ORIGINAL ARTICLE

Mood outcomes of a behavioral treatment for urinary incontinence in prostate cancer survivors

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Abstract

Purpose This study aimed to assess whether prostate cancer survivors who received a behavioral intervention to urinary incontinence had experienced a significant mood improvement.

Methods One hundred fifty-three prostate cancer survivors with persistent incontinence were included in this secondary data analysis. They were randomly assigned to usual care or interventions that provided pelvic floor muscle exercises and self-management skills. All subjects had measures of anxiety, depression, and anger at baseline, 3 months (post-intervention), and 6 months (follow-up). Negative binomial regression analysis was performed to examine the group status, daily leakage frequency at 3 months, and their interactions at 3 months as predictors for mood outcomes at 6 months, controlling for demographic and medical variables.

Results The main effect of daily leakage frequency at 3 months significantly predicted anxiety at 6 months ($p < .01$). The group main effect on any mood outcomes at 6 months was not statistically significant. The interaction between the group and 3-month leakage had a significant effect on anxiety; intervention subjects achieving a significant leakage reduction at 3 months exhibited significantly less anxiety at 6 months than other subjects ($p = .04$). Age, employment status, and receiving surgery at baseline were significantly associated with less anxiety, depression, and anger at 6 months.

Conclusions Reduced urinary incontinence significantly predicted less anxiety, especially among the intervention subjects. The findings suggest a significant association between a behavioral therapy of urinary incontinence and anxiety reduction in prostate cancer survivors.

Keywords Behavioral intervention · Anxiety · Cancer care · Prostate cancer · Psychosocial studies

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Introduction

Prostate cancer causes significant psychological distress [1]. Studies have shown that 20% and 6% of prostate cancer patients experienced anxiety and depression, respectively, following a prostate cancer diagnosis [2], and 10–17% of the patients continued to report anxiety or depression up to 18 years afterwards [3–6]. Most prostate cancer patients (92%) are diagnosed in early stages, in which the 10-year survival rate is 98% [7]. Thus, the persistent prevalence of anxiety and depression may be explained by the chronic morbidity of prostate cancer more than the patient's fears of mortality.

Urinary incontinence is a major chronic and debilitating health problem resulting from prostate cancer treatments [8]. It affects 90% of men undergoing prostatectomy, and 30% of these patients in the following years, with 15% experiencing daily urinary leakage 5 years after surgery [8–10]. Urinary incontinence not only causes daily use of protective pads, skin infection, family burden for caregiving and medical cost, and restriction of daily activities, but also causes embarrassment [11], social stigma for wearing pads [12], isolation [13], and anger over a loss of control [14] or self-worth [15, 16]. Even using a single pad daily can result in a feeling of significant bother [17].

An epidemiological study of 50,856 prostate cancer patients has shown that urinary incontinence was a significant predictor of anxiety and depression at 10 years post-diagnosis, based on the Surveillance, Epidemiology, and End Results (SEER) database [18]. Other researchers also reported a significant association between urinary incontinence and anxiety or depression [19, 20]. In a study of 408 prostate cancer patients that underwent radical prostatectomy, 31% had anxiety due to urinary dysfunction [21]. In another study, more than a third of prostate cancer patients suffered from urinary incontinence at 10 years after cancer treatment and reported higher depression scores than those without urinary incontinence [22]. These findings suggest that urinary incontinence significantly affects a patient's mental well-being [19]. Because anxiety and depression have a significant impact on men's functioning and quality of life [23–25], it is important to know whether a reduction of urinary incontinence can influence anxiety and depression in prostate cancer survivors.

The prevailing treatments for prostate cancer patient's mood problems are conventional psychological approaches (e.g., cognitive-behavioral therapy) that have shown a limited effect on mental well-being in this population [26]. The literature regarding the impact of incontinence treatment on prostate cancer patient mood is scarce. Urinary incontinence is treated medically or behaviorally, but medication and surgical procedures have certain limitations due to high costs and side effects [27], and not all behavioral treatments of incontinence (e.g., pelvic floor muscle exercise [PFME]) have been shown

to be effective [28]. Thus, studies of incontinence treatments mainly focused on examining incontinence and general quality of life and rarely have considered mood outcomes. However, psychoneuroimmunology has established a body-mind connection in health and provides a theoretical framework for improved mood outcomes from the treatment of physical problems such as urinary incontinence [29]. The speculation that incontinence treatments improve the prostate cancer patient's mood is conceptually reasonable, but supporting evidence is still lacking. Clearly, a gap exists in our current knowledge and needs to be bridged with scientific endeavor. With this intent in mind, we conducted this study to explore whether behavioral treatments of urinary incontinence can significantly reduce mood problems of anxiety, depression, and anger in prostate cancer survivors.

Methods

In this secondary data analysis study, we chose data from a study of a behavioral intervention that effectively reduced urinary incontinence [30]. The primary study was a randomized, controlled, longitudinal clinical trial conducted from 2010 to 2013 in Cleveland, Ohio. Unlike the primary study that aimed to examine the effect of a behavioral intervention on urinary incontinence, the goal of this secondary analysis was to explore whether patient's mood was improved due to the intervention. Subject eligibility included early stage (I, II, or III) prostate cancer, completion of cancer treatment for at least 6 months, and presenting incontinent symptoms (e.g., dripping, a common and bothersome symptom that can progress without adequate care). Exclusion criteria were concurrent hormonal treatment, urinary tract infection or retention, cognitive impairment, and an implant for correcting incontinence. The International Continence Society ICSmale short form questionnaire (ICSmaleSF) [31], the Short Portable Mental Status Questionnaire (SPMSQ) [32], and a symptom list of urinary infection and retention were used for eligibility screening, along with a medical chart review. The study was approved by the local institutional review board (IRB# CC437), and all the participants provided written informed consent.

In the primary study, a computerized approach [33, 34] was used to randomly assign participants to three study groups: (a) biofeedback PFME plus a support group (BF + SUPPORT), (b) biofeedback PFME plus telephone (BF + PHONE), and (c) usual care (UC), balanced on specific treatment type and hospital site. The BF + SUPPORT and BF + PHONE subjects learned PFME through biofeedback, using a computerized biofeedback machine, and then received problem-solving therapy (PST) [35] through 6 biweekly sessions (45 to 60 min long) either in a support group or by individual telephone contact with a therapist over 3 months. The participants

learned problem-solving and self-management skills during the PST sessions, such as maintaining daily PFME, adequate fluid intake with restriction of caffeine intake, regular voiding schedules, and physical exercise. A therapist monitored their daily PFME and self-management behaviors during the PST sessions using a urinary diary. Because the two intervention groups received the same intervention that differed merely in the mode of delivery, subjects from both groups were expected to receive similar benefits. Therefore, the two intervention groups were combined in the data analysis to ensure adequate power for the purpose of analysis. By contrast, the UC subjects continued receiving usual care from health care providers such as regular follow-ups without receiving any intervention training sessions. All subjects were assessed at baseline, 3 months (post-intervention), and 6 months (follow-up). The details of study methodology are published elsewhere [30].

Mood outcomes were assessed on the profile of mood states (POMS). POMS has been used extensively to measure psychological adjustment to cancer and is a sensitive indicator of cancer patients' responses to psychological intervention [36]. Its 36-item subscales of tension or anxiety (9 items), depression or dejection (15 items), and anger or hostility (12 items), rated on a 5-point Likert scale (0–4), were used to measure anxiety, depression, and anger, with a higher score indicating worsening mood. High internal consistency and test-retest reliability have been reported for the subscales [36, 37].

The frequency of daily leakage, a primary indicator of urinary incontinence, was recorded in a diary for 3 days, and the average daily frequency was calculated. Previous research has identified that 3-day diaries are equally effective and accurate as 7-day diaries for assessing frequency of daily leakage, with good validity and reliability [38, 39].

Demographic, socioeconomic, and medical variables (e.g., cancer stage and treatment type) were collected at the baseline and verified against the medical chart. Comorbidity was evaluated using the Charlson Comorbidity Index (CCI) [40]. We also asked questions at the end of the study about whether the subject continued PFME and self-management and the reasons for continuing or discounting them.

Bivariate statistics were computed to examine baseline group differences in demographic and clinical variables. Further, negative binomial regression was performed to evaluate how the intervention effect at post-intervention 3 months affected anxiety, depression, and anger at the 6-month follow-up. Mood outcomes were measured as integer-valued count values, and the exploratory analysis of the data indicated that the three mood variables exhibited the characteristic skewness of distributions associated with count variables. The data was tested for overdispersion and the presence of excessive zeros. The data did not indicate the presence of zero inflation but show the characteristic difference between the mean and variance associated with overdispersion. The negative binomial

regression model was therefore chosen as an appropriate analysis. It included a main effect of daily leakage frequency at 3 months, a main effect of group status (intervention versus usual care control), and the effect of interaction between the leakage frequency at 3 months and the group. Covariates of age, race, marital status, education, employment status, household annual income, cancer stage, surgery or radiation, and Charlson Comorbidity Index were also included in the models. A type I error rate of 0.05 was used to determine statistical significance; p values were considered two-sided. No adjustment was made for multiple testing/multiple comparisons. All analyses were carried out using SAS version 9.4.

Results

Two hundred and forty-four patients participated in and completed the intervention study, of which 153 subjects completed 6-month assessments on mood variables and all other variables included, thus were retained for this study. The intervention ($n = 105$) and control ($n = 48$) groups did not differ at baseline on most demographic and clinical characteristics. In both groups, the majority of the patients were White (70% vs. 67%), over two thirds were married (67% vs. 65%) and received education beyond high school (71% vs. 73%), nearly half were still employed (50% vs. 40%), and less than half had a household income of $50,000 or more (43% to 35%). Subjects in both groups had about the same level of comorbidity (CCI = 0.8 vs. 0.6), similar cancer stages at diagnosis (73% to 71% at stage II /III), and similar types of cancer treatment with non-significant variations (61% vs. 54% for surgery, and 45% vs. 52% for radiation). All subjects leaked about three times per day on average. The only variable that differed significantly by group at baseline was age (mean = 64 vs. 67; $p = .01$), with the control group slightly older by an average of 3 years than the intervention group. See Table 1 for complete results.

The levels of anxiety, depression, and anger at baseline and 6 months are presented in Table 2 on each group. The baseline anxiety, depression, and anger were not significantly different by group ($p = 0.43$, 0.56, and 0.57, respectively). However, t test shows that the level of anxiety was significantly lower at 6 months in the intervention group ($p = 0.03$). No other significant change in the outcome variables was detected.

Negative binomial regression analysis was run for all subjects, using predictors of group status, leakage frequency at 3 months, interaction between group status and leakage frequency at 3 months, and controlling for age, race, marital status, education level, employment status, income level, cancer stage, comorbidity, surgery, and radiation treatment. Results are presented in Table 3. There was no statistical significance in the group status main effect for any of the three mood outcomes, meaning no group difference at baseline. The

Table 2 Changes in outcome scores from baseline to 6 months

Intervention (*n* = 105)

	Baseline		6 months		Difference			
Outcome	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev	*t* value	*p* value
Anxiety	8.1	6.2	7.2	6.1	− 0.9	4.1	− 2.20	0.0303
Depression	9.1	10.5	7.9	8.9	− 1.1	6.3	− 1.75	0.0832
Anger	7.4	8.6	6.7	8.2	− 0.6	5.5	− 1.09	0.2799
Controls (*n* = 48)								
Anxiety	6.9	5.6	6.0	5.0	− 0.8	3.9	− 1.33	0.1893
Depression	6.9	8.5	5.6	7.6	− 1.1	6.4	− 1.18	0.2428
Anger	5.9	6.0	4.8	6.7	− 1.0	5.8	− 1.24	0.2206

on adherence behaviors. If so, we shall enhance the intervention effect by further helping patients incorporate PFME into routines and by extending the intervention to a longer duration. With enhanced intervention effect, we hope that more intervention subjects will experience reduced leakage frequency, and thus, a better mood outcome.

We did not detect a significant intervention effect on depression and anger in this study, perhaps because these two mood problems had other causes that were not addressed by the study intervention and therefore could not be eliminated by reducing urinary leakage alone. If the intervention effect on depression and anger is more limited, then it may be better observed in a larger sample and over a longer period as a primary outcome. Relatively speaking, anxiety is a more prominent mood problem in prostate cancer patients [3, 6]. Studies have showed that intrusive thought about well-being is associated with anxiety in prostate cancer patients, but the ability to reappraise and manage a health problem and the hope (i.e., optimism) are associated with lowered anxiety [41, 42]. Regaining urinary health can help patients feel hopeful about their physical health and more confident in physical and social functioning, thereby lessening anxiety. Thus, a behavioral intervention that effectively reduces urinary incontinence could be a useful tool for improving mood in this patient population.

The findings regarding demographic and disease determinants of long-term mood outcome are generally consistent with previous studies of prostate cancer patients [18]. Being older ($p < .01$) and employed ($p = .03$) were associated with lower anxiety, depression, and anger at 6 months. Having received a prostatectomy was significantly associated with better moods at 6 months ($p < .0001$). Perhaps the surgery

Table 3 Coefficients of negative binomial regression models for anxiety/depression/anger at 6 months (*N* = 153)

	Outcome at 6 months								
	Anxiety			Depression			Anger		
Parameter	*b*	exp(b)	*p* value	*b*	exp(b)	*p* value	*b*	exp(b)	*p* value
Group	0.19	1.20	0.28	0.08	1.09	0.77	− 0.06	0.94	0.84
Leak frequency at 3 months	0.07	1.07	0.01	0.07	1.08	0.11	0.07	1.08	0.12
Group × leak frequency at 3 months	− 0.09	0.91	0.04	− 0.10	0.90	0.18	− 0.09	0.91	0.26
White	0.24	1.27	0.13	0.13	1.13	0.63	0.19	1.21	0.48
Married	− 0.01	0.99	0.93	− 0.19	0.83	0.42	− 0.12	0.89	0.64
Education > HS	− 0.06	0.94	0.67	− 0.03	0.97	0.89	0.04	1.05	0.86
Employed	− 0.31	0.74	0.03	− 0.59	0.55	0.01	− 0.72	0.49	< 0.01
Income > $50K/year	− 0.07	0.93	0.66	0.03	1.03	0.89	− 0.21	0.81	0.46
Cancer stage 2 or 3	0.26	1.29	0.07	0.14	1.15	0.53	0.27	1.30	0.28
Age	− 0.04	0.96	< 0.01	− 0.06	0.94	< 0.01	− 0.06	0.94	< 0.01
CCI	0.04	1.04	0.56	0.16	1.17	0.23	0.01	1.01	0.95
Surgery	− 0.52	0.59	0.03	− 0.98	0.38	0.01	− 1.12	0.33	0.02
Radiation	0.01	1.01	0.97	− 0.25	0.78	0.53	− 0.46	0.63	0.30

b is the regression coefficient associated with the parameter in the regression mode

suggested a treatable disease condition or provided hopes for a cure. Knowing this, the behavioral intervention can be modified to help younger and unemployed patients, as well as those without a surgery, to better manage their anxiety in order to effectively reduce mood problems in this population.

The study has important implications for future clinical practice and research. It alerts health care providers to anxiety reduction as a psychological benefit of treating urinary incontinence. It calls on psychosocial behavioral therapists to refer patients in a timely manner for the treatment of urinary incontinence. It also encourages clinicians to consider a combined therapy of medical behavioral interventions for better improving urinary continence, and subsequently anxiety, both of which are prevalent among prostate cancer survivors. The study also encourages researchers to further investigate how to enhance the intervention effects on urinary incontinence. Future studies of urinary incontinence treatment should include measures of mood outcomes to advance our understanding of the psychological benefits of the treatment.

This study has certain limitations. The study findings may not be generalized beyond early stage and surgical or radiological treatment of prostate cancer, because patients receiving a stage IV diagnosis or hormonal therapy were excluded and their mood profiles can be quite different due to disease or drug influences. The outcome measure of mood (POMS) does not characterize clinically diagnosable mood disorders, and more measures of emotional states should be considered. The effect of the behavioral intervention on depression and anger was limited; possible reasons and solutions for these mood problems need to be investigated. Further, because of the small number of subjects in each study group and thus a lack of power for detailed analysis, we were unable to compare the two intervention groups to examine impacts of specific components of the intervention and different intervention strategies on mood. All of these issues will need to be addressed in future research.

In conclusion, this is the first study to demonstrate that improved continence resulting from a behavioral intervention is significantly associated with reduced anxiety of prostate cancer survivors, which is a significant source of mood disturbance. It highlights a new route towards controlling anxiety in this patient population.

Compliance with ethical standards

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