Comparing Care for Breast Cancer Survivors to Non-Cancer Controls: A Five-Year Longitudinal Study

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BACKGROUND: Deficiencies in care for cancer survivors may result from unclear roles for primary care providers (PCPs) and oncology specialists in follow-up.

OBJECTIVES: To compare cancer survivors' care to non-cancer controls.

DESIGN: Retrospective, longitudinal, controlled study starting 366 days post-diagnosis.

SUBJECTS: Stage 1-3 breast cancer survivors age 65+ diagnosed in 1998 (n=1961) and matched non-cancer controls (n=1961).

MEASUREMENTS: Using the SEER-Medicare database, we examined the number of visits to PCPs, oncology specialists, and other physicians; receipt of influenza vaccination, cholesterol screening, colorectal cancer screening, bone densitometry, and mammography; and whether care receipt was associated with physician mix visited.

RESULTS: Survivors were consistently less likely to receive influenza vaccination, cholesterol screening, colorectal cancer screening, and bone densitometry but more likely to receive mammograms than controls (all $p < 0.05$). Over time, colorectal cancer screening and mammography decreased and influenza vaccination increased for both groups (all $p < 0.0001$). Trends over time in care receipt were similar for survivors and controls. In Year 1, survivors had more visits to PCPs but fewer visits to other physicians than controls (both $p < 0.05$). Over time, survivors' visits to PCPs and other physicians increased and to oncology specialists decreased (all $p < 0.0001$). Controls' visits to PCPs increased ($p < 0.0001$) faster than survivors' ($p = 0.003$). Controls' visits to other physicians increased ($p < 0.0001$) at a rate similar to survivors. Survivors who visited both a PCP and oncology specialist were most likely to receive each service.

CONCLUSIONS: Better coordination between PCPs and oncology specialists may improve care for older breast cancer survivors.

KEY WORDS: breast cancer; preventive care; survivorship.

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INTRODUCTION

The 2005 Institute of Medicine report *From Cancer Patient to Cancer Survivor: Lost in Transition* highlights the complex follow-up care needs of cancer survivors, including preventive care and screening, surveillance for recurrence, treatment for long-term sequelae of the disease and its treatment, and care for comorbid conditions.¹ Coordination of care between oncology specialists and primary care providers (PCPs) in providing this follow-up care is critical, as noted by the American Society of Clinical Oncology (ASCO) guidelines for breast cancer survivor follow-up.² The guidelines recommend a history and physical every 3-6 months for years 1-3, every 6-12 months for years 4-5, and annually thereafter. The guidelines also recommend survivors have a mammogram annually unless otherwise indicated. Because studies have demonstrated that survivors followed by PCPs have equivalent outcomes to those followed by oncology specialists,³ the guidelines suggest that follow-up care may be provided by a PCP, though survivors on endocrine therapy require oncology specialist involvement. To facilitate survivors' care coordination, ASCO developed templates to summarize patients' treatment receipt and follow-up care required.⁴

Previous research demonstrates that there may be deficiencies in the care cancer survivors receive. For example, providers may be so focused on breast cancer-specific issues that other health maintenance services do not receive adequate attention. Do providers recommend follow-up mammograms but fail to give survivors flu shots or monitor their cholesterol? Perhaps the survivors visit oncology specialists so often that they do not see their PCPs for general primary and preventive care. Do PCPs assume that oncology specialists are providing the care the survivor requires or vice versa? How do these relationships change over time? The data suggest that these questions pose real issues for cancer survivors and their providers. A study in colorectal cancer demonstrated that, over the first five years of survivorship, oncology specialists became less involved in survivors' care, and survivors relied more on their PCPs only.⁵ Accompanying the decrease in oncology specialists' involvement was a decrease in cancer screening (i.e., mammography and cervical cancer screening). Earle and

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Neville⁶ examined care for colorectal cancer survivors cross-sectionally five years post-treatment and found that survivors were less likely to receive appropriate care than matched non-cancer controls.

This study builds on previous research by assessing longitudinal trends in care for breast cancer survivors and comparing survivors' care to non-cancer controls. Over 20% of the 10 million cancer survivors in the US have survived breast cancer.¹ Due to improvements in screening and treatment,⁷ survival rates for breast cancer are quite high, with 98% of those with localized disease and 85% of those with regional disease surviving for five years.⁸ Approximately 182,460 women will be diagnosed with breast cancer in 2008 in the US,⁸ and women 65 and older account for about 42% of breast cancer cases.⁹ While Earle et al¹⁰ examined care for breast cancer survivors cross-sectionally after five years, this study fills a gap by examining longitudinal trends. Specifically, this study focuses on changes over time in physician specialties visited by and care received by survivors compared to non-cancer controls and whether physician mix visited is associated with care receipt.

METHODS

Study Design

This descriptive, retrospective, longitudinal, controlled study compared patterns of physician visits and care receipt for breast cancer survivors and matched non-cancer controls. Survivors and controls were followed for five years starting on day 366 after diagnosis (controls were assigned a fixed diagnosis date of January 1, 1998). We calculated the number of visits to different physician specialties and the percentage of survivors and controls who received recommended care services each year for five years. Then, for survivors only, we assessed whether care receipt was associated with the mix of physician specialties visited.

Data Source

We used the SEER-Medicare database, which links the Surveillance, Epidemiology and End Results (SEER) cancer registry data with Medicare claims.¹¹ The SEER registries provide data on diagnosis, tumor characteristics, and survival. The Medicare claims data provide information on Medicare-covered health care services. For comparison purposes, the SEER-Medicare database also includes data from a random sample of non-cancer controls living in SEER regions. In 1998, there were 13 SEER registries, covering a representative sample of approximately 14% of the U.S. population.¹²

Study Subjects

Survivors meeting the following criteria were included: diagnosis of stage 1-3 breast cancer in 1998, living in a SEER region at diagnosis, eligible for Medicare based on age and continuously enrolled in the fee-for-service program during the study period, survived without subsequent malignant diagnosis, did not receive chemotherapy or radiation therapy during the study period, and did not enroll in hospice. Controls were matched with survivors one-to-one using age (within 2 years), race (White, Black, Other), sex, and SEER region. Controls had

to meet the same eligibility criteria as survivors, except for having a breast cancer diagnosis, and were required to have had a mammogram in 1998 (the year the case was diagnosed).

Variables

We used the following clinical and sociodemographic variables: age, race, SEER region, comorbidity index, urban/rural location, and stage of disease (survivors only). The comorbidity index was calculated as a categorical variable (0, 1, 2+),¹³⁻¹⁵ excluding cancer and metastatic disease. Using census tract median income, subjects' socioeconomic status was divided in quintiles and used as a continuous variable. Annual number of physician visits were grouped as 0-4, 5-7, 8-12, and 13+.

Using the Medicare physician specialty codes, physicians were classified as a PCP, oncology specialist, or other physician. PCPs included general practice, internal medicine, family practice, obstetrics/gynecology, geriatrics, and multispecialty group practice. Oncology specialties included medical oncology, hematology-oncology, general surgery, surgical oncology, and radiation oncology. Physician specialties not listed as PCP or oncology specialist were categorized as other physicians. We evaluated influenza vaccination, cholesterol screening, colorectal cancer screening (colonoscopy, flexible sigmoidoscopy, or fecal occult blood tests), bone densitometry, and mammography (excluding women with bilateral mastectomy). These care services were used by Earle et al¹⁰ and were selected from the Health Plan Employer Data and Information Set based on their relevance to breast cancer survivors and the feasibility of assessing them using claims data.

For survivors only, we categorized the physician mix visited: both a PCP and an oncology specialist, a PCP but not an oncology specialist, an oncology specialist but not a PCP, and neither a PCP nor an oncology specialist. For all categories, study subjects may have had visits to other physicians.

Analyses

All analyses were descriptive. We calculated the mean age and the distribution of race, comorbidity index, SEER region, and stage (survivors only). Because survivors and controls were not matched on comorbidity, we tested for differences between the two groups using a chi-square test. We examined patterns of care in three sets of analyses:

1. *Patterns of Physician Visits:* In the first set of analyses, the outcome variables were the number of visits to different specialties, and the main independent variable was group (survivor vs. control). We calculated the mean number of visits to PCPs, other physicians, and oncology specialists (survivors only) each year for the five-year survivorship period. We compared the number of PCP and other physician visits each year using Poisson regression with the number of visits modeled as a function of group (survivor vs. control). We then used Poisson regression with generalized estimating equations (GEE) to model the number of visits across the five years as a function of year to test for changes over time. We used GEE to address the violation of independence of the error terms because each subject was included in the model five times (for each year of follow-up). We then added an interaction term for year-by-group to test for differences between groups in the

Table 1. Characteristics of Breast Cancer Survivors and Matched Controls

Characteristic	Survivors (n=1961)	Controls (n=1961)
Age		
Mean (standard deviation)	75.0 (6.0)	75.0 (6.0)
Race n(%)		
White	1766 (90.1)	1766 (90.1)
Black	81 (4.1)	81 (4.1)
Other	114 (5.8)	114 (5.8)
Comorbidity Index* n(%)		
0	1491 (76.0)	1522 (77.6)
1	360 (18.4)	349 (17.8)
2+	110 (5.6)	90 (4.6)
Stage n(%)		
Stage 1	1374 (70.1)	NA
Stage 2	556 (28.4)	NA
Stage 3	31 (1.6)	NA
Surveillance, Epidemiology, and End Results Registry (SEER) Region n(%)		
San Francisco	154 (7.9)	154 (7.9)
Connecticut	271 (13.8)	271 (13.8)
Detroit	279 (14.2)	279 (14.2)
Hawaii	57 (2.9)	57 (2.9)
Iowa	305 (15.6)	305 (15.6)
New Mexico	70 (3.6)	70 (3.6)
Seattle	259 (13.2)	259 (13.2)
Utah	95 (4.8)	95 (4.8)
Atlanta	122 (6.2)	122 (6.2)
San Jose	82 (4.2)	82 (4.2)
Los Angeles	263 (13.4)	263 (13.4)
Rural Georgia	4 (0.2)	4 (0.2)

*Comorbidity index excludes cancer and metastatic disease; chi-square p -value=0.29 for difference between cases and controls.

trend over time. These analyses adjusted for socioeconomic status, urban/rural status, and comorbidity.

2. *Patterns of Care Receipt:* In the second set of analyses, the outcome variables were receipt of recommended care, and the main independent variable was survivor vs. control. We calculated the percentage of survivors and controls receiving each service each year for the five years and tested for differences using logistic regression with receipt of each service as the outcome and group as the independent variable. To test for changes in care over time, we used GEE logistic regression with receipt of each service as

the outcome and year as the independent variable. Again, GEE was used because each subject was included in the analysis five times (for each year of follow-up). We added an interaction for year-by-group to test for differences in the trend over time between survivors and controls. These analyses adjusted for socioeconomic status, urban/rural status, comorbidity, and total number of visits.

3. *Relationship between Physician Mix Visited and Care Receipt:* In the third set of analyses (which included survivors only), the outcome variable was receipt of care and the main independent variable was physician mix seen. As described above, physician mix categories were PCP only, oncology specialist only, both, or neither. Physician mix visited was categorized for each survivor each year. We conducted a repeated measures analysis to test for marginal homogeneity in the categorization of survivors over time. We then combined the five years of follow-up data and calculated the percentage of survivors in each provider-mix group who received each service. We tested whether care receipt was associated with physician-mix visited with logistic regression models that accounted for repeated measures using GEE. These analyses adjusted for total number of visits, age, race, stage, comorbidity index, socioeconomic status, urban/rural location, year of follow-up, and SEER region.

RESULTS

We matched 1961 survivors with 1961 controls (Table 1). The average age was 75, and 90% were White. The comorbidity index was 0 for 76% of survivors and 78% of controls ($p=0.29$). Among survivors, 70% had stage 1 disease.

In Year 1, survivors had more visits to PCPs but fewer visits to other physicians than controls (both $p<0.05$) (Table 2). Specifically, in Year 1, survivors had 9.3 total visits on average (2.3 oncology specialist, 4.0 PCP, 3.0 other physician), and controls had 6.7 (3.4 PCP, 3.3 other physician). By Year 5, survivors' average total visits decreased to 8.9 (1.0 oncology specialist, 4.4 PCP, 3.5 other physician; $p<0.0001$ for oncology specialist decrease and for PCP and other physician increases); controls' visits increased to 8.2 (4.3 PCP, 3.9 other physician;

Table 2. Mean Number and Pattern of Physician Visits Over Five Years for Breast Cancer Survivors and Controls

Mean (SD)	Year 1	Year 2	Year 3	Year 4	Year 5	P-Value for Trend over Time [†]	P-Value for Difference in Trend over Time Between Groups [†]
Oncology Specialists							
Survivors	2.3 (2.4)	1.7 (2.1)	1.4 (2.1)	1.2 (1.9)	1.0 (1.8)	<0.0001	NA
Primary Care Providers							
Survivors	4.0 (4.2)*	4.0 (4.3)*	4.2 (4.4)*	4.3 (4.6)*	4.4 (4.8)	<0.0001	0.003
Controls	3.4 (3.6)	3.7 (3.9)	4.0 (4.3)	3.9 (4.3)	4.3 (4.5)	<0.0001	
Other Physicians							
Survivors	3.0 (4.1)*	3.0 (4.1)*	3.2 (4.1)*	3.5 (4.6)	3.5 (4.7)*	<0.0001	0.67
Controls	3.3 (4.5)	3.4 (4.4)	3.6 (4.7)	3.5 (4.7)	3.9 (5.0)	<0.0001	

* $p<0.05$ for difference between survivors and controls for the number of visits, adjusting for socioeconomic status, urban/rural status, and comorbidity.

[†]Adjusting for socioeconomic status, urban/rural status, and comorbidity.

Table 3. Care Received for Breast Cancer Survivors and Controls

Percentage	Year 1	Year 2	Year 3	Year 4	Year 5	P-Value for Trend over Time†	P-Value for Difference in Trend over Time Between Groups†
Influenza Vaccination							
Survivors	53.2*	55.3	57.3*	58.5*	58.1*	<0.0001	0.36
Controls	63.2	55.7	62.2	62.3	66.2	<0.0001	
Cholesterol Screening							
Survivors	31.6*	31.8*	31.8*	33.4*	32.6*	0.07	0.26
Controls	39.3	40.7	41.5	39.7	41.8	0.63	
Colorectal Cancer Screening							
Survivors	30.4*	29.3*	29.4*	27.4*	22.8*	<0.0001	0.14
Controls	37.1	36.0	32.9	31.1	27.8	<0.0001	
Bone Densitometry							
Survivors	15.3*	14.4*	14.7*	14.8*	16.5*	0.12	0.96
Controls	16.4	17.3	17.0	18.6	18.4	0.10	
Mammograms							
Survivors	79.9*	77.7*	74.6*	69.9*	64.2*	<0.0001	0.35
Controls	64.3	65.6	62.9	60.1	54.5	<0.0001	

* $p < 0.05$ for difference between survivors and controls for the percentage receiving the service, adjusting for socioeconomic status, urban/rural status, comorbidity, and total number of visits.

†Adjusting for socioeconomic status, urban/rural status, comorbidity, and total number of visits.

both $p < 0.0001$ for change over time). Survivor visits to PCPs increased less quickly than controls ($p = 0.003$), but the change in other physician visits did not differ between groups. The most frequently visited other physician specialties were cardiology, ophthalmology, and orthopedic surgery.

Survivors were less likely than controls to get each preventive service each year (except for influenza vaccination in Year 2) but were more likely to get mammograms (all $p < 0.05$) (Table 3). Influenza vaccination increased over time (53% to 58% for survivors; 63% to 66% for controls); colorectal cancer screening decreased over time (30% to 23% for survivors; 37% to 28% for controls); and mammography decreased over time (80% to 64% for survivors; 64% to 55% for controls) (all $p < 0.0001$). There were no changes over time in cholesterol screening or bone densitometry for survivors or controls. The rates of change over time in care receipt did not differ between survivors and controls.

Over time, survivors were less likely to be followed by both a PCP and oncology specialist or an oncology specialist only and more likely to be followed by a PCP only or neither ($p < 0.0001$) (Table 4). In Year 1, 57% of survivors were followed by both and 14% by an oncology specialist only, but by Year 5, only 36% of survivors were being followed by both and 10% by an oncology specialist only. In contrast, survivors with visits to a PCP only increased from 23% in Year 1 to 42% in Year 5, and survivors with visits to neither doubled from 6% to 12%.

Table 4. Physician Mix Visited Each Year for Five Years for Breast Cancer Survivors*

Percentage	Year 1	Year 2	Year 3	Year 4	Year 5
Both PCP and Oncologist	56.8	51.4	45.5	40.8	35.9
PCP Only	22.9	28.1	33.7	37.9	42.1
Oncologist Only	14.1	11.5	10.7	11.2	9.6
Neither PCP nor Oncologist	6.2	9.1	10.2	10.2	12.4

PCP: Primary Care Provider

* p -value for trend over time: < 0.0001

In unadjusted analyses combining the data from Years 1-5, survivors with visits to both were most likely to receive each service (Table 5). After adjusting for clinical and socio-demographic factors, survivors who were followed by both continued to be most likely to receive each care service ($p < 0.05$), although the differences with PCP only were not statistically significant for colorectal cancer screening (odds ratio(OR): 0.89; 95% confidence interval (CI): 0.78-1.02) or bone densitometry (OR: 0.95; 95% CI: 0.83-1.10), and the difference with oncology specialist only was not significant for mammograms (OR: 0.90; 95% CI: 0.72-1.12) (Table 6). Survivors followed by PCP only were more likely to receive all five services compared to those followed by neither. Compared to survivors followed by neither, survivors followed by an oncology specialist only were more likely to receive colorectal cancer screening (OR: 0.70 vs. 0.51) and mammograms (OR: 0.90 vs. 0.22). Survivors followed by a PCP only were more likely to receive colorectal cancer screening than those followed by an oncology specialist only (OR: 0.89 vs. 0.70), but survivors followed by an oncology specialist only were more likely to have mammograms versus those followed by a PCP only (OR: 0.90 vs. 0.32).

Table 5. Care Received by Physician Mix Seen: Years 1-5 Combined (Breast Cancer Survivors Only)

Percentage	Both PCP and Oncologist (n=4517)	PCP Only (n=3228)	Oncologist Only (n=1118)	Neither PCP nor Oncologist (n=942)
Influenza Vaccination	62.1	56.4	47.6	40.8
Cholesterol Screening	37.5	30.6	26.4	19.8
Colorectal Cancer Screening	33.8	25.9	21.5	13.7
Bone Densitometry	17.7	14.1	12.5	9.6
Mammograms	85.6	60.7	81.5	47.6

PCP: Primary Care Provider

Table 6. Adjusted* Odds Ratios (95% Confidence Intervals) for Care Receipt (Breast Cancer Survivors Only)

	Influenza Vaccination	Cholesterol Screening	Colorectal Cancer Screening	Bone Densitometry	Mammograms
Both	—	—	—	—	—
PCP Only	0.82 (0.72-0.95) ‡	0.85 (0.74-0.99) ‡	0.89 (0.78-1.02) † ‡	0.95 (0.83-1.10) ‡	0.32 (0.28-0.38) ‡
Oncologist Only	0.69 (0.58-0.84)	0.80 (0.65-0.98)	0.70 (0.57-0.86) ^	0.79 (0.63-0.98)	0.90 (0.72-1.12) † ^
Neither	0.56 (0.45-0.70)	0.65 (0.50-0.84)	0.51 (0.39-0.67)	0.72 (0.55-0.94)	0.22 (0.17-0.28)
0-4 Total Visits	—	—	—	—	—
5-7 Total Visits	1.33 (1.16-1.53)	1.45 (1.24-1.69)	1.50 (1.28-1.75)	1.23 (1.03-1.47)	1.47 (1.27-1.71)
8-12 Total Visits	1.50 (1.29-1.75)	1.82 (1.54-2.14)	1.73 (1.47-2.04)	1.46 (1.22-1.75)	1.44 (1.22-1.69)
13 + Total Visits	1.76 (1.47-2.10)	2.09 (1.74-2.51)	2.11 (1.77-2.52)	1.57 (1.31-1.89)	1.48 (1.23-1.78)
Year of Follow-Up	1.08 (1.05-1.11)	1.04 (1.01-1.07)	0.93 (0.90-0.96)	1.03 (0.99-1.07)	0.87 (0.84-0.89)
Age	1.00 (0.99-1.02)	0.98 (0.96-0.99)	0.96 (0.95-0.97)	0.95 (0.94-0.96)	0.95 (0.94-0.96)
White	—	—	—	—	—
Black	0.45 (0.32-0.64)	0.86 (0.60-1.22)	0.70 (0.48-1.01)	0.28 (0.16-0.46)	0.46 (0.32-0.66)
Other	0.84 (0.52-1.37)	1.06 (0.63-1.79)	1.49 (0.96-2.30)	1.40 (0.92-1.12)	0.85 (0.47-1.51)
Stage 1	—	—	—	—	—
Stage 2	0.77 (0.66-0.90)	0.80 (0.68-0.93)	0.79 (0.69-0.91)	0.89 (0.77-1.03)	0.79 (0.68-0.92)
Stage 3	0.63 (0.37-1.04)	0.94 (0.56-1.58)	0.39 (0.20-0.75)	0.95 (0.60-1.50)	0.48 (0.29-0.79)
0 Comorbidities	—	—	—	—	—
1 Comorbidity	1.06 (0.88-1.27)	1.06 (0.89-1.27)	0.90 (0.77-1.06)	0.80 (0.68-0.93)	0.79 (0.66-0.94)
2+ Comorbidities	1.20 (0.91-1.58)	1.70 (1.25-2.30)	0.56 (0.40-0.77)	0.84 (0.63-1.12)	0.72 (0.54-0.96)
Socioeconomic Status	1.09 (1.04-1.16)	1.00 (0.95-1.05)	1.10 (1.05-1.15)	1.07 (1.02-1.12)	1.01 (0.96-1.06)
Rural	—	—	—	—	—
Urban	1.13 (0.84-1.52)	0.74 (0.54-1.03)	1.05 (0.80-1.39)	1.22 (0.89-1.66)	1.06 (0.76-1.46)

PCP: Primary Care Provider

* Also adjusted for SEER registry site

—: Reference Category

BOLD: $p < 0.05$ vs. Reference Category† $p < 0.05$ PCP Only vs. Oncology Specialist Only‡ $p < 0.05$ PCP Only vs. Neither^ $p < 0.05$ Oncology Specialist Only vs. Neither

DISCUSSION

In this study, we examined patterns of physician visits and care receipt for breast cancer survivors versus non-cancer controls and whether survivors' care receipt was associated with the physician mix visited. We found that, over time, survivors see their oncology providers less and their PCPs and other physicians more. Accompanying the decrease in oncology specialist involvement was a decrease in both colorectal cancer screening and mammography for survivors. However, controls' rates of these services decreased at an equal rate as survivors. In fact, there were no differences in changes over time in care receipt between survivors and controls, so survivors were less likely than controls to receive each preventive service each year (except influenza vaccination in Year 2). Survivors, as expected, were more likely to get mammograms. Because survivors of stage 3 disease may have different projected benefits from these health services, we conducted a sensitivity analysis excluding stage 3 survivors, but the conclusions did not change. Similar to previous research, we found that survivors who visited both a PCP and oncology specialist were most likely to receive appropriate care.^{6,10,16}

That we found consistent statistically significant differences between survivors and controls is due in part to the sample size. However, even small differences are important to the large population affected. Comparing the Year 5 rates for our survivors

to the rates of survivors in the Earle et al¹⁰ study, our survivors were less likely to receive influenza vaccination (58% vs. 65%), cholesterol screening (33% vs. 48%) and mammography (64% vs. 74%) but more likely to get colorectal cancer screening (23% vs. 17%) and bone densitometry (17% vs. 8%). Importantly, Earle et al¹⁰ used a two-year window for care receipt, while we used only one-year. Because the usefulness of certain services annually is debatable, we would not necessarily expect to see high rates of each service each year. Consequently, our analyses focused primarily on comparing rates between survivors and controls and trends over time.

While we found differences in care between survivors and controls in the first five years of survivorship, Earle et al¹⁰ did not find differences between five-year survivors and controls in their cross-sectional study. In their study, survivors were more likely than controls to receive appropriate care overall. However, when controls were limited to those who had had a mammogram in the year the case was diagnosed, survivors were less likely to have a cervical exam and more likely to have mammography than controls. Controls in our study had to have had a mammogram in the year the survivor was diagnosed because prior screening practices may influence future screening practices, and we know that our survivors each had a mammogram. However, it is important to note that survivors' mammograms may not have been for screening purposes, so requiring our controls to have

had a mammogram provides a "worst case" estimate of how cases compare to controls.

The findings from this study are similar to those from previous research in colorectal cancer using the same design (but no control group).⁵ In both studies, we found that, over time, oncology specialists are less involved in care, survivors rely exclusively on their PCP more often, and cancer screening decreases. Adding the control group in this study is useful because we found that the decreases in cancer screening are also occurring among non-cancer controls. Whether these decreases in cancer screening are appropriate for either the survivor or control groups is an interesting question.

Our study benefits from the use of the SEER-Medicare dataset. The SEER registries provide population-based case ascertainment with rigorous quality control and inclusion of nearly all cases from the SEER regions. Linking SEER cancer data with Medicare claims provides a powerful combination of clinical and health services utilization data. However, the reliance on claims data also has limitations. For example, we have no record as to why care was not provided, and our study only included Medicare recipients in the fee-for-service program who are 65 or older. The database does not include care that was provided but not billed to Medicare. Further, our sample had limited inclusion of minorities. SEER added four more registries in 2000 to expand its coverage of minority populations, but our cohort of survivors was diagnosed in 1998.

Despite these limitations, the study's findings have important implications. First, improved coordination between PCPs and oncology specialists in delivering follow-up care is needed. While this study did not examine care by particular oncology specialists and PCPs, it found that survivors followed by both PCPs and oncology specialists were consistently more likely to receive appropriate care. ASCO's treatment summary and survivorship care plan templates may help facilitate communication across providers;⁴ however, additional interventions are likely needed. It may be appropriate to allow individual oncology specialists and PCPs to determine who is best suited to follow-up a particular breast cancer survivor. Alternatively, formalized treatment protocols that specify what services oncology specialists should provide and what services PCPs should provide may be required. Care coordination may be facilitated by cancer specialists and PCPs practicing in multi-specialty groups. Research on the most efficient approach to follow-up care could help inform these policy decisions.

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