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Factors Influencing Changes in Employment Among Women with Newly Diagnosed Breast Cancer

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Structured Abstract

Background—While studies have shown that women are less likely to work after being diagnosed with breast cancer, the influence of cancer treatments on employment is less clear. We assessed whether chemotherapy or radiation therapy was associated with a disruption in employment during the year after a breast cancer diagnosis.

Methods—Using a database of health insurance claims covering 5.6 million United States residents, we identified 3233 women ≤ 63 years old who were working full or part-time when diagnosed with breast cancer between 1998 and 2002. All changes in employment during the year after a breast cancer diagnosis were identified. Using a Cox proportional hazards model that incorporated time-varying treatment variables, we evaluated the impact of chemotherapy and radiation therapy on the likelihood of experiencing an employment disruption.

Results—While most women (93%) continued to work, chemotherapy-recipients were more likely than non-recipients to go on long term disability, stop working, or retire (hazard ratio=1.8, $P<.01$). Women aged 54 and older were more likely to experience a change in employment than women ≤ 44 ($P<.01$). Radiation therapy did not influence employment ($P=.22$).

Conclusions—In this population of employed insured women, chemotherapy negatively impacted employment. This finding may aid treatment decision-making and could foster the development of interventions that support patient's ability to continue working following treatment. It also reinforces the need to assess the impact treatments, especially new treatments, have on patient-centered outcomes such as employment.

Keywords

breast cancer; employment; disability; outcomes; risk factors

Introduction

A substantial proportion (40–54%) of adult cancer survivors reduce their work hours or stop working altogether after their cancer diagnosis.[1–3] Working women with breast cancer are no exception.[4–7] Older women, African-American women, and those who have physically demanding jobs, less accommodating employers, more advanced cancer and more comorbidities are especially likely to experience a disruption of employment.[5, 6, 8–12]

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While temporary changes in employment may be needed to complete therapy and could be welcomed by patients, permanent changes could lead to the loss of income, work-related benefits, social connections and satisfaction and may precipitate anxiety or depression. The resulting financial strain and psychological distress could have a substantial detrimental impact on quality of life.[2, 13–16]

Many of the 200,000+ women diagnosed with breast cancer each year in the United States work.[4, 6, 17] Unfortunately, relatively little is known about the influence of chemotherapy and radiation therapy on a woman's desire and ability to work. Clinical trials usually do not report the effects of treatment on employment. While two retrospective surveys of employed women with newly diagnosed breast cancer found that chemotherapy did not result in a reduction in employment,[8, 18] one prospective cohort study found receipt of chemotherapy was associated with more lost wages and longer absence from work.[19]

Whether or not chemotherapy and radiation therapy lead to permanent changes in employment status remains unclear. These treatments are being given increasingly frequently for ever-smaller absolute benefits, and newer more intensive treatment regimens could be more likely to affect employment than traditional regimens. So, understanding the impact these treatments have on employment could help patients make informed treatment decisions. Our goal was to determine whether chemotherapy or radiation therapy was associated with a major disruption in employment during the year after a breast cancer diagnosis.

Methods

The Medstat MarketScan Commercial Claims and Encounters Research Database served as the data source for this analysis. Medstat is a medical information company that compiles data from health plans that provide insurance to large companies, state and local governments, and public organizations in the United States. The MarketScan database includes claims and enrollment records for more than 5.6 million individuals receiving employer-sponsored health insurance. Similar to a previous analysis,[20] we used data from January 1, 1998 to December 31, 2002 to identify women 18–63 years old with at least two breast cancer diagnosis codes (174.x from the International Classification of Diseases, 9th Edition [ICD-9]). The codes had to be at least 30 days apart, with at least one from a face-to-face encounter with a health care provider and women had to be continuously enrolled for at least 3 months before through 12 months after the first breast cancer diagnosis. Patients with other cancer diagnoses were excluded. Based on a previously developed algorithm for identifying incident breast cancer using administrative data[21], women had to have at least one code for a breast cancer biopsy/surgery.

Employment status was recorded on a monthly basis for up to 12 months following the first breast cancer diagnosis. We categorized employment status using definitions created by Medstat, who characterized employment status monthly based on data provided by the employer-sponsored health plans. Medstat's eight categories were full-time, part-time, early retiree, retiree, long-term disability, Comprehensive Omnibus Reconciliation Act (COBRA) insurance, or unknown. Women whose employment data were unavailable and those who were not working full or part-time when first diagnosed with breast cancer were excluded from the analysis. For women working full-time, we recorded a change in employment for those whose work status changed to part-time, early retiree, retiree, long-term disability, COBRA or unknown. For women working part-time, we recorded a change in employment for those whose work status changed to early retiree, retiree, long-term disability, COBRA or unknown. We assumed each of these employment changes reflected a decrease in hours worked or discontinuation of employment. This included women whose employment status

changed to COBRA or unknown, because we knew these women were no longer working in their old jobs and we believed they were unlikely to start new jobs while receiving cancer therapy. Patients were censored after their first employment status change. We did not assess return to work, because the dataset did not capture employment at other employers and did not allow the linkage of records between employers. We focused our analysis only on the year after the breast cancer diagnosis, because most treatments occur or start within this time frame.

We extracted data on age (categorized into quintiles defined as 44 or less, 45–49, 50–53, 54–57, or 58–63 years), health plan type (basic comprehensive, health maintenance organization, point of service, preferred provider organization, or point of service with capitation), and region of residence (Northeast, Midwest, South, West or unknown) for each woman when first diagnosed with breast cancer. Non-cancer comorbidity was categorized using the Klabunde modification of the Charlson score.22¯24 A co-morbid condition was considered present if two claims for that condition were made at least 30 days apart from 3 months before to 12 months after the first breast cancer.20 Metatstatic status was identified using International Classification of Disease, 9th edition (ICD-9) codes for secondary malignant neoplasms (197–199); because this analysis was based on insurance claims, more detailed stage data were not available. Variables were categorized as in Table 1. Medical claims during the 12 months after the breast cancer diagnosis were used to identify chemotherapy, radiation therapy and hospitalization for serious chemotherapy-related adverse events; the specific claims used included current procedural terminology (CPT) codes, ICD-9 codes, diagnosis related group (DRG) codes, and J & Q codes, and were described previously.20 Chemotherapy medications included all major cytotoxic agents used to treat breast cancer. Since anthracyclines have been associated with additional adverse effects,25 receipt of an anthracycline was also coded separately.

We calculated the incident rate of change in employment, expressed as the number of employment changes per 1000 patient years, and used t-tests and analysis of variance to compare this rate by patient characteristics and receipt of treatments. Claims for chemotherapy and radiation therapy were used to derive on-treatment intervals for these therapies. The 30-day period after a treatment was considered ‘time on treatment;’ all other periods were considered ‘time off treatment.’ When a patient received a second treatment within the 30-day window, as is typically the case (for example, most chemotherapy regimens consist of 4–8 treatments given every 2–3 weeks), the on-treatment period was considered continuous until 30 days after the last treatment. An employment change was attributed to a therapy only if it occurred during an on-treatment period for that therapy.

A Cox proportional hazards model was used to assess the effect of chemotherapy and radiation therapy on the likelihood of experiencing a change in employment while on treatment. Time-varying treatment variables for chemotherapy and radiation therapy were included in the model so women could contribute information to the treatment groups when on therapy and to the control group when not on therapy. The model also included the covariates described above. To explore whether other factors might help explain the association between chemotherapy and change in employment, we modified the base model in several ways. First, we added a time-varying covariate for women who experienced hospitalizations for serious chemotherapy-related adverse events to test whether these events explained any part of the association between chemotherapy and change in employment. Second, we added a variable reflecting receipt of anthracycline chemotherapy to assess whether these agents were responsible for any part of the association between chemotherapy and employment change. Third, to test whether proportional hazards was a reasonable assumption, we added time-by-predictor interaction variables (e.g., time*age, time*chemotherapy, time*radiation, time*metastatic status). The interaction terms tested

whether the effects of the predictors changed after a certain time had elapsed; such effects are commonly referred to as change-points. Since no significant interaction effects were found, we concluded that the proportional hazards assumption was reasonable.

In sensitivity analyses, we restricted the cohort to the 70% of employment changes to early retiree, retiree, and long-term disability status (i.e., excluding changes to COBRA and unknown); results were similar and are not presented. We also repeated analyses restricting the cohort to women who were working full-time at diagnosis (99% of women); again results were similar and are not presented. Finally, to explore whether the relationship between chemotherapy and employment varied for younger versus older women, we repeated analyses after stratifying at the median age (51 years). Model results are presented as hazard ratios with 95% confidence intervals. Statistical analyses were performed using SAS software version 9.2 (Cary, NC). All statistical tests were two-sided; P values < .05 were considered significant.

Results

Of the 5.6 million insured lives in the MedStat dataset from January 1998 to December 2002 there were 4068 women <64 years old who had newly diagnosed breast cancer and at least one year of follow-up data. Seventy-nine percent (3233) of these women were working full or part-time when first diagnosed with breast cancer diagnosis; these women comprised the main cohort analyzed by this study. Most of the 835 patients not included in the final cohort were early retirees at the time of breast cancer diagnosis. They tended to be older (mean age 58.3 vs. 50.6 years; difference 7.7 years; 95% CI 7.2–8.2) and less likely to receive chemotherapy (40.5% vs. 53.8%; $P < .001$).

The baseline characteristics of the 3233 women who were working full or part-time appear in Table 1. Most women had non-metastatic disease and no comorbidities (Table 1). Approximately 54% received chemotherapy, 58% received radiation therapy, and 6.6% experienced a change in employment. The most common employment change was from full-time to early retiree (67%), followed by full-time to unknown (12%), full-time to COBRA (9%), full-time to retiree (6%), and full-time to long-term disability (5%). Only 2% of all changes were from part time to another status. Not controlling for other predictors, women who were older and those who had metastatic cancer or a comorbidity score ≥1 demonstrated a higher rate of employment change than others (Table 2). Chemotherapy-recipients also demonstrated a higher rate of employment change than non-recipients, but this unadjusted difference was not statistically significant.

Controlling for other observed patient characteristics and using time-varying treatment variables to examine the effects of treatments on employment, women receiving chemotherapy had 1.8-fold greater risk of experiencing a change in employment versus women not receiving chemotherapy, and older women were more likely to experience a change in employment than younger women (Table 3). Radiation therapy was not associated with employment change, nor was having more comorbid conditions or metastatic cancer. In additional models, receiving anthracycline chemotherapy and being hospitalized for a chemotherapy-related adverse effect were also not associated with employment change. None of the interaction terms added to the base model (including chemotherapy*age, radiation therapy*age, chemotherapy*metastatic status, and age*metastatic status) were statistically significant. When the model was repeated stratified by age, a significant association between chemotherapy use and employment change was seen among women >51 years old (HR 1.9; 95%CI 1.2–3.0), but not among women ≤51 years old (HR 1.5; 95%CI 0.5–3.9). There was less power to detect an association in the younger women,

because the relative difference between the event rates in the chemotherapy and non-chemotherapy subgroups was smaller.

Discussion

We observed that chemotherapy recipients were more likely to go on long-term disability, stop working, or retire compared with women not receiving chemotherapy even after controlling for other patient characteristics and treatment variables. While our analysis could not characterize the exact mechanism by which chemotherapy affects employment, we suspect chemotherapy–related adverse events decrease patients' desire or ability to work or both. Interestingly, hospitalizations for acute chemotherapy-related adverse events did not appear to mediate this relationship. This suggests that chronic chemotherapy-related adverse events are more likely to influence employment than short-term chemotherapy-related side effects, even when those short-term side effects are serious enough to cause hospitalization. We also found that the association between chemotherapy and employment was larger for older women than for younger women, although the relationship for younger women was imprecisely estimated due to the small number of employment changes in that group. No other patient characteristics were associated with a greater risk of experiencing a change in employment, nor was receipt of radiation therapy.

Quality-of-life studies identify chemotherapy as the breast cancer treatment that causes the most long-term physical and emotional morbidity.[26–30] Many women with breast cancer who stop working within 6-months of their diagnoses do so because of treatment-related symptoms.[6] Yet two previous studies, a survey of 145 breast cancer patients diagnosed 1986–1991 and a study of 416 breast cancer patients diagnosed 2001–2002, found no association between receipt of chemotherapy and employment.[8, 18] Several factors could explain why we found an association when these other studies did not. First, our analysis may have had greater power to detect a relationship, because the sample size was larger. Moreover, the multivariable model accounted for predictor variables that could have masked the effect of chemotherapy and incorporated time-varying covariates that may have helped isolate the component of variation attributable to chemotherapy. Second, we obtained information on cancer treatments and employment directly from patients' insurance companies, rather than patient surveys, which may be subject to response and recall bias. Finally, patients with more advanced cancer or those who have more difficulty with chemotherapy may have been less likely to complete surveys but more likely to experience employment changes. Our results build on and reinforce the findings of a recently reported, contemporaneous study that found chemotherapy recipients had, on average, 19 additional weeks of absence from work and 8% less compensation during their absence.[19]

In our large population-based cohort, 93% of women who were working when they were diagnosed breast cancer were still working 12 months later. This is higher than several previous estimates of employment among women with newly diagnosed breast cancer. One study compared 646 breast cancer survivors with 890 controls, and found 79% of the cancer survivors and 85% of the controls were working 3 years later.[4] A second study, a longitudinal analysis of working women with newly diagnosed breast cancer identified from the Metropolitan Detroit Cancer Surveillance System, found 82% were employed 12 months after their diagnosis.[6, 8] Our cohort may have been less likely to experience an employment change than the general population of working women with breast cancer for several reasons. First, we required continuous enrollment in a health plan for 12 months. Women who disenrolled before 12 months may have experienced an employment change but were not included in our analysis. However, women who left the workforce, but maintained their health insurance benefits via COBRA were included in the analysis. Second, our analysis only included women who worked for the employers sponsoring the health plans. Women

classified as spouses or dependants may have been more likely to stop working, but were excluded from the analysis because the Medstat file did not contain their employment information. Since all of the women in our study risked losing their benefits if they stopped working, they had an incentive to keep working. Finally, everyone in our cohort worked for a large employer. Compared with small employers or women who are self-employed, large employers may be more able to accommodate employees and in some cases are required to do so by law.[8, 31, 32] Our analysis has several limitations. First, although employment status was defined in a non-traditional way, the categories we used (full-time, part-time, early retiree, retiree, COBRA, and long term disability) came directly from employer-sponsored health plans as coded by Medstat, and reflected major changes in employment. Moreover, our findings were robust to different definitions of employment change. In other words, restricting the analysis to women employed full-time when diagnosed with breast cancer or to women whose employment status changed only to retiree, early-retiree or long-term disability (i.e., excluding COBRA and unknown) yield similar results. We were not able to control for return to work at other employers, or to assess employment changes occurring more than one year after a breast cancer diagnosis. However, at least one study suggests that few employment changes occur more than one year after a breast cancer diagnosis.[7]

Second, information about several potentially important covariates were not available from the Medstat file. Some of these variables, like grade and receptor-status, are unlikely to have a direct impact on the relationship between chemotherapy use and employment change. They could indirectly affect employment via their influence on treatment decisions. However, treatments were included in the model, so we believe excluding grade and receptor-status does not limit the validity of our findings. Other variables, like socioeconomic status, race/ethnicity, occupational characteristics, marital status, spousal employment, other family members' insurance coverage, second jobs, or return to work, cannot be excluded as potential confounding or mediating variables. Future analyses that include these variables would help to assess their impact on employment change.

Third, we could only control for stage to a limited degree, because detailed stage data were not available. Any impact stage could have on employment would likely be mediated either via treatment-related adverse effects caused by more aggressive treatment, or cancer-related symptoms. Our study controlled for treatments and metastatic status (patients with metastatic disease have the greatest chance of experiencing cancer-related symptoms). While we did not observe an association between advanced stage (i.e., metstatic disease) and change in employment, previous studies have.[2, 3, 8] Our study may have lacked sufficient power to identify an association, because only a small fraction of the patients had metastatic disease. While it is possible that unmeasured variations in stage could explain the relationship between chemotherapy and employment status that we observed, this seems unlikely, because employment status changes were attributed to chemotherapy only if they occurred within 30 days of receiving chemotherapy. Since disease severity could shape the decisions made by patients and providers its influence on employment should be studied further.

For many breast cancer patients, the trend is to offer more aggressive therapies that lead to more frequent and more serious consequences (e.g., taxanes and trastuzumab for the adjuvant treatment of women with node-positive and HER-2 positive breast cancer, respectively). Clinical trials provide few details regarding patients' ability to continue working — a practical consequence of therapy that may be of particular interest to patients. Future clinical trials should assess the impact of treatment on patient-centered outcomes such as employment. In addition, research studies should strive to better understand the reasons for the association between chemotherapy and employment (i.e., do changes in

employment result directly from toxicities or do they reflect a priori choices made by patients receiving chemotherapy), which chemotherapy-related toxicities have the greatest impact on employment, and what factors prevent women who want to return to work from doing so.

While knowing that chemotherapy might affect employment is unlikely to have a substantial impact on the decisions made by many women with breast cancer, this information could prove particularly valuable for women in whom chemotherapy offers relatively modest benefits and employment change confers significant detrimental consequences. For example, while it is doubtful that an association between chemotherapy and employment would impact the decision making of a 46 year-old women who has stage III, HER2 positive breast cancer, works part-time and is enrolled in a health plan through her husband's employer, this information could influence the decision making of a 62 year-old woman who has stage II, ER positive breast cancer, is employed full time and could lose her health insurance if she stops working. Regardless, knowledge of a link between receipt of chemotherapy and experiencing a change in employment could lead to stronger efforts, by employers and others, to support women while they are being treated for cancer and to provide rehabilitative services that help women return to work if that is what they desire.

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Table 1

Characteristics of Breast Cancer Patients [*]

Characteristics	Proportion of Patients
Age (years) [†]	
44 or less	18.5
45 to 49	21.1
50 to 53	23.6
54 to 57	19.8
58 to 63	17.0
Metastatic status [‡]	
Non-metastatic	88.7
Metastatic	11.3
Comorbidity score [§]	
0	92.6
1 or more	7.4
Health plan type [‖]	
Basic / Comprehensive	34.8
Health maintenance organization	7.6
Point of service	13.9
Preferred provider organization	31.0
Point of service with capitation	12.8
Region of residence in U.S.	
Northeast	14.0
Midwest	20.3
South	59.6
West	2.4
Unknown	3.8
Cancer-Directed Therapies	
No Chemotherapy	46.2
Chemotherapy	53.8
No Radiation Therapy	42.1
Radiation Therapy	57.9
Hospitalizations / ER Visits for chemotherapy-related adverse events	
0	89.1

Characteristics	Proportion of Patients
1 or more	10.9

*Based on 3233 women employed either full or part time at their first breast cancer diagnosis, using data from the MarketScan Commercial Claims and Encounters Research Database.

†Age groups represent approximate quintiles of the entire cohort.

‡Metastatic status was identified using ICD-9 codes for secondary malignant neoplasms (197–199).

§Comorbid diagnoses were considered present if two claims were made at least 30 days apart during the 3 months before and the 12 months after the first breast cancer diagnosis (other cancer diagnoses were excluded).

‖Includes only 3229 patients; health plan type data were absent for 4 records.

Table 2

Rate of change in employment (unadjusted)

Characteristics	Changes in employment per 1000 patient years	*P* value †
Age (years) ‡		
44 or less	43	<0.01
45 to 49	48	
50 to 53	58	
54 to 57	73	
58 to 63	174	
Metastatic status §		
Non-metastatic	75	0.33
Metastatic	94	
Comorbidity score ‖		
0	73	0.06
1 or more	113	
Health plan type ¶		
Basic / Comprehensive	60	0.24
Health maintenance organization	90	
Point of service	71	
Preferred provider organization	87	
Point of service with capitation	87	
Region of residence in U.S.		
Northeast	75	0.36
Midwest	88	
South	75	
West	33	
Unknown	117	
Cancer-Directed Therapies		
Off Chemotherapy	75	0.67
Receiving Chemotherapy	80	
Off Radiation Therapy	77	0.47
Receiving Radiation Therapy	68	

* Based on 3233 women employed either full or part time at their first breast cancer diagnosis, using data from the MarketScan Commercial Claims and Encounters Research Database. Ref = Referent group.

[†] *P* values obtained using *T*-tests for binary and ANOVA based F-tests for categorical variables.

[‡] Age groups represent quintiles of the entire cohort.

[§] Metastatic status was identified using ICD-9 codes for secondary malignant neoplasms (197–199).

[‖] Comorbid diagnoses were considered present if two claims were made at least 30 days apart during the 3 months before and the 12 months after the first breast cancer diagnosis (other cancer diagnoses were excluded).

[¶] Includes only 3229 patients; health-plan type data were absent for 4 records.

Table 3

Hazard ratios for change in employment (adjusted)*

Characteristics	Hazard Ratio for change in employment	95% confidence interval	*P* value
Age (years) †			
44 or less	Ref	Ref	Ref
45 to 49	1.3	0.8–2.2	0.35
50 to 53	1.6	0.9–2.6	0.08
54 to 57	2.0	1.2–3.3	<0.01
58 to 63	4.8	3.1–7.6	<0.01
Metastatic status‡			
Metastatic (vs. Non-metastatic)	1.0	0.7–1.6	0.88
Comorbidity score §			
1 or more (vs. none)	1.2	0.8–1.8	0.50
Health plan type ‖			
Basic / Comprehensive	Ref	Ref	Ref
Health maintenance organization	1.6	0.9–2.8	0.08
Point of service	1.2	0.8–1.9	0.36
Preferred provider organization	1.4	1.0–2.0	0.03
Point of service with capitation	1.9	1.2–2.9	<0.01
Region of residence in U.S.			
Northeast	Ref	Ref	Ref
Midwest	1.1	0.7–1.8	0.58
South	1.0	0.7–1.5	0.93
West	1.7	0.8–3.6	0.15
Unknown	0.3	0.1–0.9	0.04
Cancer-directed therapies			
Chemotherapy (vs. No Chemotherapy)	1.8	1.2–2.5	<0.01
Radiation therapy (vs. No Radiation Therapy)	1.3	0.9–1.9	0.22

*Based on 3233 women employed either full or part time at their first breast cancer diagnosis, using a Cox proportional hazards model controlling for age, metastatic status, comorbidity, health plan type, region of residence, chemotherapy and radiation therapy. Ref = Referent group.

†Age groups represent quintiles of the entire cohort.

‡Metastatic status was identified using ICD-9 codes for secondary malignant neoplasms (197–199).

§Comorbid diagnoses were considered present if two claims were made at least 30 days apart during the 3 months before and the 12 months after the first breast cancer diagnosis (other cancer diagnoses were excluded).

‖Includes only 3229 patients; health-plan type data were absent for 4 records. This variable may serve as a proxy for type of employer, as different employers adopt different health plans and different benefit packages.