

## Do Patients With Localized Prostate Cancer Treatment Really Want More Aggressive Treatment?

Julia J. van Tol-Geerdink, Peep F.M. Stalmeier, Emile N.J.T. van Lin, Eric C. Schimmel, Henk Huizenga, Wim A.J. van Daal, and Jan-Willem Leer

### A B S T R A C T

#### Purpose

Examine whether patients with prostate cancer choose the more aggressive of two radiotherapeutic options, whether this choice is reasoned, and what the determinants of the choice are.

#### Patients and Methods

One hundred fifty patients with primary prostate cancer ( $T_{1-3}N_0M_0$ ) were informed by means of a decision aid of two treatment options: radiotherapy with 70 Gy versus 74 Gy. The latter treatment is associated with more cure and more toxicity. The patients were asked whether they wanted to choose, and if so which treatment they preferred. They also assigned importance weights to the probability of various outcomes, such as survival, cure and adverse effects. Patients who wanted to choose their own treatment ( $n = 119$ ) are described here.

#### Results

The majority of these patients (75%) chose the lower radiation dose. Their choice was highly consistent ( $P \leq .001$ ), with the importance weights assigned to the probability of survival, cure (odds ratio [OR] = 6.7 and 6.9) and late GI and genitourinary adverse effects (OR = 0.1 and 0.2). The lower dose was chosen more often by the older patients, low-risk patients, patients without hormone treatment, and patients with a low anxiety or depression score.

#### Conclusion

Most patients with localized prostate cancer prefer the lower radiation dose. Our findings indicate that many patients attach more weight to specific quality-of-life aspects (eg, GI toxicity) than to improving survival. Treatment preferences of patients with localized prostate cancer can and should be involved in radiotherapy decision making.

*J Clin Oncol* 24:4581-4586. © 2006 by American Society of Clinical Oncology

### INTRODUCTION

Several studies have reported that many patients prefer an aggressive treatment, even for little gain in cure. For example, many cancer patients would accept chemotherapy for 1% gain in cure<sup>1,2</sup> or even for no gain at all.<sup>3</sup> For radiotherapy, it was reported that some patients would accept postoperative radiotherapy for no gain as well.<sup>4</sup> An exception is a study reporting a willingness to exchange survival for quality of sexual life.<sup>5</sup> The aforementioned studies referred to hypothetical decisions. Patients may react differently when they choose their actual treatment. Indeed, a study on breast cancer patients reported a preference for a less aggressive treatment.<sup>6</sup> In that study, however, there was no survival gain attached to the more aggressive option. It remains to be studied, therefore, what patients prefer when a survival gain is presented in an actual choice.

In the aforementioned studies, active treatment was often compared with decline of treatment. Patients may think that any treatment is better than “doing nothing.” Treatment as such provides patients with a sense of control.<sup>7,8</sup> In general, active treatment is also promoted by family and physicians.<sup>9</sup> In the present study, in contrast, patients were involved in the choice between two active radiotherapeutic treatments of different dose. The use of a higher radiotherapeutic dose leads to more cure, but also to more adverse effects.<sup>10</sup> Because both options differ only in the chance of cure and adverse effects, and are identical on many other counts, this design provides a better case to study the patients’ trade-off between cure and morbidity. In addition, our study concerns an actual choice instead of a hypothetical exercise.

Our research questions were (1) whether patients with localized prostate cancer choose treatment with the higher (74 Gy) or the lower (70 Gy)

From the Departments of Radiation Oncology and Medical Technology Assessment, Radboud University Nijmegen Medical Center, Nijmegen; and the Arnhem Radiotherapeutic Institute, Arnhem, the Netherlands.

Submitted January 31, 2006; accepted August 1, 2006.

Supported in part by Grants No. KUN 2001-2379 and 2005-3457 from the Dutch Cancer Society, Amsterdam, the Netherlands.

Authors’ disclosures of potential conflicts of interest and author contributions are found at the end of this article.

Address reprint requests to Julia J. van Tol-Geerdink, PhD, Department of Radiation Oncology (874), Radboud University Nijmegen Medical Center, PO Box 9101, 6500 HB Nijmegen, the Netherlands; e-mail: J.vanTol@rther.umcn.nl.

© 2006 by American Society of Clinical Oncology

0732-183X/06/2428-4581/\$20.00

DOI: 10.1200/JCO.2006.05.9592

radiation dose, (2) whether their choice is reasoned in that it is consistent with the importance weights they give to the probability of various possible treatment outcomes, and (3) whether we can identify determinants of the treatment preferences.

## PATIENTS AND METHODS

### Patients

Between June 2003 and February 2005, patients with a primary localized prostate carcinoma ( $T_{1-3} N_0 M_0$ ), to be treated with three-dimensional conformal radiotherapy (3D-CRT), were included in this study. Exclusion criteria were mental disorders and insufficient knowledge of the Dutch language. Patients were enrolled at two locations; the Radboud University Nijmegen and the Arnhems Radiotherapeutic Institute (both in the Netherlands). The study was approved by the research ethics committees of both hospitals.

### Procedure

At the first visit to the radiotherapeutic center, the radiation oncologist told the patients that the radiation treatment would be spread out over "a period of over 7 weeks" without mentioning the term "standard treatment" or the exact number of radiation sessions. He informed eligible patients that this study focused on "how to involve the opinion of patients in the treatment." The researcher subsequently explained the patients that the study focused on their opinions and preferences. Patients who agreed to participate were sent a consent form and a baseline questionnaire. At the second visit to the clinic, they were interviewed and received information about two treatment options by means of a decision aid (described in the next section). Then, the patients were asked whether they wanted to choose one of the two treatment options. Finally, each patient was given a brief evaluation questionnaire to be filled out at home.

### Interview and Decision Aid

In a semistructured interview, the trade-off was mentioned between the risks and benefits of a higher or lower radiation dose. Patients received outcome and risk information on the treatments. The two treatments were explicitly presented as two equivalent treatment options and not as standard treatment versus alternative treatment. One option uses an effective radiation dose of 70 Gy,<sup>11</sup> and the other a dose of 74 Gy. The technique applied is 3D-CRT with three to four beams. Data on the expected outcomes of both treatments were derived from an extensive literature study.<sup>10</sup> Differences in life expectancy were calculated with the population-based yearly survival corrected for the 5-year survival probabilities.<sup>12</sup> Outcome information on 5-year overall survival, difference in life expectancy, 5-year disease-free survival (bNED), erectile dysfunction and severe late GI and genitourinary (GU) adverse effects were discussed. Severe adverse effects were defined as grade 2 or more on the European Organisation for Research and Treatment of Cancer–Radiation Therapy Oncology Group (EORTC-RTOG) definition,<sup>13</sup> and presented as adverse effects that have an impact on daily activities and may require medical intervention. The probability that these outcomes occurred (risk information) was presented by means of numbers and pie charts. Figure A1 shows an example of the decision aid applicable to the largest patient group (ie, ages 57.5 to 72.5 years). The information was also given to the patients, in writing, to take home (Appendix, online only).

Adverse effects were presented identically to all patients, but the effect on life expectancy was tailored to individual patient characteristics in terms of prognostic risk and age category (Table 1). Four separate information groups were distinguished. The first group consisted of low-risk patients, characterized by a prostate-specific antigen (PSA) value less than 10 ng/mL, a Gleason score less than 7, and a tumor status of T1 or T2. The remaining patients were divided into age categories of younger than 57.5 years, 57.5 to 72.5 years, and older than 72.5 years.

At the end of the interview, the patient was asked whether he wanted to choose one of the two treatment options, and if so, which treatment he preferred. After 2 days, the patient's decision was confirmed by telephone. The treatment choice of the patient (ie, 70 or 74 Gy) was carried out.

**Table 1.** Information Groups of Patients and the Associated Losses in Life Expectancy (years) As Compared With Men Without Prostate Cancer

Information Group	Patient Characteristics		Treatment A (70 Gy)	Treatment B (74 Gy)
	Age (years)	Low Risk		
1	All ages	Yes	0	0
2	> 72.5	No	1	0
3	57.5-72.5	No	2	1
4	< 57.5	No	4	2

To ensure that the patients' choices were not determined by biased information, two checks were performed. First, 20 interviews were recorded on audio tape, with permission of the patients. A sample of these tapes was judged by two physicians. They considered the information to be a fair and unbiased representation of the treatments. Secondly, when asked in the evaluation questionnaire, 96% of the patients indicated that both options were presented in an unbiased way.<sup>14</sup>

### Baseline Measures

To find determinants of the treatment choice, data on variables that may affect this choice were collected. All data were collected at baseline (ie, before the option to choose was introduced) except for the evaluation questions. Patients were asked to judge their own knowledge on prostate cancer and radiotherapy on a 10-point scale (from "very poor" to "excellent"). We measured the level of numeracy (ie, the ability to handle basic probability concepts)<sup>15</sup> by three questions on the calculation of probability. Patients were asked to rate their preference for information on a 10-point scale.<sup>16</sup>

Self-report data were collected on demographic variables (age, marital status, having [grand]children, education and religion). Medical characteristics (T status, pretreatment PSA value, Gleason score and hormone treatment) were extracted from the medical records.

The general participation preference at baseline was measured with two questions about who decides on the choice of treatment.<sup>17</sup> Data were obtained on anxiety and depression by means of the Hospital Anxiety and Depression Scale (HADS). Patients were also asked to rate their general health in the previous week on a 10-point scale. Hopelessness, avoidance, and fighting spirit were assessed with the Mental Adjustment to Cancer scale.<sup>18</sup> Patients rated their cancer worries in three questions.<sup>19,20</sup> Prostate-specific quality of life was assessed by means of the EORTC QLQ-PR25 quality of life prostate cancer module<sup>21</sup> with questions on urinary, bowel, and sexual functioning. Data on the personality traits autonomy and conscientiousness were obtained using a personality assessment instrument.<sup>22,23</sup>

### Importance Weight

In the evaluation questionnaire, patients were asked about the importance of various outcomes (eg, "Regarding your trade-off between the lower and the higher dose, how important was the probability of bowel problems?"). Patients rated the importance on a five-point scale (1 = not important to 5 = very important). Similar questions covered the probability of bladder and sexual morbidity, the absence/recurrence of the tumor, the possibility of a longer/shorter life, and of the number of radiation sessions required.

### Analyses

Patients choosing the low-dose were compared with those choosing the high-dose. In case of missing data, scale values were calculated only if at least half of the items were filled out, by imputing the mean of the remaining items. For continuous variables, a *t* test was performed, and for categorical variables the  $\chi^2$  test was used. Continuous data were also analyzed using the  $\chi^2$  test, after subdivision into two categories by use of the median split and presented with *P* value and odds ratio (OR). Only those variables that differed between patients groups at a level of *P* < .15 are presented herein. These variables were entered simultaneously in a logistic regression model.

## RESULTS

**Participants**

During the inclusion period, a total of 200 patients met the inclusion criteria and were asked to participate in the study. One hundred fifty of them (75%) gave informed consent and were included in the study. Of these 150 patients, 119 decided to choose their own treatment,<sup>14</sup> and their choice is described in this study. Patient characteristics are listed in Table 2.

**Preferred Treatment**

Of the 119 patients who made a choice, 75% (n = 89) chose the lower radiation dose. Patients found specific quality-of-life aspects more important than the likelihood of survival (Table 3). Post hoc tests showed that patients attached significantly more weight to the probability of GI toxicity than to the probability of a shorter/longer life ( $P < .001$ ).

Table 4 shows that patients who assigned high importance (ie, above median importance) to the probability of tumor recurrence and survival were more likely to choose the higher dose (as indicated by an OR > 1), whereas patients who assigned high importance to the probability of GI and GU problems were less likely to choose the higher dose (OR < 1). All associations were strongly significant ( $P < .001$ ), except for the number of radiation sessions ( $P = .026$ ) and the chance of sexual problems (not significant).

Many patient characteristics failed to show a significant association with the preferred treatment in bivariate analyses (ie, numeracy, information preference, demographic variables [except for age], Gleason score, health, mental adjustment to cancer, worries, baseline quality-of-life, and personality traits). In Table 5, only those patient characteristics that are associated with the choice for the high

**Table 3.** Importance Weights Given to Possible Treatment Outcomes

Outcome Measure	Weight	
	Mean	SD
Probability of shorter or longer life	3.5	1.3
Probability of tumor recurrence	3.9	1.2
Probability of severe GI problems	4.1	1.1
Probability of severe GU problems	3.8	1.1
Probability of sexual problems	2.8	1.6
No. of radiation sessions	3.4	1.4

NOTE. Response scale: 1 = not important to 5 = very important.  
Abbreviation: GU, genitourinary.

dose with a  $P < .15$  in bivariate analyses are listed. The information group was strongly associated with treatment choice. In the group that had nothing to gain from a high dose in terms of life expectancy (ie, low-risk patients), all patients chose the low dose. Across the four information groups, the higher the expected gain, the lower the proportion of patients who chose the low dose. Concordantly, older patients (70 years or older) were more likely to choose the lower radiation dose, as were patients with a better prognosis, in terms of T1-2 or low-risk status, and patients without hormone treatment. Patients with a clinically high score on anxiety or depression, however, were more likely to choose the high dose. In multiple logistic regression analysis, the only variable that remained statistically significant was information group ( $P = .006$ ).

## DISCUSSION

This study focused on the choice between a higher and a lower radiation dose for localized prostate cancer. Most of the patients in this study (75%) preferred the treatment with the lower radiation dose. Their choices were highly consistent with the importance weights they gave to the probability of the different treatment outcomes.

The fact that many patients preferred the lower dose may be due, in part, to the fact that patients were offered a choice between active treatments and that they were informed by means of a decision aid. A decision aid can lead to a shift towards more quality-of-life-oriented treatment choices.<sup>6,24,27</sup> In most previous studies, however, survival arguments appeared to outweigh quality-of-life aspects in the patients' treatment choice,<sup>1,4,25,26</sup> sometimes even in the absence of a survival gain.<sup>3,4</sup> To date, quality of life appeared to determine the choice of the majority of patients mainly when the choice was either hypothetical,<sup>5</sup> or realistic but without survival gain.<sup>6</sup> As such, it is a new finding that the majority of the patients in our study made a quality-of-life-based choice when presented with a survival gain in an actual treatment decision. Whether the preference for the lower dose may be related to sex, type of disease, or culture remains unanswered. The preference may be related to the fact that our patients, on average, were older and were faced with a less life-threatening disease than most cancer patients previously studied. Excluding the low-risk and oldest patients (groups 1 and 2) from the analysis resulted in less preference for the lower dose (61% instead of 75%).

Our data show not only that many patients indicate a preference for the lower dose, but also that the patients' choices are reasoned in that they are consistent with both their individual clinical

**Table 2.** Patient Characteristics of Choosers (n = 119)

Characteristic	Measure
Demographic items	
Age, years	
Mean	70
Range	51-84
College education or more	39%
Medical variables	
Tumor stage	
T1	16%
T2	35%
T3	49%
PSA	
Mean	25 ng/mL
SD	34 ng/mL
< 10 ng/mL	39%
Gleason score	
Mean	6.5
Range	3-10
< 7	54%
Low risk status (ie, T <sub>1-2</sub> and PSA < 10 and Gleason < 7)	20%
Adjuvant hormonal treatment	74%
Treatment location	
Regional Hospital Arnhem	51%
University Clinic Nijmegen	49%

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

**Table 4.** Relation Between Choosing the Higher Dose Level and the Importance Weight Given to the Probability of Different Treatment Outcomes

Probability of outcome	Low Dose		High Dose		$\chi^2$	P	Odds Ratio
	No.	%	No.	%			
Survival					14.5	< .001	6.7
High weight	36	60	24	40			
Low weight	50	91	5	9			
Tumor recurrence					10.8	.001	6.9
High weight	48	65	26	35			
Low weight	38	93	3	7			
Severe GI problems					25.1	< .001	0.1
High weight	76	86	12	14			
Low weight	11	39	17	61			
Severe GU problems					14.0	< .001	0.2
High weight	66	86	11	14			
Low weight	21	54	18	46			
Sexual problems					0.3	.567	0.8
High weight	66	76	21	24			
Low weight	19	70	8	30			
No. of radiation treatments					5.0	.026	0.4
High weight	55	83	11	17			
Low weight	32	65	17	35			

Abbreviation: GU, genitourinary.

characteristics and the importance weights they gave to possible outcomes. Consistency with the clinical characteristics was found in that older patients and patients with better prognosis were more likely to choose the lower dose. Such patients have less to gain from the higher dose. Previous reports have also linked treatment preference to age<sup>27-29</sup> and a (perceived) better prognosis.<sup>27,30</sup> The patients without hormone treatment were also more likely to choose the lower dose, probably related to their better prognosis in terms of a low T status ( $P < .001$ ). Consistency with the importance weights for outcomes was also found. A high weight assigned to cure (in terms of the probability of tumor control and survival) was associated with a preference for the higher dose, whereas a high weight assigned to the risk of severe morbidity (GI and GU) was associated with a preference for the lower dose. This suggests that the patients' treatment decisions reflect reasoned choices. The fact that the importance weight for sexual problems was not related to the choice may be partly due to pre-existing or hormone-induced impotence.

Some methodologic comments can be made. The number of patients involved in this study, although considerable, is still relatively low considering the number of determinants tested. Statistical analyses would have benefited from larger groups. Nevertheless, we were able to identify significant determinants of choice. Another consideration is that the standard effective dose used before the start of the study was 70 Gy. Although this information was not shared with the patients, and the treatment options were not specified in Gy, we cannot rule out a possible effect on patients' preferences. Yet another consideration is whether our findings can be generalized to all patients with primary localized prostate cancer. Out of 200 eligible patients, 150 (75%) gave informed consent. The patients who refused to give informed consent did not differ in age and medical characteristics from the participants.<sup>14</sup> Still, we cannot rule out the possibility that they might have made a different treatment choice. Of the 150 patients who participated, 119 patients decided to choose their treatment, and their choice is described in this study. The remaining 31 patients

decided to leave the choice to their physician.<sup>14</sup> These 31 patients were also asked to indicate whether they would have preferred the low or the high dose. Most were undecided ( $n = 21$ ), but the remainder ( $n = 10$ ) preferred the low dose over the high dose, supporting the conclusion that many of the prostate cancer patients prefer the lower radiation dose. No statistical differences in demographic or medical characteristics were found between the 31 nonchoosers and the 119 choosers.

An objection to the study design may be that not all patients received the same risk information. For example, older patients were presented with a smaller difference in life expectancy than younger patients. Thus, the effect of patient characteristics on treatment choice was confounded by differences in risk information. At the same time, it is the strength of this study that the information was individualized, in that it was tailored to specific patient groups. This way, each patient was offered information that most closely matched his personal prognosis, enabling a personalized trade-off. Another objection could be that patients chose the lower dose because the gain presented for the more aggressive option was small. However, a gain of 6% in 5-year survival is comparable to many other oncologic choices. Furthermore, it is unlikely that the preference for the lower dose in our study is caused by a biased presentation of both treatment options, since both physicians and patients considered the information to be unbiased.

As for the presented dose levels of 70 and 74 Gy, in recent years the routine dose for prostate cancer tends to rise to levels of 78 Gy (or even higher with intensity-modulated radiation therapy and smaller treatment margins). At the start of this study, however, such levels were not common in Europe. We decided to offer patients a choice between 70 and 74 Gy, because it was the explicit intent of this study to explore patient preferences between generally accepted treatments instead of between routine and experimental treatments. Moreover, the radiation dose of 70 to 74 Gy is still common practice in many hospitals for the treatment of prostate cancer.

This study showed that, in the specific group of patients with primary localized prostate cancer, many patients preferred the

**Table 5.** Relation Between Choosing the Higher Dose Level and Patient Characteristics

Characteristic	Low Dose		High Dose		$\chi^2$	P	Odds Ratio
	No.	%	No.	%			
<b>Information</b>							
Information group					24.9	< .001	NC
Low risk (all ages)	24	100	0	0			
> 72.5 years	28	85	5	15			
57.5-72.5 years	38	65	20	35			
< 57.5 years	0	0	4	100			
Patient's judgement of own knowledge					3.0	.085	2.0
Low (< 6)	29	66	15	34			
High ( $\geq$ 6)	57	80	14	20			
<b>Demographics</b>							
Age, years					11.7	.001	0.2
< 70	27	59	19	41			
$\geq$ 70	63	86	10	14			
<b>Medical parameters</b>							
Tumor stage					11.3	.001	4.7
T1 or T2	54	88	7	12			
T3	36	62	22	38			
PSA (pretreatment)					2.3	.131	2.0
< 10 ng/mL	39	83	8	17			
$\geq$ 10 ng/mL	51	70	21	30			
Low risk					9.7	.002	NC
Yes	24	100	0	0			
No	66	69	29	31			
Hormone treatment					5.3	.021	4.1
No	29	91	3	9			
Yes	61	70	26	30			
<b>Psychological</b>							
Participation preference					3.5	.062	0.4
Low	35	67	17	33			
High	55	82	12	18			
Anxiety score					8.1	.004	4.3
< 8	81	81	19	19			
$\geq$ 8	9	50	9	50			
Depression score					5.1	.024	3.8
< 8	84	79	22	21			
$\geq$ 8	6	50	6	50			

NOTE. Only associations with a  $P < .15$  in bivariate analyses are listed. In multiple logistic regression analysis, information group was the only variable that remained statistically significant ( $P = .006$ ).

Abbreviations: NC, not calculated (due to empty cells); PSA, prostate-specific antigen.

lower radiation dose (ie, the less aggressive treatment). Patients differed in their preferences, but their choices were consistent with their medical status and the importance weights assigned to the probability of different treatment outcomes. Irrationality and incapability to choose are therefore discredited as arguments to deny patients involvement in treatment selection. This study suggests that patients with localized prostate cancer attach more weight to specific aspects of the quality of life (ie, GI toxicity) than to

the probability of survival. The increased risk of morbidity was deemed too high a price for the increased probability of tumor control. It is therefore expected that the new trend of high-dose intensity-modulated radiation therapy will be valued by patients only when the higher tumor control is accompanied by a low complication rate. Treatment preferences of patients with localized prostate cancer can and should be involved in radiotherapy decision making.

## REFERENCES

- Slevin ML, Stubbs L, Plant HJ, et al: Attitudes to chemotherapy: Comparing views of patients with cancer with those of doctors, nurses, and general public. *BMJ* 300:1458-1460, 1990
- Yellen SB, Cella DF: Someone to live for: Social well-being, parenthood status, and decision-making in oncology. *J Clin Oncol* 13:1255-1264, 1995
- Jansen SJ, Kievit J, Nooij MA, et al: Patients' preferences for adjuvant chemotherapy in early-stage breast cancer: Is treatment worthwhile? *Br J Cancer* 84:1577-1585, 2001
- Palda VA, Llewellyn-Thomas HA, MacKenzie RG, et al: Breast cancer patients' attitudes about rationing postlumpectomy radiation therapy: Applicability of trade-off methods to policy-making. *J Clin Oncol* 15:3192-3200, 1997
- Singer PA, Tasch ES, Stocking C, et al: Sex or survival: Trade-offs between quality and quantity of life. *J Clin Oncol* 9:328-334, 1991
- Whelan T, Levine M, Willan A, et al: Effect of a decision aid on knowledge and treatment decision making for breast cancer surgery. *JAMA* 292:435-441, 2004
- Levine MN, Guyatt GH, Gent M, et al: Quality of life in stage II breast cancer: An instrument for clinical trials. *J Clin Oncol* 6:1798-1810, 1988

8. Charles C, Redko C, Whelan T, et al: Doing nothing is no choice: Lay constructions of treatment decision-making among women with early-stage breast cancer. *Sociol Health Illness* 20:71-95, 1998
9. Chapple A, Ziebland S, Herxheimer A, et al: Is 'watchful waiting' a real choice for men with prostate cancer? *BJU Int* 90:257-264, 2002
10. van Tol-Geerdink JJ, Stalmeier PFM, Paskerde Jong PCM, et al: A systematic review of the effect of radiation dose on tumor control and morbidity in the treatment of prostate cancer by 3D-CRT. *Int J Radiat Oncol Biol Phys* 64:534-543, 2006
11. ICRU Prescribing, recording and reporting photon beam therapy *ICRU report* 50. Bethesda, MD: International Commission on Radiation Units and Measurement, 1993
12. Central Bureau of Statistics in the Netherlands: Situation in 2000. <http://www.cbs.nl>
13. Cox JD, Stetz J, Pajak TF: Toxicity criteria of the Radiation Therapy Oncology Group (RTOG) and the European Organization for Research and Treatment of Cancer (EORTC). *Int J Radiat Oncol Biol Phys* 31:1341-1346, 1995
14. van Tol-Geerdink JJ, Stalmeier PFM, van Lin ENJT, et al: Do prostate cancer patients want to choose their own radiation treatment? *Int J Radiat Oncol Biol Phys* (in press)
15. Schwartz LM, Woloshin S, Black WC, et al: The role of numeracy in understanding the benefit of screening mammography. *Ann Intern Med* 127:966-972, 1997
16. Sutherland HJ, Llewellyn-Thomas HA, Lockwood GA, et al: Cancer patients: Their desire for information and participation in treatment decisions. *J Royal Soc Med* 82:260-263, 1989
17. Deber RB, Kraetchmer N, Irvine J: What role do patients wish to play in treatment decision making. *Arch Intern Med* 156:1414-1420, 1996
18. Watson M, Greer S, Young, et al: Development of a questionnaire measure of adjustment to cancer: The MAC scale. *Psychol Med* 18:203-209, 1988
19. Lerman C, Rimer BK, Engstrom PF: Cancer Risk Notification: Psychosocial and Ethical Implications. *J Clin Oncol* 9:1275-1282, 1991
20. Stefanek ME, Helzlsouer KJ, Wilcox PM, et al: Predictors of and satisfaction with bilateral prophylactic mastectomy. *Prev Med* 24:412-419, 1995
21. Borghede G, Sullivan M: Measurement of quality of life in localized prostatic cancer patients treated with radiotherapy: Development of a prostate cancer specific module supplementing the EORTC QLQ-C30. *Qual Life Res* 5:212-222, 1996
22. Hendriks AAJ, Hofstee WKB, De Raad B: The Five-Factor Personality Inventory (FFPI). *Pers Individ Dif* 27:307-325, 1999
23. Hendriks AAJ, Perugini M, Angleitner A, et al: The five-factor personality inventory: Cross-cultural generalizability across 13 countries. *Eur J Pers* 17:347-373, 2003
24. O'Connor AM, Rostom A, Fiset V, et al: Decision aids for patients facing health treatment or screening decision: Systematic review. *BMJ* 319:731-734, 1999
25. Thewes B, Meiser B, Duric VM, et al: What survival benefits do premenopausal patients with early breast cancer need to make endocrine therapy worthwhile? *Lancet Oncol* 6:581-588, 2005
26. Brundage MD, Dahidson JR, Mackillop WJ, et al: Using a treatment-tradeoff method to elicit preferences for the treatment of locally advanced non-small-cell lung cancer. *Med Decis Making* 18:256-267, 1998
27. Peele PB, Siminoff LA, Xu Y, et al: Decreased use of adjuvant breast cancer therapy in a randomized controlled trial of a decision aid with individualized risk information. *Med Decis Making* 25:301-307, 2005
28. Yellen SB, Cella DF, Leslie WT: Age and clinical decision making in oncology patients. *J Natl Cancer Inst* 86:1766-1770, 1994
29. Rose JH, O'Toole EE, Dawson NV, et al: Perspectives, preferences, care practices, and outcomes among older and middle-aged patients with late-stage cancer. *J Clin Oncol* 22:4907-4917, 2004
30. Weeks JC, Cook EF, O'Day SJ, et al: Relationship between cancer patients' predictions of prognosis and their treatment preferences. *JAMA* 279:1709-1714, 1998

## Appendix

The Appendix is included in the full-text version of this article, available online at [www.jco.org](http://www.jco.org). It is not included in the PDF version (via Adobe® Reader®).

### Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

### Author Contributions

**Conception and design:** Julia J. van Tol-Geerdink, Peep F.M. Stalmeier, Henk Huizenga

**Provision of study materials or patients:** Emile N.J.T. van Lin, Eric C. Schimmel

**Collection and assembly of data:** Julia J. van Tol-Geerdink

**Data analysis and interpretation:** Julia J. van Tol-Geerdink, Peep F.M. Stalmeier

**Manuscript writing:** Julia J. van Tol-Geerdink, Peep F.M. Stalmeier

**Final approval of manuscript:** Julia J. van Tol-Geerdink, Peep F.M. Stalmeier, Emile N.J.T. van Lin, Eric C. Schimmel, Henk Huizenga, Wim A.J. van Daal, Jan-Willem Leer