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Implementation of a decision aid for localized prostate cancer in routine care: A successful implementation strategy

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Abstract

For the treatment choice of localized prostate cancer, effective patient decision aids have been developed. The implementation of decision aids in routine care, however, lags behind. Main known barriers are lack of confidence in the tool, lack of training on its use, lack of resources and lack of time. A new implementation strategy addresses these barriers. Using this implementation strategy, the implementation rate of a decision aid was measured in eight hospitals and questionnaires were filled out by 24 care providers and 255 patients. The average implementation rate was 60 per cent (range 31%–100%). Hardly any barriers remained for care providers. Patients who did not use the decision aid appeared to be more unwilling than unable to use the decision aid. By addressing known barriers, that is, informing care providers on the effectiveness of the decision aid, providing instructions on its use, embedding it in the existing workflow and making it available free of charge, a successful implementation of a prostate cancer decision aid was reached.

Keywords

decision aid, implementation, implementation barriers, implementation strategy, prostate cancer, shared decision-making, treatment choice

Background

For primary localized prostate cancer, different treatment modalities are available: active surveillance, surgery, interstitial radiotherapy (brachytherapy) and external beam radiotherapy. For most patients with localized tumours, current guidelines do not indicate one ‘best’ option.^{1,2} The treatments are comparable for survival, but differ with respect to side effects. This implies that patient values and preferences should play a key role. A useful tool to involve patients in the choice of their treatment is a decision aid (DA).

A DA is a tool (booklet or website) with two goals: (1) to inform patients about the risks and benefits of their treatment options and (2) to stimulate patients to consider which risks or benefits are most important for them. According to the International Patient Decision Aid Standards (IPDAS), DAs should at least contain the following main elements: explaining the fact that there is a decision to be made, describing the treatment options with their pros and cons and helping patients to make a personal trade-off by presenting the pros and cons in a structured and balanced way.

DAs appear to have effects on patients, as shown in Lin et al.³ and Stacey et al.⁴ DAs lead to more knowledge about treatments, more realistic expectations and more shared decision-making without increasing anxiety or regret. With DA, patients are more certain about the choice, the choice reflects what matters to the patient and fewer patients want intensive treatment.^{3,4} Although some patients prefer to leave the decision to the physician, the vast majority of patients consider it a good idea to be offered the possibility to choose, even of patients who decline to make their own treatment choice.⁵

Given the fact that DAs have been shown to be effective, more effort needs to be made to implement this evidence⁶ as the implementation of DAs in routine care lags behind.⁷ To date, many patients who are eligible for more than one treatment option, do not receive a DA. A systematic implementation strategy aims to improve this. According to the model by Grol,⁸ for successful implementation, different players in health care should be involved, interventions should be adapted to local needs and barriers to change should be identified. Literature reviews have identified barriers for implementation of DAs; main barriers reported by physicians were lack of confidence in the content, lack of training on how to use decision support, fear of disruption of the workflow, time constraints, low accessibility and high cost.^{7,9–11} For example, a recent study concluded that implementation would be facilitated by informing professionals about the positive effects of the DA and by embedding the DAs in the existing workflow.¹²

We designed an implementation strategy for DAs, in which we incorporated the implementation lessons from earlier studies.^{7,9–11} The implementation strategy described in this study applies to

Table 1. Implementation strategy.

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1. *Inform and create support* for use of the decision aid (DA). In each participating hospital, the DA was presented, together with the results of a randomized trial showing its effectiveness.
 2. *Document the current care path* to find the best way, in consultation with the health care professionals, to incorporate the decision aid in the existing care path. This involved both the timing of the DA (directly following the diagnosis or later) and the health care professional to present it (urologist or specialized nurse).
 3. *Address cost and accessibility of the DA.* In this study, the booklets were made available to the hospitals free of charge.
 4. *Provide a short written instruction* for professionals who present the DA to the patients. This instruction (on a plasticized card) listed the following steps: (1) explain there is a treatment choice, (2) indicate which options are open to the patient, (3) describe options with pros and cons, (4) answer questions and (5) stimulate patients to consider their preference.
 5. *Appoint a contact per hospital.* This could be a urologist, or any other person (nurse, administrator), who is committed and keeps track of the use of the DA.
 6. *Support the initial implementation* by weekly telephone or mail checkups with the contact, to clear possible questions or problems.
 7. *Gradually reduce the support*, so that the implementation is eventually carried by the hospital itself.
 8. *Send quarterly news updates* to all participating care professionals (monitor and feedback).
 9. *Survey barriers and facilitators* in both patients and health care professionals.
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both web-based and printed DAs. The strategy focuses on removing identified barriers. Respectively, lack of confidence, lack of skills, fear of workflow disruption, time concerns, accessibility and cost are addressed (see the 'Methods' section for more details). This implementation strategy was used to implement a recently developed DA booklet for localized prostate cancer.^{13,14} DAs have been shown to be equally effective in web-based and in paper format.^{15,16}

In short, we developed and applied a strategy to achieve implementation of a DA, aiming to provide DAs to as many eligible patients as possible. Eligible patients are all patients who have more than one treatment option to choose from. Aim of our study was to measure the implementation rate of this tool, when using the implementation strategy. To date, studies lack information on the implementation rate that was actually achieved.⁷ Second, as the usage of DAs is determined both by professionals providing DAs and by patients using those DAs, we aim to identify remaining barriers and facilitators for use of the DA as perceived by both health care professionals and patients.

Methods

The implementation rates of a DA for prostate cancer were calculated per hospital, and barriers for both care providers and patients were assessed by questionnaire.

Implementation strategy

The implementation strategy is presented in Table 1. Barriers that were identified in the literature were taken into account. (1) Lack of confidence in the content was addressed, in each participating hospital, by explaining the content of the DA to the care providers, together with the results of a randomized trial^{13,14} showing its effectiveness. (2) To reduce chance of disruption of workflow, local health care professionals were involved in the logistic decisions on how to best embed the DA in the existing care path in their own hospital. (3) To address accessibility and cost barriers, the DAs were provided to the hospitals free of charge. (4) To address the lack of training on how to use

decision support, the following instructions for the use of the DA were incorporated in the above presentations: (a) make clear there is a treatment choice to be made, (b) identify the treatment options for this individual and mark these in the DA booklet, (c) discuss pros and cons of each option, (d) stimulate the patient to think about which pros and cons are most important to him, (e) give the DA with this information to take home, allow the patient some time to consider, (f) discuss, and reach a shared decision. These instructions were also handed out to the health care professionals on plasticized cards at the start of the implementation phase. As shown in Table 1, our implementation strategy also included several monitoring and feedback steps (step 5 through step 8) and a survey of other potential barriers and facilitators (step 9).

Procedure

We studied the implementation of a DA for localized prostate cancer. This DA has been shown to improve patients' knowledge and participation in decision-making¹³ without inducing anxiety or regret.¹⁴ It consists of a booklet to be used during the consultation and to take home for further consideration. The booklet describes the treatments, it compares outcome information, that is, the likelihood of cure and of the side effects associated with each treatment, and a table listing the pros and cons of each treatment. The outcome information is presented for two risk groups: (A) Gleason ≤ 7 and prostate-specific antigen (PSA) ≤ 20 and T1T2 or (B) Gleason > 7 and/or PSA > 20 and/or T3. On a dedicated first page of the DA booklet, the care provider indicated which treatment options are open to this individual patient and which risk information applied (A or B). The DA booklets were distributed to the hospitals. Care providers were asked to hand out and go through the DA with each eligible patient, according to the instructions described above as item 4 of the implementation strategy. All patients who have more than one treatment option are eligible. The only exclusion criterion is insufficient Dutch language proficiency. Depending on the local care path, this could be done by a urologist or a specialized nurse. In addition, the care provider asked patients whether a researcher could contact them about the study. The care provider documented whether or not the patient agreed with the telephone call and gave this information to the researcher. The researcher (J.J.v.T.-G.) explained the aim of the study to the patients by telephone and, after verbal informed consent, sent a written consent form, a questionnaire and a reply-paid envelope.

Questionnaires

Health care professionals filled out an online questionnaire after using the DA for a period of 6 to 8 months. This questionnaire was based on the MIDI tool,¹⁷ which identifies barriers and facilitators at the level of the innovation (DA), the user (health care professional) and the organization (hospital).

Patients filled out a questionnaire 2 weeks after they received the DA. It contained questions on the presentation and content of the DA, whether they had used the DA and possible barriers and facilitators for the use of the DA.

Analyses

Our primary outcome measure was the implementation rate per hospital per year. The implementation rate per hospital was defined as the number of patients who received the DA divided by the number of eligible patients as estimated from a registry. More precisely, for the numerator, patients were counted who received the DA and who were also enrolled in the study. For the denominator (number of eligible patients), hospital-specific data were extracted from the National Cancer Registry of the Netherlands (IKNL). The number of patients with prostate cancer, excluding

clinical T4, N+ and M+, were counted per hospital over the preceding 6 years and corrected for the duration of inclusion.

Barriers for care providers who used the DA 10 times or less were compared to colleagues who used the DA more often. For each barrier of facilitator, the percentages of care providers that endorsed it were analysed using chi-square tests. Patients who did or did not use the DA were also compared using chi-square tests. To correct for the number of barriers and facilitators tested, a Bonferroni correction was applied by dividing the significance level α by the number of barriers/facilitators.

Results

Patients and health care professionals

Ten hospitals in the region were asked to participate in the study, of which eight hospitals agreed. Two declined because they already participated in a study on DAs. Between spring of 2013 and summer of 2014, 30 health care professionals presented the DA to 316 patients. Of these patients, 11 were not eligible for the study, because additional diagnostics showed they had tumour growth outside of the prostate (N=8) or had other health issues (N=3) which meant they did not have a choice of treatment options. Of the remaining 305 patients, 294 (96%) gave informed consent and 255 (84%) returned the questionnaire. Of the 30 health care professionals, 24 filled out their questionnaire, representing a response rate of 80 per cent. The characteristics of the participating patients and care providers are listed in Table 2.

Implementation rate

Table 3 presents the estimated implementation rate of the DA. The number of patients who received the DA and were enrolled in the study in each hospital (A) was divided by the estimated number of eligible patients in each hospital (B). Since one hospital did not give permission to obtain registry data, the results are presented for seven of the eight hospitals. Overall, the average implementation rate was 60 per cent, ranging from 31 to 100 per cent.

Evaluation by health care professionals

The reception of the DA by the health care professionals was positive. They rated its value 8.1 (range = 6–9) on a scale from 1 to 10.

Presenting the DA. The vast majority of care providers reported that, when presenting the DA, they explained to patients that there were different treatment options, indicated which options were open for the patient and stimulated the patient to consider the pros and cons and make a personal trade-off (96%–100%). Most providers (88%) reported having asked their patients for their preference after the patients had gone over the DA.

Barriers and facilitators. The majority of health care professionals (92%) stated that they had offered the DA to all eligible patients. Those who had not always offered the DA endorsed various reasons which were related to logistics (somebody else offered the DA), physician-related (I forgot) or patient-related (patient nervous, already decided, unwilling). Time constraints did not appear to be an important factor; some care providers indicated that the DA required extra time (17%), but most answered neutrally (71%) or agreed with the statement that the DA saved time (13%). Moreover,

Table 2. Characteristics of the professionals and patients who filled out the questionnaires.

Characteristics of care professionals (N=24)	N (%)
Urologist	16 (67)
Oncology nurse	8 (33)
<i>Working in:</i>	
University hospital	5 (21)
Other urology training hospital	6 (25)
General hospital	13 (54)
Characteristics of patients (N=255)	%
Married/living together	88
College education	38
Paid job	29
Age (years), mean (SD)	66 (6)
Pre-existing urinary problems	37
Previously on active surveillance	14
Second opinion	14
<i>Tumour characteristics</i>	
T1T2	89
Gleason \leq 7	90
PSA \leq 10	73

SD: standard deviation; PSA: prostate-specific antigen.

Table 3. Estimated minimal implementation rate.

Hospital	Number of patients who received a DA (and enrolled in the study) A	Estimated number of eligible patients ^a B	Implementation rate (A/B) (%)
1	45	144	31
2	45	79	57
3	78	90	87
4	28	47	60
5	7	19	37
6	54	43	100
7	27	48	56
8 ^b	–	–	–
Total	284	470	60%

DA: decision aid.

^aEstimated from national registry data per hospital over a 6-year period.

^bHospital 8 did not give permission to obtain registry data on their number of eligible patients.

none of the care professional indicated that they ‘lacked the time’ to offer the DA. An open question yielded no additional barriers.

Table 4 shows the percentages of care providers who endorsed potential barriers and facilitators. Most professionals disagreed with the negative statements (suggested barriers) and agreed with the positive statements (suggested facilitators). The facilitator that was endorsed by all care providers

Table 4. Agreement with facilitators and barriers for professionals who were high DA providers (to more than 10 patients) versus low DA providers (to 10 patients or less).

Possible facilitators and barriers	High ^a DA providers (N=13) (% agree)	Low ^b DA providers (N=11) (% agree)	p-value
<i>Facilitators</i>			
It is clear to me what needs to be done, and in which order, when presenting the DA	92	82	.44
The DA is based on correct information	85	91	.64
The DA contains all the information necessary to use it	92	82	.44
The DA fits well with how I usually work	85	91	.64
I clearly notice the effects of using the DA	46	55	.68
I consider the DA appropriate for/applicable to all patients with localized prostate cancer, who have a choice between two or more treatment options	92	91	.90
The DA is based on current knowledge	85	91	.64
The information in the DA is complete	85	91	.64
The DA is practical to use	100	91	.27
The DA saves me time	23	0	.09
The DA made it easier to discuss the treatment options with my patient	62	82	.28
The DA makes my patients more satisfied with the information provision	54	73	.34
Offering the DA is compatible with the existing guidelines and procedures	100	100	–
<i>Barriers</i>			
The DA is too complex for professionals to use	15	9	.64
The DA is biased towards a particular treatment option	31	0	.04
Active surveillance should get more attention in the DA	62	36	.22
My trust in the DA is insufficient	8	18	.44
Using the DA is bothersome for my patients	0	0	–

DA: decision aid.

^aHigh providers: offered the DA to more than 10 patients.

^bLow providers: offered the DA to 10 patients or less.

(100%) was ‘Offering the DA fits well with the existing guidelines and procedures’. After Bonferroni correction, no significant difference was found between care professionals who presented the DA to more than 10 patients versus those who presented the DA to less patients.

Evaluation by patients

Use of the DA. Of the 255 patients who received the DA, 88 per cent indicated that they had used the DA (N=225) and 12 per cent that they had not used it (N=30). Users were comparable to non-users for demographic characteristics, such as age (66.1 ± 6 vs 65.1 ± 6 , $p=.36$), marital status

Table 5. Agreement with facilitators and barriers for patients who used the DA versus those who did not use the DA, after receiving it.

Barriers/facilitators	DA users (N=223) (% agree)	DA non-users (N=26) (% agree)	p-value
<i>Barriers</i>			
The DA is too difficult	2	12	.005
Too directive towards a specific treatment	9	8	.97
The DA is unclear	1	8	.026
The DA is not practical	3	15	.002*
Lack of trust	6	28	<.001*
Nothing to gain from it	4	24	<.001*
Too bothersome	5	8	.44
Lack of motivation	3	19	<.001*
Would increase my uncertainty	5	19	.009
Insufficiently adapted to my specific needs	11	20	.22
<i>Facilitators</i>			
The DA is a pleasure to use	95	54	<.001*
Facilitates treatment comparison	94	54	<.001*
Provides insight in pros and cons	94	68	<.001*
Information is complete	85	67	.056
I believe the DA can help me decide	88	54	<.001*
Would reduce my uncertainty	72	42	.009
My choice was made with the DA	76	33	<.001*
I liked using the DA as an additional source of information	96	71	<.001*
Facilitates talking with family and friends	86	58	.003
Facilitates talking with my care provider	84	54	.002*

DA: decision aid.

*Significant after Bonferroni correction for number of tests: $\alpha = .05/20 = .0025$.

(12% vs 10%, single, $p = .73$) and tumour characteristics (90% vs 90%, Gleason score ≤ 7 , $p = .95$ and 70% vs 77%, PSA ≤ 10 , $p = .69$). A difference was found for education; more users had a college degree than non-users (41% vs 20%, $p = .028$).

Barriers and facilitators. The barriers and facilitators that users and non-users endorsed are listed in Table 5. Clearly, non-users experienced more barriers and less facilitators compared to users. After Bonferroni correction, 11 barriers/facilitators still differed significantly between users and non-users (Table 5).

Of the users, 83 per cent said that the DA had ‘much’ or ‘very much’ added value compared to other information they had received, and all (100%) would recommend the DA to others. The evaluation of the decision-making process was also positive. Most patients found it meaningful (97%) and desirable (89%) to be involved in the treatment choice. It was easy for most patients to reach a decision (83%), and most patients felt no pressure during the decision-making process (98%).

Content of the DA. Patients were positive about the content of the DA. The information was clear (98%), complete (84%) and easy to use (96%). Most patients (95%) indicated that the information about the different treatment options was balanced. To the question how often words were unknown,

Table 6. Most appropriate professional to present DA according to patients.

Who presented the DA to you?	Urologist most appropriate	Nurse most appropriate
Urologist (N = 181)	97%	3%
Specialized nurse (N = 47)	36%	64%

DA: decision aid.

Questions asked were as follows: (1) Who presented the DA to you? (2) Who do you consider to be the most appropriate professional to do so?

the content was too complicated or they needed someone else to help them understand the text, almost all patients (96%) responded that this was rarely or never the case.

Presenting the DA (by whom and when). Most patients were satisfied with the way the DA was applied by the health care professionals. Table 6 shows that the DA was presented most frequently by the urologist (79%, N = 181) and less often by the oncology nurse (21%, N = 47). The urologist was considered the most appropriate person to do so, according to the vast majority (97%) of patients who received it from the urologist. However, of the patients who received the DA from the nurse, a majority (64%) considered the nurse to be the most appropriate person.

Most patients (59%) received the DA on the same day as their diagnosis of prostate cancer. Other patients received the DA either 1 day to 1 week after diagnosis (10%), 1 to 2 weeks after diagnosis (12%) or more than 2 weeks after diagnosis (19%). Whether patients felt that they had received the DA at the appropriate moment is shown in Figure 1. Of the patients who received the DA on the day of diagnosis, 1 per cent would have preferred to receive it later. Of the patients who received it 1 day to 1 week after diagnosis, all considered this the appropriate time to receive the DA. After more than 1 week, some patients would have preferred to receive the DA earlier.

Most patients (89%) indicated that the care provider had asked for their treatment preference. Almost all indicated that they had felt sufficient opportunity to discuss their preference with the professional (95%) and to get their questions answered (92%).

Discussion

The implementation strategy, used in this study, yielded an implementation rate of 60 per cent on average over eight hospitals. The strategy reduced previously identified barriers for implementation. No additional barriers were identified from the care providers' perspective or from the patients' perspective. The DA was well received by patients and care professionals. Patients considered both physicians and nurses to be appropriate professionals to hand out the DA. Receiving the DA on the same day as the diagnosis was acceptable to almost all patients.

Below, we will discuss the results regarding the implementation rates, the barriers and facilitators, first from the physicians' point of view and second from the patients' point of view. Finally, we will discuss the incorporation of DAs in the care pathway.

Successful implementation

The estimated implementation rate was higher than expected, that is, 60 per cent. Still, this may be a conservative estimate. It was calculated using the number of patients who received the DA and who were also enrolled in the study. This may have resulted in an underestimation of the actual implementation rate, since not all patients receiving the DA may have been enrolled in the study.

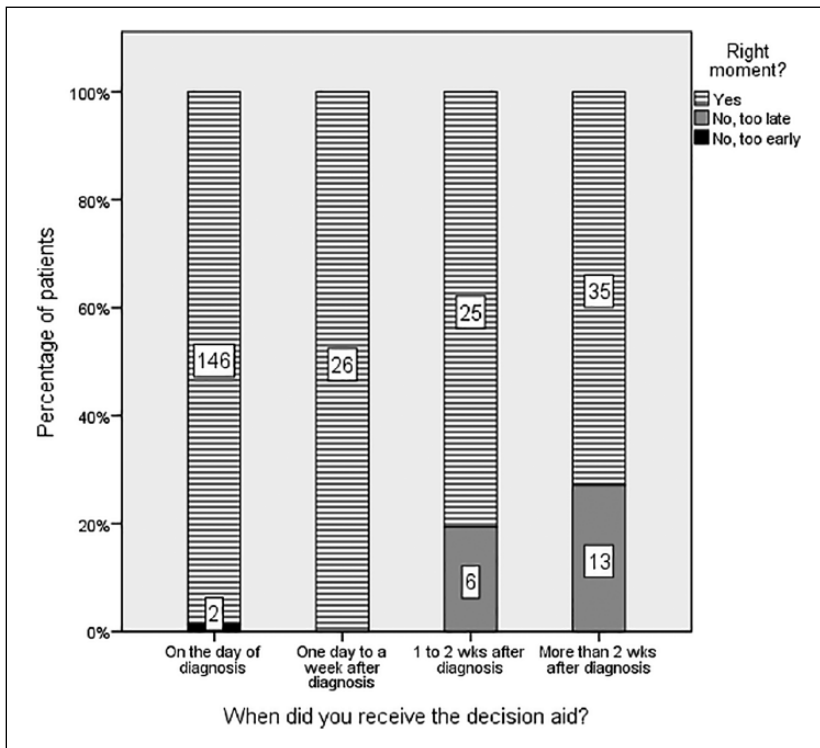


Figure 1. Timing and satisfaction with timing of the decision aid.

N indicates the number of patients.

Indeed, roughly twice as many DAs were used from stock by the participating hospitals as there were patients included in the study.

It is hard to compare the average implementation rate of 60 per cent with implementation rates achieved in other settings. Surveys in the United States on implementation of DAs showed that about one-third of physicians reported using a DA.^{18,19} These studies, however, do not report an implementation rate, that is, an estimate on how many of the eligible patients received a DA. One study on the use of a DA for cystic fibrosis patients reported an exceptional 95 per cent implementation rate, but this was self-reported by care providers and could not be verified in patients or otherwise.²⁰ A systematic review of 17 studies on the implementation of patient decision support reported a lack of specific information about the implementation rates that were achieved.⁷

This study measured the implementation rate that was attained and, as such, adds to the existing literature in which such data are lacking. It is important to measure the attained implementation rate, as a considerable gap has been reported between physician’s intention to adopt DAs and their actual behaviour.¹⁸ This intention-behaviour gap may underlie the poor implementation in some hospitals.

In this study, a large variation in implementation rates was found between hospitals. No obvious reasons for this variation were found. The type of hospital, university or regional, large or small, was not related to implementation rates. After 2 years, the DAs were reportedly still used by all eight participating hospitals. In one hospital, the use of the DA was reduced in comparison with the study period. Two other hospitals reported an increase in implementation rate, as their care

pathway was reorganized and the DAs were now handed out by a dedicated nurse who saw all patients with prostate cancer. Underlying reasons for the variation in implementation rates will be further explored by interviews.

Barriers and facilitators

Some care providers indicated that the DA required extra time, but most answered neutral or even agreed that the DA saved time. In other settings, 20 to 32 per cent of the physicians also agreed that DAs will save time.¹⁸ The main facilitating factor for the care providers in this study turned out to be its agreement with the guidelines. Guidelines do urge the use of shared decision-making.^{2,21} However, it would be even more helpful if, in addition, they would support the use of DAs more explicitly, as this might ensure greater adoption of DAs.¹⁹

A recent survey in urologists and radiation oncologist showed that most were familiar with DAs. Still, only a minority used them in daily care. An important barrier for professionals who did not use DAs was the assumption that patients could not process information from DAs.¹⁹ This assumption was not supported by the data of the patients in our study, since 96 per cent indicated that the content of the DA was not too complicated and that they did not need someone else to help them understand.

For *patients*, other barriers have been reported in literature. To participate in shared decision-making, patients do not only need knowledge but also need to be empowered to participate.²² DAs that solely focus on the provision of information fail to address the acceptability and need for patient involvement. A review of 44 studies revealed that patient barriers include a lack of perception that there is a preference-sensitive decision to be made, incorrect timing of receiving the DA and physicians who do not inquire about patients' preferences or needs.²³ In our study, the DA and the instructions for care providers on when and how to engage patients appear to have reduced such barriers. The patients overwhelmingly agreed with the suggested facilitators and hardly agreed with the suggested barriers.

The differences in endorsed barriers between patients that were users versus non-users do not suggest that non-users were unable to use the DA; barriers such as 'too difficult/unclear/insufficiently adapted to my needs/information is (not) complete' were not endorsed more by non-users. Instead, non-users appear to be unwilling or unmotivated to use the DA; significantly more often, they endorsed barriers such as lack of trust/lack of motivation/(not) believe the DA can help me decide. This suggests that the use of DAs could be increased by explaining the potential benefits more clearly to patients. Here, the care providers could potentially play a role in motivating their patients.

In all, most barriers were removed by the implementation strategy, for both care providers and patients. This confirms the notion that barriers are modifiable rather than fixed.²³ This is important because in physicians treating prostate cancer, a strong relation was found between their endorsement of barriers and their actual application of DAs.¹⁹ Our study suggests that using an implementation strategy that takes known barriers into account may result in adoption of DAs for prostate cancer.

Implementation strategy

Designing implementation strategies is challenging. Successful implementation requires active targeting of the users, that is, health care providers and patients.²⁴ It is known that successful implementation requires tailored interventions based on identified barriers.²⁵ The implementation strategy, used in this study, involved reducing previously identified barriers for implementation. Our study did not reveal any additional barriers or facilitators that could be incorporated in adapting or optimizing our strategy. The strategy resulted in a satisfactory implementation rate. Since the

introduction of the DA was well received by both patients and care professionals, this strategy may be useful for other clinical contexts using DAs as well.

How and when to implement the DA in the care pathway

The first week after diagnosis appears to be the preferred moment for patients to receive a DA. Even the day of diagnosis was considered an appropriate time by almost all patients who had received the DA on the day of diagnosis.

The experience with delivery of the DA by a nurse appears to make patients more appreciative of delivery by the nurse. This fits well in a recent development; a growing number of hospitals in the Netherlands allot a role to specialized nurses in informing patients about their treatment options.

Limitations

To calculate the implementation rate, the estimated number of eligible patients was derived from historic data (i.e. the mean number of eligible patients per year in the participating hospitals in the preceding 6 years). Although no trend was found over those years, the number of eligible patients may have changed.

All data on decision-making were self-reported by patients and physicians. There were no video or audio recordings of the consultations to confirm whether care providers followed all instructions.

Another limitation may be the selection bias professionals and patients who are not interested in using DAs may have been less willing to fill out the questionnaire and may have had a different opinion on the barriers.²⁶ This is a common bias in studies on health care innovations. Please note that the implementation rates in our study are not based on the questionnaires and are calculated for the entire urology departments, including the patients of possibly reluctant care providers.

Conclusion

A successful implementation of a DA on prostate cancer can be reached, by addressing known barriers. By informing caregivers on the effectiveness of the DA, by providing instructions on its use, by embedding it in the existing workflow and by making it available free of charge, implementation barriers were strongly reduced. This article may help to facilitate the implementation of DAs, both paper-based and online versions, in daily practice.

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Author contributions

J.J.v.T.-G., C.F.v.U.-K., M.d.V. and P.F.M.S. contributed critically to the design of the study. J.J.v.T.-G., I.M.v.O., D.M.S., C.J.W. and A.G. contributed substantially to the acquisition and interpretation of data. All authors read and revised the manuscript critically and gave final approval for publication.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Ethical approval

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Trial registration

The study was registered at the Dutch Trial Register NTR 6245.

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