

# Uncertainty and perception of danger among patients undergoing treatment for prostate cancer

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Study Type – Therapy (attitude prevalence)  
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## OBJECTIVES

- To investigate patient uncertainty and perception of danger regarding prospects for clinical prostate cancer control.
- To determine the impact of these factors on satisfaction with overall prostate cancer treatment outcome.

## PATIENTS AND METHODS

- Men who had undergone primary treatment for early stage prostate cancer and who were participants in the Prostate Cancer Outcomes and Satisfaction with Treatment Quality Assessment (PROSTQA) prospective cohort study of prostate cancer outcomes (the parent study) were offered the opportunity to participate in the present study.
- Centralized phone interviews were conducted to determine patient-reported uncertainty regarding cancer status (measured by the Mishel Uncertainty in

## What's known on the subject? and What does the study add?

Marked differences in uncertainty among patients have been found relating to race and social environment indicating that as uncertainty increases, social functioning declines. Correlations have been found between uncertainty and patients' coping, psychological adjustment and perceptions of their health and illness. Studies suggest the detrimental effect of uncertainty among patients with prostate cancer in the perception of their quality of life. These studies underline the potential benefit of targeted intervention.

The study provides a unique insight into the impact of uncertainty and perception of danger on overall satisfaction with treatment outcomes in men with prostate cancer. Its results suggest that possible disparities related to patient racial background and education may exist in the perception of cancer-related uncertainty. Racial and educational disparities, coupled with a mild to moderate association of uncertainty or danger perception and overall outcome satisfaction, suggest an unmet need for healthcare and nursing services for men undergoing treatment for prostate cancer.

Illness Scale-Community Form), perception of danger (measured by Folkman and Lazarus' Appraisal Scale) and satisfaction with treatment outcome (measured by the Service Satisfaction Scale for Cancer Care). The study used the same centralized telephone interview centre as was used in the parent study.

- Data were collected at 48, 60 or 72 months after the completion of prostate cancer treatment.

- Relationships among measures were characterized by Spearman rank correlation coefficients ( $r$ ).

## RESULTS

- A total of 338 agreed to participate, representing 76% of those who were invited.
- Younger patients experienced less uncertainty ( $r = 0.20$ ,  $P < 0.001$ ), yet

reported greater perception of danger ( $r = -0.12$ ;  $P = 0.03$ ) concerning their previously treated prostate cancer.

- African-American patients showed greater uncertainty than other ethnic groups ( $P = 0.005$ ) but did not have a greater perception of danger ( $P = 0.36$ ).
- Education played a major role in uncertainty; patients with lower levels of education tended to report higher degrees of uncertainty ( $r = -0.25$ ;  $P < 0.001$ ).
- There was a mild to moderate general association between the three outcomes. A

greater sense of uncertainty was associated with a greater perception of danger ( $r = 0.34$ ,  $P < 0.001$ ), and as danger and uncertainty increased, satisfaction with treatment outcome tended to decrease ( $r$  was between  $-0.30$  and  $-0.34$ ,  $P < 0.001$ ).

### CONCLUSIONS

- Results suggest that possible disparities related to patient racial background and education may exist in the perception of cancer-related uncertainty.

• Racial and educational disparities, coupled with a mild to moderate association of uncertainty or danger perception and overall outcome satisfaction, suggest an unmet need for healthcare and nursing services for men undergoing treatment for prostate cancer.

### KEYWORDS

prostate cancer, uncertainty, danger, treatment satisfaction

## INTRODUCTION AND BACKGROUND

Prostate cancer is a major health problem for men. With ~ 217 730 new cases reported in the USA in 2010, it is the most commonly diagnosed cancer in US men [1]. It is estimated that one in six men will be diagnosed with prostate cancer during his lifetime, and about one in 36 will die from the disease. The role of uncertainty as a determinant of the state of health of a patient with prostate cancer was originally described using the conceptual framework proposed by Mishel [2]. The importance of uncertainty among prostate cancer survivors has been further explored in recent studies, suggesting that the impact of uncertainty on a cancer survivor's health state is mediated by their appraisal of danger [3,4]; however, the impact of freedom from recurrence as compared with PSA relapse (after primary treatment for prostate cancer) on the appraisal of danger, and mediation of uncertainty by perception of danger on a patient's overall state of health, has not been sufficiently characterized. Moreover, the impact of uncertainty and perception of danger on overall cancer treatment outcome satisfaction has not been evaluated [5].

Uncertainty in illness is defined as a cognitive state resulting from insufficient cues with which a patient might form a cognitive schema or meaning of a situation or event [6]. Prostate cancer, appraised as either a danger or an opportunity, may have an impact on a patient's uncertainty and consequently satisfaction with his treatment outcome. The aims of the present study were to characterize patient, cancer and treatment factors that have an impact on uncertainty, perceived danger and

satisfaction of outcome in men with localized prostate cancer and to evaluate the impact of uncertainty and the potential mediation of perceived danger upon overall outcome satisfaction.

Germino *et al.* [7] evaluated the role of uncertainty in determining quality of life in men with localized prostate cancer and their families. The researchers compared baseline demographics, measurement of uncertainty, and quality of life outcomes among 140 men who underwent surgery, 35 men treated by external beam radiation therapy and 26 men who chose watchful waiting. After controlling for age and education, the authors found no differences in levels of uncertainty among the different treatment groups, but they reported marked differences in uncertainty related to race and social environment with resultant worsening social functioning associated with increasing uncertainty. Small but significant correlations were noted between uncertainty and patients' coping, psychological adjustment and perceptions of their health and illness. Correlates of uncertainty included perceptions about the quality of medical care, treatment and satisfaction with care. The small sample size in their study precluded strong conclusions regarding the presence and associations with uncertainty within each treatment group after stratifying by race; however this research identified strong cultural associations with perceptions of uncertainty and their role in perceptions of quality of life in men with localized prostate cancer.

Payment [8] found that men receiving hormone therapy for prostate cancer reported greater uncertainty than did men

treated with radical prostatectomy. The investigator suggested that the findings might be explained by the belief that surgical intervention implies cure, whereas hormone therapy is designed to halt disease spread temporarily. The experience of uncertainty may be more apparent as one's illness becomes more serious or complex because of longer hospitalization, complex or experimental treatment regimens and mixed messages from healthcare providers.

Mishel *et al.* [9] completed two large trials assessing an intervention to counter uncertainty in men with both localized disease ( $n = 239$ ) and advanced prostate cancer ( $n = 271$ ). They documented the negative effects of illness uncertainty on quality of life and the benefit of an uncertainty management intervention to better manage incontinence and to provide better sexual functioning. In the second study of men with advanced or recurrent disease, intervention subjects reported less severe back pain, fewer problems with constipation, and an improved ability to get and maintain an erection. These studies suggest the detrimental effect of uncertainty in perception of quality of life among patients with prostate cancer and underline the potential benefit of targeted intervention.

## PATIENTS AND METHODS

### PATIENTS

The Prostate Cancer Outcomes and Satisfaction with Treatment Quality Assessment (PROSTQA) study is a prospective, longitudinal, multicentre cohort

comprising men with previously untreated clinical stage T1 to T2 prostate cancer who elected to undergo prostatectomy, brachytherapy, or external beam radiotherapy as primary treatment. They were enrolled from 2003 to 2006 at nine US university-affiliated hospitals, using an institutional review board-approved protocol, after providing written informed consent [5]. All patients with an active PROSTQA follow-up interview over a 6-month period were eligible for the present study, except those enrolled at UCLA and the University of Michigan-Providence. These 517 patients were at their 48, 60, or 72 month PROSTQA follow-up interview and were asked to consent after answering PROSTQA questions. Of these 517 patients, a total of 444 patients were asked to participate, of whom 338 (76%) patients consented and 106 patients declined, 52 patients were not reached for the interview and 21 declined further study participation before being asked. The present study added the Mishel Uncertainty in Illness Scale (MUIS-A) and Folkman and Lazarus' Appraisal Scale (to assess perception of danger) as instruments after patients had undergone the PROSTQA interview.

Potential participants who met eligibility criteria were identified from the pool of patients participating in the parent PROSTQA cohort study. PROSTQA participants were asked for written formal consent to participate in research related to their treatment for prostate cancer. At the time of the 48- or 60- or 72-month telephone interview for data collection for the parent study, participants were invited to participate in the present companion research study, evaluating the uncertainty and danger that they perceived related to their prostate cancer health. Those patients who gave consent to participate had the uncertainty and danger appraisal questions administered as part of their regular interview for the parent study. Pilot testing of these additional questions at the computer assisted telephone interview (CATI) test centre has indicated that they took an additional 10–12 min to complete. To ensure uniformity in data collection, data were collected by the same centralized telephone interview centre used by the parent study. Supervisory staff at the interview centre monitored the interview process for adherence to protocol.

## INSTRUMENTS

The domains of danger, uncertainty and satisfaction with treatment outcome were assessed using the MUIS-Community Form (MUIS-C), Folkman and Lazarus' Appraisal Scale, and five questions from the Service Satisfaction Scale for Cancer Care (SCA). A higher score in each instrument, respectively, reflects an increase in perceived uncertainty, perceived danger and satisfaction with treatment outcome.

The 23-item MUIS-C uses a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) modified from the 33-item MUIS-A. The MUIS-C is intended for use with community-dwelling chronically ill adults who may or may not be receiving treatment. Although the validity of the MUIS-C has not been directly measured, its items are highly similar to those of the original MUIS-A and the validity results from that instrument have been used to support the MUIS-C [10].

Folkman and Lazarus' Appraisal Scale [11] consists of 15 questions, on a 5-point Likert scale (0 = not at all; 5 = a great deal) for a possible total of 75 points. Respondents are asked to rate the extent to which they felt each of 15 emotions regarding a stressor, in the present case prostate cancer or its treatment side effects; eight questions pertain to perceived danger and the others to perceived opportunity. The sum of the chosen numerical values give a final opportunity and danger appraisal score. Previous research [3] has shown that the addition of 'danger' in the prostate cancer population significantly increased the variance in quality of life above and beyond uncertainty, underscoring the emphasis of danger in this research.

The five SCA questions that addressed satisfaction with treatment outcome were on the following areas: (i) the effect of health care services; (ii) the effect of treatment on cancer progression; (iii) the quality of cancer care; (iv) the effect of services; and (v) overall satisfaction with treatment. The mean scores from the five questions provide a score ranging from 0 to 100 [12].

No instrument guidelines could be found on how to handle missing item responses in the MUIS-C and the danger appraisal scale. Case mean substitution as described by

Fox-Wasylyshyn and El-Masri [13] and Fayers *et al.* [14] was used to impute missing item responses separately for each instrument. If a patient responded to at least half the domain's questions, the mean of the other responses was used to impute missing responses. Nine of 338 patients who consented to the present study either did not respond to at least half the uncertainty or half the danger domain questions.

Further imputation using the satisfaction with treatment outcome score beyond that which was carried out in the PROSTQA parent study was not performed. In that study, a satisfaction with treatment outcome score was obtained as long as four of five questions on the survey were answered. Only one patient did not answer at least four questions. A description of this and the other nine patients with an insufficient number of uncertainty or danger domain responses are shown in Table 1 as patients who consented to the present study but did not complete the interviews.

As a sensitivity check, conclusions did not change when imputing the lowest and the highest possible response for each unanswered question. The one exception was that the univariate effect of planned treatment upon perceived danger loses its significance when assuming either the minimum or maximum item response; however, the effect of planned treatment upon danger may, in the first place, be more reflective of age and other demographics of each planned treatment type.

## STATISTICAL ANALYSIS

A Fisher's exact test, and ANOVA in the case of body mass index, was used to test for demographic differences among those analysed, those who consented but were unanalysable, and those who declined consent (Table 1). Spearman rank correlations were used to summarize which continuous characteristics (such as age at baseline) were associated with increased outcomes of perception of danger, uncertainty, and satisfaction with treatment outcome; associations of categorical characteristics (such as education level) to these outcomes were tested by linear regression with outcomes estimated by generalized estimating equations (GEEs), and the Kruskal-Wallis Test in the case of variables with sparse cells (Table 2). Because

TABLE 1 Characteristics of PROSTQA participants approached for Uncertainty study\*

Demographic	Consented – completed interviews (n = 328)	Consented – did not complete interviews (n = 10)	Declined consent (n = 106)	P value†
Year of follow-up when approached for uncertainty – no. (%)				0.74
48 month interview	95 (29)	1 (10)	30 (28)	
60 month interview	84 (26)	4 (40)	27 (26)	
72 month interview	149 (45)	5 (50)	49 (46)	
Age				0.32
Median – yr	64	71	64	
Range – yr	45–80	58–75	47–85	
Age group – no. (%)				
<60 yr	100 (30)	1 (10)	31 (29)	
60–69 yr	134 (41)	3 (30)	40 (38)	
>69 yr	94 (29)	6 (60)	35 (33)	
Race – no. (%)‡				0.22
White	299 (91)	0 (0)	88 (83)	
African American	23 (7)	10 (100)	15 (14)	
Other	2 (1)	0 (0)	1 (1)	
Not reported	4 (1)	0 (0)	2 (2)	
Education level at baseline – no. (%)				0.94
<HS graduate	6 (2)	0 (0)	4 (4)	
HS graduate	59 (18)	1 (10)	18 (17)	
Some college	75 (23)	2 (20)	27 (25)	
College graduate	69 (21)	2 (20)	21 (20)	
Grad school	119 (36)	5 (50)	36 (34)	
Married or with partner – no. (%)§	284 (87)	10 (100)	89 (84)	0.54
Any coexisting illnesses – no. (%)	75 (23)	2 (20)	25 (24)	0.97
Mean body-mass index – no. (%)	28.1 ± 4.3	30.6 ± 3.7	28.0 ± 5.0	0.23
PSA				0.38
Median – ng/ml	5.4	5.1	5.5	
Range – ng/ml	0.5–54.0	3.0–7.1	1.2–30.7	
Group – no. (%)				
<4 ng/mL	66 (20)	4 (40)	21 (20)	
4–10 ng/mL	217 (66)	6 (60)	75 (71)	
>10 ng/mL	45 (14)	0 (0)	10 (9)	
Gleason score on biopsy – no. (%)				0.63
<7	182 (55)	5 (50)	64 (60)	
7	130 (40)	5 (50)	35 (33)	
>7	16 (5)	0 (0)	7 (7)	
Clinical stage – no. (%)				0.004
T1	232 (71)	7 (70)	91 (86)	
T2	96 (29)	3 (30)	15 (14)	
Overall cancer severity – no. (%)¶				0.64
Low risk	160 (49)	5 (50)	60 (57)	
Intermediate risk	142 (43)	5 (50)	38 (36)	
High risk	26 (8)	0 (0)	8 (7)	
Planned treatment – no. (%)				0.97
Radical prostatectomy	158 (48)	5 (50)	55 (52)	
External radiation therapy	89 (27)	3 (30)	27 (25)	
Brachytherapy	81 (25)	2 (20)	24 (23)	
Planned neoadjuvant hormonal therapy – no. (%)	36 (11)	0 (0)	10 (9)	0.70

\*Plus-minus values are means ± SD. A higher score reflects an increase in perceived danger, perceived uncertainty, and Satisfaction with Treatment Outcome. †Fisher's exact test between those who accepted and completed the interviews; those who accepted but did not complete the interviews; and those who declined participation in the Uncertainty Study; BMI tested with ANOVA. ‡Four individuals who accepted participation did not self-report race. §One individual who accepted participation did not self-report marriage/living with partner status. ¶Risk defined by D'Amico Risk Level. Low Risk, PSA ≤ 10 & Gleason Score < 7 & Stage = T1 or T2a. High Risk, PSA > 20 or Gleason Score > 7 or Stage ≥ T2c. Intermediate Risk, All else.

TABLE 2 Association of participant characteristics with perception of danger, uncertainty and satisfaction of treatment outcome

Demographic	Danger		Uncertainty		Satisfaction with treatment outcome	
	Correlation/Median (Q1,Q3)	P*	Correlation/Mean (SD)	P*	Correlation/Median (Q1,Q3)	P*
All Time since treatment	1 (0, 4)	–	42.3 (13.4)	–	93 (83, 100)	–
Spearman rank correlation	–0.02	0.66	0.06	0.30	0.02	0.69
Follow-up stage when approached for participation in the present study		0.92		0.18		0.24
48-month interview	2 (0, 4)		41.1 (11.7)		90 (83, 100)	
60-month interview	1 (0, 4)		40.9 (13.3)		93 (83, 100)	
72-month interview	1 (0, 6)		43.8 (14.4)		93 (83, 100)	
Age at treatment						
Spearman rank correlation	–0.12	0.03	0.20	<0.001	–0.03	0.64
Age group		0.22		0.006		0.13
<60 years	2 (0, 6)		39.3 (12.8)		97 (83, 100)	
60–69 years	1 (0, 5)		42.1 (12.6)		90 (83, 100)	
>69 years	0 (0, 3)		45.8 (14.5)		95 (83, 100)	
Race/Ethnicity		0.36		0.005		0.79
White	1 (0, 5)		41.6 (13.2)		93 (83, 100)	
African-American	2 (0, 4)		51.7 (13.6)		97 (83, 100)	
Other	0 (0, 0)		42.0 (5.7)		95 (90, 100)	
Not reported	1 (0, 2)		42.0 (12.1)		90 (83, 98)	
Education level at treatment						
Spearman rank correlation	0.00	0.93	–0.25	<0.001	0.03	0.61
Level of education		0.25		<0.001		0.63
<High school graduate	1 (0, 4)		49.8 (6.7)		92 (86, 100)	
High school graduate	1 (0, 4)		47.5 (14.5)		97 (83, 100)	
Some college education	2 (0, 6)		43.9 (13.3)		90 (83, 100)	
College graduate	1 (0, 4)		40.9 (13.3)		90 (83, 100)	
Graduation school	1 (0, 5)		39.1 (12.2)		93 (83, 100)	
Married or with partner		0.13		0.94		0.51
No	0 (0, 3)		44.0 (17.8)		93 (83, 100)	
Yes	2 (0, 5)		42.0 (12.7)		93 (83, 100)	
Not reported	8 (8, 8)		40.0†		100 (100, 100)	
Coexisting illnesses at treatment						
Spearman rank correlation	–0.04	0.50	0.04	0.47	0.05	0.39
Presence of coexisting illnesses		0.36		0.89		0.06
No	1 (0, 4)		42.2 (13.2)		93 (83, 100)	
Yes	1 (0, 5)		42.5 (14.0)		90 (83, 100)	
Planned treatment		0.05		0.82		0.05
Radical prostatectomy	2 (0, 6)		41.9 (12.6)		93 (83, 100)	
External beam radiation therapy	1 (0, 4)		42.4 (13.5)		97 (83, 100)	
Brachytherapy	0 (0, 3)		43.0 (15.0)		90 (83, 100)	
Planned neoadjuvant hormonal therapy		0.97		0.63		0.84
No	1 (0, 5)		42.2 (13.5)		93 (83, 100)	
Yes	2 (0, 4)		43.3 (13.1)		93 (83, 100)	

A higher score reflects an increase in perceived danger, uncertainty and satisfaction with treatment outcome. \*Spearman rank correlation coefficient P values (vs. correlation of 0) as specified in the Table. Because of sparse cell values, 'Race/Ethnicity' and 'Married or with partner' were compared using the Kruskal–Wallis test. The remaining P values were obtained from univariate GEE models of the demographic on perception of danger, uncertainty and satisfaction with treatment outcome. †Only one participant did not report 'Married or with partner' status and no SD was calculated.

**TABLE 3** Multivariable associations with **A**, perception of danger and **B**, uncertainty among the 328 patients

Characteristic	Coefficient (SE)	P*
<b>A: Multivariable associations with perception of danger</b>		
Intercept	1.6 (3.2)	–
Planned treatment		0.01
Radical prostatectomy	10.8 (4.9)	
External beam radiation therapy	–4.5 (4.5)	
Brachytherapy	Reference	
Age at planned treatment†		0.02
Radical prostatectomy	–0.13 (0.06)	
External beam radiation therapy	0.09 (0.05)	
Brachytherapy	0.01 (0.05)	
<b>B: Multivariable associations with uncertainty</b>		
Intercept	16.1 (8.3)	–
Age at treatment	0.4 (0.1)	<0.001
Race/Ethnicity		0.05
White	–0.4 (5.4)	
African-American	7.6 (5.9)	
Other	2.0 (6.2)	
Not reported	Reference	
Base education level at treatment		0.001
<High school graduate	9.5 (2.5)	
High school graduate	7.2 (2.1)	
Some college education	5.4 (1.9)	
College graduate	2.7 (1.9)	
Graduation school	Reference	

A higher score reflects an increase in perceived danger and uncertainty. \* Multivariable associations were tested using Wald tests from linear regression (using GEEs). Characteristics with a significant univariate association were included for danger and uncertainty. †The 'age at treatment' main effect was included in the multivariable danger model (P = 0.77) and is accounted for in estimating the 'Age at planned treatment' coefficients and SEs.

**TABLE 4** Spearman rank correlation and P values

	Danger	Uncertainty	Satisfaction with treatment outcome
Danger	–	0.34 P < 0.001	–0.30 P < 0.001
Uncertainty		–	–0.33 P < 0.001
Satisfaction with treatment outcome			–

responses to danger and satisfaction of outcome were heavily skewed, the median and first and third quartile are shown in Table 2. Uncertainty responses were more closely distributed; these data are presented as mean (SD) values. Each test was two-sided and a P value of 0.05 was considered to indicate statistical

significance. Univariate characteristics significantly associated with each outcome were tested in a multivariable linear regression model, again using GEEs, to see if their association remained (Table 3A and B). Spearman rank correlations were used to assess the general trend among perception of danger, uncertainty, and

satisfaction with treatment outcome domains (Table 4).

**RESULTS**

Among the 328 patients who consented, 328 patients completed the interview sufficiently so as to be included in the analysis. Table 1 shows the characteristics of these 328 patients, the 10 patients who consented but did not sufficiently complete the interviews, and the 106 patients who declined to participate. Characteristics of men in the PROSTQA study cohort who were approached to participate in the present study were not significantly different among those who agreed or declined to participate (Table 1), with the exception that patients with clinical stage T2 disease were more likely to consent than those with T1 disease (P = 0.004).

Among the 328 analysable participants, the median danger score was 1/5 (interquartile range [IQR] 0, 4), the mean uncertainty score was 42.3/75 (SD 13.4), and the median satisfaction with treatment outcome score was 93/100 (IQR 83, 100). There was a significant association among each of these domains (Table 4): Perception of danger was positively correlated with uncertainty (r = 0.34, P < 0.001) and negatively correlated with satisfaction with treatment outcome (r = –0.30, P < 0.001), and uncertainty was likewise negatively correlated with satisfaction with treatment outcome (r = –0.33, P < 0.001).

Table 2 shows the associations of patient characteristics with perception of danger, uncertainty and satisfaction with treatment outcome. Younger patients appeared to perceive a greater degree of danger than older patients (r = –0.12, P = 0.03). Younger patients were also more likely to report a lower degree of uncertainty than older patients (r = 0.20, P < 0.001). African-American patients also reported greater uncertainty than other ethnic groups (mean [SD] score 51.7 [13.6], P = 0.005). Similarly, level of education appeared to be associated with the experience of uncertainty, such that patients with lower levels of education were more likely to report a higher degree of uncertainty than those with either a college or graduate-level degree (r = –0.25; P < 0.001). Planned treatment showed a marginal association with perception of

danger ( $P = 0.05$ ) and satisfaction of treatment outcome ( $P = 0.05$ ).

The associations of age, race and education with uncertainty remained when considered in a multivariable model (Table 3A and B). As for perception of danger, the association of age and treatment remained, but age was modified by treatment group. Younger patients were associated with a greater danger score among those receiving radical prostatectomy – the youngest treatment group with a median age of 61 years; however, the association of younger age and greater perception of danger did not remain within the patients undergoing external beam radiation therapy (median age 69 years).

## DISCUSSION

The present study extends the previous understanding of prostate cancer survivors' uncertainty and their perception of danger regarding prostate cancer, by evaluating the impact of these factors on satisfaction with overall prostate cancer treatment outcome. Previous researchers have identified an association between age, race/ethnicity, education, medical comorbidity and illness uncertainty in prostate cancer [7,9,15] but how these concerns relate to cancer survivors' satisfaction with overall cancer care outcome has not previously been characterized.

African-American patients reported higher levels of uncertainty compared with other ethnic groups. This finding is consistent with the work of Germino *et al.* [7], who evaluated the role of uncertainty in determining quality of life in men with localized prostate cancer. The researchers in the present study reported marked differences in uncertainty scores related to race. The findings from the present and previous studies may be explained by the higher probability of dying from prostate cancer in the African-American ethnic group [1]. Moreover, a traditional lack of trust in the healthcare system among African-American men, as described by Halbert *et al.* [16], may have contributed to the higher level of uncertainty among African-American men with prostate cancer regarding their disease and the side effects of its treatment. The combination of the aggressiveness of tumours in this ethnic group and the lack of

trust in healthcare providers to effectively manage recurrent disease may have led to this uncertainty.

In the univariate setting, the present study found that a higher degree of perceived danger was associated with surgery; multivariable analysis, however, indicates that this association may be driven by treatment method or by age. These findings are consistent with the report by Germino *et al.* [7] who found that there were no differences in uncertainty between the radical prostatectomy group and the radiation treatment group. The authors did observe low, but significant correlations between uncertainty and coping, psychological adjustment, and perceptions of health and illness. Furthermore, uncertainty was not related to perceptions about quality of care or treatment.

As hypothesized, greater uncertainty was associated with greater danger and a reduction in satisfaction with treatment outcome. This finding may have important implications for the role of uncertainty and danger management in improving patient satisfaction with treatment by managing the perception of uncertainty and danger associated with diagnosis. Interestingly, the correlation of uncertainty with outcome satisfaction that was observed ( $r = -0.33$ ) was stronger than correlation of health-related quality-of-life domains with overall cancer care outcome satisfaction (whose correlation  $r$  was generally  $< 0.3$ ) as previously reported by Sanda *et al.* [5], suggesting that cancer survivor uncertainty and perception of danger warrant greater emphasis in medical decision-making and in the education of patients with newly diagnosed prostate cancer and treated survivors alike.

The present study showed that as uncertainty and perceived danger increase, patient satisfaction with treatment decreases. Hart *et al.* [17] reported that, in the CaPSURE cohort, treatment satisfaction levels mitigated the impact of fear of recurrence on lower levels of quality of life. Specifically, men who reported lower treatment satisfaction and fear of recurrence reported significantly lower levels of quality of life compared with other patients in the sample. Interventions that reduce uncertainty and manage perceptions

of danger, such as those reported by Kazer *et al.* [18] may potentially improve both quality of life and satisfaction with treatment outcome.

Whereas previous studies have been small and have focused on the period immediately after treatment when studying uncertainty and danger, a strength of the present study is that it draws from a large cohort of men from multiple sites across the USA followed up for 4–6 years after treatment for prostate cancer. This cohort provided a means of studying the impact of uncertainty and danger on satisfaction of prostate cancer treatment outcome. The results of the present study provide information that health professionals can use in patient education and in helping improve patient outcomes after treatment. Furthermore, the findings can be used as the basis for the design and implementation of future uncertainty management interventions for patients with prostate cancer.

A limitation of the present study was the fact that, as a companion study to an ongoing longitudinal cohort, data collection was initiated at 48–72 months after treatment and therefore uncertainty and danger baseline data before initiation of treatment, and at the time of diagnosis are lacking. However, as the parent study provides access to a large number of men treated for prostate cancer, and because of the limited amount of information available on the impact of uncertainty and danger appraisal on satisfaction with prostate cancer treatment outcome, it is felt that the present study can add substantially to the body of knowledge in the area. In addition, by conducting the study in conjunction with the larger parent study, data were available for the two studies with little additional expense, which is an efficient use of available research funds.

In conclusion, uncertainty and perception of danger among men with prostate cancer correlate negatively with satisfaction with outcome of therapy. Age, race and education all appear to be associated with these outcomes to varying degrees. Cancer survivor uncertainty and perception of danger warrant greater emphasis in medical decision-making and in the education of patients with newly diagnosed prostate

cancer and treated survivors alike. This unmet health need is a rational target for future expansion of nursing care. The results of the present study strengthen support for the development of uncertainty management interventions to improve patient outcomes. Improved uncertainty management has the potential to facilitate higher quality of life and satisfaction with treatment outcome among the large number of patients with prostate cancer undergoing all treatment options.

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### CONFLICT OF INTEREST

None declared.

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**Abbreviations:** PROSTQA, Prostate Cancer Outcomes and Satisfaction with Treatment Quality Assessment; MUIS-A, Mishel Uncertainty in Illness Scale; MUIS-C, MUIS-Community Form; SCA, Service Satisfaction Scale for Cancer Care; GEE, generalized estimating equation; IQR, interquartile range.