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Quality of preventive care before and after prostate cancer diagnosis

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Abstract

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OBJECTIVE—To examine if the use of general preventive services were diminished in a cohort of men following their diagnosis of prostate cancer.

PATIENTS AND METHODS—16,604 men enrolled in Kaiser Permanente Southern California who were newly diagnosed with prostate cancer from January 1, 2002 through December 31, 2009 were passively followed through electronic medical records to determine the use of preventive services, including screening for colorectal cancer (colonoscopy and/or fecal occult blood tests (FOBT)), tests for diabetes (glucose and hemoglobin A1c) and heart disease (serum cholesterol, high density lipoprotein (HDL) and triglycerides) and vaccinations (influenza and pneumococcal). Preventive service use was compared in the two years prior to and following prostate cancer diagnosis using matched odds ratios (MOR) and 95% confidence intervals (CI) in 2013.

RESULTS—Men were more likely to receive a flu vaccine (MOR: 2.70, 95% CI: 2.52–2.90), lipid tests (MOR: 1.51, 95% CI: 1.42–1.61), diabetes tests (MOR: 2.13, 95% CI: 2.00–2.26) and screening for colorectal cancer (MOR: 1.80, 95% CI: 1.71–1.89) in the two years after prostate cancer diagnosis compared to before. Men with advanced disease at diagnosis were more likely to receive all types of preventive services after diagnosis when compared to men with localized disease.

CONCLUSIONS—Once diagnosed with prostate cancer in this setting, no less attention was paid to general preventive care, although there remains room for improvement in pneumococcal vaccination and colon cancer screening rates. The delivery of high-quality continuing care after diagnosis is critical for aging cancer patients.

Keywords

prostate cancer- clinical; oncology; primary care

INTRODUCTION

As a result of developments in the early detection, treatment and care related to cancer, the number of people surviving and living with cancer as a chronic illness has rapidly increased in recent years. Currently, there are more than 13.7 million cancer survivors in the United States and it is estimated that the number of survivors will exceed 18 million by 2022.[1,2] Due to the growing incidence among the aging population, the majority of cancer survivors are now over the age of 65 years.[3] Thus, they are at increased risk for the development of other comorbid diseases of aging such as heart disease, type 2 diabetes and secondary cancers.[3]

Prostate cancer, the most common non-cutaneous cancer among men, now accounts for the largest proportion of male cancer survivors and second largest proportion of cancer survivors overall.[3] With a 5-year survival rate that is approaching 100%,[4] prostate cancer is a largely survivable chronic condition for most men. The advanced age and prolonged survival of men diagnosed with prostate cancer suggests that many have or are at increased risk of developing other comorbid diseases of aging. This makes the delivery of appropriate preventive services to prostate cancer survivors particularly critical[5,6] to prevent the onset and progression of these comorbid conditions.

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Given the potentially protracted treatment courses and prolonged recoveries, prostate cancer care is often focused on managing the effects of treatment and preventing recurrence. This could be at the expense of delivering appropriate preventive care for other diseases of aging. While the United States Preventive Service Task Force (USPSTF) recommends that aging men receive a variety of screening and preventive services,[7] it is possible that the complex delivery of prostate cancer care and the potentially inadequate transition between care phases may result in less preventive care being delivered. In addition, while it remains largely unknown what impact the delivery of preventive care has on overall mortality among prostate cancer survivors, it is plausible that by increasing the quality of preventive care in the survivorship period, decreasing the risk of death which is most likely due to causes other than cancer could be beneficial.

Out of this concern and in order to advance our understanding regarding the preventive care of prostate cancer survivors, the goal of this study was to compare the use of preventative health services for other comorbid diseases of aging before and after prostate cancer diagnosis in a multi-ethnic population of men diagnosed with prostate cancer in Kaiser Permanente Southern California.

MATERIALS and METHODS

Study Population

KPSC is an integrated health care system that provides comprehensive health services for approximately 3.7 million residents of Southern California via 14 hospitals, 209 medical offices and more than 6,000 physicians. Members enroll through the Kaiser Foundation Health Plan for pre-paid health care insurance, including pharmaceutical benefits. The population served by KPSC is socio-economically diverse and broadly representative of the racial/ethnic groups living in Southern California.[8] Healthcare access barriers are minimized due to universal insurance coverage. Information regarding diagnoses, treatments and utilization of a variety of health services is available through extensive electronic medical records (EMR).

The source population for this study was the 1.6 million male health plan members in KPSC. Men were eligible for inclusion if they were diagnosed with prostate cancer between 2002 and 2009 (N=19,970). In order to be able to capture preventive service use before and after diagnosis, men who were not members for at least one year prior to and following their prostate cancer diagnosis were excluded (N=3,323). Men were also excluded from the analysis if prior to baseline, they had a diagnosis of prostate cancer (N=4), had previously undergone a radical prostatectomy (N=39). The remaining 16,604 men (83.1%) were included in this analysis. The Kaiser Permanente Internal Review Board reviewed and approved this study and the data were analyzed in 2013.

Prostate Cancer Diagnosis

Prostate cancer survivors were defined as men diagnosed with any stage of biopsy-confirmed prostate cancer from 2002 through 2009. Men with prostate cancer are identified through the KPSC cancer registry, which reports to Surveillance Epidemiology and End

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Results (SEER) registry. The registry data are 99% complete for both inpatient and outpatient admissions for the diagnosis of new and prevalent cancers.[9] Cancer stage is based on the SEER staging system[10] and grade, on Gleason score.[11]

Preventive Services

The use of preventive and health-maintenance services as recommended by the USPSTF for aging men was identified two years pre and post-prostate cancer diagnosis using electronic health plan files. Included are use of adult preventive services for heart and vascular disease (total cholesterol, triglyceride, high-density lipoprotein measurement), colorectal cancer screening (FOBT, and/or sigmoidoscopy or colonoscopy), diabetes (glucose testing and hemoglobin A1C measurement), pneumonia (vaccination) and influenza (seasonal vaccination). Because prostate specific antigen screening is often ordered as part of a preventive service panel, the use of services 90 days before and after prostate cancer diagnosis were excluded from this analysis to avoid inflating the use of services at the time of prostate cancer diagnosis.

Covariate Assessment

Age at prostate cancer diagnosis, race (non-Hispanic White, Black, Hispanic, Asian, Other), membership length and marital status were abstracted from the EMR. Medical histories, including previous diagnosis of comorbid conditions such as cardiovascular disease (including hypertension), diabetes, hyperlipidemia and other cancers were collected via electronic health plan files. The presence of comorbidities was measured with the Charlson index.[12] Prostate cancer characteristics, including cancer stage at diagnosis, grade, Gleason and primary treatment within 6 months of diagnosis (surgery, radiation, hormone, none/other) were collected from the cancer registry files.

Statistical Analysis

The use of preventive services 2 years prior to and following incident prostate cancer diagnosis (2002–2009) was determined and compared using conditional logistic regression. Matched odds ratios and 95% CI were used to estimate the odds of preventive service use after prostate cancer diagnosis when compared to use before prostate cancer diagnosis. The use of preventive services before and after prostate cancer diagnosis was then stratified by race/ethnicity, prostate cancer stage at diagnosis, prostate cancer diagnosis date and age to assess potential effect modification. All analyses used an alpha-level of 0.05 to determine statistical significance and were performed using SAS 9.2 (Cary, NC).

RESULTS

Of the 16,604 men included in this study, the mean age at prostate cancer diagnosis was 65 years old. The study population was diverse: 54.9% were Caucasian, 18.6% were Hispanic 16.7% were African American and 2.4% were Asian. Approximately 46% of men attained an education level of college or greater. The majority of the men had localized prostate cancer at diagnosis (83.5%) that was well/moderately differentiated (60.4%). (Table 1)

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In comparing the use of preventive services before and after prostate cancer diagnosis (Table 2), men were more likely to receive a flu vaccine (MOR: 2.70, 95% CI: 2.52–2.90), a lipid panel test (MOR: 1.51, 95% CI: 1.42–1.61), and a screening or maintenance test for diabetes (MOR: 2.13, 95% CI: 2.00–2.26) in the two years after prostate cancer diagnosis as compared to the two years before diagnosis. Men were also more likely be screened for colorectal cancer in two years following prostate cancer diagnosis as compared to the two years before (MOR: 1.80, 95% CI: 1.71–1.89). However, men were similarly as likely to receive a pneumococcal vaccination after diagnosis when compared to before (MOR: 1.10, 95% CI: 1.04–1.17).

When these results were stratified by race/ethnicity (Table 3), the trend of men being more likely to receive flu vaccine, lipid panel, diabetes testing and CRC screening after diagnosis persisted across all racial/ethnic categories, with very little variation. (results not shown). In addition, very little variation in the use of preventive services was seen when the results were stratified by age at prostate cancer diagnosis. (results not shown).

When stratified by prostate cancer stage at diagnosis, the increased use of services after diagnosis when compared to before was more pronounced among those with advanced prostate cancer (Stage III/IV) as compared to localized disease (Stage I/II) for all types of clinical preventive services. The proportion of men who received the flu vaccine after diagnosis compared to before increased 14% if they were diagnosed with advanced disease (MOR: 3.17, 95% CI: 2.67–3.76) compared to a 10% increase among men who had localized disease at diagnosis (2.61, 95% CI: 2.41–2.82). The increased use of diabetes tests after diagnosis was also strongest among those with advanced disease at diagnosis, with a 16.3% increase after diagnosis compared to an 8.8% increase in men with localized disease. (Table 4)

When stratified by year of prostate cancer diagnosis (Table 4), CRC screening was more common after diagnosis compared to before, but this increase in use after diagnosis was greatest in the later time periods (2006 through 2009). FOBT/FIT testing after diagnosis alone increased from 5.6% in 2002–3 to 36.8% in 2008–9. We also assessed the use of the other preventive services stratified by prostate cancer diagnosis date and found the increased use of services after prostate diagnosis when compared to before to be consistent regardless of the timing of prostate cancer diagnosis. (Results not shown)

Table 5 displays the mean number of visits by provider type in the two years before and after diagnosis. Overall, the mean number of ambulatory visits doubled after diagnosis, with 30.3 visits in the two years following diagnosis compared to 15.7 visits in the two years before on average. The mean number of visits to Urology/Oncology increased from 1.0 visit in the two years prior to diagnosis to 5.1 visits in the two years after diagnosis. Also, the mean number of visits to primary care (family and/or internal medicine) increased slightly, from 5.6 visits in the two years before diagnosis compared to 6.7 visits in the two years after diagnosis. (Table 5)

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DISCUSSION

These data suggest that subsequent to a diagnosis of prostate cancer, men experience greater levels of preventive services in this setting, counter to our working hypothesis that they would decrease following diagnosis. In addition, very little variation in the increased use of services after diagnosis was seen across race/ethnicity, age at diagnosis or year of diagnosis. However, the increased use of services after diagnosis was most pronounced among men with advanced prostate cancer at diagnosis.

Previous studies suggest that prostate cancer survivors receive comparable preventive care to disease-free controls after diagnosis,[13–16] but few have compared the use of services before and after diagnosis. Snyder and colleagues found an increase in use of flu vaccines and a slight decrease in the use of CRC screening among prostate cancer survivors when compared to controls.[15] Khan and colleagues found that men with prostate cancer were equally as likely to receive flu vaccines and cholesterol tests after diagnosis compared to cancer-free controls.[17] Our findings are similar, as flu vaccines, cholesterol and diabetic tests were consistently used both before and after prostate cancer diagnosis in this cohort, suggesting that no less attention is being paid to the delivery of these services after diagnosis. It is possible that the high use of services in this cohort is related to an increase in physician visits once diagnosed, as shown in previous studies by Snyder et al that focused on colorectal and breast cancer patients.[18–21]

The proportion of men with prostate cancer in this study who used preventive services is higher than those previously reported in other survivor populations.[13,15,19] Greater than 80% of men had a lipid test, approximately 75% had a diabetes test and 65% had a flu vaccine in the 2 years before or after prostate cancer diagnosis. Snyder and colleagues found the rates of preventive services to be lower in the first year following diagnosis of prostate cancer in SEER-Medicare, with 48% of men receiving a flu vaccine, 28% receiving cholesterol testing and 29% receiving colorectal cancer screening.[15] Our increased rates of use may due, in part, to the equal access afforded by this insured population. Results from Yabroff, et al. suggest that access to care plays an important role in the use of services among survivors, use of preventive services was greatest among insured cancer survivors and lowest among uninsured survivors.[22] This may also be a reflection of the greater number of clinic visits that occurred following the prostate cancer diagnosis, thus creating more opportunities for men to receive these services. This study was done in a managed care organization that employs an integrated care model, which promotes the use of preventive care, regardless of provider specialty. For example, a proactive office encounter tool embedded in the electronic medical record which prompts the physician (regardless of specialty) to order appropriate preventive services was implemented system-wide in 2007. Services evaluated in this study such as the vaccinations and colorectal cancer screenings are addressed by this tool and as a result, it is possible that this system-level intervention may result in higher rates of use when compared to other populations and potentially is creating ceiling effects.

When stratified by clinical stage at diagnosis, our results suggest that the use of preventive services is greater among men diagnosed with advanced stage disease. This counters our working hypothesis that the use of services would be diminished after diagnosis, particularly

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among men with advanced disease in whom treatment and palliative care are prioritized. It is possible that this increase in use among men with advanced disease and limited life expectancy may be due, in part, to a greater number of office visits and therefore more opportunities to receive these services compared to men with localized disease. It also may represent increased attention due to a greater perceived vulnerability.

Men in this study were more likely to receive screening for CRC after prostate cancer diagnosis when compared to before and the use of CRC screening both before and after diagnosis increased over time. This is most likely the result of a colorectal cancer screening outreach program, which was rolled out in 2006–2007 to improve the use of FOBT/FIT. Our results track closely the implementation of this program, as the rates of FOBT/FIT use in this sample increased 30% in the years following the implementation of the program. This increase in CRC use supports the notion that system-level interventions may prove to be useful when trying to improve the quality of preventive care among cancer survivors.

While this study assessed the use of preventive care services both before and after prostate cancer diagnosis in a large, diverse cohort of men with prostate cancer of all ages in equal-access, general practice settings, there are several potential limitations to consider. This analysis did not account for previous use of preventive services and therefore did not take into account whether men were due to receive these services. As a result, men may not have been due to receive the services in the time period studied. A proportion of the services performed in this study may have been done for the diagnosis or maintenance of already existing comorbidities. However, when we assessed the use of these services among men with a diagnosis of heart disease or diabetes only, the results were similar to those presented in this analysis. Also, because some of these services are recommended in longer time intervals than 2 years, the rates reported may be underestimates of the true use of these services. The two-year period after diagnosis also limits the conclusions that can be made regarding the delivery of preventive care after men transition to the continuing care phase following treatment. While we employed a case-crossover design to further our understanding specifically about what happens with the use of preventive services around the time of prostate cancer diagnosis and to limit the potential for confounding, this design does not allow for the comparison of the use of services to cancer-free controls, which is the focus of a future analysis. There are also system-level factors that are specific to this managed care organization that influenced the use of preventive services and resulted in higher rates of use, which may limit the generalizability of these findings to other populations in which these interventions are not employed. However, our results would support the notion that system interventions may play an important role in promoting the use of preventive services following cancer diagnosis.

CONCLUSIONS

Results from this study suggest that in this system, men received no less preventive care after prostate cancer diagnosis as compared to before. In fact, there were increases observed in the use of most preventive services following diagnosis, although there remains room for improvement. As more men with prostate cancer die from causes other than their cancer,

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identifying ways to promote the delivery of appropriate services for preventable diseases of aging is critical.

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Table 1

Demographics and Clinical Characteristics (N=16,604)

Demographics	**N (%)**
Age at baseline,*mean (SD)*	65.4 (9.5)
<40	6 (0.1)
40–49	773 (4.7)
50–59	3956 (23.8)
60–69	6532 (39.3)
70–79	4152 (25.0)
80+	1185 (7.1)
Race	
Non-Hispanic White	9123(54.9)
African American	2778(16.7)
Hispanic	3089(18.6)
Asian	396(2.4)
Other/Unknown	1218(7.3)
Marital status	
Divorce/separated/widowed	2235(13.5)
Married or live with partner	11713(70.5)
Never married	1337(8.1)
Other/unknown	1315 (7.9)
Prostate Cancer Characteristics	**N (%)**
Year of diagnosis	
2002–2005	7836(47.2)
2006–2008	8768(52.8)
Stage	
Localized	13756(83.5)
Advanced	2726(16.5)
Grade	
Well/moderately differentiated	9745(60.4)
Poorly differentiated	6392(39.6)

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Table 2

Preventive service use 2 years before and after prostate cancer diagnosis

Clinical Preventive Services*	2 years before diagnosis N (%)	2 years after diagnosis N (%)	MOR (95% CI)
Immunizations			
Influenza	8974 (54%)	10736 (64.7%)	2.70 (2.52– 2.90)
Pneumococcal	2098 (12.6%)	2313 (13.9%)	1.10 (1.04– 1.17)
Heart Disease			
Any lipid test	12682 (76.4%)	13495 (81.3%)	1.51 (1.42– 1.61)
Diabetes			
Hemoglobin A1c or fasting glucose	12324 (74.2%)	13988 (84.2%)	2.13 (2.00– 2.26)
Colorectal cancer			
Any colorectal screening	4311 (26%)	6297 (37.9%)	1.80 (1.71– 1.89)

*Services received 3 months before or after prostate cancer diagnosis were excluded.

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Table 3

Preventive service use 2 years before and after prostate cancer diagnosis: Stratified by stage at diagnosis*

Stage at prostate cancer diagnosis	Localized Disease (I/II)	Advanced Disease (III/IV)
Influenza vaccine		
2 years prior	7588 (55.2%)	1321 (48.5%)
2 years after	8964 (65.2%)	1692 (62.1%)
MOR (95% CI)	***2.61 (2.41– 2.82)***	***3.17 (2.67–3.76)***
Pneumococcal vaccine		
2 years prior	1758 (12.8%)	312 (11.4%)
2 years after	1927 (14%)	372 (13.6%)
MOR (95% CI)	***1.10 (1.03– 1.17)***	***1.19 (1.03– 1.39)***
Heart Disease (Lipid panel)		
2 years prior	10718 (77.9%)	1880 (69%)
2 years after	11282 (82%)	2119 (77.7%)
MOR (95% CI)	***1.43 (1.33– 1.53)***	***1.90 (1.63– 2.20)***
Diabetes (HbA1c and/or fasting glucose)		
2 years prior	10389 (75.5%)	1846 (67.7%)
2 years after	11590 (84.3%)	2289 (84%)
MOR (95% CI)	***1.95 (1.82– 2.09)***	***3.15 (2.69– 3.69)***
Any CRC screening		
2 years prior	3656 (26.6%)	633 (23.2%)
2 years after	5276 (38.4%)	983 (36.1%)
MOR (95% CI)	***1.77 (1.68– 1.87)***	***1.96 (1.73– 2.23)***

* Services received 3 months before or after prostate cancer diagnosis were excluded.

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Table 4

Colorectal cancer screening 2 years before and after prostate cancer diagnosis: Stratified by year of prostate cancer diagnosis*

Year of Prostate Cancer Diagnosis	2002–2003	2004–2005	2006–2007	2008–2009
Any CRC screening				
2 years prior	649 (16.4%)	611 (15.8%)	1009 (23%)	2042 (46.6%)
2 years after	802 (20.3%)	1190 (30.7%)	2150 (49.1%)	2155 (49.1%)
MOR (95% CI)	***1.31 (1.16– 1.47)***	***2.35 (2.10– 2.63)***	***3.01 (2.73– 3.30)***	***1.11 (1.02– 1.21)***
FOBT/FIT				
2 years prior	213 (5.4%)	177 (4.6%)	516 (11.8%)	1566 (35.7%)
2 years after	220 (5.6%)	555 (14.3%)	1621 (37%)	1612 (36.8%)
Colonoscopy/Sigmoidoscopy				
2 years prior	472 (11.9%)	465 (12%)	595 (13.6%)	791 (18%)
2 years after	636 (16.1%)	758 (19.5%)	948 (21.6%)	933 (21.3%)

*Services received 3 months before or after prostate cancer diagnosis were excluded

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Table 5

Mean number of visits two years before and after prostate cancer diagnosis by provider specialty or location

	Utilization 2 years before prostate cancer diagnosis	Utilization 2 years after prostate cancer diagnosis
	2 years before	2 years after
Department	**Mean (SD)**	**Mean SD)**
Ambulatory	15.7 (17.33)	30.3 (24.55)
Family/Internal	5.6 (5.84)	6.7 (6.96)
Urology/Oncology	1.0 (2.62)	5.1 (6.00)
Inpatient	0.2 (0.65)	0.6 (1.06)
Other (home health, hospice, etc.)	0.1 (1.20)	0.5 (2.47)
Emergency Dept.	0.6 (1.36)	0.8 (1.69)