37%) patients to tailor the content of the DA. However, none of the DAs allowed patients to view probabilities based on their own situation, or to tailor information to patients' own preference for the mode of information presentation.

3.3.3. Interaction

Of the 16 DAs that helped patients to consider personal values and preferences, all passively asked patients to think about their personal values, and 10 (63%) used interactive methods such as weighting exercises (7; 44%) and/or sliders to assign values to preferences (4; 25%). Treatment comparison was realized by 13 aids (68%). Of these, cross tables including positive and negative features of treatments were a principle feature (11; 84%), along with verbal comparisons (9; 69%). Only 5 (39%) incorporated interactive methods such as rating or ranking exercises, and 1 (8%) provided the patient with the most suitable option on the basis of values and preferences. Finally, feedback was

Table 1
Summary of the decision aids included in the systematic review

ID	Title	Organization/authors	Country	Target audience	Publication date (last update)	Treatments discussed	Format	Identified through
1	Proven best choices: Treatment options for men with low-risk prostate cancer	Institute for Clinical and Economic Review (ICER)	USA	Low risk	Unknown (unknown)	AS, RP, BT (IMRT, PBT)	Paper	Online sources
2	De keuze maken: Beslissingshulp voor patiënten met vroegtijdige stadium gelokaliseerde prostaatkanker	KU Leuven LUCAS, Isebaert [31,32]	BE	Localized, early-stage	Oct 2007 (unknown)	WW, RP, EBRT, BT	Paper	Published literature
3	Healing choices for men with prostate cancer	Mount Sinai Medical Center, Fox Chase Cancer Center, Diefenbach [45]	USA	Localized, early-stage	2008 (unknown)	AS, RP, EBRT, BT	Web	Published literature
4	Beslissingshulp voor patiënten met vroegtijdige, gelokaliseerde prostaatkanker	KU Leuven LUCAS, Schrijvers [46]	BE	Localized, early-stage	2010 (Unknown)	WW, RP, EBRT, BT	Web	Published literature
5	Treatment choices for men with early-stage prostate cancer	National Cancer Institute	USA	Early-stage	Jan 2011 (unknown)	AS, RP, EBRT, BT, HT (IMRT, PBT, CT)	Paper	Online sources
6	Knowing your options: A decision aid for men with clinically localized prostate cancer	Agency for Healthcare Research and Quality	USA	Localized	Sep 2011 (Unknown)	AS, RP, EBRT, BT, HT (HIFU, PBT, CT)	Web	Online sources
7	Keuzehulp prostaatkanker	VU Medical Center, De Argumentenfabriek, Al-Itejawi [33,34]	NL	Localized	Sep 2013 (unknown)	AS, RP, EBRT, BT	Web	Published literature
8	Keuzehulp voor mannen met gelokaliseerde prostaatkanker	Radboud UMC Nijmegen, KWF Kankerbestrijding, Prostaatkankerstichting, van Tol-Geerdink [35,36]	NL	Localized	2012 (2014)	AS, RP, EBRT, BT (HIFU, CT)	Paper	Published literature
9	Making the choice: Deciding what to do about early-stage prostate cancer	Michigan Cancer Consortium, Holmes-Rovner [37]	USA	Early-stage	2004 (Apr 2014)	AS, WW, RP, EBRT, BT (CT)	Paper	Published literature
10	Prostate cancer treatment possibilities	National Health Service	UK	Prostate cancer	Unknown (Jan 2015)	AS, WW, RP, EBRT, BT, HT (HIFU, CT, TURP)	Web	Online sources
11	Treatment choices for localized prostate cancer: A shared decision-making program	Health Dialog, Arterburn [38], Formica [39]	USA	Localized	2013 (June 2015)	AS, WW, RP, EBRT, BT (combined EBRT and BT)	Paper	Published literature
12	Prostate cancer decision aid for early-stage patients	Queen's University, Feldman-Stewart [40]	CAN	Early-stage	Unknown (July 2015)	AS, WW, RP, EBRT, BT, HT	Web	Published literature
13	Treating localized prostate cancer: A review of the research for adults	Agency for Healthcare Research and Quality	USA	Localized	Jan 2016 (Unknown)	AS, WW, RP, EBRT, BT, HT	Paper	Online sources

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Table 1 (*Continued*)

ID	Title	Organization/authors	Country	Target audience	Publication date (last update)	Treatments discussed	Format	Identified through
14	P3P: Personal patient profile prostate	Dana-Farber Cancer Institute, University of Washington, Berry [41,42]	USA	Localized	Mar 2007 (May 2016)	AS, WW, RP, EBRT, BT, HT	Web	Published literature
15	Treatment choice: Prostate cancer	MAASTRO Clinic, UMC+ Maastricht	NL	Localized, low, medium, high risk	Unknown (Jan 2017)	AS, RP, EBRT, BT	Web	Online sources
16	Prostaatkanker keuzehulp	Zorgkeuzelab, Cuypers [43], Lamers [44]	NL	Localized, low, medium risk	2014 (Apr 2017)	AS, RP, EBRT, BT	Web	Published literature
17	Prostate cancer: Should I choose active surveillance?	Healthwise	USA	Localized, low risk	Unknown (May 2017)	AS, RP, RT	Web	Online sources
18	Treatment options for low-risk prostate cancer	Option grid collaborative, EBSCO health	UK	Low risk	Unknown (Feb 2018)	AS, WW, RP, RoP, EBRT, BT	Web	Online sources
19	Prostate cancer: Should I have radiation or surgery for localized prostate cancer?	Healthwise	USA	Localized, low risk	Unknown (Apr 2018)	AS, RP, EBRT, BT	Web	Online sources

Note: AS = active surveillance; BT = brachytherapy; CT = cryotherapy; EBRT = external beam therapy; HIFU = high intensity focused ultrasound; HT = hormonal therapy; IMRT = intensity-modulated radiation therapy; PBT = proton beam therapy; RP = radical prostatectomy; RoP = robot prostatectomy; RT = radiation therapy; TURP = transurethral resection of prostate; WW = watchful waiting; Minor discussed treatments are shown in parentheses.

given in various ways. Eight DAs (42%) showed the progress of the aid, 7 (37%) provided a summary of the values and preferences, and 11 (58%) had the opportunity to print the DA as a single document. In addition, 8 DAs (42%) provided space for note taking, and 3 (16%) included a short knowledge test.

3.3.4. Information control

Eleven DAs (58%) allowed patients to only receive information that they wanted to read. All except for 1 DA (95%) provided a step-by-step way to move through the DA, and 16 (84%) provided patients the opportunity to read more about a specific topic of interest. The majority (16; 84%) included the option to search for keywords by means of the "ctrl-f" function or a search bar.

3.3.5. Accessibility and suitability

In terms of accessibility, a total of 15 DAs (79%) were freely available on the web, and 5 (26%) required a login code to get full access. Eleven DAs (58%) reported the date of last update, and only 4 (21%) reported update frequency. The majority could be used on multiple devices (16; 84%), such as a laptop/computer or smartphone/tablet. Concerning suitability, 15 aids (79%) contained more than 10 (web) pages. Of the 14 aids that contained illustrations, 8 (57%) also contained illustrations that did not have a direct link with the message being presented verbally.

3.3.6. Source of information

Of the 19 DAs, most included probabilities for treatment side effects and/or quality of life (15; 79%) followed by mortality rate (12; 63%), incidence rate (9; 47%), treatment after active surveillance (6; 32%), survival rate (5; 26%), progression of cancer (4; 21%), and comorbidity (1; 5%). Only 6 DAs (32%) reported the original source of the data, of which half provided detailed information about the patients included in the data (sets) and the period of data collection.

4. Discussion

In this systematic review, we identified 19 DAs for LPC treatment decision-making, and reviewed them for IPDAS criteria and their usage of various CAs. Consistent with previous reviews [8–10,25], adherence to the IPDAS checklist varied substantially across DAs. Many did not adhere to good practice guidance on the presentation of outcome probabilities associated with treatment options, and also lacked substantial information regarding the development process and readability levels of the aids. More importantly, a novel finding of this review was that the use of CAs also varied substantially across DAs. Here, we will discuss some major CA shortcomings found in the DAs, and – based on insights from communication research – provide

Table 2
Summary of the studies included in the systematic review

DA ID	First author, year	Country	Study design	Study population	Methods	Results
2	Isebaert, 2007 [31]	BE	Evaluation study	Newly diagnosed LPC patients ($n = 50$)	Patients were given a DA and were interviewed before and after the decision-making consultation.	The use of a DA led to more active involvement in treatment decision-making and more information exchange between clinician and patient. Also, the DA had a positive impact on the decision-making process, and improved the quality of the consultation.
2	Isebaert, 2008 [32]	BE	Evaluation study	Newly diagnosed LPC patients ($n = 31$)	See Isebaert (2007)	See Isebaert (2007)
3	Diefenbach, 2018 [45]	USA	RCT	Newly diagnosed LPC patients ($n = 369$)	Patients were randomized to either the intervention group (standard consultation plus the DA) or the usual care group (standard consultation), and the study outcomes were decisional conflict and cancer-related distress.	The DA did not lead to less decisional conflict or cancer-related distress compared to the standard care condition. Patients who received the DA reported higher levels of decisional support, which was greatest for non-white minority patients and for patients with lower levels of education.
4	Schrijvers, 2013 [46]	USA	Usability study	Newly diagnosed LPC patients ($n = 74$)	Patients received the DA while their actual use (e.g., frequency of page visits, time spent on each page, and use of technological features) was examined by means of web-log analysis.	Patients most frequently visited and spent most time on webpages with information about treatment options. Furthermore, patients mostly (especially aged older than 70) used features such as comparative tables, followed by value clarification tools.
7	Al-Itejawi, 2016 [33]	NL	Usability and evaluation study	Newly diagnosed LPC patients ($n = 5$)	A participatory design (by means of focus groups, semi-structured interviews, and usability testing) was used to design a DA that met the patients' and healthcare professionals' needs.	Healthcare professionals considered medical information about treatment options and side effects as most important, while patients also found other nonmedical information (e.g., location) important to be included in the DA. Both parties expected the DA to be beneficial for the decision making process. Challenges were observed regarding the implementation of the DA into clinical practice, including barriers such as time and money consuming.
7	Al-Itejawi, 2017 [34]	NL	RCT (protocol)	Newly diagnosed LPC patients	A stepped-wedge cluster RCT will be conducted to assess the effectiveness (with decisional conflict as primary measure), and cost-utility of the DA compared to usual care.	N.A.
8	van Tol-Geerdink, 2013 [35]	NL	RCT	Newly diagnosed LPC patients ($n = 240$)	The effect of a DA on treatment choice and whether this was affected by increased patent participation was investigated by means of an RCT. Patients were randomized to either the intervention group (treatment discussion with a specialist plus the DA) or the usual care group (only treatment discussion with specialist).	For both groups, prostatectomy was the most frequently preferred treatment, but those who received the DA were more likely to choose brachytherapy and remained undecided less frequently compared to patients with usual care.
8	van Tol-Geerdink, 2016 [36]	NL	RCT	Newly diagnosed LPC patients ($n = 201$)	The effects of a DA on patient participation and different aspects of regret were investigated by means of an RCT. Patients were randomized to either the intervention group (treatment discussion with specialist plus the DA) or the usual care group (only treatment discussion with a specialist).	Patients who received the DA reported higher levels of patient participation. However, whether patients received the DA or usual care did not influence their levels of regret.

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Table 2 (***Continued***)

DA ID	First author, year	Country	Study design	Study population	Methods	Results
9	Holmes-Rovener, 2005 [37]	USA	Evaluation study	Newly diagnosed LPC patients ($n = 60$)	Formative evaluation methods including focus groups and surveys were used to evaluate a newly developed DA in plain language. Knowledge of patients who received the DA was compared to the knowledge of historical controls.	Patients who received the DA had more discussions with their clinician about surgery, better knowledge of side effects of radiotherapy, but were less likely to be informed about their personal stage of their cancer compared to the historical controls.
11	Arterburn, 2015 [38]	USA	Pre-post observational evaluation	Newly diagnosed LPC patients ($n = 117$)	A pre-post observational evaluation design was used to investigate associations between DA use (DA implementation vs. control group) and rates of receiving active treatment and healthcare costs.	DA implementation was associated with a lower level of receiving active treatment. However, no significant associations were found between healthcare costs in both the DA and control group.
11	Formica, 2017 [39]	USA	Cross-sectional study	Newly diagnosed low-risk LPC patients ($n = 452$)	A cross-sectional study was conducted to determine whether patients who received a DA had a better understanding of the rationale for active surveillance compared to patients who did not receive the DA.	Patients who received the DA had a better understanding of why active surveillance can be seen as a viable treatment option than patients who did not view the DA.
12	Feldman-Stewart, 2012 [40]	CAN	RCT	Newly diagnosed low- or intermediate early stage prostate cancer patients ($n = 156$)	Within a multicenter RCT, Patients either received a DA with or without value clarification exercises, and at 3 moments (during decision-making, 3 mo after completing treatment, and >1 y after the decision was made) the effects of the aids were measured on decisional conflict, preparation for decision making, and decisional regret.	No differences were observed between the 2 groups on any outcome during decision making and 3 mo after completing treatment. However, >1 y after the decision was made, patients who had received the DA with explicit value clarification exercises reported to be better prepared for decision making and to have less regret compared to patients who had received a DA without value clarification.
14	Berry, 2013 [41]	USA	RCT	Newly diagnosed LPC patients ($n = 467$)	A multicenter RCT was conducted to determine the effects of a DA on decisional conflict, time-to-treatment, and treatment choice. Patients were randomized to either the intervention group (a newly developed DA) or the usual care group (education material alone).	Time-to-treatment was comparable between the two groups. However, those patients who received the DA had lower levels of decisional conflict, and choose more often brachytherapy as treatment option compared to patients who only received education material.
14	Berry, 2018 [42]	USA	RCT	Newly diagnosed LPC patients ($n = 276$)	A multicenter RCT was conducted to determine the effect of a DA on decisional conflict. Patients were randomized to either the intervention group (a newly developed DA) or the usual care group (usual education plus links to websites), after which their decisional conflict was measured.	Patients who received the DA had lower levels of decisional conflict compared to patients who only received usual education. This effect was modified by factors such as the patients' risk level and resources.
16	Cuypers, 2015 [43]	NL	RCT (protocol)	Patients diagnosed with low or intermediate early-stage prostate cancer	An RCT (at the hospital level) will be conducted to assess the effectiveness (with decisional conflict as primary measure; and shared decision making and health outcomes as secondary measures) of the DA compared to usual care.	N.A.
16	Lamers, 2017 [44]	NL	RCT (only intervention arm)	Newly diagnosed patients with low- or intermediate risk prostate cancer ($n = 175$)	The effect of a newly developed DA on patients' preferences (and how the use of the DA could change this treatment preference) was investigated. The urologists' preferences were also asked.	After DA use, most patients preferred prostatectomy as treatment option, followed by active surveillance, brachytherapy and external beam therapy. For most patients, the DA did not change their initial treatment preference.

Note. DA = decision aid; LPC = localized prostate cancer; N.A. = not applicable; RCT = randomized controlled trial.

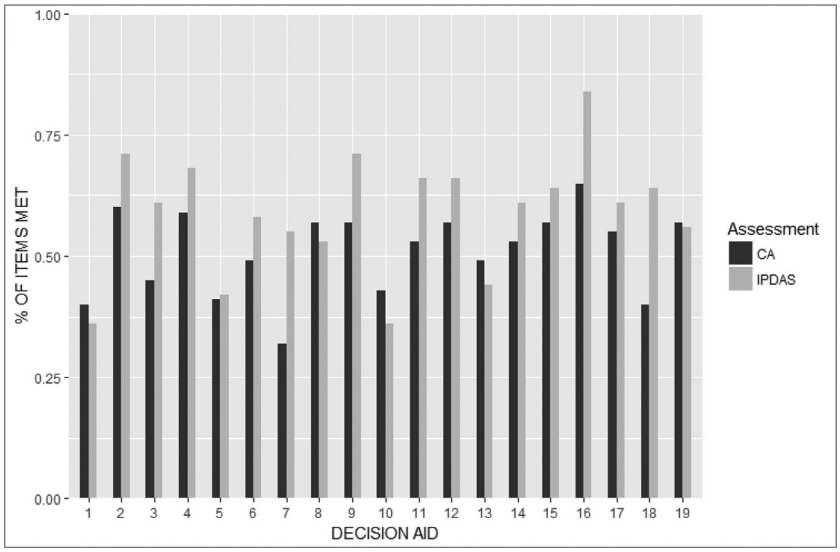

Fig. 2. Percentage of items met on the IPDAS and CA checklist for each decision aid. CA = communicative aspect; IPDAS = International Patient Decision Aid Standards.

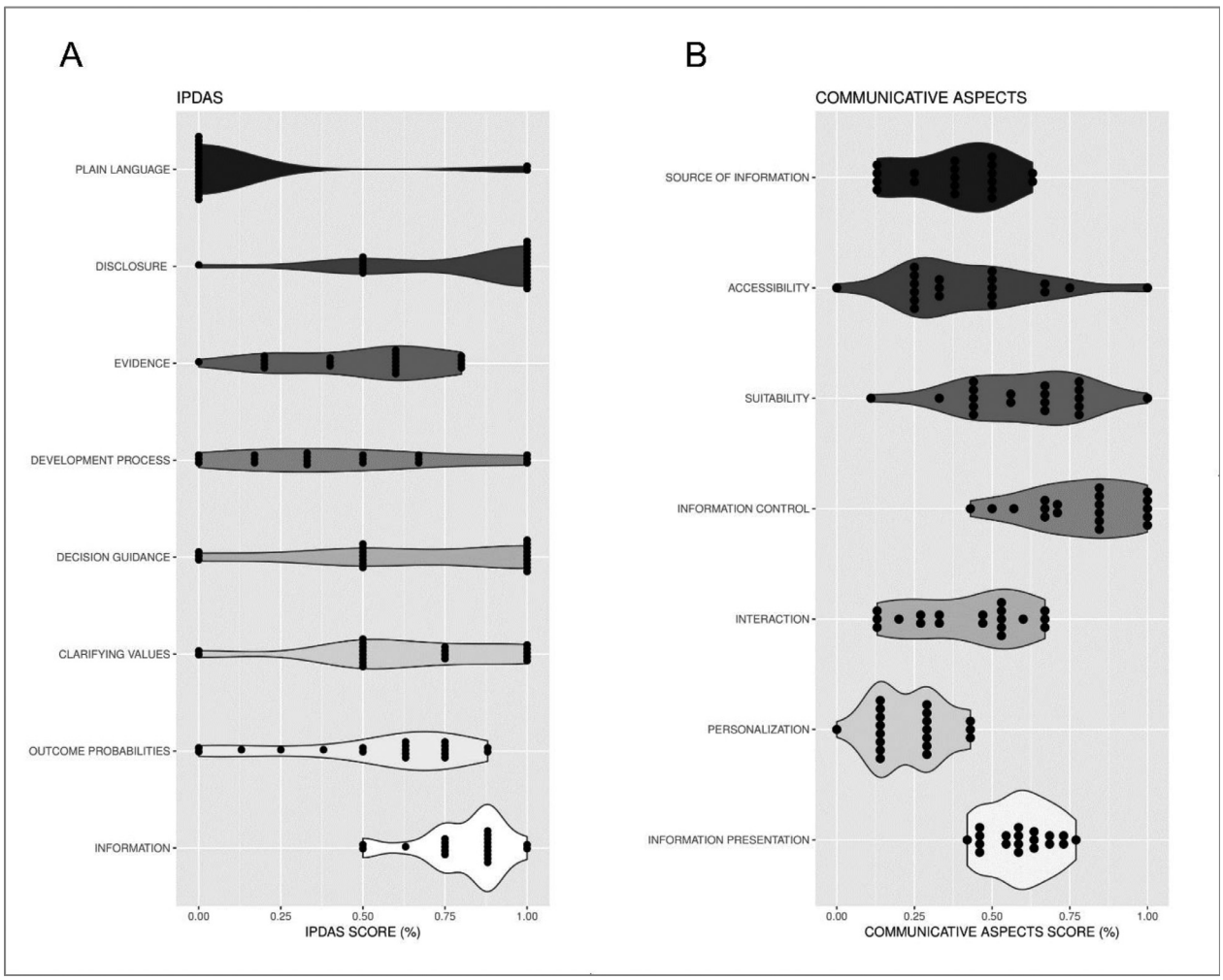

Fig. 3. Violin plots of the percentages of items met on the IPDAS checklist separated for each dimension (A), and percentage of items met on the CA checklist separated for each aspect (B). For each violin plot, dark dots represent the DAs. CA = communicative aspect; DAs = decision aids; IPDAS = International Patient Decision Aid Standards.

Table 3
Overview of communicative issues and recommendations for clinicians in the development and use of decision aids for localized prostate cancer treatment

Communicative aspect	Issues observed in DAs	Recommendations for clinicians
Information presentation	Probability information was often communicated verbally (e.g., high chance of. . .) or numerically (e.g., 10% chance of. . .) but less visually (e.g., icon arrays).	Consider the possible communication channels through which different pieces of information can be explained to patients.
Personalization	Probability information of side effects of associated treatment options were generic and based on average statistics.	Make use of recent developments in artificial intelligence for determining individualized outcome probabilities based on patient data.
	The mode of delivery was typically fixed (e.g., only text) and could not be personalized based on patients' preferences.	Consider the individual differences in information processing by patients, and how to personalize the mode of delivery of the DAs.
Interaction	Most side-by-side displays of the pros and cons of treatment options were biased and unbalanced.	Take the potential influence of several cognitive biases in DAs into account, and its influence on treatment decision-making.
	Interaction methods that elicit patients' values and preferences of treatment options were rarely used	Provide (active) interactive exercises that help patients clarify their values and preferences.
Suitability of information	Some were quite lengthy and most were fixed in terms of size and format.	Develop multiple formats of the DA (paper-based vs. web-based), or providing variation in terms of size (short vs. elaborated DAs).
Accessibility of information	Few were up-to-date and/or freely available to patients, some required login information to get full access.	Consider how DAs can be dynamically updated based on new evidence and patient data in order to facilitate maintenance and implementation of the tools.
Source of information	Original sources of probability information were most of the time unknown.	Provide reliable sources of information to help patients better understand how to apply the probabilities to their own situation.

recommendations and best practices for clinicians who are involved in the development or use of DA in their clinical practice (for an overview, see Table 3).

First of all, only a minority of the DAs used visual aids or other graphical methods to convey statistical information. However, given that this kind of information is often difficult to process and understand for many patients [18], various guidelines and best practices have been developed over the years how to communicate this through multiple channels [47,48]. Moreover, content-related information (e.g., LPC, procedures of treatments) was most of the time explained unimodally rather than multimodally. However, there is substantial evidence that the latter form often leads to better information recall [15–17], especially for people with lower health numeracy and health literacy skills [49]. Therefore, future DA developments should consider the possible *communication channels* (and their combination) through which different pieces of information can be explained to patients.

Another finding was that all DAs were generic and *lacked personalization,* particularly in terms of outcome probabilities (e.g., option to view statistics based on each patient's medical history) and mode of delivery (e.g., option to adjust the presentation modality). However, insights from health communication research suggest that individualized information is more likely to be considered as personally relevant (and hence, to be read) compared to generic and static information [20,21] This in-depth processing of information can lead to higher levels of engagement, which potentially encourages patients to actively participate in SDM [50]. Recent technological developments in data science and artificial intelligence offer promise for the generation of individualized risks and benefits of treatment options, and future studies should determine whether this personalized approach of DAs would also lead to improvements in LPC patients' understanding of risks [51,52].

Furthermore, only a small number of DAs contained *interactive* methods to assess patients' values and preferences, or to compare pros and cons of the available options. This aspect of interaction is particularly important for preference-sensitive decisions such as for LPC, in which there is typically no single best option. The majority of the aids incorporated interaction methods such as a side-by-side table of the positive and negative features of options. Interestingly, our analyses also demonstrated that many of these tables included biases such as an unequal number of positive and negative features of treatments, or a dissimilar amount of text for each option. Such (cognitive) biases could unintentionally influence patients' decision-making [53]. It is important that such potential biases are taken into consideration during the development and use of DAs.

This review further reveals some other communicative issues that could potentially hinder the successful implementation of the DAs in clinical practice. For instance, the majority of the aids did not specify the original source of statistical information, or did not mention anything about the characteristics of the patients involved in the clinical

trials. However, this information could be helpful to patients to better understand how to apply the probabilities to their own situation [54]. Furthermore, not all DAs were up-to-date and freely available to patients, some required login information to get full access, and most were quite lengthy in terms of size, which limits their potential usage. Therefore, we recommend clinicians who make use of DAs in their daily clinical practice to be aware of the *suitability* and *accessibility* of their tools for their patients. In addition, clinicians who are involved in the development of DAs might consider how such tools can be dynamically updated based on new evidence and patient data in order to facilitate maintenance and implementation of the tools. Here, again, recent technological advances may be helpful.

Finally, an interesting question is whether DAs with high scores on CAs also lead to improved quality of decision-making or other outcome measures of SDM. This could not be investigated in the current review, since we could not link the outcome measures of the reported trials with our assessment measures. Rather, our main focus was on conducting a systematic description of the use of CAs and IPDAS criteria by currently available DAs for LPC treatment, in order to determine its shortcomings. Nevertheless, this is an important issue, and future studies are needed in order to determine whether improved communicative characteristics of DAs in (prostate) cancer care will lead to improvements in SDM outcomes such as decisional conflict, decisional regret, knowledge, or preparation for decision-making.

5. Conclusions

The integration of DAs for LPC into daily clinical practice is becoming an important intervention to support patient participation in SDM [4,5,55]. Using insights from communication research and relying on technological advances in artificial intelligence research, we argue that patient DAs for LPC treatment could be further improved by taking CAs such as personalization of treatment information, interaction, and the possible channels to communicate information into account. Such improvements are not only limited to the domain of prostate cancer care, but are also useful to many other decisions in health care that do not have a single best option. We therefore believe that our findings have implications for both clinicians who are making use of DAs in daily clinical practice, as well as for clinicians who are involved in the development of such decision support tools.

Acknowledgments

We would like to thank Kim Tenfelde for her help with assessing part of the decision aids, and Robin Vernooij for developing the search strategy.

Appendices

Appendix A

Tables A.1, A.2, A.3, A.4, and A.5.

Table A.1
Search strategy MEDLINE

1	"Prostatic Neoplasms"[Mesh]
2	prostat*[tiab] AND neoplas*[tiab]
3	prostat*[tiab] AND cancer*[tiab]
4	prostat*[tiab] AND carcin*[tiab]
5	prostat*[tiab] AND tumour*[tiab]
6	prostat*[tiab] AND tumor*[tiab]
7	prostat*[tiab] AND metasta*[tiab]
8	prostat*[tiab] AND malig*[tiab]
9	"Prostate"[Mesh]
10	neoplas*[tiab] OR cancer*[tiab] OR carcin*[tiab] OR tumo*[tiab] OR metasta*[tiab] OR malig*[tiab] OR "Neoplasms"[Mesh]
11	#9 AND #10
12	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #11
13	"Decision Making"[Mesh]
14	"Clinical Decision-Making"[Mesh]
15	"Decision Support Systems, Clinical"[Mesh]
16	"Decision Support Techniques"[Mesh]
17	"Choice Behavior"[Mesh]
18	#13 OR #14 OR #15 OR #16 OR #17
19	(decision*[tiab] OR decid*[tiab]) AND (support*[tiab] OR tool*[tiab] OR aid*[tiab] OR instrument*[tiab] OR technolog*[tiab] OR system*[tiab])
20	decision aid*[tw]
21	Interactive health communication[tw]
22	(interacti* AND (internet OR online OR graphic* OR booklet* OR leaflet* OR tool))[tw]
23	shared decision making[tw]
24	#19 OR #20 OR #21 OR #22 OR #23
25	#18 OR #24

(*continued*)

26	"Patients"[Mesh]
27	"Patient Participation"[Mesh]
28	"Patient Education as Topic"[Mesh]
29	"Patient Satisfaction"[Mesh]
30	#26 OR #27 OR #28 OR #29
31	#25 OR #30
32	"Prostatectomy"[Mesh]
33	prostatectom*[tiab] OR (transurethral*[tiab] AND (resection*[tiab] OR removal*[tiab]) AND prostat*[tiab])
34	#32 OR #33
35	"Radiotherapy"[Mesh]
36	radiotherap*[tiab]
37	#35 OR #36
38	“Watchful Waiting”[Mesh]
39	(Watchful*[tiab] AND waiting*[tiab]) OR (active[tiab] AND surveillance[tiab])
40	#38 OR #39
41	“Hormone Replacement Therapy”[Mesh]
42	(Hormon*[tiab] AND therap*[tiab])
43	#41 OR #42
44	treatment*[tiab]
45	"Prostatic Neoplasms/ Therapy"[Mesh]
46	#34 OR #37 OR #40 OR #43 OR #44 OR #45
47	#12 AND #31 AND #46
48	Limit 47 to (English or Dutch language and yr=”1990-Current”)

Table A.2
Search strategy EMBASE

1	prostate cancer’/exp
2	prostat*:ab,ti AND neoplas*:ab,ti
3	prostat*:ab,ti AND cancer*:ab,ti
4	prostat*:ab,ti AND carcin*:ab,ti
5	prostat*:ab,ti AND tumour*:ab,ti
6	prostat*:ab,ti AND tumor*:ab,ti
7	prostat*:ab,ti AND metasta*:ab,ti
8	prostat*:ab,ti AND malig*:ab,ti
9	‘prostate’/exp
10	neoplas*:ab,ti OR cancer*:ab,ti OR carcin*:ab,ti OR tumo*:ab,ti OR metasta*:ab,ti OR malig*:ab,ti OR ’neoplasm’/exp
11	#9 AND #10
12	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #11
13	‘decision making’/exp
14	‘clinical decision making’/exp
15	‘clinical decision support system’/exp
16	‘decision support system’/exp
17	#13 OR #14 OR #15 OR #16
18	(decision*:ab,ti OR decid*:ab,ti) AND (support*:ab,ti OR tool*:ab,ti OR aid*:ab,ti OR instrument*:ab,ti OR technolog*:ab,ti OR system*:ab,ti)
19	decision aid*.tw
20	Interactive health communication.tw
21	(interacti* AND (internet OR online OR graphic* OR booklet* OR leaflet* OR tool)).tw
22	shared decision making.tw
23	#18 #19 OR #20 OR #21 OR #22
24	#17 OR #23
25	‘consumer’/exp
26	‘patient participation’/exp
27	‘patient education’/exp
28	‘patient satisfaction’/exp
29	#25 OR #26 OR #27 OR #28
30	#24 OR #29
31	‘Prostatectomy’/exp
32	prostatectom*:ab,ti OR (transurethral*:ab,ti AND (resection*:ab,ti OR removal*:ab,ti) AND prostat*:ab,ti)
33	#31 OR #32
34	‘Radiotherapy’/exp
35	radiotherap*:ab,ti
36	#34 OR #35
37	‘watchful waiting’/exp

(*continued*)

38	(Watchful*:ab,ti AND waiting*:ab,ti) OR (active:ab,ti AND surveillance:ab,ti)
39	#37 OR #38
40	'hormonal therapy'/exp
41	(Hormon*:ab,ti AND therap*:ab,ti)
42	#40 OR #41
43	treatment*:ab,ti
44	'prostate cancer'/exp/dm_th
45	#33 OR #36 OR #39 OR #42 OR #43 OR #44
46	#12 AND #30 AND #45
47	#46 AND ([1990-2017]/py AND ([dutch]/lim OR [english]/lim))

Table A.3
Search strategy CINAHL

S1	(MH "Prostatic Neoplasms")
S2	AB (prostat* AND neoplas*) AND TI (prostat* AND neoplas*)
S3	AB (prostat* AND cancer*) AND TI (prostat* AND cancer*)
S4	AB (prostat* AND carcin*) AND TI (prostat* AND carcin*)
S5	AB (prostat* AND tumour*) AND TI (prostat* AND tumour*)
S6	AB (prostat* AND tumor*) AND TI (prostat* AND tumor*)
S7	AB (prostat* AND metasta*) AND TI (prostat* AND metasta*)
S8	AB (prostat* AND malig*) AND TI (prostat* AND malig*)
S9	(MH "Prostate")
S10	AB (neoplas* OR cancer* OR carcin* OR tumo* OR metasta* OR malig*) OR TI (neoplas* OR cancer* OR carcin* OR tumo* OR metasta* OR malig*) OR (MS "Neoplasms")
S11	S9 AND S10
S12	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S11
S13	(MH "Decision Making")
S14	(MH "Decision Making, Clinical")
S15	(MH "Decision Support Systems, Clinical")
S16	(MH "Decision Support Techniques")
S17	S13 OR S14 OR S15 OR S16
S18	AB (decision* OR decid*) AND (support* OR tool* OR aid* OR instrument* OR technolog* OR system*) OR TI (decision* OR decid*) AND (support* OR tool* OR aid* OR instrument* OR technolog* OR system*)
S19	TX decision aid*
S20	TX interactive health communication
S21	TX (interacti* AND (internet OR online OR graphic* OR booklet* OR leaflet* OR tool))
S22	TX shared decision making
S23	S18 OR S19 OR S20 OR S21 OR S22
S24	S17 OR S24
S25	(MH "Patients")
S26	(MH "Consumer Participation")
S27	(MH "Patient Education")
S28	(MH "Patient Satisfaction")
S29	S25 OR S26 OR S27 OR S28
S30	S24 OR S29
S31	(MH "Prostatectomy")
S32	AB (prostatectom* OR (transurethral* AND (resection* OR removal*) AND prostat*)) OR TI (prostatectom* OR (transurethral* AND (resection* OR removal*) AND prostat*))
S33	S31 OR S32
S34	(MH "Radiotherapy")
S35	AB (radiotherap*) OR TI (radiotherapy*)
S36	S34 OR S35
S37	AB ((Watchful* AND waiting*) OR (active AND surveillance))
S38	TI ((Watchful* AND waiting*) OR (active AND surveillance))
S39	S37 OR S38
S40	(MH "Hormone Replacement Therapy")
S41	(MH "Hormone Therapy")
S42	AB (Hormon* AND therap*) OR TI (Hormon* AND therap*) OR TI (
S43	S40 OR S41 OR S42
S44	AB (treatment*) OR TI (treatment*)
S45	(MH "Prostatic Neoplasms/TH")
S46	S33 OR S36 OR S39 OR S43 OR S44 OR S45
S47	S12 AND S30 AND S46
S48	S47: Limiters – (English language)

Table A.4
Search strategy Cochrane Library

1	MeSH descriptor: [Prostatic Neoplasms] explode all trees
2	(prostat* AND neoplas*):ti, ab, kw (Word variations have been searched)
3	(prostat* AND cancer*):ti, ab, kw (Word variations have been searched)
4	(prostat* AND carcin*):ti, ab, kw (Word variations have been searched)
5	(prostat* AND tumour*):ti, ab, kw (Word variations have been searched)
6	(prostat* AND tumor*):ti, ab, kw (Word variations have been searched)
7	(prostat* AND metasta*):ti, ab, kw (Word variations have been searched)
8	(prostat* AND malig*):ti, ab, kw (Word variations have been searched)
9	MeSH descriptor: [Prostate] explode all trees
10	MeSH descriptor: [Neoplasms] explode all trees
11	(neoplas* OR cancer* OR carcin* OR tumo* OR metasta* OR malig*):ti, ab, kw (Word variations have been searched)
12	#9 AND (#10 OR #11)
13	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #12
14	MeSH descriptor: [Decision Making] this term only
15	MeSH descriptor: [Clinical Decision-Making] this term only
16	MeSH descriptor: [Decision Support Systems, Clinical] this term only
17	MeSH descriptor: [Decision Support Techniques] this term only
18	MeSH descriptor: [Choice Behavior] this term only
19	#14 OR #15 OR #16 OR #17 OR #18
20	(decision* OR decid*) AND (support* OR tool* OR aid* OR instrument* OR technolog* OR system*):ti, ab, kw (Word variations have been searched)
21	decision aid:ti, ab, kw (Word variations have been searched)
22	Interactive health communication:ti, ab, kw (Word variations have been searched)
23	(interacti* AND (internet OR online OR graphic* OR booklet* OR leaflet* OR tool)):ti, ab, kw (Word variations have been searched)
24	shared decision making:ti, ab, kw (Word variations have been searched)
25	#20 OR #21 OR #22 OR #23 OR #24
26	#19 OR #25
27	MeSH descriptor: [Patients] explode all trees
28	MeSH descriptor: [Patient Participation] this term only
29	MeSH descriptor: [Patient Education as Topic] this term only
30	MeSH descriptor: [Patient Satisfaction] this term only
31	#27 OR #28 OR #29 OR #30
32	#26 OR #31
33	MeSH descriptor: [Prostatectomy] this term only
34	prostatectom* OR (transurethral* AND (resection* OR removal*) AND prostat*):ti, ab, kw (Word variations have been searched)
35	#33 OR #34
36	MeSH descriptor: [Radiotherapy] this term only
37	radiotherap*:ti, ab, kw (Word variations have been searched)
38	#36 OR #37
39	MeSH descriptor: [Watchful Waiting”] this term only
40	(Watchful* AND waiting*) OR (active AND surveillance):ti, ab, kw (Word variations have been searched)
41	#39 OR #40
42	MeSH descriptor: [Hormone Replacement Therapy] this term only
43	(Hormon* AND therap*):ti, ab, kw (Word variations have been searched)
44	#42 OR #43
45	treatment*:ti, ab, kw (Word variations have been searched)
46	MeSH descriptor: [Prostatic Neoplasms] explode all trees and with qualifier(s): [Therapy − TH)
47	#35 OR #38 OR #41 OR #44 OR #45 OR #46
48	#13 AND #32 AND #47
49	#48 in Trials
50	Limit 49 to (yr = ”1990-Current”)

Table A.5
Search strategy PsycINFO

1	exp Prostate/ AND exp Neoplasms/
2	(prostat* AND neoplas*).ti,ab.
3	(prostat* AND cancer*).ti,ab.
4	(prostat* AND carcin*).ti,ab.
5	(prostat* AND tumour*).ti,ab.
6	(prostat* AND tumor*).ti,ab.
7	(prostat* AND metasta*).ti,ab.
8	(prostat* AND malig*).ti,ab.
9	exp Prostate/
10	(neoplas* OR cancer* OR carcin* OR tumo* OR metasta* OR malig*).ti,ab. OR (exp Neoplasms/)
11	#9 AND #10
12	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #11
13	exp Decision Making/
14	Clinical decision-making.mp
15	exp Decision Support Systems/
16	Decision support techniques.mp
17	exp Choice Behavior/
18	#13 OR #14 OR #15 OR #16 OR #17
19	(decision* OR decid*) AND (support* OR tool* OR aid* OR instrument* OR technolog* OR system*).mp
20	decision aid*.mp
21	Interactive health communication.mp
22	(interacti* AND (internet OR online OR graphic* OR booklet* OR leaflet* OR tool))[tw]
23	shared decision making[tw]
24	#19 OR #20 OR #21 OR #22 OR #23
25	#18 OR #24
26	exp patients/
27	exp client participation/
28	exp client education/
29	exp client satisfaction/
30	#26 OR #27 OR #28 OR #29
31	#25 OR #30
32	exp surgery/
33	prostatectom* OR (transurethral* AND (resection* OR removal*) AND prostat*).ti,ab
34	#32 OR #33
35	exp radiation therapy/
36	radiotherap*.ti,ab
37	#35 OR #36
38	(Watchful* AND waiting*) OR (active AND surveillance).ti,ab
39	exp hormone therapy/
40	(Hormon* AND therap*).ti,ab
41	#39 OR #40
42	treatment*.ti,ab
43	exp drug therapy/
44	#34 OR #37 OR #38 OR #41 OR #42 OR #43
45	#12 AND #31 AND #44
46	Limit 47 to (english language and yr=”1990-Current”)

Appendix B

Table B.1.

Table B.1
Results from the International Patient Decision Aids Standards (IPDAS) checklist of the patient decision aids ($n = 19$)

Item	IPDAS dimension	Item description	*n*	%
1	Information about options	The DST describes the health condition or problem (intervention, procedure, or investigation) for which the index decision is required	19	100
2		The DST described the decision that needs to be considered (the index decision)	18	95
3		The DST describes the options available for the index decision	19	100
4		The DST describes the natural course of the health condition or problem, if no action is taken	17	89
5		The DST describes positive features (benefits or advantages) of each option	15	79
6		The DST describes negative features (harms, side effects or disadvantages) of each option	19	100
7		The DST makes it possible to compare the positive and negative features of the available options	10	53
8		The DST shows the negative and positive features of options with equal detail	5	26
9	Outcome probabilities	The DST provides information about outcome probabilities associated with the options (i.e, the likely consequences of decisions)	17	89
10		The DST specifies the defined group (reference class) of patients for which the outcome probabilities apply	10	53
11		The DST specifies the event rates for the outcome probabilities	14	74
12		The DST specifies the time period over which the outcome probabilities apply	8	42
13		The DST allows the user to compare outcome probabilities across options using the same denominator and time period	10	53
14		The DST provides information about the levels of uncertainty around event or outcome probabilities	11	58
15		The DST provides more than one way of viewing the probabilities	9	47
16		The DST provides balanced information about event or outcome probabilities to limit framing bias	4	21
17	Clarifying values	The DST describes the features of options to help patients imagine what it is like to experience physical effects	17	89
18		The DST describes the features of options to help patients imagine what it is like to experience the psychological effects	7	37
19		The DST describes the features of options to help patients imagine what it is like to experience social effects	10	53
20		The DST asks patients to think about which positive and negative features of the options matters most to them	14	74
21	Decision guidance	The DST provides a step-by-step way to make a decision	13	68
22		The DST includes tools like worksheets or lists of questions to use when discussing options with a practitioner	12	63
23	Development process	The DST (or associated paper) mentions that the development process included finding out what clients or patients need to prepare them to discuss a decision	6	32
24		The DST (or associated paper) mentions that the development process included finding out what health professionals need to prepare them to discuss a specific decision with patients	4	21
25		The DST (or associated paper) mentions that the development process included expert review by clients/patients not involved in producing the DST	9	47
26		The DST (or associated paper) mentions that the development process included expert review by health professionals not involved in producing the DST	16	84
27		The DST (or associated paper) mentions that the DST was field tested with patients who were facing the decision	8	42
28		The DST (or associated paper) mentions that the DST was field tested with practitioners who counsel patients who face the decision	7	37
29	Using evidence	The DST (or associated paper) provides citations to the studies selected	12	63
30		The DST (or associated paper) describes how research evidence was selected or synthesized	13	68
31		The DST (or associated paper) provides a production or publication rate	12	63
32		The DST (or associated paper) provides information about the proposed update policy	7	37
33		The DST (or associated paper) describes the quality of the research evidence used	3	16
34	Disclosure and transparency	The DST (or associated technical documentation) provides information about the funding used for development	13	68
35		The DST includes author/developer credentials or qualifications	18	95
36	Plain language	The DST (or associated paper) reports readability levels (using one or more of the available scales)	2	11

Note. DST = decision support technology.

Appendix C

Table C.1.

Table C.1
Results from the communicative aspects (CAs) checklist of the patient decision aids ($n = 19$)

Item	Aspect	Item description	*n*	%
1	Information presentation	Number of decision aids that included probabilistic information	19	100
		Methods used to communicate probabilistic information:		
2		Verbal		
		Absolute risks descriptions	19	100
		Relative risks descriptions	15	79
3		Numerical		
		Percentages	10	53
		Natural frequencies	16	84
		Absolute risks	13	68
		Relative risks	1	5
		Absolute risk reduction	0	0
		Relative risk reduction	0	0
		Number needed to treat/harm	1	5
4		Visual		
		Pie chart	2	11
		Bar chart	1	5
		Line graph	0	0
		Icon array	5	26
		Risk scale	0	0
5		Number of decision aids that described uncertainties around probabilities	15	79
		Methods used to communicate uncertainties:		
6		Verbal		
		Textual descriptions	15	100
7		Numerical		
		Numerical range	11	73
8		Visual		
		Confidence intervals	0	0
		Colored pictograms	1	7
9		Number of decision aids that included disease-related information	16	84
		Methods used to communicate this information:		
10		Verbal (text)	16	100
11		Visual (illustrations)	12	75
12[a]		Audiovisual (video clips) ($n = 10$)	3	30
13[a]		Audio (audio clips) ($n = 10$)	1	10
14		Number of decision aids that included information about procedures of treatments	19	100
		Methods used to communicate this information:		
15		Verbal (text)	19	100
16		Visual (illustrations)	7	37
17[a]		Audiovisual (video clips) ($n = 12$)	2	17
18[a]		Audio (audio clips) ($n = 12$)	0	0
19		Number of decision aids that presented the information in a balanced and unbiased way	2	11
		Methods used for balanced and unbiased information:		
20		Uses roughly the same amount of text for each option	10	53
21		Displays statistics in the same wat for each option (n=15)	10	67
22		Uses similar fonts for each option	16	84
23		Uses language that is not biased in favor of a specific option	12	63
24		Presents equal number of positive features of each option (n=16)	6	38
25		Presents equal number of negative features of each option	4	21
26		Keeps the order of positive and negative features constant (n=16)	14	88
27	Personalized information	Tailoring in general towards type of treatment	3	16
28		Tailoring in general towards specific populations	1	5
29		Tailoring in general towards PSA value or Gleason score	3	16
30		Tailoring in general towards prostate cancer stage	17	89
31		Probability tailoring	0	0
32		Mode of presentation tailoring	0	0
33		Content tailoring	7	37

(*continued*)

Table C.1 (***Continued***)

Item	Aspect	Item description	*n*	%
34	Interaction	Number of decision aids that help patients to consider personal values and preferences	16	84
		Methods used to consider or assess values and preferences (*n*=16):		
		Passive methods		
35		Recommends patients to think about their values and preferences	16	100
		Asks patients for their personal values and preferences	10	63
		Active methods		
36		Weighting exercises	7	44
37		Sliders to assign values to preferences	4	25
38		Number of decision aids that help allow for comparison of positive and negative features of treatment options	13	68
		Methods used to compare positive and negative features of options (*n*=13):		
39		Ranking or rating scale	5	39
40		Table to compare positive and negative features	11	84
41		Verbal comparisons	9	69
42		Discrete choice task	1	8
43		Number of decision aids that provide patient the most suitable treatment option	1	5
		Methods used to provide feedback:		
44		The decision aid shows the progress of the decision aid	8	42
45		The decision aid provides patients a summary of their values and preferences	7	37
46		The decision aid permits printing as a single document	11	58
47		The decision aid provides space for note taking	8	42
48		The decision aid includes a short knowledge test	3	16
49	Information control	The decision aid allows for patients to only receive information that they want to read	11	58
50		The decision aid provides a step-by-step way to move through the decision aid	18	95
51		The decision aid provides the patient the opportunity to read more about a specific topic of interest	16	84
52		The decision aid provides access to external sources	17	89
53		The decision aid provides access to internal sources	11	58
54		The decision aid allows for patients to search for keywords	16	84
55[a]		The decision aid makes it easy for patients to return to previous parts of the decision aid ($n = 12$)	11	92
56	Suitability of information	The decision aid contains less than 10 (web) pages	4	21
57[a]		The decision aid contains videos with a length of less than 1 min ($n = 4$)	1	25
58		The decision aid has a conversational (writing) style	18	95
59		The decision aid has irrelevant illustrations ($n = 14$)	8	57
60	Accessibility of information	The decision aid is freely available on the web	15	79
61		The decision aid requires a login code	5	26
62		The decision aid is purely computer based	12	63
63		The decision aid requires access to internet for its use	12	63
64		The decision aid reports last update	11	58
65		The decision aid reports update frequency	4	21
66		The decision aid requires staff assistance	9	47
67		The decision aid is self-administered	18	95
68		The decision aid can be used on multiple devices	16	84
	Source of information	Types of outcome probabilities reported by the decision aid:		
69		Mortality rate	12	63
		Survival rate	5	26
70		Incidence rate	9	47
		Progression free survival	4	21
71		Treatment side effects	15	79
72		Treatment after active surveillance	6	32
		Comorbidity	1	5
73		Number of decision aids that mentioned on which datasets the probabilistic information are based on	6	32
		Types of datasets ($n = 6$):		
		Observational data	2	33
		Randomized controlled trials data	3	50
		Patient reported outcomes data	2	33
		Data combined from different studies	5	83
		Type of information about the data(sets) provided by the decision aid ($n = 6$):		
74		About what scale the patient data have been collected	2	33
75		About the number of patients on which the data are based on	1	17
		About characteristics of patients on which the data are based on	0	0
76		About the period of time of data collection	1	17

[a] This item does not apply to paper-based decision aids.

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