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A comparison of general, genitourinary, bowel, and sexual quality of life among long term survivors of prostate, bladder, colorectal, and lung cancer

Scott D. Ramsey^{a,*}, Ingrid J. Hall^c, Judith Lee Smith^c, Donatus U. Ekwueme^c, Catherine R. Fedorenko^a, Karma Kreizenbeck^a, Aasthaa Bansal^{a,b}, Ian M. Thompson^{d,e}, David F. Penson^{f,g}

^aFred Hutchinson Cancer Research Center, 1100 Fairview Ave. N., MS: M3-B232, Seattle, WA 98109-1024, USA

^bUniversity of Washington, Department of Pharmacy, University of Washington, Box 357630, Seattle, WA 98195, USA

^cDivision of Cancer Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Hwy, MS F76, Chamblee, GA 30341, USA

^dUniversity of Texas Health Science Center, 7979 Wurzbach Rd, San Antonio, TX 78229, USA

^eChristus Santa Rosa Hospital and Medical Center, 2827 Babcock Rd, San Antonio, TX 78229, USA

^fDepartment of Urology and Department of Preventive Medicine, University of Southern California/Norris Cancer Center, 1441 Eastlake Ave, Los Angeles, CA 90033, USA

^gVanderbilt University Medical Center, 1211 Medical Center Dr, Nashville, TN 37232, USA

Abstract

Objectives: Studies of local stage prostate cancer survivors suggest that treatments carry risk of persistent impotence, incontinence, and bowel dysfunction. To examine impacts of cancer type and side effects on health-related quality of life (HRQoL) in long-term cancer survivorship, we evaluated 5-year follow-up of patients with prostate cancer and compared results with a matched group of male long-term survivors of other local-stage cancers.

Materials and Methods: We examined genitourinary, bowel and sexual symptoms, and general quality of life. Matched survivors of colorectal, lung, and bladder cancers were recruited via registries in 3 different regions in the United States. Patients were surveyed 3–5 years after diagnosis with the SF-12 and EPIC to evaluate general mental and physical health-related quality of life (HRQoL) and patient function and bother.

*Corresponding author at: Hutchinson Institute for Cancer Outcomes Research, Fred Hutchinson Cancer Research Center, 1100 Fairview Avenue North, M3-B232, Seattle, WA 98109, USA. sramsey@fredhutch.org (S.D. Ramsey).

Author Contributions

All authors contributed to the study conception and design, interpretation of data, manuscript writing, and approval of the final manuscript. Scott D. Ramsey, Catherine R. Fedorenko, and Aasthaa Bansal were responsible for data quality control and analysis.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

Results: We analyzed responses from long-term prostate ($n = 77$) and bladder, colorectal, and lung cancer ($n = 124$) patients. In multivariate analysis, long-term local stage prostate cancer survivors had significantly higher SF-12 physical component scores but did not differ from long-term survivors of other cancers in terms of their SF-12 mental summary scores. Prostate survivors had similar mental, urinary, bowel, and sexual HRQoL compared to long-term survivors of other local stage cancers.

Conclusion: Long-term general and prostate-specific HRQoL was similar between local stage prostate and bladder, colorectal, and lung patients with cancer. Future research focusing on factors other than initial treatment and the cancer type per se may provide more meaningful information regarding factors that predict disparities on HRQoL among longer-term survivors of early stage male cancers.

Keywords

Quality of life; Symptom burden; Local stage prostate; Bladder cancer; Colorectal cancer; Lung cancer

1. Introduction

Recent estimates report that there are nearly 17 million cancer survivors in the United States with about 64% aged 65 years or older [1]. The majority of these individuals will likely live long term after diagnosis due to earlier disease detection and use of more effective therapies. Given these large numbers, and projected continued increase, older cancer survivors have become an important group to study [2]. Research examining the long term impacts to health related quality of life (HRQoL) and exploring the post treatment healthcare requirements of cancer survivors to meet their continuing needs beyond immediate cancer treatment were identified as important areas lacking evidence [3].

Prostate cancer survivors number better than 3.7 million and comprise 45% of 8 million male survivors [1]. Survival following treatment of local stage prostate cancer is very favorable [4], but follow-up studies suggest that treatments (surgery, radiation) carry a risk of persistent morbidity, including impotence, incontinence, and bowel dysfunction [5–7]. While much effort has focused on advising men regarding the risks and impacts alongside the potential benefits of treatment, there has been less study of contextual factors for prostate cancer; specifically, how genitourinary and bowel side effects compare to those experienced by male long term survivors of other early-stage cancers. The Family And Cancer Treatment Selection (FACTS) study, evaluated the decision-making process and 1-year outcomes for patients with localized prostate cancer and their partners [8–13]. In this study, we report results from 5-year follow-up of the FACTS patient cohort. A novel feature for this phase of the FACTS study—designed to provide context for prostate cancer survivorship—was our recruitment of a matched group of male long-term survivors of other local-stage cancers. Due to continued aging and the pervasive decline in urinary and sexual function with age, we hypothesized that genitourinary and bowel symptoms would be no different for long-term prostate cancer survivors compared to those with the other cancer types. We also examined sexual symptoms and general quality of life in these populations.

2. Materials and Methods

2.1. Patient Population and Study Approach

To provide perspective on the health impacts of treatment for local stage prostate cancer survivors, we chose cancers where the impact would be expected to be largely genitourinary (bladder), one where bowel issues are likely to predominate (colorectal), and one where genitourinary or bowel symptoms would not be expected long term (lung)—and administered the same questionnaires as the prostate survivors group, including a global health-related quality of life instrument, the 12-item Short Form Survey (SF-12) [14] and the Expanded Prostate Cancer Index Composite (EPIC), a comprehensive instrument designed to evaluate patient function and bother after prostate cancer treatment [15].

The study population consisted of local stage prostate patients with cancer from the original FACTS [13] study. Patients who were recruited through University of Southern California (USC) and the University of Texas Health Science Center at San Antonio (UTHSCA), were re-contacted 3–5 years after the initial phase of the FACTS study to participate in the follow-up study. Two of the three original FACTS study sites (USC and UTHSCA) participated in the 5-year follow-up study.

A comparison group of male patients with local stage bladder, colorectal, and lung cancer, 3–5 years from diagnosis were identified through the California [16], South Carolina [17], and Texas [18] State Cancer Registries.

All participants from the original FACTS study who had consented to future contact were mailed study information. Study staff at the Fred Hutchinson Cancer Research Center (FHCRC) followed-up the approach letter and survey mail-out with phone calls to optimize response rate. Consented patients who completed the follow-up survey received a check for \$30.00.

The study protocol and materials were approved by the institutional review board at each recruitment center, the coordinating center at the FHCRC in Seattle, WA, and the human subjects review committee at the Centers for Disease Control and Prevention.

2.2. Patient Surveys

Survey items from the original FACTS survey were included for the longitudinal section of the FACTS Follow-up Patient Survey. These survey items included the SF-12 for assessing general quality of life, as well as the EPIC survey to ascertain urinary, bowel, and sexual side-effects related to cancer treatment, and the Patient Health Questionnaire-9 (PHQ-9) Depression Scale [19]. The survey development methods and the taxonomy of items have been described in detail elsewhere [12]. Higher survey scores indicate better functioning and HRQoL on the SF-12 and EPIC while lower scores are more favorable on the PHQ-9. The FACTS survey also collected information on chronic conditions that survivors were being treated for at time of survey including hypertension, diabetes, arthritis, depression, and heart failure among others.

2.3. Statistical Analysis

Linear regression models were employed to estimate the association between scores and demographic factors such as age, race, education, marital status, and initial treatment(s), the latter available from the Cancer Registries. As we included patients that have different follow-up and cancer types in our sample, in each regression we controlled for the number of years after diagnosis as well as cancer type, with “non-prostate” cancer (i.e., bladder, colorectal, or lung) being the reference cancer. Categorical variables indicating whether a patient received surgery or other treatment within 1 year or more than 1 year after diagnosis were also included in the model. We evaluated the following outcomes of interest: SF-12 physical and mental scores, PHQ-9 depression score, and EPIC urinary, bowel, and sexual scores. The PHQ-9 depression score was approximately log-normally distributed; therefore, the log-transformed PHQ-9 depression score was analyzed as a continuous response variable. In addition, we used a logistic regression model to identify factors associated with depression (PHQ-9 depression score ≥ 5), as part of a sensitivity analysis. Further, the variables listed above that were used in the linear regression models were also included in the sensitivity analysis. Data are presented as the ‘expected difference’ between summary scores for prostate cancer survivors vs non prostate survivors for each scale used. A positive difference indicates greater functioning among prostate survivors, while negative difference indicates worse functioning in this group.

The analyses were performed using SAS 9.4 (SAS Institute, Cary, NC). All statistical tests were two-sided, and P values less than 0.05 were considered statistically significant. Standard errors and 95% confidence intervals were also constructed.

3. Results

3.1. Patient Population

We sent invitations to 181 patients from the FACTS study prostate cohort and to 185 bladder, colorectal, and lung patients with cancer recruited from state cancer registries. A total of 77 prostate and 124 bladder, colorectal, and lung patients with cancer returned surveys (response rates 42% and 67%, respectively). Table 1 lists the descriptive characteristics for the prostate and non-prostate cohorts. In general, prostate patients with cancer were significantly further from the date of diagnosis at the time of survey and more likely to have higher levels of education compared to the other patients with cancer. Nearly 80% of prostate patients with cancer received surgery within 1 year, compared with 90% for the other cancers. A higher proportion of non-prostate patients with cancer received chemotherapy, while more prostate patients with cancer received radiation and/or hormone therapy.

In unadjusted analysis, patients with prostate cancer and patients with other cancer types did not clinically differ in their health-related quality-of-life (HRQoL), specifically for their scores on the mental and physical component of the SF-12, the PHQ-9 depression survey, or the EPIC urinary, bowel, or sexual subcomponent scores (Fig. 1). In multivariate analysis for each HRQoL survey, prostate patients with cancer had significantly higher SF-12 physical component scores (expected difference = 8.11, $p < .0001$), indicating better outcomes, but

did not differ from long-term survivors of other cancers in terms of their SF-12 mental summary scores (Table 2). Higher educational attainment was significantly associated with higher SF-12 physical and mental component scores; oldest age (75+) and higher comorbidity was significantly associated with lower scores, indicating worse physical functioning, however oldest survivors reported greater mental functioning (expected difference = 4.35, $p < .036$). For the SF-12 survey, persons with 2 comorbidities commonly had significantly poorer scores than persons with fewer comorbidities.

Prostate patients with cancer did not differ significantly from non-prostate patients with cancer in terms of their EPIC urinary, bowel, or sexual component scores in adjusted analyses (Tables 3–5). For the EPIC sexual questionnaire, older and married men had significantly lower scores, indicating worse sexual function and/or bother, than younger and nonmarried men. Across the other components of the EPIC survey (genitourinary, bowel), there were no cofactors with significant associations.

There was also no difference in PHQ-9 depression scores between groups, both as summary values (Appendix) and when assigning a cutoff score and evaluating with logistic regression (sensitivity analysis) (data not shown). Men with 2 or more comorbidities had significantly higher scores on the PHQ-9 depression questionnaire.

4. Discussion

Prognosis for local stage prostate cancer is excellent: 98% of patients with prostate cancer are alive 5 or more years beyond their diagnosis [20]. According to statistics from 2016 for persons who are living with a cancer diagnosis (cancer survivor), there were approximately 5.3 million male [1] survivors of prostate, colorectal, lung, and bladder cancers in the United States, with an estimated increase to 7.1 million by 2030 [21]. The long-term impacts of cancer and treatment for cancer survivors remain a major concern for survivors and for the cancer care system, particularly as the cost of cancer care increases much faster than other diseases [22] and survivors face substantial financial hardships [23–25]. In this context, it is useful to reference HRQoL for long term prostate cancer survivors against persons with other types of local stage cancers. In particular, concerns about urinary, bowel, and sexual function are of great concern and interest among local stage prostate patients with cancer due to the known long-term impacts of curative therapies on quality of life [5].

In this study, we found that long-term local stage prostate cancer survivors had significantly higher physical, similar mental, and similar urinary, bowel, and sexual-related HRQoL compared to long-term survivors of other local stage cancers. Our findings suggest that prostate patients with cancer fare well compared to long-term survivors of other local stage cancers. Since the great majority of all cancers we studied were treated initially with surgery, our findings suggest that the long-term impacts of site-specific surgery for the local stage cancers we examined tend to converge over time, either due to resolution of adverse impacts of surgery or convergence of overall health concerns such that there is little to distinguish based on the cancer type itself or treatment. Of note is that men with 2 or more additional chronic conditions reported higher levels of depression than those with fewer comorbidities.

The higher score of the summary physical component of the SF-12 for men with prostate cancer may reflect the reduced burden of treating local stage prostate cancer compared to local stage, lung, colorectal, or bladder cancer, or that persons with these cancers have comorbid conditions related to risk factors (e.g., smoking) that reduce physical functioning but are not captured in comorbidity assessment. The lack of differences in urinary, bowel, and sexual function on the highly specific EPIC questionnaire were somewhat surprising, given the reports of long-term adverse effects of treatment (in this case, predominantly surgery) for prostate cancer. Certainly, problems with these organ systems become increasingly common in all men as they age (e.g., benign prostatic hyperplasia, declining sexual interest and function).

Although studies have evaluated general quality of life using instruments such as the SF-12, we are not aware of studies that have used the EPIC to evaluate persons with cancers other than prostate. The urinary, bowel, and sexual health questions on EPIC do not reference prostate cancer or specific treatments. We found very high response rates for this questionnaire, and no missingness in the completed surveys, suggesting that these questions are appropriate and relevant for survivors of other cancers.

A growing body of literature focuses on short- and long-term impacts of cancer survivorship with distinctions made between needs among the elderly compared to other age groups [26]. Our findings suggest that long-term impacts in physical, mental, and clinical function may not be dependent on cancer type but may be impacted by advanced age. Long-term cancer effects among older adults often coexist along with aging-related problems [27,28], comorbidities, and other chronic conditions [2,29,30]. There is increasing emphasis on promotion of healthy behaviors (diet weight, physical activity, and smoking avoidance) to improve overall well-being and QoL [31]. Recent calls have emerged for more research to determine how best to transition long term survivors' care from oncologists to primary care and community settings [32].

We note the limitations of our study and analysis. As noted, one of our study sites did not participate in the follow-up survey of persons with lung, colorectal, and bladder cancer. As a result, we had insufficient statistical power to detect significant differences between non-prostate cancer groups. In addition, our response rates were limited, and it is possible that persons who chose to return the follow-up survey were different than those who did not. Our sample was predominantly white and skewed younger, limiting our ability to explore physical, mental, and urinary, bowel, and sexual-related HRQoL among the oldest old. The EPIC questionnaire was designed and tested on patients with prostate cancer. Although the questions contained in EPIC do not reference specific cancers or treatments, it is possible that its construct validity has less application to men with other cancers. Heterogeneity in the non-prostate populations with different risks of genitourinary and bowel toxicity among colon and bladder cancer patients contributes to variability in the HRQoL estimates for those populations. Finally, the study sites were academic medical centers, and thus the findings may not translate into those seen in community practice settings.

In summary, in a survey of long-term male survivors of local stage prostate, lung, bladder, and colorectal cancer, we found equivalent or better HRQoL for prostate cancer survivors

versus those for other diseases. In particular, quality of life related to urinary, bowel, and sexual domains were similar for all groups, suggesting that prostate patients with cancer fared well compared to men with other local stage cancers. Future research focusing on factors other than initial treatment and the cancer type per se may provide more meaningful information regarding factors that predict disparities on HRQoL among longer-term survivals of early stage male cancers.

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The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or their Contractors and Sub-contractors, the National Cancer Institute or the State Cancer Registries.

Appendix A.: Appendix

Association between clinical characteristics and PHQ-9 depression (Log Transformed, $N=126$).^a

Variable	Expected difference ^b	95% Confidence interval	P-Value
Age			
65–74	–0.16	(–0.57, 0.25)	0.447
75	–0.25	(–0.69, 0.20)	0.278
64 (Reference)	-	-	-
Years after Dx	–0.03	(–0.11, 0.06)	0.531
Cancer Type			
Prostate	0.36	(–0.04, 0.76)	0.077
Non-prostate (Reference)	-	-	-
Race			
White	0.27	(–0.24, 0.79)	0.296
Non-white (Reference)	-	-	-
Education			
Some college	–0.29	(–0.78, 0.20)	0.255
College graduate	–0.35	(–0.88, 0.18)	0.195
Graduate degree	–0.49	(–1.06, 0.09)	0.099
High school or less (Reference)	-	-	-
Marital Status			
Married	–0.24	(–0.67, 0.19)	0.275

Variable	Expected difference ^b	95% Confidence interval	P-Value
Not married (Reference)	-	-	-
Comorbidity Scores			
2	0.41	(0.08, 0.73)	0.017
0-1 (Reference)	-	-	-
Surgery within 1 Year			
Yes	0.26	(-0.23, 0.75)	0.296
No (Reference)	-	-	-
Surgery after 1 Year			
Yes	-0.03	(-0.77, 0.71)	0.940
No (Reference)	-	-	-
Other Treatment within 1 Year			
Yes	0.17	(-0.19, 0.53)	0.362
No (Reference)	-	-	-
Other Treatment after 1 Year			
Yes	-0.10	(-0.45, 0.26)	0.589
No (Reference)	-	-	-

^aExcluded patients with missing age, years after dx, education, marital status, scores and patients who answered 0s to this question.

^bAdjusted for all variables in table.

References

- [1]. Miller KDNL, Mariotto AB, et al. Cancer treatment and survivorship statistics, 2019. *CA Cancer J Clin* 2019;69(5):363–85. [PubMed: 31184787]
- [2]. Avis NE, Deimling GT. Cancer survivorship and aging. *Cancer* 2008;113(12 Suppl): 3519–29. [PubMed: 19058151]
- [3]. Rowland JH, Bellizzi KM. Cancer survivorship issues: life after treatment and implications for an aging population. *J Clin Oncol* 2014;32(24):2662–8. [PubMed: 25071099]
- [4]. Ries L, Melbert D, Krapcho M, et al. SEER Cancer Statistics Review, 1975–2005. National Cancer Institute; 2010. http://seer.cancer.gov/csr/1975_2005/ Published 2008. Accessed July 7.
- [5]. Barocas DA, Alvarez J, Resnick MJ, et al. Association between radiation therapy, surgery, or observation for localized prostate cancer and patient-reported outcomes after 3 years. *Jama* 2017;317(11):1126–40. [PubMed: 28324093]
- [6]. Potosky AL, Davis WW, Hoffman RM, et al. Five-year outcomes after prostatectomy or radiotherapy for prostate cancer: the prostate cancer outcomes study. *J Natl Cancer Inst* 2004;96(18):1358–67. [PubMed: 15367568]
- [7]. Tyson MD 2nd, Koyama T, Lee D, et al. Effect of prostate cancer severity on functional outcomes after localized treatment: comparative effectiveness analysis of surgery and radiation study results. *Eur Urol* 2018;74(1):26–33. [PubMed: 29501451]
- [8]. Bansal A, Koepf LM, Fedorenko CR, et al. Information seeking and satisfaction with information sources among spouses of men with newly diagnosed local-stage prostate Cancer. *J Cancer Educ* 2018;33(2):325–31. [PubMed: 28238032]
- [9]. Ramsey SD, Zeliadt SB, Blough DK, et al. Impact of prostate cancer on sexual relationships: a longitudinal perspective on intimate partners' experiences. *J Sex Med* 2013; 10(12):3135–43. [PubMed: 24118980]
- [10]. Rim SH, Hall IJ, Fairweather ME, et al. Considering racial and ethnic preferences in communication and interactions among the patient, family member, and physician following

diagnosis of localized prostate cancer: study of a US population. *Int J General Med* 2011;4:481–6.

- [11]. Ramsey SD, Zeliadt SB, Fedorenko CR, et al. Patient preferences and urologist recommendations among local-stage prostate cancer patients who present for initial consultation and second opinions. *World J Urol* 2011;29(1):3–9. [PubMed: 20959991]
- [12]. Zeliadt SB, Moinpour CM, Blough DK, et al. Preliminary treatment considerations among men with newly diagnosed prostate cancer. *Am J Manag Care* 2010;16(5): e121–30. [PubMed: 20455638]
- [13]. Zeliadt SB, Penson DF, Moinpour CM, et al. Provider and partner interactions in the treatment decision-making process for newly diagnosed localized prostate cancer. *BJU Int* 2011;108(6):851–6 (discussion 856–857). [PubMed: 21244609]
- [14]. Ware J Jr, Kosinski M, Keller SD. A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Med Care* 1996;34(3):220–33. [PubMed: 8628042]
- [15]. Wei JT, Dunn RL, Litwin MS, Sandler HM, Sanda MG. Development and validation of the expanded prostate cancer index composite (EPIC) for comprehensive assessment of health-related quality of life in men with prostate cancer. *Urology* 2000; 56(6):899–905. [PubMed: 11113727]
- [16]. California Cancer Registry. <http://www.ccrca.org/>. (Accessed).
- [17]. South Carolina Central Cancer Registry. <https://www.scdhec.gov/health/diseases-conditions/cancer/sc-cancer-statistics-and-reports/sc-central-cancer-registry>. (Accessed).
- [18]. Texas Cancer Registry. <https://www.dshs.texas.gov/tcr/>. (Accessed).
- [19]. Kroenke K, Spitzer RL, Williams JB, Lowe B. The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. *Gen Hosp Psychiatry* 2010;32(4):345–59. [PubMed: 20633738]
- [20]. National Cancer Institute. SEER Cancer Statistics. <https://seer.cancer.gov/statistics/>; 2020. (Accessed September 28, 2019).
- [21]. Miller KD, Siegel RL, Lin CC, et al. Cancer treatment and survivorship statistics, 2016. *CA Cancer J Clin* 2016;66(4):271–89. [PubMed: 27253694]
- [22]. Committee on Improving the Quality of Cancer Care. Addressing the challenges of an aging P, board on health care S, Institute of M. In: Levit L, Balogh E, Nass S, Ganz PA, editors. *Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis*. Washington (DC): National Academies Press (US) copyright 2013 by the National Academy of Sciences; 2013 All rights reserved.
- [23]. Ekwueme DU, Zhao J, Rim SH, et al. Annual out-of-pocket expenditures and financial hardship among Cancer survivors aged 18–64 years - United States, 2011–2016. *MMWR Morb Mortal Wkly Rep* 2019;68(22):494–9. [PubMed: 31170127]
- [24]. Ramsey S, Blough D, Kirchoff A, et al. Washington state cancer patients found to be at greater risk for bankruptcy than people without a cancer diagnosis. *Health Affairs (Project Hope)* 2013;32(6):1143–52. [PubMed: 23676531]
- [25]. Yabroff KR, Dowling EC, Guy GP Jr, et al. Financial hardship associated with cancer in the United States: findings from a population-based sample of adult cancer survivors. *J Clin Oncol* 2016;34(3):259–67. [PubMed: 26644532]
- [26]. Bellury LM, Ellington L, Beck SL, Stein K, Pett M, Clark J. Elderly cancer survivorship: an integrative review and conceptual framework. *Eur J Oncol Nurs* 2011;15(3): 233–42. [PubMed: 21530396]
- [27]. Berger NA, Savvides P, Koroukian SM, et al. Cancer in the elderly. *Trans Am Clin Climatol Assoc* 2006;117:147–55 (discussion 155–146). [PubMed: 18528470]
- [28]. Deimling GT, Sterns S, Bowman KF, Kahana B. Functioning and activity participation restrictions among older adult, long-term cancer survivors. *Cancer Invest* 2007;25(2):106–16. [PubMed: 17453822]
- [29]. Hewitt M, Rowland JH, Yancik R. Cancer survivors in the United States: age, health, and disability. *J Gerontol A Biol Sci Med Sci* 2003;58(1):82–91. [PubMed: 12560417]
- [30]. Avis NE, Smith KW, McGraw S, Smith RG, Petronis VM, Carver CS. Assessing quality of life in adult cancer survivors (QLACS). *Qual Life Res* 2005;14(4):1007–23. [PubMed: 16041897]

- [31]. Eyl RE, Xie K, Koch-Gallenkamp L, Brenner H, Arndt V. Quality of life and physical activity in long-term (5 years post-diagnosis) colorectal cancer survivors - systematic review. *Health Qual Life Outcomes* 2018;16(1):112. [PubMed: 29859108]
- [32]. Bluethmann SM, Sciamanna CN, Winkels RM, Sturgeon KM, Schmitz KH. Healthy living after cancer treatment: considerations for clinical and community practice. *Am J Lifestyle Med* 2018;12(3):215–9. [PubMed: 30283252]

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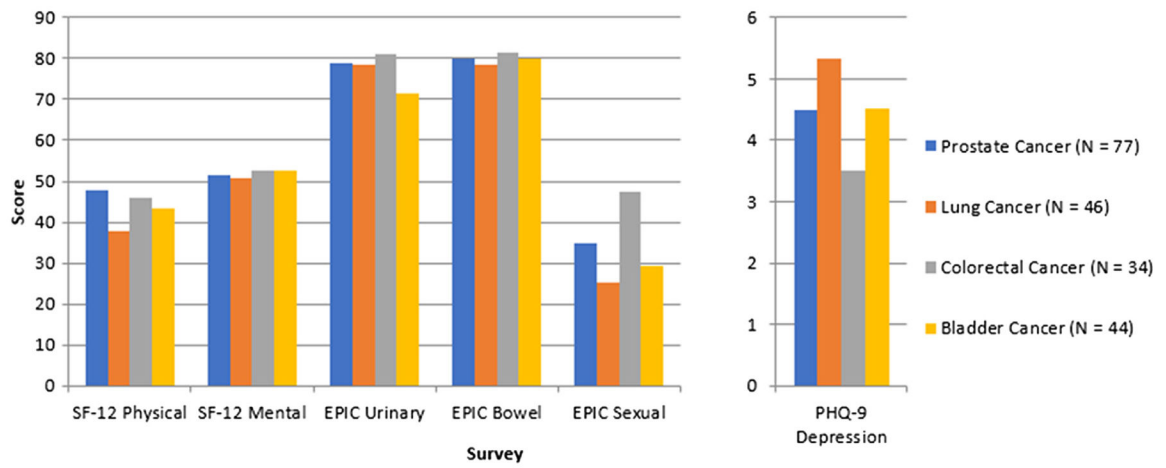


Fig. 1. SF-12^a, EPIC and PHQ 9 results^b among 5-year cancer survivors, by cancer type. ^aSF-12, Short Form Survey; EPIC, Expanded Prostate Cancer Index Composite; PHQ-9, Patient Health Questionnaire. ^bSummary scores for patients with fully completed surveys. Higher scores indicate more favorable outcomes, except for the PHQ-9.

Table 1Baseline demographic and disease characteristics – patients.^a

Characteristics	Prostate cancer (N = 77)		Non-prostate Cancer (N = 124)		All (N = 201)	
	N ^d	%	N ^d	%	N ^d	%
Site						
USC	44	57%	45	36%	89	44%
UTHSCSA	21	27%	65	52%	86	43%
MUSC	12	16%	14	11%	26	13%
Cancer type						
Prostate	77	100%	0	0%	77	38%
Lung	0	0%	46	37%	46	23%
Colorectal	0	0%	34	27%	34	17%
Bladder	0	0%	44	35%	44	22%
Age ^b						
< 64	16	21%	28	23%	44	22%
65–69	20	26%	17	14%	37	18%
70–74	20	26%	32	26%	52	26%
75 +	19	25%	45	36%	64	32%
Age (Mean, SD)	70.4 (7.3)		70.7 (9.5)		70.6 (8.7)	
Years after Dx (Mean, SD)	6.3 (2.4)		4.1 (1.5)		4.9 (2.2)	
Race						
White	65	84%	110	89%	175	87%
Non-white	9	12%	9	7%	18	9%
Employment						
Working	24	31%	29	23%	53	26%
Not working	53	69%	92	74%	145	72%
Education						
High school or less	10	13%	19	15%	29	14%
Some college	20	26%	54	44%	74	37%
College graduate	18	23%	24	19%	42	21%
Graduate degree ^c	29	38%	24	19%	53	26%
Marital status						
Married	64	83%	103	83%	167	83%
Not married	13	17%	18	15%	31	15%
Treatment received within 1 Year ^e						
Surgery	60	78%	111	90%	171	85%
Chemo	<5	<6%	24	19%	<29	<14%
Radiation	16	21%	13	10%	29	14%
Hormone	<5	<6%	0	0%	<5	<2%
Watching	14	18%	16	13%	30	15%

Characteristics	Prostate cancer (N = 77)		Non-prostate Cancer (N = 124)		All (N = 201)	
	N ^d	%	N ^d	%	N ^d	%
BCG ^f	0	0%	26	21%	26	13%
Other ^g	<5	<6%	<5	<4%	<9	<4%
Other health problems						
Hypertension	42	55%	70	56%	112	56%
Diabetes	17	22%	28	23%	45	22%
Arthritis	16	21%	27	22%	43	21%
Depression	17	22%	17	14%	34	17%
Heart failure	6	8%	22	18%	28	14%
Lung disease	<5	<6%	26	21%	<31	<15%
Heart attack	<5	<6%	15	12%	<20	<10%
Angina	<5	<6%	7	6%	<12	<6%
IBS	<5	<6%	5	4%	<10	<5%
Stroke	<5	<6%	<5	<4%	<9	<4%
Liver disease	<5	<6%	<5	<4%	<9	<4%
Ulcer	<5	<6%	<5	<4%	<9	<4%
Other ^f	30	39%	53	43%	83	41%
Number of other health problems						
0	11	14%	13	10%	24	12%
1	25	32%	39	31%	64	32%
2+	41	53%	72	58%	113	56%

^aExcluded patients who had multiple cancers.

^bTwo prostate cancer patients had missing age info; two non-prostate cancer patients had missing age info.

^cGraduate degree = some graduate + graduate degree.

^dCell sizes of $N < 5$ are masked/collapsed to maintain the de-identified nature of the data.

^eAllows for multiple responses per respondent.

^fBCG, *Bacillus Calmette-Guerin*, intravesical therapy for bladder cancer.

^gOther includes "Don't know" and Treatment or Health Problems not listed above.

Table 2

Association between demographic and clinical characteristics and SF-12 scores (N= 164).^a

Variable	Physical function			Mental function		
	Expected Difference ^b	95% Confidence Interval	P-Value	Expected Difference ^b	95% Confidence Interval	P-Value
Age						
65-74	-3.38	(-7.42, 0.65)	0.102	1.41	(-2.34, 5.17)	0.462
75	-5.03	(-9.34, -0.71)	0.024	4.35	(0.33, 8.36)	0.036
64 (Reference)	-	-	-	-	-	-
Years after DX	-1.02	(-1.81, -0.22)	0.014	0.08	(-0.67, 0.82)	0.842
Cancer type						
Prostate	8.11	(4.26, 11.97)	<0.0001	-1.60	(-5.19, 1.99)	0.384
Non-prostate (Reference)	-	-	-	-	-	-
Race						
White	-1.26	(-6.24, 3.72)	0.620	0.68	(-3.96, 5.31)	0.776
Non-white (Reference)	-	-	-	-	-	-
Education						
Some college	4.33	(-0.88, 9.55)	0.105	4.93	(0.08, 9.78)	0.048
College graduate	4.06	(-1.33, 9.45)	0.142	5.71	(0.70, 10.73)	0.027
Graduate degree	7.77	(2.29, 13.24)	0.006	4.73	(-0.37, 9.83)	0.071
High school or less (Reference)	-	-	-	-	-	-
Marital status						
Married	-2.27	(-6.61, 2.07)	0.307	5.28	(1.24, 9.32)	0.011
Not married (Reference)	-	-	-	-	-	-
Comorbidity scores						
2	-6.55	(-9.70, -3.40)	<0.0001	-6.11	(-9.04, -3.18)	<0.0001
0-1 (Reference)	-	-	-	-	-	-
Surgery within 1 Year	3.54	(-1.49, 8.57)	0.170	-0.24	(-4.92, 4.44)	0.921
Yes	-	-	-	-	-	-
No (Reference)	-	-	-	-	-	-
Surgery after 1 Year	4.84	(-1.88, 11.57)	0.160	-3.54	(-9.80, 2.71)	0.269
Yes	-	-	-	-	-	-

Variable	Physical function			Mental function		
	Expected Difference ^b	95% Confidence Interval	P-Value	Expected Difference ^b	95% Confidence Interval	P-Value
No (Reference)	-	-	-	-	-	-
Yes	0.74	(-2.92, 4.39)	0.693	-1.73	(-5.13, 1.67)	0.321
No (Reference)	-	-	-	-	-	-
Other treatment after 1 Year	2.88	(-0.47, 6.22)	0.094	1.52	(-1.59, 4.64)	0.339
No (Reference)	-	-	-	-	-	-

^aExcludes patients with missing age, years after diagnosis, education, marital status, and scores.

^bAdjusted for all variables in table.

Table 3Association between demographic and clinical characteristics and EPIC urinary scores ($N=91$)^a *.

Variable	Expected Difference ^b	95% Confidence Interval	P-Value
Age			
65–74	1.02	(–7.75, 9.78)	0.821
75	–1.31	(–11.10, 8.48)	0.794
64 (Reference)	-	-	-
Years after Dx	–0.64	(–2.54, 1.26)	0.510
Cancer Type			
Prostate	3.80	(–4.30, 11.90)	0.361
Non-prostate (Reference)	-	-	-
Race			
White	0.68	(–11.34, 12.70)	0.912
Non-white (Reference)	-	-	-
Education			
Some college	–5.93	(–16.96, 5.10)	0.295
College graduate	1.87	(–9.88, 13.62)	0.756
Graduate degree	–1.87	(–14.22, 10.49)	0.768
High school or less (Reference)	-	-	-
Marital Status			
Married	2.40	(–5.76, 10.57)	0.566
Not married (Reference)	-	-	-
Comorbidity Scores			
2	–4.42	(–11.41, 2.57)	0.220
0–1 (Reference)	-	-	-
Surgery within 1 Year			
Yes	5.75	(–3.75, 15.25)	0.239
No (Reference)	-	-	-
Surgery after 1 Year			
Yes	3.77	(–10.26, 17.81)	0.600
No (Reference)	-	-	-
Other Treatment within 1 Year			
Yes	–1.67	(–9.50, 6.17)	0.678
No (Reference)	-	-	-
Other Treatment after 1 Year			
Yes	–2.85	(–10.25, 4.55)	0.452
No (Reference)	-	-	-

^aExcludes patients with missing age, years after dx, education, marital status, and scores.^bAdjusted for all variables in table.

Table 4Association between demographic and clinical characteristics and EPIC bowel scores ($N = 88$)^a.

Variable	Expected Difference ^b	95% Confidence Interval	P-Value
Age			
65–74	–0.77	(–12.13, 10.60)	0.895
75	6.47	(–5.33, 18.27)	0.286
64 (Reference)	-	-	-
Years after Dx	–1.23	(–4.35, 1.90)	0.445
Cancer Type			
Prostate	0.01	(–11.76, 11.78)	0.999
Non-prostate (Reference)	-	-	-
Race			
White	4.04	(–8.57, 16.66)	0.532
Non-white (Reference)	-	-	-
Education			
Some college	–7.88	(–20.53, 4.77)	0.226
College graduate	5.21	(–9.73, 20.16)	0.496
Graduate degree	–0.69	(–13.99, 12.61)	0.919
High school or less (Reference)	-	-	-
Marital Status			
Married	1.33	(–10.72, 13.37)	0.830
Not married (Reference)	-	-	-
Comorbidity Scores			
2	0.15	(–8.08, 8.38)	0.972
0–1 (Reference)	-	-	-
Surgery within 1 Year			
Yes	–1.58	(–14.60, 11.43)	0.812
No (Reference)	-	-	-
Surgery after 1 Year			
Yes	4.41	(–13.22, 22.04)	0.626
No (Reference)	-	-	-
Other Treatment within 1 Year			
Yes	0.86	(–9.05, 10.78)	0.865
No (Reference)	-	-	-
Other Treatment after 1 Year			
Yes	0.52	(–8.47, 9.50)	0.910
No (Reference)	-	-	-

^aExcluded patients with missing age, years after dx, education, marital status, and scores.^bAdjusted for all variables in table.

Table 5Association between demographic and clinical characteristics and EPIC sexual scores ($N = 140$)^a.

Variable	Expected Difference ^b	95% Confidence Interval	P-Value
Age			
65–74	–14.20	(–25.12, –3.27)	0.012
75	–23.26	(–35.16, –11.36)	0.000
64 (Reference)	-	-	-
Years after Dx	–0.89	(–3.09, 1.31)	0.428
Cancer Type			
Prostate	3.64	(–6.55, 13.83)	0.485
Non-prostate (Reference)	-	-	-
Race			
White	3.66	(–10.19, 17.51)	0.605
Non-white (Reference)	-	-	-
Education			
Some college	–4.56	(–18.11, 8.99)	0.511
College graduate	0.02	(–14.44, 14.49)	0.998
Graduate degree	6.83	(–7.74, 21.41)	0.360
High school or less (Reference)	-	-	-
Marital Status			
Married	–12.42	(–24.15, –0.69)	0.040
Not married (Reference)	-	-	-
Comorbidity Scores			
2	–7.45	(–16.15, 1.26)	0.096
0–1 (Reference)	-	-	-
Surgery within 1 Year			
Yes	6.56	(–6.69, 19.82)	0.334
No (Reference)	-	-	-
Surgery after 1 Year			
Yes	–3.73	(–21.41, 13.94)	0.680
No (Reference)	-	-	-
Other Treatment within 1 Year			
Yes	6.14	(–4.03, 16.30)	0.239
No (Reference)	-	-	-
Other Treatment after 1 Year			
Yes	7.51	(–1.48, 16.50)	0.104
No (Reference)	-	-	-

^aExcluded patients with missing age, years after dx, education, marital status, and scores.^bAdjusted for all variables in table.