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Impact of diagnosis and treatment of clinically-localized prostate cancer on health-related quality of life for older Americans: a population-based study

Bryce B. Reeve, PhD[1], **Angela M. Stover, MA**[2], **Roxanne E. Jensen, PhD**[3], **Ronald C. Chen, MD, MPH**[4], **Kathryn L. Taylor, PhD**[3], **Steven B. Clauser, PhD**[5], **Sean P. Collins, MD, PhD**[6], and **Arnold L. Potosky, PhD**[3]

[1]Lineberger Comprehensive Cancer Center; Department of Health Policy and Management, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

[2]Department of Health Behavior and Health Education, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

[3]Cancer Control Program, Department of Oncology, Lombardi Comprehensive Cancer Center, Georgetown University

[4]Department of Radiation Oncology, University of North Carolina at Chapel Hill

[5]Outcomes Research Branch, Applied Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute

[6]Department of Radiation Oncology, Georgetown University Hospital

Abstract

Background—Few studies have measured the longitudinal change in health-related quality of life (HRQOL) of prostate cancer patients starting prior to cancer diagnosis, or provide simultaneous comparisons with a matched non-cancer cohort. Our study addresses these gaps by providing unique estimates of the effects of a cancer diagnosis on HRQOL accounting for the confounding effects of ageing and comorbidity.

Methods—The Surveillance, Epidemiology, and End Results registry data were linked with the Medicare Health Outcomes Survey (MHOS) data. Eligible patients (n=445) were Medicare beneficiaries, aged 65 years and older, from 1998–2003 whose first prostate cancer diagnosis occurred between their baseline and follow-up MHOS. Using propensity score matching, we identified 2225 participants without cancer in the MHOS. Analysis of covariance models were used to estimate changes in HRQOL as assessed with the Short Form-36 and activities of daily living scale.

Results—Before diagnosis, prostate cancer patients reported similar HRQOL to men without cancer. Following diagnosis, men with prostate cancer experienced significant decrements in physical, mental, and social aspects of their lives relative to controls, especially within the first 6 months from diagnosis. For men surveyed beyond one year after diagnosis, HRQOL was similar

Corresponding Author: Bryce B. Reeve, Ph.D., 135 Dauer Drive; 1101-D McGavran-Greenberg Building, Chapel Hill, NC 27599-7411, Phone: 919-843-8793, Fax: 919-843-6362, bbreeve@email.UNC.edu.

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Informed Consent

The SEER-MHOS data are considered by HIPAA requirements as a limited data set, which required the investigators to sign a Data Use Agreement prior to receiving the data. This exception allowed for the release of de-identified SEER-MHOS data without obtaining authorization from individual patients (see Federal Register, August 14, 2002, pg 53235).

to controls. However, we observed an increased risk for major depressive disorder among men undergoing either conservative management or external beam radiation.

Conclusions—These findings illustrate the time-sensitive nature of decline in HRQOL after a cancer diagnosis and enhance our understanding of the impact of prostate cancer diagnosis and treatment on older men' physical, mental, and social well-being.

Keywords

Prostate Cancer; health-related quality of life; population-based; prospective; older Americans

Introduction

In 2011, an estimated 240,890 men were diagnosed with prostate cancer, with 62% of cases diagnosed in men older than 65 years of age.[1] Treatments for localized prostate cancer include: radical prostatectomy, external beam radiation therapy, brachytherapy, and conservative management (androgen deprivation therapy alone or no treatment).[2] While treated men often experience excellent long-term survival, the treatments can have an impact on men's health-related quality of life (HRQOL).[2–4]

A large number of studies have documented the effects of prostate cancer and its treatment on HRQOL; however, these studies have collected prospective HRQOL data starting after a prostate cancer diagnosis.[5–9] To our knowledge, only our published study has measured the impact with a baseline HRQOL assessment prior to prostate cancer diagnosis to capture the true prospective impact of the disease on patients' HRQOL.[10] In addition, longitudinal comparison data for men without cancer have rarely been collected,[11] limiting the ability to assess the marginal effects of prostate cancer on the elderly for whom it may be difficult to attribute longitudinal declines in HRQOL to prostate cancer accounting for ageing and other chronic comorbid conditions.

The 2007 linkage of data from the National Cancer Institute (NCI)'s Surveillance, Epidemiology, and End Results (SEER) program with the Centers for Medicare & Medicaid Services' (CMS) Medicare Health Outcomes Survey (MHOS) provides a unique opportunity to measure the burden of prostate cancer and treatment on older men's lives.[12] The population-based SEER cancer registries provide detailed clinical data on incident cancers including stage and initial treatment. The MHOS provides data on patients' experiences and perspectives as they relate to physical, mental, and social well-being.

This study will estimate the prospective change in HRQOL from before to after prostate cancer diagnosis for men aged 65 years and older, and to compare their changes relative to a similar cohort of men without cancer. This report differs from our prior study using the SEER-MHOS dataset that compared HRQOL among 9 different cancer types.[10] Here we focus on prostate cancer-specific clinical characteristics such as treatment type, stage of disease, and time since diagnosis likely to be important influences on changes in HRQOL.

Methods

Study Participants

Under the CMS and NCI collaboration, survey data from CMS' MHOS[13] were linked in 2007 with data from NCI's SEER cancer registries.[14] During the study period from 1998 to 2003, the MHOS was administered annually to a random sample of 1000 Medicare beneficiaries from each Medicare Advantage Organization (MAO) under contract with CMS. Each participant completed a baseline and two year follow-up survey if he remained

in the same managed care plan. An overview of the SEER–MHOS data linkage is provided elsewhere.[10,12]

Four MHOS cohorts were included in the study with baseline years from 1998 to 2001 and 2-year follow-up surveys. Response rates for the baseline MHOS ranged from 64% to 72% and follow-up rates ranged from 76% to 85%, resulting in a sample size of 11,683 MHOS respondents linked to SEER.[12]

Our study cohort included those prostate cancer patients whose first SEER-confirmed diagnosis occurred after their baseline and before the follow-up MHOS. We identified 467 eligible men with prostate cancer in this manner. We excluded 22 men diagnosed with regional or metastatic prostate cancer, resulting in a final sample of 445 men. The average time from baseline MHOS to prostate cancer diagnosis was 11.5 months (SD = 7.1) and from prostate cancer diagnosis to follow-up survey was 12.6 months (SD = 7.1).

We selected non-cancer controls (n=16,397 men) who responded to both a baseline and follow-up MHOS and who resided in the same SEER region and participated in the same managed care plans as the cancer patients. Using propensity score matching procedures,[15–17] we matched 5 controls to each cancer case to balance the proportion of patient and survey characteristics as well as pre-existing comorbid conditions between the groups.[10,18,19] This resulted in 2,225 controls matched to 445 men with prostate cancer.

Data Collected

The MHOS provides self-reported data on sociodemographics (education, age, race and ethnicity, smoking status, marital status), survey characteristics (self-report or proxy, mail or phone-interview), HRQOL, clinical symptoms, and chronic medical conditions.[20] While the study would be more homogeneous by excluding proxy reporting and men who switched assessment modes from baseline to follow-up, these data were kept in the analyses in an attempt to capture the extent of HRQOL changes, including those whose HRQOL may have been poor enough to require a proxy response. These variables were controlled for in the regression models.

The MHOS includes the Medical Outcomes Study Short Form-36 (MOS SF-36, version 1);[21] a HRQOL measure widely used in medicine.[10,22] The SF-36 includes eight subscales: physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The subscales produce a physical component summary and mental component summary scores. SF-36 scores are normalized to the general US population (mean = 50, standard deviation = 10). Higher scores indicate better HRQOL. A change in SF-36 scores of at least a half standard deviation (i.e., 5 points) is considered clinically meaningful.[23]

The MHOS also includes a measure of activities of daily living (ADL) which assesses difficulties with getting in or out of chairs, dressing, walking, using the toilet, eating, and bathing. Each ADL is reviewed individually and summed together with higher scores reflecting more limitations.

The MHOS includes a question about urinary incontinence, which is typically impacted by treatments for prostate cancer. However, the MHOS did not include any items on sexual or bowel function, two other key domains for this disease.

The MHOS includes three items from the Diagnostic Interview Schedule (DIS).[24] Together with a question from the SF-36 mental health subscale to capture more recent depressive mood, an indicator was developed for risk of major depressive disorder (MDD) based on the

algorithm from a published study.[25] This MDD indicator is more conservative than the MHOS website recommendation that a positive screen for MDD is an affirmative response to at least one of the three DIS questions.[20]

The survey included questions about the presence of multiple chronic medical conditions. We grouped these according to whether they were "pre-existing" diagnosed conditions (i.e., before baseline survey) versus "newly diagnosed" conditions (i.e., between baseline and follow-up survey). See Table 1 for list of conditions. We summed the comorbidities applying weights based on the association of each condition with physical and mental aspects of HRQOL. Development of the physical and mental weighted comorbidity indices are described in a previous study.[10]

SEER provided information regarding stage of diagnosis, date of diagnosis, and initial treatment received.[14] Among our localized cases, the clinical extent of disease was classified according to the following categories used in clinical practice: T1 (clinically inapparent or incidentally detected disease); T2 (clinically or radiographically apparent disease); T2 prostatic apex (extension to prostatic apex); T1 or T2 (i.e., insufficient information to classify); or unstaged based on lack of any clinical extension information. Time from SEER-confirmed cancer diagnosis to the follow-up MHOS survey was categorized from 0–6, 7–12, 13–18, and 19 or more months to allow for comparison of HRQOL in patients surveyed at different points in their post-diagnosis trajectory. We categorized treatments into: radical prostatectomy (including those who also received adjuvant radiation therapy), external beam radiation therapy (EBRT), brachytherapy, or conservative management (defined as the absence of documented curative intent surgery or radiation treatments). Because neither SEER nor Medicare includes data on the use of outpatient-based hormonal therapy or Androgen Deprivation Therapy (ADT), it is likely that a sizable proportion of men in our conservative management group did receive such therapy. SEER contains nearly complete data on surgery, but there has been recent evidence of a slight under-ascertainment of radiotherapy.[26,27]

Statistical Analysis

A mixed-effect analysis of covariance (ANCOVA) model was used to estimate the change in HRQOL scores adjusting for baseline scores. The model adjusted for clustering for respondents enrolled in the same MAO and for the five controls matched to each cancer patient.[28] The model included patient characteristics, comorbidities, and survey characteristics, listed in Table 1, as covariates. Models were tested to look for differences in HRQOL by treatment type and time since diagnosis, both as main effects and interactions. Models that included the variable time since diagnosis alone combined prostate cancer patients across all treatments; thus significant findings may be weighted by treatment groups overrepresented in the sample (EBRT and conservative management, see Table 1). All analyses used SAS version 9.2 (Cary, NC).

Results

Sample Description

The characteristics of the men with prostate cancer (n = 445, categorized by initial treatment) and their matched controls (n = 2,225) are described in Table 1. No statistically significant differences were observed on demographic characteristics, survey characteristics, and pre-existing health conditions after propensity score matching. For newly diagnosed health conditions (not included in the propensity score model), men with prostate cancer had a higher percentage of gastro-intestinal disorders than men without cancer (3.19% vs 1.39%, respectively; $p < .01$).

Changes in Physical Health

At baseline, the mean SF-36 physical component summary (PCS) score for the non-cancer matched controls was 45.6 (SD = 11.2) and for the prostate cancer patients (prior to diagnosis) was 45.1 (SD = 10.9). These were similar by treatment group and consistent with age-adjusted US general population 1998 SF-36 norms.[29,30]

In general, there were few statistically significant differences between the treatment groups and controls in changes over time for the overall PCS or for the SF-36 sub-domains of physical function (PF), role-physical (RP), or bodily pain (BP). The exception was that for both the EBRT and conservative management groups we found a statistically significant decline (adjusted mean change = −3.9 and −3.6, $p < .01$, respectively) in general health (GH) relative to the matched controls (mean change = −1.7).

We next examined the changes in patients' HRQOL relative to controls for patients classified by the time from diagnosis to their follow-up survey (Figure 1). Men surveyed within six months from diagnosis had statistically worse overall PCS scores (mean change −4.9 versus −2.1 in controls; $p < .01$), RP (−7.6 versus −3.0; $p < .01$), and GH (−5.0 versus −1.7; $p < .01$). Prostate cancer patients surveyed from 7–12 months after diagnosis also experienced significantly decreased RP (−6.3; $p = .046$) and GH (−3.5; $p = .03$) relative to controls. For PCS, RP, and GH, we did not find an interaction of treatment group and time since diagnosis. When both variables were included in the model, time since diagnosis but not treatment remained significantly associated with decreased physical health.

The prostatectomy group experienced a statistically significant improvement relative to controls ($p = .03$) in overall ADL from baseline (0.69 change compared with 0.61 on 0 to 6 scale) to follow-up (mean 0.38 compared with 0.88). The prostatectomy group reported improvements after diagnosis in bathing, dressing, eating, and using the toilet; the controls reported greater limitations for all the ADLs.

Urinary incontinence was a significant problem reported by all prostate cancer patients regardless of treatment (Table 2). Each treatment group experienced more urinary incontinence than controls at the follow-up, with prostatectomy patients reporting the largest increase in incontinence.

Changes in Mental Health

At baseline, the mean SF-36 MCS score for the non-cancer matched controls was 53.5 (SD = 10.3) and for the cancer patients was 53.4 (SD = 10.1). These were similar by treatment group and consistent with age-adjusted general US population 1998 SF-36 norms.[29,30]

Compared to matched controls without cancer, EBRT patients reported significantly larger declines in mental component summary (MCS) scores (adjusted mean changes of −1.1 and −3.8, respectively; adjusted $p < .01$), role emotional (RE) scores (−2.3 and −5.9, respectively; $p < .01$), vitality (VT) scores (−1.4 and −3.2, respectively; $p = .01$), and social function (SF) scores (−1.4 and −4.2, respectively; $p < .01$).

Men surveyed 7–12 months from diagnosis had larger declines in MCS (Figure 1; mean change was −3.7 compared with −1.1 for controls; $p = .02$) and VT (−3.7 versus −1.4 for controls; $p < .01$). SF was also affected by prostate cancer. Among men surveyed within 6 months of diagnosis, the adjusted mean SF change for cases was −3.6 compared with −1.4 for controls ($p = .03$). Among men 7–12 months from diagnosis, the mean change in SF was −4.8 relative to −1.4 for controls ($p < .01$).

Men in the conservative management group were at greatest risk for major depressive disorder (MDD) with 13% and 23% classified as at-risk for MDD at baseline and at follow-up survey, respectively. This was significantly different (OR = 1.9; 95% CI 1.2–3.0) from matched controls (11% and 14% at baseline and follow-up, respectively). Men with prostate cancer (all treatments combined) at 19 or more months post-diagnosis had a higher change in MDD risk with 13% and 24% at risk for MDD at baseline and follow-up, respectively (OR = 2.2; 95% CI 1.3–3.8). Men receiving EBRT and who were surveyed more than 19 months from diagnosis were at an increased MDD risk than controls (OR = 3.1; 95% CI 1.3 – 7.1). In addition, relative to controls, men in the conservative management group surveyed from 13–18 months had the largest increased MDD risk (OR = 3.4; 95% CI 1.5 – 7.4); this increased MDD risk for the conservative management group, relative to controls, continued for men surveyed after 19 months (OR = 2.5; 95% CI 1.0–6.0).

Discussion

This prospective population-based study evaluated the burden of prostate cancer and treatment on the lives of American men over 65 years of age. Although prostate cancer patients surveyed before diagnosis were similar in health status to matched controls, notable HRQOL decrements following diagnosis occurred in men with cancer, especially those receiving EBRT or who were conservatively managed. HRQOL decrements were greatest for those patients surveyed within 6 months of diagnosis when the men were likely undergoing active treatment. For men surveyed beyond one year after diagnosis, HRQOL was similar to controls across most HRQOL domains. Our study is among the very few to examine HRQOL changes before and after a prostate cancer diagnosis and to use a matched control group of men without cancer. These findings illustrate the time sensitive nature of variation in physical, mental, and social well-being for men following cancer diagnosis.

Men diagnosed with prostate cancer within 6 months reported significantly larger decrements in overall physical health relative to controls and experienced more role limitations due to their poorer general health than matched controls. Each of these changes in physical health were at least a half standard deviation or higher on the SF-36; representing a clinically meaningful change.[23] Prostate cancer patients surveyed at 12 months from diagnosis had comparable decrements in physical health with similarly aged men without cancer. This trend has been observed in other prospective studies where men often returned to baseline (defined in these studies as after cancer diagnosis but prior to treatment) physical health levels.[7,9]

When examining men by treatment type, those receiving EBRT or conservatively managed reported worse general health than controls. As we did not have information on ADT, it is likely that a higher percentage of these patients received ADT for months to years following diagnosis compared with men in the surgery group.[31,32] ADT usage is known to cause fatigue, muscle weakness, and weight gain which may cause a decline in perceived general health.[33] In men undergoing radiation therapy, the late morbidity from treatment with older EBRT techniques may partly explain this decline.[34,35] Recent technical improvements such as intensity-modulated radiation therapy (IMRT) and image-guided radiation therapy (IGRT) may reduce such an effect[36] but were not widely disseminated until after collection of this data.[37,38]

Incontinence was significantly higher for men with prostate cancer than those without cancer; especially men treated with radical prostatectomy. However, even men in the conservative management group experienced a statistically significant increase in urinary incontinence at 9.2%. The rates we observed are similar to those reported in the literature.[5–7,9]

An unexpected finding is that men receiving prostatectomy reported improved activities of daily living relative to matched controls. Further investigation is needed to replicate this finding and explore potential reasons for improvement.

Differences in changes in mental health were also detected between the prostate cancer patients and controls. Men who received EBRT reported statistically significant declines, relative to controls, in overall mental health, limitations in activities because of emotional problems, social functioning, and increased fatigue. In addition, an unexpected result is that men who were 19 months or more from cancer diagnosis were approximately 2.2 times more likely to exhibit elevated risk for a major depressive disorder than men without cancer, especially in the conservative management and EBRT groups. Other studies found similar evidence of increased depression in older age prostate cancer survivors.[39–42] While ADT use may be a contributing factor in these treatment groups,[43] the impact of prostate cancer and age-associated physical limitations may also affect depressive mood.[41]

Limited social functioning was reported for men with prostate cancer within 12 months from diagnosis but men beyond 12 months reported similar social functioning as those without cancer, suggesting some adaptation or return to baseline across all treatment groups.

This study has some limitations. The data set was limited to beneficiaries in Medicare managed care plans. Past studies suggest that enrollees in MAOs have better health status than fee-for-service beneficiaries[44,45] while others have indicated that health status is similar.[46] Additionally, these data do not capture men who disenrolled from a managed care plan or passed away before responding to the follow-up survey.[47] We lack sufficient data to estimate the effect of response bias; however, the change in HRQOL scores will likely be worse when considering men who were close to end of life.

Another possible limitation is that the study included men who required a proxy to report their HRQOL on the MHOS. The concern may be that responses from proxies may be influenced by their own feelings about and experiences of caring for the cancer patient.[48] However, proxies provide critical information for men who are too ill to self-report.[48] Removing proxy data may bias the HRQOL results to reflect better HRQOL outcomes from cancer than what is actually experienced. Proxy reporting was controlled in the regression models and was associated with poorer HRQOL.

In addition, our cohort was diagnosed and treated between 1998 and 2004; thus we were unable to include some newer treatments (e.g., robotic prostatectomy and IMRT). Further, we were unable to include hormonal therapy which has been reported to be associated with various physical and mental effects, and thus potentially confounds some of our HRQOL findings.[8,49,50]

A final limitation is that the MHOS did not include cancer-specific functional measures. Many studies have shown that treatments for prostate cancer can result in significant problems. Radical prostatectomy has also been associated with increased sexual dysfunction.[2,7–9,51–53] Both EBRT and brachytherapy have been shown to be associated with urinary irritative-obstructive symptoms and bowel dysfunction.[2,7–9,51–54]

Despite these limitations, this SEER-MHOS prostate cancer study provides researchers, clinicians, patients, and health plans important information. Understanding the HRQOL effects from prostate cancer and its treatments could allow healthcare providers to better anticipate and therefore more effectively manage the physical and psychosocial sequelae of prostate cancer.[10] This study showed that the diagnosis of prostate cancer has a significant impact on health status, especially those receiving EBRT or patients conservatively managed. This study provides useful benchmarks of the net impact of prostate cancer on

HRQOL in the presence of ageing, comorbid health conditions, and sociodemographic factors. Finally, our estimates may also be informative for incorporating health status in cost-effectiveness analyses of prevention and early detection interventions. Future research will attempt to replicate these findings when new SEER-MHOS cohorts become available. Study results will enable healthcare payers and clinicians to actively monitor how improvements in treatments for prostate cancer may enhance men's lives.

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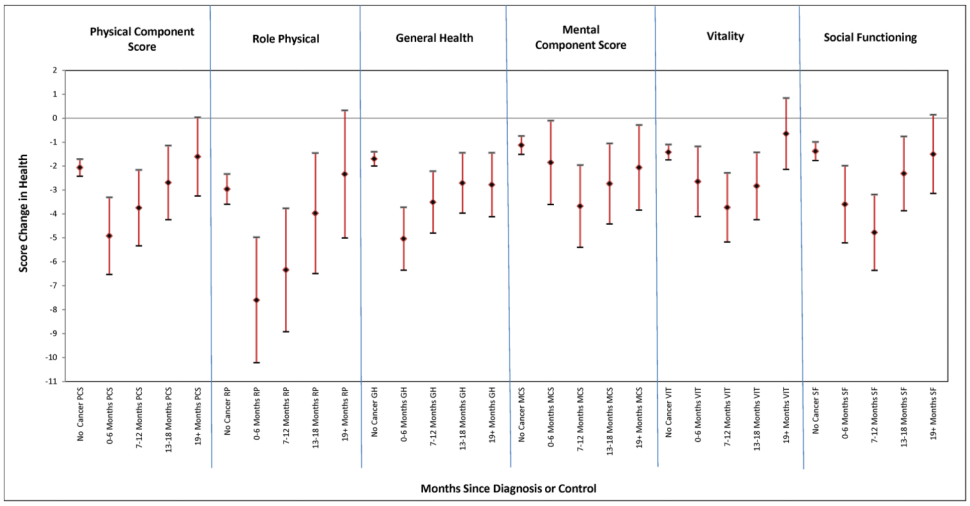

Figure 1.
HRQOL changes and 95% confidence intervals by time since prostate cancer diagnosis compared with Controls

Table 1

Comparison of covariates for cancer patients and matched control subjects without cancer

Characteristic	Matched non-cancer Controls (N=2225)	All Prostate Cancer Patients (N=445)	By Treatment Type			
			Radical Prostatectomy (N=72)	External Beam Radiation Therapy (N=169)	Brachytherapy (N=41)	Conservative Management (N=163)
Education, %						
Less than high school	23.05	25.39	22.22	21.30	26.83	30.67
High school graduate or GED	25.26	25.84	23.61	27.22	17.07	27.61
Some college or 2-year degree	26.29	24.04	30.56	26.04	14.63	21.47
College graduate or higher	25.39	24.72	23.61	25.44	41.46	20.25
Age (SD), mean years	72.39 (5.36)	72.57 (5.07)	69.54 (3.30)	71.69 (3.82)	71.51 (4.31)	75.08 (5.87)
Race, %						
White	81.62	80.00	77.78	77.51	85.37	82.21
Asian or Pacific Islander	4.72	4.49	1.39	7.10	0.00	4.29
African American	5.71	6.74	5.56	5.33	12.20	7.36
Hispanic	5.89	6.52	11.11	6.51	2.44	5.52
Other Race	1.88	2.02	4.17	3.56	0.00	0.00
Marital status (baseline), %						
Married	82.56	82.02	86.11	84.62	80.49	77.91
Never married	2.97	2.70	1.39	1.18	4.88	4.29
Divorced/ separated / widowed	12.49	13.26	11.12	13.02	12.20	14.72
Marital status change %						
Widowed, divorced, or separated between baseline and follow-up	3.60	2.25	2.78	1.78	2.44	2.45
Smoking status, %						
Never	29.75	28.09	27.78	33.14	21.95	24.54
Former	49.98	50.56	55.56	43.79	58.54	53.37
Current	12.81	13.48	11.11	15.38	14.63	12.27
Assessment mode baseline to follow-up, %						
Same Mode	85.89	87.19	87.50	89.35	90.24	84.05
Mixed Mode	14.11	12.81	12.50	10.65	9.76	15.95

Characteristic	Matched non-cancer Controls (N=2225)	All Prostate Cancer Patients (N=445)	By Treatment Type			
			Radical Prostatectomy (N=72)	External Beam Radiation Therapy (N=169)	Brachytherapy (N=41)	Conservative Management (N=163)
Proxy (baseline), %						
Yes	7.59	7.86	5.56	7.69	7.32	9.21
Proxy (follow-up), %						
Yes	9.21	10.56	9.72	7.10	9.76	14.72
Pre-existing conditions, %						
Hypertension/ high blood pressure	49.48	47.64	50.00	47.34	58.54	44.17
Angina pectoris/ coronary artery disease	16.18	16.63	18.06	15.98	12.20	17.79
Congestive heart failure	4.76	5.17	2.78	5.92	2.44	6.13
Myocardial infarction/ heart attack	11.46	11.69	8.33	12.43	12.20	12.27
Other heart conditions	16.27	16.40	9.72	18.93	19.51	15.95
Stroke	6.11	5.84	2.78	6.51	4.88	6.75
Emphysema, Asthma, or COPD	13.21	13.93	6.94	13.61	19.51	15.95
Crohn's disease, ulcerative colitis, or IBD	2.65	2.47	0.00	1.78	2.44	4.29
Arthritis of the hip or knee	24.67	25.84	20.83	27.22	31.71	25.15
Arthritis of the hand or wrist	22.07	22.70	23.61	23.08	29.27	20.25
Sciatica	16.00	16.40	18.06	17.75	14.63	14.72
Diabetes	14.70	13.93	15.28	17.16	9.76	11.04
Newly Diagnosed Conditions, %						
Hypertension/ high blood pressure	8.09	9.21	5.56	7.69	7.32	12.88
Angina pectoris/ coronary artery disease	5.80	6.52	1.39	8.28	4.88	7.36
Congestive heart failure	4.22	3.60	0.00	4.14	2.44	4.91
Myocardial infarction/ heart attack	4.22	4.04	1.39	4.14	2.44	5.52
Other heart conditions	7.55	8.09	6.94	8.28	7.32	8.59
Stroke	3.19	4.04	2.78	3.55	2.44	5.52
Ephysema, Asthma, or COPD	3.46	4.27	4.17	3.55	4.88	4.91

Characteristic	Matched non-cancer Controls (N=2225)	All Prostate Cancer Patients (N=445)	By Treatment Type			
			Radical Prostatectomy (N=72)	External Beam Radiation Therapy (N=169)	Brachytherapy (N=41)	Conservative Management (N=163)
Crohn's disease, ulcerative colitis, or IBD	1.39	3.15	2.78	2.96	4.88	3.07
Arthritis of the hip or knee	10.61	12.13	13.89	11.83	17.07	10.43
Arthritis of the hand or wrist	9.30	10.34	11.11	11.24	12.20	8.59
Sciatica	8.36	7.42	5.56	5.33	4.88	11.04
Diabetes	4.90	4.72	2.78	5.92	0.00	5.52
Time Since Diagnosis, %						
0–6 months		24.49	22.22	23.67	17.07	28.22
7–12 months		25.39	15.28	28.40	34.15	24.54
13–18 months		26.52	34.72	25.44	19.51	25.77
19+ months		23.60	27.78	22.49	29.27	21.47
Cancer Stage, %						
T1		38.20	40.28	40.83	36.59	34.97
T2		25.39	29.17	29.59	21.95	20.25
T1 or T2		12.13	16.67	6.51	12.20	15.95
T2 prostatic apex		15.51	9.72	17.75	14.63	15.95
Unstaged		8.76	4.17	5.33	14.63	12.88
Number of other cancer(s) before prostate cancer diagnosis, %						
0		92.13	94.44	91.72	95.12	90.80
1		7.19	5.56	7.69	4.88	7.98
2+		0.67	0.00	0.59	0.00	1.23

Table 2

Men reporting incontinence.

Treatment Type	N	Baseline/Before Cancer Diagnosis % Yes	2 yrs later/ After Cancer Diagnosis % Yes	Logistic Regression Odds Ratio*
Controls	2225	18.56	21.44	1
Prostatectomy	72	13.89	44.44	5.25 (3.05, 9.05)
External Beam	169	20.12	39.64	2.89 (2.00, 4.17)
Brachytherapy	41	14.63	31.71	2.22 (1.05, 4.68)
Conservative Management	163	29.45	38.65	1.92 (1.31, 2.83)

Note:

*Covariates in model: baseline urinary control score, pre-existing comorbidities, newly developed comorbidities, education, age, race, marital status (baseline), widowed/divorced/separated between baseline and followup, smoking status, mixed mode, and proxy.