

This material is protected by U.S. copyright law. To purchase quantity reprints, e-mail reprints@ons.org. For permission to reproduce multiple copies, e-mail pubpermissions@ons.org.

Changes in Sexual Function on Mood and Quality of Life in Patients Undergoing Radiation Therapy for Prostate Cancer

Kristie Howlett, RN, MS, Theresa Koettters, RN, MS, Janet Edrington, RN, PhD, Claudia West, RN, MS, Steven Paul, PhD, Kathryn Lee, RN, PhD, Bradley E. Aouizerat, PhD, William Wara, MD, Patrick Swift, MD, and Christine Miaskowski, RN, PhD

Prostate cancer is the most common cancer, excluding skin cancer, in men in the United States. Treatment options for prostate cancer include surgery, brachytherapy, external beam radiation therapy, hormonal therapy, or surveillance. The choice of treatment is determined by the tumor's stage, Gleason score, level of prostate-specific antigen, patient's age, and concurrent comorbidities as well as physicians' and patients' preferences (Incrocci, 2006; Incrocci et al., 2001). A major factor influencing preferences is treatment-specific side effects (Incrocci; Incrocci, Slob, & Levendag, 2002). The impact of a particular treatment on a patient's sexual function is an important consideration in the shared decision-making process (van der Wielen, van Putten, & Incrocci, 2007).

Side effects of external beam radiation therapy include urinary incontinence, bowel changes, and sexual dysfunction. Sexual dysfunction is a multifactorial phenomenon. According to Litwin et al. (1999), male sexual function includes the quality and frequency of erections, the strength of libido, and the ability to be physically and sexually intimate. In addition, van der Wielen et al. (2007) suggested that sexual function includes sexual interest, pleasure, and activity. Many studies have found that decreased sexual function in men with prostate cancer is associated with poorer quality of life (QOL) (Bokhour, Clark, Inui, Silliman, & Talcott, 2001; Cooperberg et al., 2003; Incrocci, 2006; Incrocci et al., 2001; Litwin et al., 1999, 2007; Potosky et al., 2004).

Although many longitudinal studies have examined changes in the QOL of men with prostate cancer during and after treatment (Chen et al., 2001; Litwin et al., 1999, 2007; Symon et al., 2006; Turner, Adams, Bull, & Berry, 1999; van der Wielen et al., 2007), none has evaluated the effect of changes in sexual function on the various

Purpose/Objectives: To describe the percentages of men with and without changes in sexual function from the beginning to end of radiation therapy and evaluate for differences in demographic and clinical characteristics, mood states, and quality of life (QOL) among patients who did and did not experience changes in sexual function.

Design: Descriptive, longitudinal.

Setting: Two radiation therapy departments in northern California.

Sample: 70 men with prostate cancer who underwent primary or adjuvant radiation therapy.

Methods: Self-report questionnaires, medical record reviews, and repeated measures analysis of variance.

Main Research Variables: Changes in sexual function; depression, anxiety, and QOL.

Findings: Patients were categorized into one of four sex groups (No Problem X 2, Problem–No Problem, No Problem–Problem, and Problem X 2) based on their responses to “Is your sexuality impacted by your illness?” at the beginning and end of radiation therapy. About 50% had a problem with sexual function either at the beginning or end of radiation therapy. Overall, men without sexual problems at both the beginning and end of radiation therapy had significantly less anxiety and depression and higher QOL scores than patients who developed a problem at the end and patients who had a problem at both time points.

Conclusions: Changes in sexual function during the course of radiation therapy affect patients' mood and QOL.

Implications for Nursing: Clinicians should evaluate the effects of radiation therapy on sexual function and monitor patients with prostate cancer for depression and anxiety as well as for changes in QOL.

domains of QOL (e.g., physical, social, psychological, spiritual). In addition, only one study was found that examined the relationships between depression and anxiety

and changes in sexual function; however, the study focused on patients' expectations rather than actual patient outcomes (Symon et al.). Based on the paucity of research on the specific effects of changes in sexual function on the mood and QOL of patients with prostate cancer, the current study aimed to describe the percentages of men who underwent primary or adjuvant radiation therapy for prostate cancer with and without changes in sexual function from the beginning to end of radiation therapy and evaluate for differences in demographic and clinical characteristics, mood, and QOL.

Methods

Patients and Settings

This descriptive, longitudinal study recruited 82 men with prostate cancer who were adults (aged older than 18 years); were able to read, write, and understand English; had a Karnofsky Performance Status (KPS) score of 60 or higher; and were scheduled to receive primary or adjuvant radiation therapy. Patients were excluded if they had metastatic disease, had more than one cancer diagnosis, or had a diagnosed sleep disorder. Patients were recruited from radiation therapy departments located in a comprehensive cancer center and a community-based oncology program. This study was approved by the human subjects committee at the University of California, San Francisco, and at the second study site in Berkeley, CA.

One hundred and eighty-eight patients were approached, and 82 consented to participate in this study (43.6% response rate). Major reasons for refusal were being too overwhelmed with their cancer experience or too busy. No differences were found in any demographic or clinical characteristics among patients who did and did not participate in the study.

Study Procedures

At the time of the simulation visit (about one week prior to the start of radiation therapy), patients were approached by a research nurse to discuss participation in the study. After obtaining written informed consent, patients were asked to complete the baseline study questionnaires. At the end of radiation therapy, patients completed the depression, anxiety, and QOL questionnaires.

Instruments

The study instruments included a demographic questionnaire, the KPS scale (Karnofsky, 1977), the Center for Epidemiological Studies-Depression Scale (CES-D) (Radloff, 1977), the Spielberger State Anxiety Inventory (STAI-S) (Spielberger, Gorsuch, Suchene, Vagg, & Jacobs, 1983), and the QOL Scale-Patient Version (QOL-PV) (Ferrell, Wisdom, & Wenzl, 1989). The demographic questionnaire provided information on age, marital

status, years of education, living arrangements, ethnicity, employment status, and comorbidities.

The CES-D consists of 20 items selected to represent the major symptoms in the clinical syndrome of depression. Scores range from 0–60, with scores 16 or higher indicating a need for individuals to seek clinical evaluation for major depression. The CES-D has well-established concurrent and construct validity (Carpenter et al., 1998; Radloff, 1977; Sheehan, Fifielf, Reisine, & Tennen, 1995). In the current study, the CES-D's Cronbach alpha was 0.83.

The STAI-S consists of 20 items that are rated from 1–4. The scores for each item are summed and can range from 20–80, with higher scores indicating greater anxiety. The STAI-S measures an individual's transitory emotional response to a stressful situation; the tool evaluates the emotional responses of worry, nervousness, tension, and feelings of apprehension related to how people feel "right now" in a stressful situation. The STAI-S has well-established criterion and construct validity (Bieling, Antony, & Swinson, 1998; Kennedy, Schwab, Morris, & Beldia, 2001; Spielberger et al., 1983). In the current study, the STAI-S's Cronbach alpha was 0.91.

The QOL-PV consists of 41 items that measure four domains of QOL (physical, psychological, social, and spiritual) in patients with cancer using 0–10 numeric rating scales (Ferrell et al., 1989). A total QOL score and subscale scores were calculated, with higher scores indicating better QOL. In the current study, the Cronbach alpha for the total QOL score was 0.88.

The question, "Is your sexuality impacted by your illness?" was chosen from the QOL-PV to categorize patients into two groups. Patients who scored lower than 5 on the item were categorized as "not having a problem," whereas patients who scored 5 or higher were categorized as "having a problem." Five was chosen as the cutpoint because previous studies have shown that a score of 5 or higher on other symptom scales suggests at least a moderate degree of symptom severity (Paul, Zelman, Smith, & Miaskowski, 2005; Zelman, Hoffman, Seifeldin, & Dukes, 2003). Based on the patients' responses to the sexuality item at the beginning and end of radiation therapy, men were categorized into one of four sex groups: men who had no problem at both the beginning and end of radiation therapy (No Problem X 2), men who had no problem at the beginning of radiation therapy but had a problem at the end (No Problem–Problem), men who had a problem at both the beginning and the end of radiation therapy (Problem X 2), and men who had a problem at the beginning of radiation therapy but no problem at the end (Problem–No Problem).

Data Analysis

Data were analyzed using SPSS® version 14. Descriptive statistics and frequency distributions were generated for sample characteristics, symptom severity scores, and QOL scores. One-way analyses of variance

Table 1. Demographic Characteristics of the Total Sample and Differences Among the Four Sex Groups

| Characteristic | Total (N = 70) | | No Problem X 2 (1) (N = 27) | | Problem X 2 (2) (N = 31) | | No Problem– Problem (3) (N = 7) | | Problem– No Problem (4) (N = 5) | | Statistics |
|---------------------------------|-------------------|-----|-----------------------------------|-----|-----------------------------|-----|---------------------------------------|-----|---------------------------------------|-----|---|
| | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | |
| Age (years) | 67.1 | 7.8 | 69.2 | 7.7 | 64.9 | 8.2 | 65.9 | 6.8 | 71 | 4.3 | $F_{3,66} = 1.98, p = 0.125$ |
| Education (years) | 16.3 | 3.2 | 16 | 2.8 | 16.9 | 3.6 | 16.3 | 3.4 | 14.6 | 2 | $F_{3,65} = 0.85, p = 0.47$ |
| Mean score on sexuality item | | | | | | | | | | | (1) $t = -3.16, p = 0.004$ (2) $t < 0.001, p = 1$ (3) $t = -6.18, p = 0.001$ (4) $t = 8.43, p = 0.001$ |
| Baseline | 4.7 | 4.3 | 0.6 | 1.1 | 8.87 | 1.5 | 0.7 | 1.1 | 7 | 1.9 | |
| End of RT | 5.2 | 4 | 1.3 | 1.5 | 8.87 | 1.8 | 7 | 2.2 | 0.8 | 1.3 | |
| Characteristic | n | % | n | % | n | % | n | % | n | % | Statistics |
| Ethnicity | | | | | | | | | | | $\chi^2 = 0.31, p = 0.96$ |
| Caucasian | 55 | 79 | 21 | 78 | 25 | 81 | 5 | 71 | 4 | 80 | |
| Not Caucasian | 15 | 21 | 6 | 22 | 6 | 19 | 2 | 29 | 1 | 20 | |
| Marital status | | | | | | | | | | | $\chi^2 = 6.22, p = 0.1$ |
| Married | 52 | 74 | 19 | 70 | 25 | 81 | 3 | 43 | 5 | 100 | |
| Not married | 18 | 26 | 8 | 30 | 6 | 19 | 4 | 57 | – | – | |
| Lives alone | | | | | | | | | | | $\chi^2 = 4.11, p = 0.25$ |
| Yes | 15 | 21 | 7 | 26 | 5 | 16 | 3 | 43 | – | – | |
| No | 55 | 79 | 20 | 74 | 26 | 84 | 4 | 57 | 5 | 100 | |
| Employed | | | | | | | | | | | $\chi^2 = 4.09, p = 0.25$ |
| Yes | 30 | 43 | 9 | 33 | 15 | 48 | 5 | 71 | 1 | 20 | |
| No | 40 | 57 | 18 | 67 | 16 | 52 | 2 | 29 | 4 | 80 | |

RT—radiation therapy

(ANOVA) were used to evaluate for differences in demographic and clinical characteristics among the four sex groups. Two-way repeated measures (RM)-ANOVAs with one between subjects factor (e.g., sex group) and one within subjects factor (e.g., time) were used to evaluate for differences over time among the four sex groups in depression, anxiety, and QOL scores.

All calculations used actual values. Adjustments were not made for missing data. Therefore, the cohort for each analysis was dependent on the largest set of data across sex groups. If the overall main effect of group test indicated differences among the four sex groups, pairwise contrasts were done to determine where the differences occurred; if the group by time interaction was significant, pairwise interaction contrasts were done to determine where the differences occurred. The Bonferroni procedure was used to distribute a family α of 0.05 across the six pairwise contrasts. All reported p values were adjusted so that values less than 0.05 were considered statistically significant.

Results

Complete data on the sexuality item were available for 70 patients. Based on responses to the item, “Is your sexuality impacted by your illness?” at the beginning

and end of radiation therapy, 39% of the patients were categorized as No Problem X 2, 10% as No Problem–Problem, 44% as Problem X 2, and 7% as Problem–No Problem. Using paired t tests within the four groups, significant differences from the beginning to end of radiation therapy were found on the sexual function item scores for No Problem X 2 ($t = -3.16, p = 0.004$), No Problem–Problem ($t = -6.18, p = 0.001$), and Problem–No Problem ($t = 8.43, p = 0.001$) (see Table 1).

Demographic Characteristics

Most men were Caucasian (79%), married or partnered (74%), and well educated ($\bar{X} = 16.3$ years), with a mean age of 67.1 years. No differences were found in any of the demographic characteristics among the four sex groups.

Clinical Characteristics

Most men had early stage disease (51% T1), had not had a prostatectomy prior to receiving radiation therapy (90%), had received hormonal therapy prior to radiation therapy (53%), and underwent whole pelvis radiation with a conformal boost (76%) (see Table 2). No differences were found among the four sex groups on any of the clinical characteristics except pretreatment Gleason

score ($p = 0.03$), KPS score ($p = 0.02$), and prior use of hormonal therapy ($p = 0.01$). Patients in Problem X 2 had significantly higher Gleason scores and significantly lower KPS scores, and a significantly higher percentage had received prior hormonal therapy than the patients in No Problem X 2.

Depression

Two-way RM-ANOVA for the CES-D scores revealed a significant main effect of sex group ($F_{3,62} = 2.84$, $p = 0.05$) and a significant group by time interaction ($F_{3,62} = 2.97$, $p = 0.04$), but no main effect of time ($F_{1,62} = 0.31$, $p = 0.58$) (see Figure 1). The significant group by time interaction indicates that the change in depression

scores from the beginning to end of radiation therapy depended on sex group. Post hoc interaction contrasts demonstrated that the change over time in CES-D scores differed significantly between No Problem X 2 and No Problem–Problem ($p = 0.047$). Although No Problem X 2's depression score decreased about 2.2 points, No Problem–Problem's depression score increased by about 3.4 points.

Anxiety

Two-way RM-ANOVA for the state anxiety scores revealed a significant main effect of sex group ($F_{3,62} = 5.87$, $p = 0.001$) but no main effect of time ($F_{1,62} = 1.09$, $p = 0.3$) and no group by time interaction ($F_{3,62} = 1.36$,

Table 2. Clinical Characteristics of the Total Sample and Differences Among the Four Sex Groups

| Characteristic | Total (N = 70) | | No Problem X 2 (1) (N = 27) | | Problem X 2 (2) (N = 31) | | No Problem– Problem (3) (N = 7) | | Problem– No Problem (4) (N = 5) | | Statistics |
|--|-------------------|---------|-----------------------------------|-------|-----------------------------|---------|---------------------------------------|------|---------------------------------------|---------|--|
| | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | \bar{X} | SD | |
| Pretreatment PSA | 10.2 | 8.3 | 8.5 | 6.6 | 11.7 | 9.5 | 10.1 | 9.4 | 11.5 | 7.9 | $F_{3,65} = 0.74$ $p = 0.53$ |
| Gleason score | 6.8 | 0.9 | 6.5 | 0.7 | 7.17 | 1.1 | 6.9 | 1.1 | 6.4 | 0.5 | $F_{3,65} = 3.23$ $p = 0.03$ $1 < 2$, $p = 0.03$ |
| KPS | 96.2 | 5.5 | 98.5 | 4.7 | 94.2 | 5.6 | 95.7 | 5.4 | 98 | 4.5 | $F_{3,65} = 3.42$ $p = 0.02$ $1 > 2$, $p = 0.02$ |
| Total dose of RT (cGy) | 6,843.4 | 1,049.7 | 7,000 | 924.5 | 6,618.7 | 1,204.1 | 7,228.6 | 75.6 | 6,852 | 1,324.2 | $F_{3,66} = 0.99$ $p = 0.4$ |
| Characteristic | n | % | n | % | n | % | n | % | n | % | Statistics |
| Clinical stage | | | | | | | | | | | $\chi^2 = 4.51$ $p = 0.61$ |
| T1 | 36 | 51 | 14 | 52 | 16 | 50 | 4 | 57 | 2 | 50 | |
| T2 | 28 | 40 | 12 | 44 | 10 | 33 | 3 | 43 | 3 | 50 | |
| T3 | 6 | 9 | 1 | 4 | 5 | 17 | – | – | – | – | |
| Prostatectomy | | | | | | | | | | | $\chi^2 = 6.71$ $p = 0.08$ |
| Yes | 7 | 10 | – | – | 6 | 19 | 1 | 14 | – | – | |
| No | 63 | 90 | 27 | 100 | 25 | 81 | 6 | 86 | 5 | 100 | |
| Hormone therapy | | | | | | | | | | | $\chi^2 = 11.58$ $p = 0.01$ $2 > 1$, $p < 0.05$ |
| Yes | 37 | 53 | 9 | 32 | 22 | 71 | 5 | 71 | 1 | 20 | |
| No | 33 | 47 | 18 | 68 | 9 | 29 | 2 | 29 | 4 | 80 | |
| RT treatment plan | | | | | | | | | | | $\chi^2 = 14.73$ $p = 0.1$ |
| WP and C | 7 | 10 | – | – | 6 | 19 | 1 | 14 | – | – | |
| WP and C boost | 53 | 76 | 24 | 89 | 18 | 58 | 6 | 86 | 5 | 100 | |
| WP and XRT-HDR | 4 | 6 | – | – | 4 | 13 | – | – | – | – | |
| WP and SI | 6 | 8 | 3 | 11 | 3 | 10 | – | – | – | – | |
| C—conformal; cGy—centigray; KPS—Karnofsky Performance Status; PSA—prostate-specific antigen; RT—radiation therapy; SI—seed implant; WP—whole pelvis; XRT-HDR—high-dose radiation | | | | | | | | | | | |

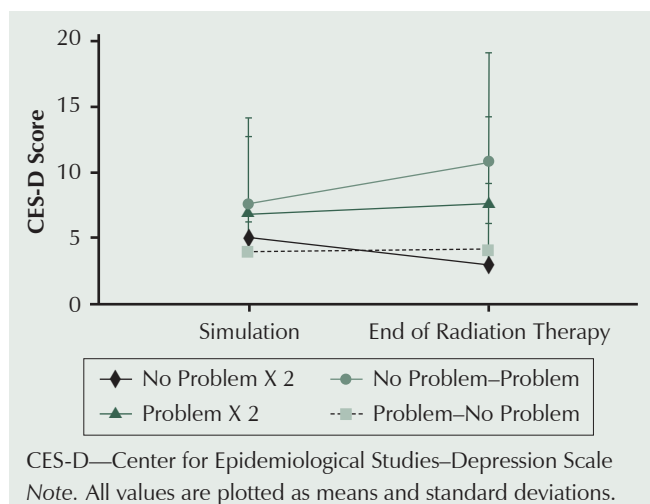


Figure 1. Changes in Depression Scores Among the Four Sex Groups

$p = 0.27$) (see Figure 2). Post hoc contrasts for the main effect of sex group revealed significantly higher overall anxiety scores in Problem X 2 versus No Problem X 2 ($p = 0.003$).

Subscale and Total Quality of Life Scores

Two-way RM-ANOVA for the physical well-being subscale of the QOL-PV revealed a significant main effect of sex group ($F_{3,65} = 4.19$, $p = 0.009$) and a significant main effect of time ($F_{1,65} = 23.95$, $p < 0.0001$) but no group by time interaction ($F_{3,65} = 1.27$, $p = 0.29$) (see Figure 3). Post hoc contrasts for the main effect of sex group revealed significantly lower overall physical well-being scores in No Problem-Problem versus No Problem X 2 ($p = 0.04$).

Two-way RM-ANOVA for the psychological well-being subscale revealed a significant main effect of sex group ($F_{3,65} = 9.03$, $p < 0.0001$) but no main effect of time ($F_{1,65} = 0.11$, $p = 0.74$) and no group by time interaction ($F_{3,65} = 1.44$, $p = 0.24$). Post hoc contrasts for the main effect of sex group revealed significantly lower overall psychological well-being scores in Problem X 2 ($p < 0.0001$) and No Problem-Problem ($p = 0.03$) versus No Problem X 2.

Two-way RM-ANOVA for the social well-being subscale revealed a significant main effect of sex group ($F_{3,66} = 22.65$, $p < 0.0001$), a significant main effect of time ($F_{1,66} = 5.74$, $p = 0.02$), and a significant group by time interaction ($F_{3,66} = 9.3$, $p < 0.0001$). Patterns of change among the four sex groups were as follows. No Problem X 2 and Problem X 2's social well-being scores worsened by 0.3 points, No Problem-Problem's social well-being score worsened by 2.1 points, and Problem-No Problem's social well-being score improved by 1.1 points. Five of the six possible post hoc interaction contrasts were significant; the only exception was the comparison

between No Problem X 2 to Problem X 2. Post hoc contrasts for the main effect of sex group revealed significantly lower overall social well-being scores in Problem X 2 and No Problem-Problem (both, $p < 0.0001$) versus No Problem X 2.

No significant main effects of group and time as well as no significant group by time interaction were found for the spiritual well-being subscale of the QOL-PV (data not shown).

Two-way RM-ANOVA for the total QOL scores revealed a significant main effect of sex group ($F_{3,65} = 9.74$, $p < 0.0001$) and no main effect of time ($F_{1,65} = 1.59$, $p = 0.21$) but a significant group by time interaction ($F_{3,65} = 3.21$, $p = 0.03$). The significant group by time interaction indicates that the change in total QOL scores from the beginning and end of radiation therapy depended on sex group. Post hoc interaction contrasts demonstrated that the change in total QOL scores differed significantly between the No Problem X 2 and No Problem-Problem ($p = 0.037$). Although No Problem X 2's total QOL score stayed the same, No Problem-Problem's total QOL score worsened by about 1 point. Post hoc contrasts for the main effect of sex group revealed significantly lower total QOL scores in both Problem X 2 ($p < 0.0001$) and No Problem-Problem ($p = 0.04$) versus No Problem X 2.

Discussion

To the authors' knowledge, the current study is the first to examine the relationships between changes in sexual function and mood (e.g., depression, anxiety) and four domains of QOL (physical, psychological, social, and spiritual) in patients who underwent radiation therapy for prostate cancer. Based on the sex group

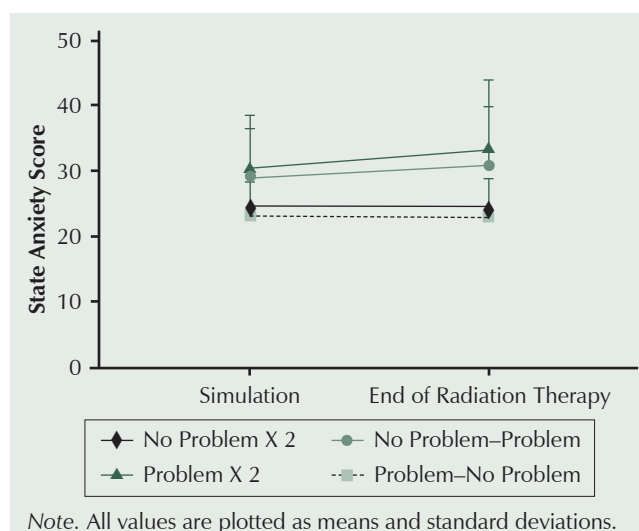
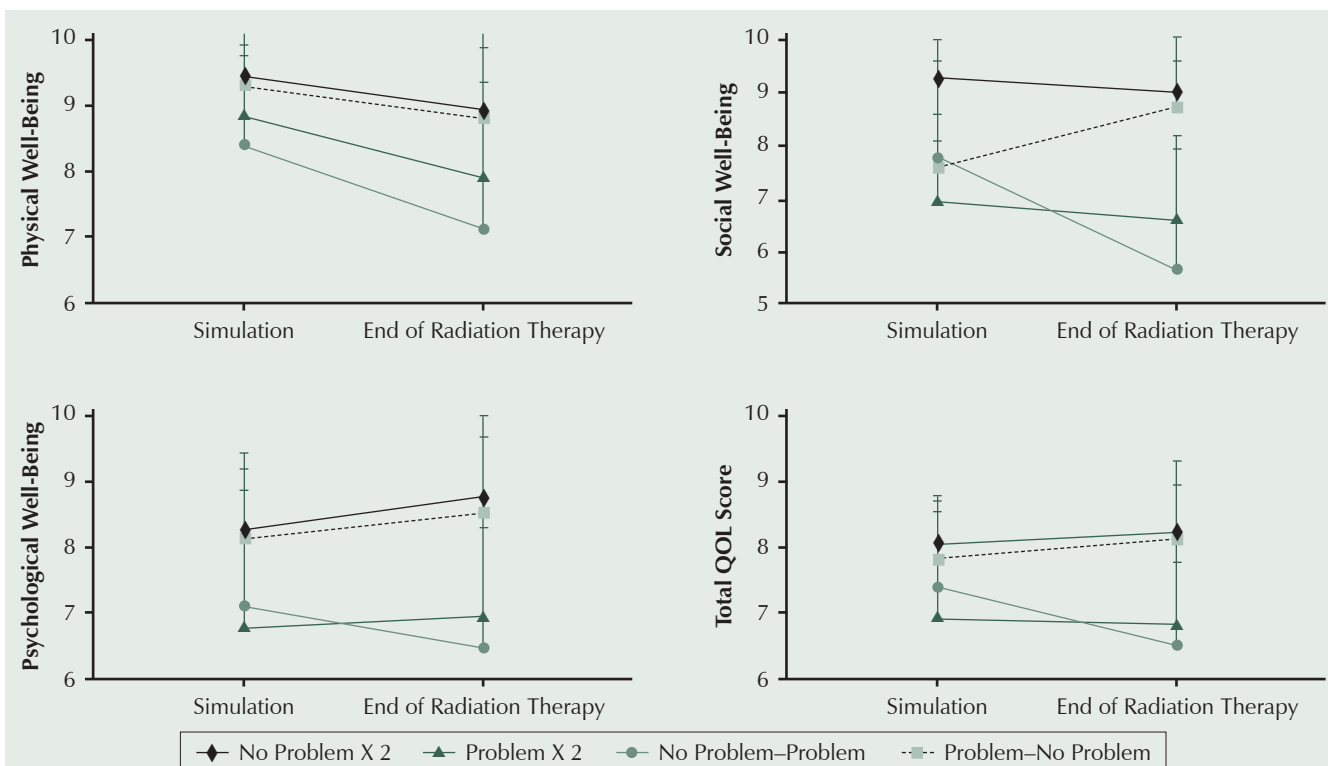


Figure 2. Changes in State Anxiety Scores Among the Four Sex Groups



Note. All values are plotted as means and standard deviations.

Figure 3. Changes in Physical Well-Being, Psychological Well-Being, Social Well-Being, and Total Quality of Life (QOL) Scores Among the Four Sex Groups

categorization, about 50% of these patients had a problem with sexual function either at the time of the simulation visit or at the end of radiation therapy. The findings are consistent with previous reports that problems with sexual function vary from 2%–86% (Cooperberg et al., 2003; Incrocci, 2006; Incrocci et al., 2002). Overall, men without sexual problems at both the beginning and end of radiation therapy had significantly less anxiety and depression and higher QOL scores than patients who developed a problem and patients who had problems at both time points. Most men in No Problem-Problem and Problem X 2 had received prior hormonal therapy, which is associated with decreases in sexual function (Chen et al., 2001; Green et al., 2004; Potosky et al., 2002; Zelefsky et al., 1999).

Of note, none of the sex groups in the current study had a mean CES-D score higher than 16 at either the beginning (\bar{X} score = 6.1 ± 5.4) or end of radiation therapy (\bar{X} score = 5.8 ± 6.2). The finding is consistent with a previous report noting that men tend to score lower on the CES-D than women (Stommel et al., 1993). However, changes in depression scores over time were significantly different depending on the sex group. No Problem X 2's CES-D scores improved over the course of radiation therapy, whereas No Problem-Problem's scores worsened. Unfortunately, no studies were found that evaluated for changes over time in depression

scores in relationship to changes in sexual function in a similar patient population. However, the significant increase in the mean score on the sexuality item from the beginning of radiation therapy (0.71) to the end of radiation therapy (7) for No Problem-Problem is of interest. The large increase may partially explain the increase in depression scores reported by this group. However, the finding warrants replication given the small number of patients in this group.

Mean state anxiety scores for the total sample approached the clinically significant cutpoint of higher than 32 at both the beginning (27.5 ± 7.6) and end (29.2 ± 9.4) of radiation therapy. In addition, anxiety scores remained relatively constant across time within each sex group. Finally, only Problem X 2 had significantly higher overall anxiety scores than No Problem X 2. Because no studies were found that examined for changes in anxiety in men with prostate cancer during the course of radiation therapy, these findings warrant confirmation.

Although changes in sexual function affected three of the four domains of QOL (physical, psychosocial, and social but not spiritual) as well as overall QOL, all domains were not affected in the same way. In all four sex groups, physical well-being scores decreased significantly over the course of radiation therapy. The decreases in physical well-being scores may reflect the

deleterious effects of radiation therapy, such as fatigue and sleep disturbance. In addition, the finding is consistent with work by Sanders, Pedro, Bantum, and Galbraith (2006), who reported that men felt unable to be self-sufficient because of increased physical weakness and decreased endurance and stamina related to radiation therapy.

In terms of the psychological well-being domain, men who reported no sexual problems at both the beginning and end of radiation therapy had significantly higher scores than men in Problem X 2 and No Problem–Problem. The finding is consistent with previous studies showing that a decrease in psychological well-being is associated with sexual dysfunction (Eller et al., 2006; Litwin et al., 1999; Nelson, Choi, Mulhall, & Roth, 2007).

In the current study, the most notable impact of the change in sexual function was in the social well-being domain of QOL. Questions from the QOL-PV evaluated various aspects of this domain, including interpersonal relationships, employment, sense of isolation, sexual functioning, and financial burden. With the exception of Problem–No Problem, all sex groups' social well-being scores decreased over time. Social well-being scores were significantly lower in Problem X 2 and No Problem–Problem compared to No Problem X 2. The findings are consistent with work by Ward-Smith and Kapitan (2005), who found that the social well-being of men who underwent radiation therapy for prostate cancer declined throughout the first year after treatment. In addition, results from the current study are consistent with Bokhour et al.'s (2001) finding that sexual dysfunction affected how men viewed themselves, which, in turn, had a negative impact on their social relationships. In addition, several studies have reported that sexual dysfunction after prostate cancer treatment has a negative impact on couple's interpersonal relationships (Galbraith, Arechiga, Ramirez, & Pedro, 2005; Nelson et al., 2007; Sanders et al., 2006; Soloway, Soloway, Kim, & Kava, 2005).

An evaluation of the changes in total QOL scores demonstrated that changes in sexual function during the course of radiation therapy had an effect on participants' QOL. Patients in No Problem X 2 had relatively high QOL scores at the beginning (8.1 ± 0.7) and end (8.1 ± 0.8) of radiation therapy. In contrast, Problem X 2 had relatively low QOL scores at the beginning (6.9 ± 1) and end (6.7 ± 1.3) of radiation therapy, whereas No Problem–Problem's total QOL score decreased significantly from the beginning (7.3 ± 1.4) to end (6.4 ± 1.3) of radiation therapy. The differences in QOL scores at the end of radiation therapy represent clinically meaningful differences in QOL (i.e., effect sizes in standard deviation units ranged from -1 to -1.3) compared to No Problem X 2 (Guyatt, Osoba, Wu, Wyrwich, & Norman, 2002; Norman, Sloan, & Wyrwich, 2003; Osoba,

Rodrigues, Myles, Zee, & Pater, 1998). The findings are consistent with a previous study (Dahn et al., 2004) that found that men who had lower sexual function scores reported lower QOL scores.

Several limitations of the current study should be noted. The generalizability of the findings is limited because most participants were Caucasian, well-educated, and had a single cancer diagnosis. Another limitation is the sexual measure used to create the sex group categories. Specific causes of sexual dysfunction could not be determined because the current study did not use a more specific sexual function assessment tool. Although the sample size was relatively small, particularly in No Problem–Problem and Problem–No Problem, the results do provide preliminary and important information about the impact of changes in sexual function on anxiety, depression, and QOL in men who underwent radiation therapy for prostate cancer.

Conclusions and Implications for Clinical Practice

Despite the limitations, the findings from this relatively small sample of men suggest that changes in sexual function do have an impact on mood and QOL. Additional research is warranted to replicate the findings in a larger sample and to determine the long-term effects of sexual dysfunction on mood and QOL. Until that research is completed, clinicians should evaluate the effects of radiation therapy on sexual function and monitor patients with prostate cancer for depression and anxiety as well as for changes in their QOL.

In their review articles, Darst (2007) and Madsen and Ganey-Code (2006) make specific suggestions about how oncology nurses should address the topic of sexual function with their patients. The topic can be introduced with the statement that the two primary concerns patients have after treatment for prostate cancer are incontinence and erectile function. This type of acknowledgement provides patients with an opportunity to voice their concerns and any specific problems that they may be experiencing during or after treatment. Oncology nurses need to become comfortable with discussing sexual problems with their patients. At a minimum, nurses should be able to perform a sexual assessment to identify problems and provide accurate information about the occurrence rates for sexual problems following various types of treatments for prostate cancer. If patients report sexual problems, oncology nurses need to provide counseling or referrals to specialists for sexual rehabilitation (Darst; Madsen & Ganey-Code).

Kristie Howlett, RN, MS, is a clinical nurse specialist in the Sutter Roseville Medical Center in Roseville, CA. Theresa Koettters, RN, MS, is an assistant clinical professor in health sciences,

Janet Edrington, RN, PhD, is an assistant adjunct professor, Claudia West, RN, MS, is a professor, Steven Paul, PhD, is a principal statistician, and Kathryn Lee, RN, PhD, is a professor, all in the School of Nursing; Bradley E. Aouizerat, PhD, is an associate professor in the Institute of Human Genetics and the School of Nursing; and William Wara, MD, is a professor in the School of Medicine, all at the University of California, San Francisco. Patrick Swift, MD, is a director of oncology at Alta Bates Comprehensive Cancer Center in Berkeley, CA, and Christine Miaskowski, RN, PhD, is a professor and associate dean for academic affairs

in the School of Nursing at the University of California, San Francisco. This research was supported by a grant from the National Institute of Nursing Research (NR04835). Aouizerat's research is funded through the National Institutes of Health Roadmap for Medical Research Grant (K12RR023262). Miaskowski can be reached at chris.miaskowski@nursing.ucsf.edu, with copy to editor at ONFEditor@ons.org. (Submitted October 2008. Accepted for publication March 7, 2009.)

Digital Object Identifier: 10.1188/10.ONF.E58-E66

References

- Bieling, P.J., Antony, M.M., & Swinson, R.P. (1998). The State-Trait Anxiety Inventory, Trait version: Structure and content re-examined. *Behavioral Research and Therapy*, 36, 777-788. doi: 10.1016/S0005-7967(98)00023-0
- Bokhour, B.G., Clark, J.A., Inui, T.S., Silliman, R.A., & Talcott, J.A. (2001). Sexuality after treatment for early prostate cancer: Exploring the meanings of "erectile dysfunction." *Journal of General Internal Medicine*, 16, 649-655. doi: 10.1111/j.1525-1497.2001.00832.x
- Carpenter, J.S., Andrykowski, M.A., Wilson, J., Hall, L.A., Rayens, M.K., Sachs, B., & Cunningham, L.L. (1998). Psychometrics for two short forms of the Center for Epidemiologic Studies-Depression Scale. *Issues in Mental Health Nursing*, 19, 481-494. doi: 10.1080/016128498248917
- Chen, C.T., Valicenti, R.K., Lu, J., Derose, T., Dicker, A.P., Strup, S.E., . . . Gomella, L.G. (2001). Does hormonal therapy influence sexual function in men receiving 3D conformal radiation therapy for prostate cancer? *International Journal of Radiation Oncology, Biology, Physics*, 50, 591-595. doi: 10.1016/S0360-3016(01)01504-8
- Cooperberg, M.R., Koppie, T.M., Lubeck, D.P., Ye, J., Grossfeld, G.D., Mehta, S.S., . . . CaPSURE. (2003). How potent is potent? Evaluation of sexual function and bother in men who report potency after treatment for prostate cancer: Data from CaPSURE. *Urology*, 61, 190-196. doi: 10.1016/S0090-4295(02)02118-0
- Dahn, J.R., Penedo, F.J., Gonzalez, J.S., Esquiabro, M., Antoni, M.H., Roos, B.A., & Schneiderman, N. (2004). Sexual functioning and quality of life after prostate cancer treatment: Considering sexual desire. *Urology*, 63, 273-277. doi: 10.1016/j.urology.2003.09.048
- Darst, E.H. (2007). Sexuality and prostatectomy: Nursing assessment and intervention. *Urologic Nursing*, 27, 534-541.
- Eller, L.S., Lev, E.L., Gejerman, G., Colella, J., Esposito, M., Lanteri, V., . . . Sawczuk, I. (2006). Prospective study of quality of life of patients receiving treatment for prostate cancer. *Nursing Research*, 55(2, Suppl.), S28-S36.
- Ferrell, B.R., Wisdom, C., & Wenzl, C. (1989). Quality of life as an outcome variable in the management of cancer pain. *Cancer*, 63(11, Suppl.), 2321-2327. doi: 10.1002/1097-0142(19890601)63:11<2321::AID-CNCR2820631142>3.0.CO;2-T
- Galbraith, M.E., Arechiga, A., Ramirez, J., & Pedro, L.W. (2005). Prostate cancer survivors' and partners' self-reports of health-related quality of life, treatment symptoms, and marital satisfaction 2.5-5.5 years after treatment [Online Exclusive]. *Oncology Nursing Forum*, 32, E30-E41. Retrieved from <http://ons.metapress.com/content/t128147q6u1684t8/fulltext.pdf>
- Green, H.J., Pakenham, K.I., Headley, B.C., Yaxley, J., Nicol, D.L., Mactaggart, P.N., . . . Gardiner, R.A. (2004). Quality of life compared during pharmacological treatments and clinical monitoring for non-localized prostate cancer: A randomized controlled trial. *British Journal of Urology International*, 93, 975-979.
- Guyatt, G.H., Osoba, D., Wu, A.W., Wyrwich, K.W., & Norman, G.R. (2002). Methods to explain the clinical significance of health status measures. *Mayo Clinic Proceedings*, 77, 371-383. doi: 10.4065/77.4.371
- Incrocci, L. (2006). Sexual function after external-beam radiotherapy for prostate cancer. *Critical Review of Oncology and Hematology*, 57, 165-173. doi: 10.1016/j.critrevonc.2005.06.006
- Incrocci, L., Madalinska, J.B., Essink-Bot, M.L., Van Putten, W.L., Koper, P.C., & Schroder, F.H. (2001). Sexual functioning in patients with localized prostate cancer awaiting treatment. *Journal of Sex and Marital Therapy*, 27, 353-363. doi: 10.1080/009262301317081106
- Incrocci, L., Slob, A.K., & Levendag, P.C. (2002). Sexual (dys)function after radiotherapy for prostate cancer: A review. *International Journal of Radiation Oncology, Biology, Physics*, 52, 681-693.
- Karnofsky, D. (1977). Performance scale. In G.T. Kennealy & M.S. Mitchell (Eds.), *Factors that influence the therapeutic response in cancer: A comprehensive treatise* (pp. 97-101). New York, NY: Plenum Press.
- Kennedy, B.L., Schwab, J.J., Morris, R.L., & Beldia, G. (2001). Assessment of state and trait anxiety in subjects with anxiety and depressive disorders. *Psychiatry Quarterly*, 72, 263-276. doi: 10.1023/A:1010305200087
- Litwin, M.S., Flanders, S.C., Pasta, D.J., Stoddard, M.L., Lubeck, D.P., & Henning, J.M. (1999). Sexual function and bother after radical prostatectomy or radiation for prostate cancer: Multivariate quality-of-life analysis from CaPSURE. Cancer of the Prostate Strategic Urologic Research Endeavor. *Urology*, 54, 503-508. doi: 10.1016/S0090-4295(99)00172-7
- Litwin, M.S., Gore, J.L., Kwan, L., Brandeis, J.M., Lee, S.P., Withers, H.R., & Reiter, R.E. (2007). Quality of life after surgery, external beam irradiation, or brachytherapy for early-stage prostate cancer. *Cancer*, 109, 2239-2247. doi: 10.1002/cncr.22676
- Madsen, L.T., & Ganey-Code, E. (2006). Assessing and addressing erectile function concerns in patients postprostatectomy. *Oncology Nursing Forum*, 33, 209-211. doi: 10.1188/06.ONF.209-211
- Nelson, C.J., Choi, J.M., Mulhall, J.P., & Roth, A.J. (2007). Determinants of sexual satisfaction in men with prostate cancer. *Journal of Sexual Medicine*, 4, 1422-1427. doi: 10.1111/j.1743-6109.2007.00547.x
- Norman, G.R., Sloan, J.A., & Wyrwich, K.W. (2003). Interpretation of changes in health-related quality of life: The remarkable universality of half a standard deviation. *Medical Care*, 41, 582-592. doi: 10.1097/00005650-200305000-00004
- Osoba, D., Rodrigues, G., Myles, J., Zee, B., & Pater, J. (1998). Interpreting the significance of changes in health-related quality-of-life scores. *Journal of Clinical Oncology*, 16, 139-144.
- Paul, S.M., Zelman, D.C., Smith, M., & Miaskowski, C. (2005). Categorizing the severity of cancer pain: Further exploration of the establishment of cutpoints. *Pain*, 113, 37-44. doi: 10.1016/j.pain.2004.09.014
- Potosky, A.L., Davis, W.W., Hoffman, R.M., Stanford, J.L., Stephenson, R.A., Penson, D.F., & Harlan, L.C. (2004). Five-year outcomes after prostatectomy or radiotherapy for prostate cancer. *Journal of the National Cancer Institute*, 96, 1358-1367.
- Potosky, A.L., Reeve, B.B., Clegg, L.X., Hoffman, R.M., Stephenson, R.A., Albertsen, P.C., . . . Stanford, J.L. (2002). Quality of life following localized prostate cancer treated initially with androgen deprivation therapy or no therapy. *Journal of the National Cancer Institute*, 94, 430-437.
- Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385-401. doi: 10.1177/014662167700100306
- Sanders, S., Pedro, L.W., Bantum, E.O., & Galbraith, M.E. (2006). Couples surviving prostate cancer: Long-term intimacy needs and concerns following treatment. *Clinical Journal of Oncology Nursing*, 10, 503-508. doi: 10.1188/06.CJON.503-508

- Sheehan, T.J., Fifield, J., Reisine, S., & Tennen, H. (1995). The measurement structure of the Center for Epidemiologic Studies Depression Scale. *Journal of Personality Assessment*, 64, 507–521. doi: 10.1207/s15327752jpa6403_9
- Soloway, C.T., Soloway, M.S., Kim, S.S., & Kava, B.R. (2005). Sexual, psychological, and dyadic qualities of the prostate cancer 'couple.' *British Journal of Urology International*, 95, 780–785.
- Spielberger, C.G., Gorsuch, R.L., Suchene, R., Vagg, P.R., & Jacobs, G.A. (1983). *Manual for the State-Anxiety (form Y): Self-Evaluation Questionnaire*. Palo Alto, CA: Consulting Psychologists Press.
- Stommel, M., Given, B.A., Given, C.W., Kalaian, H.A., Schulz, R., & McCorkle, R. (1993). Gender bias in the measurement properties of the Center for Epidemiologic Studies Depression Scale (CES-D). *Psychiatry Research*, 49, 239–250. doi: 10.1016/0165-1781(93)90064-N
- Symon, Z., Daignault, S., Symon, R., Dunn, R.L., Sanda, M.G., & Sandler, H.M. (2006). Measuring patients' expectations regarding health-related quality-of-life outcomes associated with prostate cancer surgery or radiotherapy. *Urology*, 68, 1224–1229. doi: 10.1016/j.urology.2006.08.1092
- Turner, S.L., Adams, K., Bull, C.A., & Berry, M.P. (1999). Sexual dysfunction after radical radiation therapy for prostate cancer: A prospective evaluation. *Urology*, 54, 124–129. doi: 10.1016/S0090-4295(99)00032-1
- van der Wielen, G.J., van Putten, W.L., & Incrocci, L. (2007). Sexual function after three-dimensional conformal radiotherapy for prostate cancer: Results from a dose-escalation trial. *International Journal of Radiation Oncology, Biology, Physics*, 68, 479–484. doi: 10.1016/j.ijrobp.2006.12.015
- Ward-Smith, P., & Kapitan, D. (2005). Quality of life among men treated with radiation therapy for prostate cancer. *Urologic Nursing*, 25, 263–268.
- Zelevsky, M. J., Cowen, D., Fuks, Z., Shike, M., Burman, C., Jackson, A., . . . Leibel, S.A. (1999). Long term tolerance of high dose three-dimensional conformal radiotherapy in patients with localized prostate carcinoma. *Cancer*, 85, 2460–2468. doi: 10.1002/(SICI)1097-0142(19990601)85:11<2460::AID-CNCR23>3.0.CO;2-N
- Zelman, D.C., Hoffman, D.L., Seinfeldin, R., & Dukes, E.M. (2003). Development of a metric for a day of manageable pain control: Derivation of pain severity cut-points for low back pain and osteoarthritis. *Pain*, 106, 35–42. doi: 10.1016/S0304-3959(03)00274-4