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Original article

How do patients choose between active surveillance, radical prostatectomy, and radiotherapy? The effect of a preference-sensitive decision aid on treatment decision making for localized prostate cancer

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Abstract

Purpose: To determine the effect of a decision aid (DA) on treatment preferences and to investigate which patient preferences are important for final treatment preferences. We also determined if the patient's treatment decision was influenced by the urologist's treatment preference.

Patients and methods: Between August 2014 and July 2015, newly diagnosed patients with low-/intermediate-risk prostate cancer were offered to use a web-based DA after diagnosis. Treatment preferences and patient's values were extracted from the DA. Urologists' treatment preferences were indicated at the time of inclusion.

Results: We included 181 patients, of whom 21% preferred active surveillance, 33% radical prostatectomy, 10% brachytherapy, 3% external beam radiotherapy, and 34% did not indicate a specific preferred treatment option after DA use (missing $N = 6$).

Among 67%, treatment preference before DA use did not change after DA use.

In men who chose active surveillance after DA use, 97% (37/38) preferred to postpone unnecessary treatment. For radical prostatectomy, 91% (52/57) of the patients valued tumor removal, and for brachytherapy, 88% (15/17) valued incontinence worse than bowel complaints.

For 64% (missing $N = 21$) of the patients, urologists indicated one specific preferred treatment option as most suitable for the patient concerned.

Agreement between final treatment decision and urologist's preference was lower ($\kappa = 0.68$) than between final treatment decision and preferred treatment after DA use ($\kappa = 0.82$).

Conclusion: Most patients with prostate cancer chose the treatment in accordance with the post-DA preference and to a lesser extent the urologists preference; implications of this are prospectively investigated in an ongoing study. © 2017 Elsevier Inc. All rights reserved.

Keywords: Decision aid; Prostate cancer; Treatment; Decision making; Patient preferences

1. Introduction

Patients diagnosed as having localized prostate cancer (PC) are often eligible for multiple treatment options with comparable oncology outcomes. Therefore, patients' values and preferences play an important role in treatment decision

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making [1,2]. Although treatment options include active surveillance (AS), radical prostatectomy (RP), external beam radiotherapy (EBRT), and brachytherapy (BT), current guidelines do not indicate the best oncological treatment option [3]. Unfortunately, treatment-related adverse effects and complications occur frequently and may influence the quality of life negatively [4–8]. AS is mainly associated with anxiety and distress, RP with erectile dysfunction and urinary incontinence, EBRT with bowel problems and erectile dysfunction, and BT with erectile dysfunction and irritative/obstructive urinary complaints [4,6–10]. Thus, the various PC treatment options differ in their benefit-risk profiles; therefore, treatment decision making is sensitive to patients' values and preferences [11]. It is, therefore, important that patients are well informed about the possibilities of complications to make a value-based treatment decision. A recently published review article showed that patients who prefer AS over active treatment valued the avoidance of complications of surgery, and patients who chose for active treatment over AS reported pressure from urologists and family [12]. In addition to this, specific treatment choices were more often related to intrinsic characteristics (e.g., duration of therapy and invasiveness) of treatment alternatives than to the probabilities of treatment-related adverse effects [12,13]. The most common reasons for choosing RP were removal of the tumor; for EBRT, it was “evidence for the treatment”; and for BT, it was short duration of the treatment [13].

Despite the importance of patient preference clarification in the decision-making process, treatment choices are often based on a urologist's advice, rated as the most important factor influencing treatment decision [12,14–16]. This is a disconcerting fact as studies have shown that patients and urologists differ in their preferences and trade-offs [1,11,17]. Additionally, treatment recommendations of urologists may be biased, as urologists and radiation oncologists have been shown to often recommend the therapy that they themselves deliver [18].

Decision aids (DAs) are instruments to improve shared decision making, stimulate patients to take a more active role in decision making, and improve accurate risk perceptions and knowledge regarding treatment options [19]. We developed a web-based DA containing evidence-based information about AS, RP, EBRT, and BT, including benefits and risks, success rates, and complication rates according to the current guidelines and literature [3,20]. Values clarification exercises (VCEs) are used to clarify patients' preferences and support patient involvement in decision making.

In this study, we investigated the initial PC treatment preference after diagnosis (before DA use and initial treatment preference) and how this treatment preference may change owing to the use of a DA (final treatment preference). In addition, we determined which patient preferences are important in the determination of patients' final treatment choice. Finally, we determined to what extent a

patient's treatment decision was influenced by the urologist's treatment preference.

2. Patients and methods

Between August 2014 and July 2015, newly diagnosed patients with low- or intermediate-risk PC (T1–T2N0M0) were recruited in 9 nonacademic Dutch hospitals [21]. Patients were eligible for inclusion if they were offered ≥ 2 treatment options according to their urologist and had access to a PC, laptop, or tablet with an internet connection. Exclusion criteria were cognitive impairment or being too ill at the time of the study and insufficient comprehension of the Dutch language to complete questionnaires and understand the DA.

After diagnosis, urologists requested informed consent and offered the web-based DA by handing out a “DA recipe” containing the DA URL, possible treatment options, prostate-specific antigen (PSA) level (<10 $\mu\text{g/l}$ or 10 – 20 $\mu\text{g/l}$), and Gleason score. At the same time, urologists indicated their preferred treatment option for the patient concerned on a separate form; this information was not communicated to patients. If patients did not return their informed consent form, they still had the opportunity to use the DA. DA users without informed consent could not be identified. Once informed consent was given, patients also received questionnaires, and subsequently, the questionnaire data were linked to the patients' DA data. This study took place within an ongoing 2-armed pragmatic cluster randomized controlled trial that assessed the effect of a web-based DA on the decision-making process and patient-reported outcomes. In the trial, one arm received usual care after PC diagnosis, and the other arm received usual care and a web-based DA to support treatment decision making. The current analyses only included the intervention arm. The complete study protocol as well as the information about timing, location, and administration of the decision aid has been described before in more detail [22].

2.1. Patients' demographics and medical characteristics

Information regarding treatment preferences pre-DA and post-DA use and patients' preferences/values (VCEs) was entered directly into the DA by the patients. All statements used in the VCEs were developed by a team of urologists, psychologists, and engineers based on previous experience and observation of conversations where treatment decisions were discussed. The statements were evaluated during usability testing among patients, urologists, and nurses ($N = 10$). After informed consent, additional data were obtained on sociodemographics, patient characteristics, and final treatment decisions from online (or paper on request) questionnaires that were sent after DA use and treatment decision making but before treatment was received [22]. Urologists' treatment preferences and medical

characteristics (possible treatment options, PSA levels, and Gleason scores) were provided by the recruiting urologist at time of inclusion on a paper form.

2.2. Decision aid

Patients were offered the use of a web-based DA after PC diagnosis (www.prostaat.keuzehulp.nl). The DA provides a stepwise guidance through the decision process, depending on the possible treatment options for a particular patient. The first step provides general information about PC and treatment options (benefits and risks, success rates, and complication rates according to the current guidelines and literature) [3,20]. The second step offers the consideration between AS and curative treatment (surgery or radiotherapy). VCEs are presented in this step to elicit a patient's preference based on 3 main differences between AS and curative treatment: deferring treatment, possible overtreatment, and adverse effects. Each statement is related to 1 of the 2 treatment alternatives offered in this step. On a slider scale, patients could indicate for each set of statements the strength of their preference toward one of the alternatives (e.g., "If treatment might be unnecessary, I would rather wait." vs. "I prefer treatment, even if it might be unnecessary."). For patients who indicated to prefer active treatment in the previous step, the next step supports the consideration between surgery and radiotherapy (BT and EBRT). Again, information provision was followed by VCEs. The VCEs in this step emphasized the main differences between surgery and radiation therapy (both BT and EBRT) regarding treatment procedure, adverse effects, secondary treatment, and fear for surgery. In the next part of the DA, patients were asked to indicate their final treatment preference. A summary then provided an overview of all VCEs and patients' final treatment preference. To facilitate discussion with the urologist, this summary could be printed or accessed online during the next consultation [22].

2.3. Statistical analyses

We used Pearson chi-square test to analyze differences in PSA levels (<10 µg/l or 10–20 µg/l) between the various treatment options and hospitals. One-way analysis of variance (ANOVA) was conducted to analyze differences in mean age for the various final treatment decisions and hospitals. The concordance between treatment preferences and final treatment decision was measured using kappa (κ). We considered a $P < 0.05$ to be statistically significant. All analyses were performed using SPSS version 19.0 (Statistical Package for Social Sciences, Chicago, IL, USA).

3. Results

A total of 209 patients were invited for participation—87% (181) used the DA after PC diagnosis, 64% (134)

returned their informed consent forms, and 52% (109) returned a questionnaire. From 175 DA users, pre-DA and post-DA treatment preferences were obtained. From 160 DA users, data on urologists' preferences at time of diagnosis were available (Fig.). Mean age was 65 years (SD = 6). No differences in mean age were found between received treatment options ($P = 0.103$) and hospitals ($P = 0.758$). We found fewer PSA levels between 10 µg/l and 20 µg/l in the AS group ($P = 0.022$). No differences in PSA levels were found between hospitals ($P = 0.518$).

Offered treatment options included AS among 41% (75/181), RP among 88% (159/181), BT among 74% (133/181), and EBRT among 69% (125/181). Patient characteristics are shown in Table 1. Numbers were too low to analyze differences in final treatment options between hospitals. Baseline comparison between non-responders (patients who did not return a questionnaire) and responders (patients who did return a questionnaire) showed no differences in age in years ($P = 0.100$), Gleason score (Gleason 6 vs. Gleason 7, $P = 0.177$), and PSA level (<10 µg/l vs. 10–20 µg/l, $P = 0.866$).

3.1. Initial and final treatment preferences

Of the 181 patients who used the DA, 175 patients (missing $N = 6$) indicated whether or not they had an initial (pre-DA use) treatment preference. Of those patients, 74% (129/175) indicated one specific initial treatment preference after PC diagnosis but before DA use. Indicated options were AS among 22%, RP among 30%, BT among 15%, EBRT among 7%, and *no initial preference* among 26%. After DA use, the final preferred treatment options were AS among 21%, RP among 33%, BT among 10%, EBRT among 3%, and 34% did not indicate a specific preferred treatment option after DA use. Of the patients who had indicated an initial preference, 67% (87/129) stayed with their initial treatment preference and 33% (42/129) changed their treatment preference after DA use. Of the 42 patients who had changed their preference after DA use, 36 did not indicate a specific final treatment preference or were undecided after DA use. Half of the patients who did not indicate an initial treatment preference were able to indicate a final treatment preference after DA use (Table 2).

3.2. Themes of patient preferences and final preferred treatment option

Of the men who indicated a preference for AS after DA use, 97% (37/38) preferred to postpone or avoid unnecessary treatment, and 87% (33/38) were confident enough that they would be treated on time if needed. For RP, 91% (52/57) valued tumor removal and 90% (51/57) were comforted by the thought that additional radiation would be possible (Table 3). Of the BT patients, 88% (15/17) valued incontinence worse over bowel complaints. For EBRT, numbers were too low to draw conclusions

Fig. Flowchart.

(Table 3). Vice versa, after transposing Table 3, we found that most men who responded positively to VCEs preferred the final treatment congruent with that particular VCE (Table 4).

Patients who indicated that they were comforted by the thought that additional radiation would be possible after RP were younger than those who indicated to accept that surgery is difficult after radiation (age 68 vs. 64 years, respectively, $P = 0.015$).

3.3. Urologists' treatment preference and patient preferences

We asked urologists “What do you consider the most suitable treatment option for this patient?” on paper forms at the time of inclusion. In 64% (102/160, missing $N = 21$) of the cases, urologists indicated one specific preferred treatment option as most suitable for the patient concerned. If urologists indicated more than 1 treatment option, this was labeled as “No specific preference indicated by urologist.” The most frequently indicated preferred treatment options by urologists were AS (39%) and RP (35%). From 155 patients, we obtained data on both patients' and urologists' initial treatment preferences (Table 5). In 62% (61/98) of the cases, the initial treatment preference was in correspondence with the urologists' treatment preference ($\kappa = 0.72$).

3.4. Final treatment decision

Questionnaires after decision making clarified which treatment was finally chosen (final treatment decision). We received 109 questionnaires from DA users, and 99 patients indicated their final treatment decision. These data showed that most patients finally chose the treatment which they preferred post-DA use ($\kappa = 0.82$, excellent agreement). Comparing the urologists preference with the final treatment decision, we found a moderate to good agreement ($\kappa = 0.68$).

Of the patients who did not indicate a final treatment preference after DA use and indicated a final treatment decision in the questionnaire ($N = 20$), most chose the treatment their urologist preferred ($\kappa = 0.66$).

4. Discussion

In this study, we analyzed the development of treatment preferences throughout the decision-making process using a DA. Analyses included the response to VCEs and correlation between patients' and clinicians' preferences. We found that most patients who chose RP did so because they valued tumor removal and they were comforted by the thought that additional radiation would still be possible. Patients who were comforted by the thought that additional radiation would be possible after RP were younger than those who

Table 1
Patient characteristics

Characteristics	N (%)
Mean age, years (SD, N = 109))	65 (6.0)
DA users	181 (100)
Returned questionnaires	109 (100)
PSA level, µg/l (entered in DA)	
< 10	135 (75)
10–20	44 (24)
Missing	2 (1)
Total	181 (100)
Gleason score (entered in DA)	
6	60 (33)
7	113 (63)
Missing	8 (4)
Total	181 (100)
Education ^a	
Low	4 (3)
Medium	44 (41)
High	58 (53)
Other	2 (2)
Missing	1 (1)
Total	109 (100)
Accrual in hospital	
A	7 (4)
B	1 (1)
C	23 (13)
D	21 (12)
E	10 (5)
F	10 (5)
G	53 (29)
H	34 (19)
I	22 (12)
Total	181 (100)

^aLow (no or primary school), medium (lower general secondary education or vocational training), and high (preuniversity education, high vocational training, and university).

indicated to accept that surgery is difficult after radiation. Not surprisingly, this shows that younger patients are more concerned about long-term consequences than older patients are.

AS patients indicated that they wanted to postpone unnecessary treatment and were confident enough that if

needed they would be treated on time. Patients who chose BT after DA use valued incontinence worse than bowel complaints. Values indicated as important for choosing RP and AS are in line with other studies. In the current DA, we used VCEs to distinguish between surgery and radiotherapy (both BT and EBRT). Therefore, we have no specific information about treatment-related values considered important for specifically choosing BT or EBRT (e.g., duration of therapy and radio nuclear activity), as was shown in other studies [12,13]. For BT, we used other themes of patient preferences, which makes comparison with findings from the literature more difficult. This study has shown that patients' responses to our VCEs are congruent with the final treatment preference, indicating that the VCEs used in the DA can properly support decision making for a treatment that is compatible with each patient's preferences and values.

After DA use, RP and AS preference percentages did not alter; however, EBRT preference percentages changed from 7% to 3% after DA use. Reasons for this decrease in EBRT preference may be regional patient preferences or potentially imbalanced information provision at the disadvantage of EBRT. However, radiation oncologists were involved in the DA content development and endorsed the current content. Another reason for the decrease in EBRT preference may be explained by the fact that not all patients are offered to visit a radiation oncologist. This often depends on the presence of a multidisciplinary outpatient clinic (patients then see both an urologist and a radiation oncologist) or local practice. Of 4 of newly diagnosed patients with PC, 3 already had a specific initial treatment preference before DA usage, usually RP or AS. We found that 2 of 3 of these patients did not change their preference after DA use. For these patients, use of this DA may lower decisional conflict because patients might be more convinced of their initially preferred treatment option, which would be in line with current literature that describes that DAs lower decisional conflict [19]. Results concerning decisional conflict would follow from an ongoing study [22]. However, a third of the DA users did not indicate a specific final treatment preference after DA use. Additionally, we investigated this group and found that most of them eventually chose for the

Table 2
Initial and final treatment preferences

N	Final preference = AS (% row)	Final preference = RP (% row)	Final preference = BT (% row)	Final preference = EBRT (% row)	No final preference indicated/undecided (% row)	Total
Initial preference = AS	28 (74)	2 (5)	0 (0)	1 (3)	7 (18)	38 (100)
Initial preference = RP	1 (2)	43 (83)	0 (0)	0 (0)	8 (15)	52 (100)
Initial preference = BT	0 (0)	1 (4)	12 (46)	0 (0)	13 (50)	26 (100)
Initial preference = EBRT	0 (0)	0 (0)	1 (8)	4 (31)	8 (61)	13 (100)
I do not have an initial preference	8 (17)	11 (24)	4 (9)	0 (0)	23 (50)	46 (100)
Total ^a	37 (21)	57 (32)	17 (10)	5 (3)	59 (34)	175 (100)

^aMissing N = 6.

Table 3
Themes of patient preferences

	Final preference = AS, N (% column)	Final preference = RP, N (% column)	Final preference = BT, N (% column)
Values clarification exercises (VCEs) themes			
Decision moment: AS vs. active treatment			
Deferring treatment ^a			
“I am confident enough that I will be treated on time, if necessary” vs.	33 (87)	1 (12.5)	0 (0)
“I do not want to postpone treatment because I do not want to be too late”	1 (3)	6 (75)	7 (88)
Equally important	4 (10)	1 (12.5)	1 (12)
Unnecessary treatment ^a			
“If treatment might be unnecessary, I would rather wait” vs.	37 (97)	3 (30)	2 (25)
“I prefer treatment, even if it might be unnecessary”	0 (0)	6 (60)	6 (75)
Equally important	1 (3)	1 (10)	0 (0)
Treatment adverse effects ^a			
“I find possible treatment side effects like erectile and urinary dysfunctions difficult to accept” vs.	25 (66)	3 (30)	3 (38)
“I find the possible treatment side effects acceptable”	6 (16)	6 (60)	4 (50)
Equally important	7 (18)	1 (10)	1 (12)
Decision moment: RP vs. radiotherapy			
Tumor removal ^b			
“I find it important that all cancer cells are removed from my body” vs.	na	52 (91)	2 (12)
“I find it important that the cancer cells die and not grow further”	na	1 (2)	11 (65)
Equally important	na	4 (7)	4 (23)
Differences in adverse effects ^b			
“I find bowel problems worse than incontinence” vs.	na	25 (44)	0 (0)
“I find incontinence worse than bowel problems”	na	7 (12)	15 (88)
Equally important	na	25 (44)	2 (12)
Secondary treatment ^b			
“I am comforted by the thought that I can have additional radiation if surgery is unsuccessful” vs.	na	51 (90)	5 (29)
“I accept that surgery is difficult after radiation”	na	1 (2)	9 (53)
Equally important	na	5 (88)	3 (18)
RP anxiety ^b			
“I am not anxious about surgery” vs.	na	44 (77)	9 (53)
“I am anxious about surgery”	na	7 (12)	4 (23.5)
Equally important	na	6 (11)	4 (23.5)
Total	38 (100)	57 (100)	17 (100)

^aOnly presented to patients suitable for AS.

^bonly presented to patients who preferred active treatment. na = not applicable.

treatment their urologist preferred. This is not surprising, as this is known as one of the most important issues in the decision-making process [12,14–16]. Further investigation of this group is interesting to evaluate whether or not this group is satisfied with the DA or became more confused in the decision-making process. It is possible that this DA is not the most optimal decision support tool for this group, and alternative decision support would be more suitable.

In 64% of the cases, urologists indicated one specific treatment preference, and in 62%, the initial patients' treatment preference was in line with the urologist's preference. It is possible that urologists already revealed (unintentionally or intentionally) their treatment preference at the time of diagnosis, which may have influenced initial

patients' treatment preferences. Another hypothesis is that urologist have made a good estimate of the best treatment option for each individual. Qualitative research of the conversations at the time of diagnosis should be performed to investigate these hypotheses.

We additionally investigated the final treatment decisions and discovered that most patients decided to choose their preferred treatment option after DA use ($\kappa = 0.82$). Correlation between final treatment decision and urologist's preference was lower ($\kappa = 0.68$). This implies that urologists' treatment preferences did not affect patients' treatment decisions as much as observed from the literature, probably because the DA overrules the urologist's preference after indicating a final treatment preference [12,14–16].

Table 4
Distribution of treatment preferences by VCEs

Values clarification exercises (VCEs) themes				
<i>Decision moment: AS vs. active treatment</i>				
Deferring treatment ^a				
	“I am confident enough that I would be treated on time, if necessary”	“I do not want to postpone treatment because I do not want to be too late”	Equally important	
Final preference = AS	33	1	4	38
Final preference = RP	1	7	2	10
Final preference = BT	0	7	1	8
Unnecessary treatment ^a				
	“If treatment might be unnecessary, I would rather wait”	“I prefer treatment, even if it might be unnecessary”	Equally important	
Final preference = AS	33	1	4	38
Final preference = RP	3	6	1	10
Final preference = BT	2	6	0	8
Treatment adverse effects ^a				
	“I find possible treatment side effects like erectile and urinary dysfunctions difficult to accept”	“I find the possible treatment side effects acceptable”	Equally important	
Final preference = AS	25	6	7	38
Final preference = RP	3	6	1	10
Final preference = BT	3	4	1	8
<i>Decision moment: RP vs. radiotherapy</i>				
Tumor removal ^b				
	“I find it important that all cancer cells are removed from my body”	“I find it important that the cancer cells die and not grow further”	Equally important	
Final preference = AS	na	na	na	na
Final preference = RP	52	1	4	57
Final preference = BT	2	11	4	17
Differences in adverse effects ^b				
	“I find bowel problems worse than incontinence”	“I find incontinence worse than bowel problems”	Equally important	
Final preference = AS	na	na	na	na
Final preference = RP	25	7	25	57
Final preference = BT	0	15	2	17
Secondary treatment ^b				
	“I am comforted by the thought that I can have additional radiation if surgery is unsuccessful”	“I accept that surgery is difficult after radiation”	Equally important	
Final preference = AS	na	na	na	na
Final preference = RP	51	1	5	57
Final preference = BT	5	9	3	17
RP anxiety ^b				
	“I am not anxious about surgery”	“I am anxious about surgery”	Equally important	
Final preference = AS	na	na	na	na
Final preference = RP	44	7	6	57
Final preference = BT	9	4	4	17

na = not applicable.

^aOnly presented to patients suitable for AS.

^bOnly presented to patients who preferred active treatment.

However, it is possible that urologists have most influence at diagnosis, at the start of the decision-making process.

Using VCEs, we objectively measured patients' preference themes as they were recorded in the DA without the interference of a researcher or urologist as has been

described in other studies [24]. This made our results more reliable; moreover, these were not influenced by clinicians. More strengths of this study are the high response rate (87% DA use), identification of the initial (pre) and final (post) treatment preferences by indicating these items directly in

Table 5
Urologists' treatment preferences

<i>N</i>	Initial preference = AS (% row)	Initial preference = RP (% row)	Initial preference = BT (% row)	Initial preference = EBRT (% row)	I do not have an initial preference (% row)	Total <i>N</i>
Urologist's preference = AS	26 (70)	5 (13.5)	1 (3)	0 (0)	5 (13.5)	37 (100)
Urologist's preference = RP	0 (0)	19 (53%)	1 (3)	1 (3)	15 (41)	36 (100)
Urologist's preference = BT	1 (5)	3 (15)	12 (60)	0 (0)	4 (20)	20 (100)
Urologist's preference = EBRT	0 (0)	1 (20)	0 (0)	4 (80)	0 (0)	5 (100)
No specific preference indicated by urologist	7 (12)	17 (29)	11 (19)	6 (10)	17 (30)	57 (100)
Total <i>N</i> ^a	34 (22)	45 (29)	25 (16)	11 (7)	41 (26)	155 (100)

^aMissing *N* = 26.

the DA, the inclusion of all treatment options (including AS), and the treatment preference of the recruiting urologist. This also differentiates our study from other studies, which studied only differences in treatment preferences/received treatment, but none investigated the urologists' preferences, initial (pre-DA) preferences, patients' values clarification (VCEs), final (post-DA) preferences, and final treatment decisions in a single study [12,15,23]. We, therefore, were able to prospectively follow the full decision-making process and the changes made during this process, including the urologists' preference.

Some limitations should be addressed. First, we could not obtain questionnaires from all DA users, because we did not obtain informed consent forms from 47 patients. A reason for this gap in numbers is that we offered the DA to all eligible patients, according to the inclusion criteria set for this study. Many patients used the DA, and after decision making, they did not return their questionnaires. This is not surprising, because patients then had obtained the benefits (DA use), and a questionnaire sent weeks later would only be an extra burden without the prospect of more benefits. Therefore, we did not succeed in obtaining complete information about patient's characteristics and final treatment decisions. We do not know if this group was as consistent in their final treatment decision as the patients who did complete their questionnaires. Also, it remains unclear if the patients who did not indicate a final preference after DA use (1 in 3) were actually undecided or just did not indicate a final preference (missing data). Therefore, we are unable to indicate whether or not more patients were truly undecided after DA use. Furthermore, not all patients were invited to visit a radiation oncologist, as this depends on local practices. Unfortunately, no information is available on radiation oncology counseling or on general practitioner counseling. Therefore, we are not informed on a possible influence on final decision making by the counseling of these health providers. Finally, we found significantly fewer PSA levels between 10 µg/l and 20 µg/l in the AS group, but this can be explained by the fact that most AS protocols only include PSA levels <10 [25,26].

In conclusion, we measured important values and preferences for choosing AS, RP, or BT, and we showed

that most patients chose the treatment they themselves preferred after DA use ($\kappa = 0.82$). Finally, the influence of the DA was shown to be higher than the urologist's preference; implications of this are being prospectively investigated in an ongoing study.

The authors suggest to incorporate DA use in clinical practice to stimulate PC shared decision making and to facilitate elicitation of patients' values and preferences.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.urolonc.2016.09.007>.

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