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Work task disability in employed breast and prostate cancer patients

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Abstract
Introduction Nearly 60% of cancer survivors are of working age, making inquiries into work-related disabilities particularly relevant. This paper describes work-related physical and cognitive disability estimates 12 and 18 months after diagnosis and treatment in a sample of employed breast and prostate cancer patients.
Methods We recruited employed, newly diagnosed patients (n=447 breast, n=267 prostate) from the Metropolitan Detroit Cancer Surveillance System for telephone interviews 12 and 18 months after diagnosis. We defined disability by work task activity limitation. Disability estimates and employment were compared using Pearson chi-square tests. Duration of hours worked was compared by disability status using t-tests.
Results Approximately 60% of women reported physical disability at 12 months which decreased to 36% at 18 months. Cognitive disability was reported by 34% and 22% of women at 12 and 18 months, respectively. Fewer men reported physical disability, only 29% at 12 months, decreasing to 17% at 18 months. Cognitive disability was reported by 12% and 7% of men at 12 and 18 months, respectively. More individuals with disability left the workforce at each timeframe than those without disability.
Conclusions A significant proportion of breast and prostate cancer patients experienced work-related disabilities 1 year or more following treatment. Physical disability was more problematic than cognitive disability.

Implications for Cancer Survivors Rehabilitation or work accommodations may be useful for working patients to minimize disabilities resulting from cancer treatments. Patients and providers should be aware of the potential for disability so they can consider mechanisms to lessen treatment effects.

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Introduction

Cancer may influence disability as a result of the disease process and treatment and has been identified as among the top ten conditions causing activity limitation [1]. While treatments may improve survival, they can result in side effects that may affect an individual for the remainder of his or her life. Many prior cancer survivorship studies measure disability in terms of limitations in activities of daily living (ADLs) or instrumental activities of daily living (IADLs). These studies have largely focused on elderly populations [2, 3]. Because of the emphasis on early cancer detection coupled with better treatments and enhanced survival in

concert with persons remaining in the workforce at older ages, increasingly more individuals of working age comprise the population of cancer survivors. These individuals may experience a different constellation of symptoms and side effects, which can impact their daily work functioning. Therefore, research beyond measurement of ADLs and IADLs is needed to fully understand the impact of cancer and its treatment on patients' ability to work [4–12].

Cancer treatment's potential for disability

Treatment options for breast cancer, and to a more limited aspect, prostate cancer, have been associated with a variety of side effects that result in one or more functional limitations that potentially could impact a cancer survivor's participation with job tasks [13, 14]. Surgical intervention of breast cancer can result in upper body strength and mobility issues on the affected side [15–17]. Cognitive limitations, especially with aspects such as attention and memory, have been identified as being problematic in the work environment for cancer patients who received chemotherapy [15, 18–20]. While the side effects of prostatectomy and radiation are less likely than the aforementioned breast cancer therapies to directly relate to job performance, any resulting discomfort from incontinence and diarrhea may compromise the ability to maintain a pre-diagnosis level of functioning [2, 17].

Treatment-induced symptoms may also linger long after treatment is completed. For example, persistent fatigue has been identified as a significant contributor to employment difficulties subsequent to cancer treatment [15, 16, 19, 21]. In a comparison of breast cancer and brain cancer patients to non-cancer controls, fatigue was identified as a major factor impacting work performance 3 and 4 years beyond treatment [15, 19].

In the past decade, several studies have demonstrated the detrimental effects of cancer and its treatment on employment. Bradley and Bednarek (2002) reported 67% employment 5 to 7 years after diagnosis among a cohort of individuals with varying cancer diagnoses [22]. Yabroff et al. (2004) reported working-age patients with cancer experienced poorer productivity outcomes (e.g. less likely to have a job, more likely to be unable to work due to health, more days lost from work) compared to matched controls [7, 23]. Short et al. (2005) conducted a study on a cohort of employed persons with cancer upwards of 5 years post-diagnosis and found that an average of 20% of patients report disability [11]. Amir et al. (2007) documented that nearly 20% of cancer survivors responding to a mailed survey were unable to return to work after their cancer treatment [24]. In contrast, a cohort of young women with breast cancer reported similar employment rates at 5 years following diagnosis as they had when diagnosed [7, 25].

A challenge for studies that focus on disability is the lack of consensus regarding how to define disability [9, 26, 27]. The International Classification of Functioning, Disability and Health (ICF) considers disability as "...limitations in physical or mental functions, caused by one or more medical conditions, in carrying out socially defined tasks or roles" [28]. We use this definition as the overarching conceptual model to frame this study. Few studies have addressed disability and the degree to which disability may interfere with patients' employment. Unlike prior studies, we describe work disability and its occurrence from baseline to 12 and 18 months post diagnosis [4–6, 29, 30]. By examining data on patient reported activity limitations and documenting changes from baseline status to post-diagnosis, this study offers the opportunity to evaluate how disability evolves in employed cancer patients and identifies tasks most affected. Identification of problematic tasks may suggest target areas for accommodation or rehabilitation. Future studies could then be structured to evaluate if/what accommodations could assist cancer patients to minimize functional limitations [31, 32].

Methods

Sample

This investigation focused on cognitive and physical limitations reported at 12 and 18 months following diagnosis by the subset of employed breast and prostate cancer patients recruited from the Metropolitan Detroit Cancer Surveillance System (MDCSS) between 2001 and 2002 for a labor market outcomes study of cancer survivors and their spouses [33]. Patients were selected from the MDCSS because of high data quality and because it had the capacity to identify patients within 6 months following diagnosis. The location of the registry in Metropolitan Detroit also provides data on a significant number of African-Americans. Eligible patients for the labor market outcomes of cancer survivors study were newly diagnosed, incident breast or prostate cancer patients aged 30 to 64, and English-speaking. The original labor market outcomes study allowed for non-employed cancer patients to participate if they had an employed spouse at the time of diagnosis and these patients were excluded from this analysis.

Patients answered questions about employment characteristics during telephone interviews conducted approximately six, 12, and 18 months following diagnosis. The methodology used to recruit and enroll subjects is described in more detail elsewhere [33]. The participation rate was

83% and 76% of eligible women and men, respectively. The study was reviewed and approved by the institutional review boards at Michigan State and Wayne State Universities. Written informed consent was obtained from patients.

We restricted our analyses for this paper to the subset of enrolled patients that were employed 3 months prior to diagnosis and retained at the 12 and 18-month follow-up periods. The resulting sample sizes included in these analyses of patient disability were 447 employed breast cancer patients and 267 employed prostate cancer patients.

Measures

Questions on specific work tasks and associated limitations were asked of patients at the 12 and 18-month interviews (Appendix A). These timeframes were selected because most patients had completed their treatments and the acute effects of therapy should have resolved. To determine if patients experienced activity limitation in work related tasks, it was first necessary to determine the types of tasks that were required for their job. We used factor analysis to assess the degree to which distinct tasks reflected underlying work dimension(s) [34]. After the initial factor structure was determined, orthogonal (i.e., varimax) rotation was used to further simplify the factor structure. The factor analysis suggested two main dimensions were represented by six tasks. Three of the items loaded heavily on the first dimension while three loaded heavily on the second dimension. The first dimension included physical effort, heavy lifting, and stooping/kneeling/crouching tasks. The second dimension included concentration, data analysis, and learning new things. Table 1 reports the rotated factor loadings for the variables for both factors. The dimensions were categorized as physical tasks (Factor 1) and cognitive tasks (Factor 2).

A physical task composite variable was created from the tasks included in the first factor. A similarly constructed composite cognitive task was created from the tasks shown to load on the second factor. A value of "0" was associated with "task not required" while a value of "1" was associated with "task required" if the participant acknowledged performing any of the individual items at least some of the time. Activity limitation was subsequently established based on the patients' response to a direct task limitation question. Task limitation assessment was restricted to those who performed tasks at least some of the time and valued as "0" representing "no limitation" and "1" representing "limitation."

Physical and cognitive disability estimates were calculated from the 12 and 18-month interviews. Once disability status was established for each participant, we further compared work force participation between those who were disabled and those not disabled. Specifically, we contrasted the proportion who was employed (e.g., working 1 or more hours for pay) to the proportion that left the workforce by disability status at 12 and 18 months using a Pearson chi-square test. A patient was considered to have left the workforce if they were non-employed (e.g., not working, retired, disabled, unable to work) and not looking for work at the time of the interview. Of those that continued to be employed at the time of the interviews, we also compared the duration of the average workday by disability status using a *t*-test.

Results

Retention

Approximately 93% (n=418) of the breast cancer cohort was retained at 12 months and 92% (n=409) remained at 18 months. Slightly fewer men were retained at 12 months and at 18 months (91% and 85%, respectively). Non-completers were compared to patients who stayed in the study for the full 18-month duration using the Pearson chi-square test or *t*-test as appropriate. More than 75% of those who did not participate for the full 18 months dropped out because they were no longer interested in continuing the study. We found no differences in socio-demographic, employment, or disease factors (e.g., age, race, household income, education, hours worked, occupation, stage, treatment, etc.) when comparing men who did not finish the study with men who did. Compared to women who remained in the study, women who did not finish the study were younger (46 years vs. 50 years, $p<0.01$) and African-American (39% vs. 20%, $p<0.01$).

Descriptive statistics

Socio-demographic characteristics of the breast and prostate cohorts are reported in Table 2. The average age of employed breast cancer patients was 50 years and the average age of employed prostate cancer patients was 55 years at diagnosis. These patients, as expected, are relatively younger than the overall cancer population, which includes employed and non-employed patients. The majority of the patients were White with approximately one fifth African-American. Overwhelmingly, the patients were college educated with nearly half holding a college degree. In addition, the majority of the patients was married, reported no comorbid conditions, and reported their pre-diagnosis health status as excellent or very good. Only a small percentage (<3%) of patients had metastatic disease and nearly all patients had surgery. Almost 60% of breast cancer patients had chemotherapy in addition to surgery.

Table 1 Rotated factor loadings for job tasks

Job task	12 month activities		18 month activities	
	Factor 1 loading (n=645)	Factor 2 loading (n=645)	Factor 1 loading (n=571)	Factor 2 loading (n=571)
Physical effort	0.7471	−0.1263	0.7619	−0.1155
Heavy lifting	0.7161	0.0122	0.6972	−0.0259
Stoop, kneel, crouch	0.6775	0.0228	0.6231	0.0118
Concentrate	0.0530	0.5429	0.0312	0.5727
Data analysis	−0.1950	0.6221	−0.2562	0.6109
Learn new things	0.0660	0.4971	0.0257	0.5639

Table 2 Characteristics of study patients

Characteristic	Breast cohort (n=447) N (%)	Prostate cohort (n=267) N (%)
Age (mean years ± SD)	49.9±7.7	55.4±5.9
Race		
White/Asian	350 (78.3)	202 (75.7)
African-American	97 (21.7)	65 (24.3)
Education		
≤ High school	121 (27.1)	62 (23.2)
College, no degree	124 (27.7)	66 (24.7)
College graduate	202 (45.2)	139 (52.1)
Marital status		
Married	270 (60.4)	213 (79.8)
Formerly married	133 (29.8)	36 (13.5)
Never married	44 (9.8)	18 (6.7)
Baseline health status		
Excellent/very good	314 (70.2)	194 (72.7)
Good	90 (20.1)	59 (22.1)
Fair/poor	43 (9.6)	14 (5.2)
Baseline annual household income		
<$20,000	31 (6.9)	7 (2.6)
$20,000–74,999	222 (49.7)	90 (33.7)
≥$75,000	179 (40.0)	161 (60.3)
Stage		
In-situ	118 (26.4)	0
Local	192 (43.0)	209 (78.3)
Regional	126 (28.2)	55 (20.6)
Distant/unknown	11 (2.5)	3 (1.1)
Treatment		
No treatment	1 (0.2)	9 (3.4)
Surgery only	85 (19.0)	171 (64.0)
Radiation (with/without surgery)	96 (21.5)	67 (25.1)
Chemotherapy (with/without radiation, surgery)	265 (59.3)	8 (3.0)
Hormone therapy (with/without surgery)	–	12 (4.5)
Comorbidities (measured at 12 mos)[a]		
None	238 (56.9)	133 (54.7)
1–2	153 (36.6)	86 (35.4)
3+	27 (6.5)	24 (9.9)

[a] Breast cohort at 12 months, n=418, Prostate cohort at 12 months, n=243

Table 3 reports the percentage of patients by job task requirements at 12 and 18 months. The majority of women and men was required to perform physical tasks as part of their jobs (71% and 64%, respectively at 12 months following diagnosis) and nearly all patients were required to perform cognitive tasks (>95% for both women and men respectively at 12 months). The need to perform physical and cognitive tasks remained constant over the study period with one exception. Fewer women reported the need to concentrate at 18 months relative to 12 months following diagnosis (90% vs. 80%, $p<0.05$). Nevertheless, the composite variable representing cognitive tasks remained unchanged between the time periods.

Disability estimate and employment impact—breast cancer patients

Table 4 reports the presence of disabilities in the sample at 12 and 18 months following diagnosis. At 12 months following diagnosis, nearly 60% of women reported a physical disability based on activity limitation. By 18 months, women experienced significantly fewer disabilities. The percentage of women who reported a physical disability decreased to 36% ($p<0.01$). Cognitive disabilities followed a similar pattern as physical disability among women. One-third (34%) reported cognitive disability at 12 months. At 18 months, this percentage decreased to 22%. The reported decrease in cognitive disability from 12 to 18 months was statistically significant (34% to 22%, $p<0.01$).

Table 5 reports the percentage of patients with and without disability by employment-related variables. Women with physical activity limitation were statistically significantly less likely ($p<0.01$) to remain employed at 12 and 18 months compared to those without disability. Significantly higher percentages of women with physical disability left the workforce than women without disability at 12 months (11.9% vs. 4.2%, $p<0.05$) and at 18 months (11.7% vs. 0.6%, $p<0.01$).

No statistically significant difference was noted in the percentage of breast cancer patients with cognitive disability remaining employed compared to those without cognitive disability at 12 months, but a significantly higher percentage of those with cognitive disability left the workforce compared to those without disability (14.0% vs. 4.2%, $p<0.05$). At 18 months, statistically significant differences were noted in the percentage of those with cognitive disability employed (81%) and leaving the workforce (13%) altogether compared to those without cognitive disability (95% and 1%, respectively). However, among those that continued to work, women with cognitive limitations did not work significantly different hours compared to those without limitations at either 12 or 18 months.

Disability estimate and employment impact—prostate cancer patients

The percentage of men that reported physical disability was 29% at 12 months (Table 4). The percentage of men with physical disability significantly decreased at 18 months to 17% ($p<0.05$). The percentage of men with cognitive disability was only 12% at 12 months, which decreased to 7% by 18 months.

No statistically significant differences were noted in the percentages remaining employed, leaving the workforce, or hours worked at 12 months between men with physical disability compared to men without physical disability (Table 5). However, at 18 months, a significantly higher percentage of men without physical disability were employed compared to men with physical disability (97% vs. 83%, $p<0.05$) while no significant difference was observed for percentages leaving the workforce and hours worked.

Few differences were observed when comparing the employment characteristics of men with cognitive disability to men without cognitive disability at 12 months. However, 97% of men without cognitive disability were employed at 18 months compared to 79% of men with cognitive disability ($p<0.05$).

Discussion

We assessed work-related disability in employed breast and prostate cancer patients 12 and 18 months following diagnosis. Nearly all patients remaining in the study throughout the 18 months following diagnosis had jobs that required cognitive tasks and a majority had jobs that had a physical aspect. Of those required to perform these activities, we observed that physical tasks appeared more problematic compared to cognitive tasks (i.e., more patients experienced physical limitations). We also observed that reported limitations decreased from 12 to 18 months post-diagnosis. These data suggest that while work-related disability following cancer diagnosis continues for at least 18 months beyond the acute phase of treatment and recovery, a significant proportion of patients experience improvement.

Employment difficulties faced by cancer patients may result from treatment-induced disabilities that prevent a patient from maintaining their pre-diagnosis employment status [11, 12, 18, 35, 36]. Results from our study of breast cancer patients support published trends; more breast cancer patients without disability remained employed compared to patients with disability. In contrast, employment rates were similar between prostate cancer patients who had work-related disability and prostate cancer patients who did

Table 3 Required job tasks

Task	Breast cohort		Prostate Cohort	
	12 months (n=418) N (%)	18 months (n=409) N (%)	12 months (n=243) N (%)	18 months (n=230) N (%)
Physical effort	256 (61.2)	216 (52.8)	126 (51.8)	111 (48.3)
Heavy lifting	133 (31.8)	122 (29.8)	74 (30.4)	64 (27.8)
Stoop, kneel, crouch	219 (52.4)	206 (50.4)	119 (49.0)	105 (45.6)
Composite physical task required	298 (71.3)	261 (63.8)	154 (63.4)	134 (58.3)
Concentrate	375 (89.7)	325 (79.5)[a]	221 (91.0)	185 (80.4)
Data analysis	313 (74.9)	275 (67.2)	198 (81.5)	175 (76.1)[b]
Learn new things	351 (84.0)	326 (79.7)	213 (87.6)	186 (80.9)
Composite cognitive task required	398 (95.2)	357 (87.3)[b]	234 (96.3)	199 (86.5)[b]

[a] Statistically significant at $p<0.05$

[b] Exact 2-Sided Test used due to cell size <5

not have work-related disability. Perhaps prostate cancer patients have treatment regimens that generally were less invasive relative to breast cancer treatments. The majority of men were treated surgically, which may not have a long-term impact on work performance.

For many patients, leaving the workforce altogether is not financially or personally desirable. In these cases, options for accommodation or schedule modifications in the workplace may be helpful [37, 38]. Steiner et al. (2008) documented that more than half of cancer survivors who returned to work altered their schedule by at least 4 hours [39]. However in these samples, no differences were observed in the average hours worked for either breast or prostate cancer patients with versus without disability [39].

Physical disabilities were more often reported at each interview than cognitive disabilities. The higher proportion of physical disability despite the reduced demand for required physical work tasks suggests that patients with physically demanding jobs may require accommodation during therapy; and possibly, physical rehabilitation following treatment to minimize morbidity.

Cognitive work-related tasks were required for the majority of women in our study. Thus, cognitive disabilities could have the potential to significantly disrupt breast cancer survivors' productivity. In order to minimize the long term adverse effects on employment, coping strategies and techniques to assist patients with maintaining cognitive skills may be helpful early in the treatment process [18]. In addition to personal strategies, workplace accommodations for cognitive tasks (e.g., job sharing) may help minimize adverse effects of treatment that could result in disability which in turn, could preserve worker productivity.

Patient reports of disability and employment changed over the study period. Fortunately, the pattern of change in both groups from 12 to 18 months post diagnosis was positive with a decrease in reported disability accompanied by an increase in the proportion of patients that were employed. It is possible that the adverse effects of treatment wane over time or perhaps patients adapt or recover from cancer or treatment-induced limitations. It is also possible that job duties have been modified or patients found a new job that did not require the compromised tasks. Although

Table 4 Patients that reported disability 12 and 18 months following diagnosis by cancer site

Variable	Physical disability N (%)	Cognitive disability N (%)
Breast cancer patients		
12 months	176 (59.5)	136 (34.3)
18 months	94 (36.3)[b]	78 (22.0)[b]
Prostate cancer patients		
12 months	44 (28.6)	28 (12.1)
18 months	23 (17.2)[a]	14 (7.0)

[a] Statistically significant at $p<0.05$

[b] Statistically significant at $p<0.01$

Table 5 Employment comparisons by disability status

Variable	Physical disability		Cognitive disability	
	Disability N (%)	No disability N (%)	Disability N (%)	No disability N (%)
Breast				
12 months	(*n*=176)	(*n*=120)	(*n*=136)	(*n*=260)
Employed[d]	137 (77.8)	108 (90.0)[b]	108 (79.4)	225 (86.5)
Left workforce[e]	21 (11.9)	5 (4.2)[a,c]	19 (14.0)	11 (4.2)[b]
Duration workday (mean hours ± SD)	7.7±2.0	7.9±2.1	7.7±2.1	7.9±1.8
18 months	(*n*=94)	(*n*=165)	(n=78)	(*n*=276)
Employed[d]	71 (75.5)	159 (96.4)[b]	63 (80.8)	262 (94.9)[b]
Left workforce[e]	11 (11.7)	1 (0.6)[b,c]	10 (12.8)	2 (0.7)[b,c]
Duration workday (mean hours ± SD)	7.8±1.4	7.9±1.8	7.9±1.4	7.9±1.7
Prostate				
12 months	(*n*=44)	(*n*=110)	(*n*=28)	(*n*=204)
Employed[d]	35 (80.0)	91 (82.7)	22 (78.6)	170 (83.3)
Left workforce[e]	4 (9.1)	11 (10.0)[c]	1 (3.6)	23 (11.3)[c]
Duration workday (mean hours ± SD)	8.7±2.1	8.7±1.4	9.3±1.2	8.6±1.6
18 months	(*n*=23)	(*n*=111)	(*n*=14)	(*n*=185)
Employed[d]	19 (82.6)	108 (97.3)[a,c]	11 (78.6)	179 (96.8)[a,c]
Left workforce[e]	1 (4.4)	1 (0.9)[c]	1 (7.1)	1 (0.5)[a,c]
Duration workday (mean hours ± SD)	8.9±1.2	8.8±2.0	9.4±1.5	8.7±1.8

[a] Statistically significant at $p<0.05$

[b] Statistically significant at $p<0.01$

[c] Exact 2-Sided Test used due to cell size ≤5

[d] Employed = working 1 or more hours for pay

[e] Left workforce = non-employed and not looking for work

less than 5% of employed patients changed employers during the 18 month duration of the study. Future work is planned to evaluate the characteristics that may influence disability.

This study has several limitations. A few patients were lost to follow-up during the 18-month tenure of the study. Women lost from the study were younger on average and more likely to be African-American. National trends suggest increasing disability with increasing age and a disproportionate representation of disability within underrepresented groups [26]. Moreover, the study is limited to the Detroit metropolitan area and may not be generalizable to other areas of the United States or to workers with less education and income or to workers in jobs that are more physically intensive. Also, data regarding the nature and type of accommodations or rehabilitative services available to patients was not available. All information regarding job tasks and limitations were based on self-report and verification against employment records was not possible. Lastly, all disability research suffers from the absence of a standardized definition for disability, which limits comparability between studies.

Our findings indicate that employed men and women with prostate or breast cancer may experience work-related disability up to 18 months after their diagnosis and treatment. Newly diagnosed patients should be made aware of the potential for long-lasting disability so they can plan accordingly. It may be beneficial to patients to consider the appropriateness of rehabilitation efforts that would focus on work tasks in addition to ADLs and to think about the possible need for job restructuring following treatment. Interventions to reduce disability and improve work force participation may be needed to reduce the burden of cancer on working age patients. Our results confirm physical demands were more problematic than cognitive demands, making them a reasonable primary target for accommodation or rehabilitation efforts. Future work is needed to understand the degree to which activities are limited and the nature of accommodation or rehabilitative services (if any) available to patients to minimize disability.

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Appendix A: Work Related Activity Limitation Questions

Question	Eligible responses
Physical tasks	
My job requires lots of physical effort	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
My job requires lifting heavy loads.	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
My job requires stooping, kneeling, or crouching	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
Cognitive tasks	
My job requires intense concentration or attention.	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
My job requires me to analyze data or information.	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
My job requires that I learn new things.	All or almost all of the time
	Most of the time
	Some of the time
	None or almost none of the time
Asked after each task if all/ most/some response	
Has cancer or its treatment limited or interfered with your ability to do this part of your job?	Yes
	No

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