Predictors of Long-Term Outcomes in Older Breast Cancer Survivors: Perceptions Versus Patterns of Care

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Purpose: **There are few data on sequelae of breast cancer treatments in older women. We evaluated posttreatment quality of life and satisfaction in a national population.**

Patients and Methods: **Telephone surveys were conducted with a random cross-sectional sample of 1,812 Medicare beneficiaries 67 years of age and older who were 3, 4, and 5 years posttreatment for stage I and II breast cancer. Regression models were used to estimate the adjusted risk of decrements in physical and mental health functioning by treatment. In a subset of women (n = 732), additional data were used to examine arm problems, impact of cancer, and satisfaction, controlling for baseline health, perceptions of ageism and racism, demographic and clinical factors, region, and surgery year.**

Results: **Use of axillary dissection was the only surgical treatment that affected outcomes, increasing the risk of arm problems four-fold (95% confidence interval, 1.56 to 10.51), controlling for other factors. Having arm problems, in turn, exerted a consistently negative independent effect on all outcomes ($P \leq .001$). Processes of care were also associated with quality of life and satisfaction. For example, women who perceived high levels of ageism or felt that they had no choice of treatment reported significantly more bodily pain, lower mental health scores, and less general satisfaction. These same factors, as well as high perceived racism, were significantly associated with diminished satisfaction with the medical care system.**

Conclusion: **With the exception of axillary dissection, the processes of care, and not the therapy itself, are the most important determinants of long-term quality of life in older women.**

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BREAST CANCER IS largely a disease of old age.[1] Older women, who account for more than half of the new cases of breast cancer each year,[2] are the fastest growing segment of the United States population.[3] Therefore, during the coming decades, older women will account for an increasing absolute number of new cases and survivors.[4] These older breast cancer survivors are likely to be a physiologically, socially, and racially heterogeneous group with multiple comorbid conditions.[5,6] At present, treatment for this growing diverse population is variable and represents evolving paradigms.[7-11] Decisions about optimal treatment patterns will ultimately depend on trial data about efficacy and women's treatment preferences.

There are currently scant data on the long-term sequelae of different breast cancer treatments to guide older women who are facing these important decisions.[12] The goal of this study was to describe the long-term impact of primary surgical and adjuvant therapy on future quality of life and satisfaction in a random cross-sectional sample of Medicare beneficiaries 3, 4, and 5 years posttreatment for stages I and II breast cancer. We use data from 1,812 survivors to test the following hypotheses: (1) women receiving breast conservation therapy will have better posttreatment physical and mental health than women having mastectomy, controlling for covariates; (2) women who have axillary node dissection will be at moderate risk for long-term impairment of arm motion, and such limitations will, in turn, lead to lower physical functioning after considering age and prediagnosis health; and (3) satisfaction with breast cancer care is associated with perceptions of the processes of care, rather than actual treatment.

PATIENTS AND METHODS

This study uses data collected as part of the breast cancer Outcomes and Preferences for Treatment in Older Women Nationwide Study (OPTIONS) project.

Population and Sampling

After institutional review board and United States Health Care Financing Administration (HCFA) approval were obtained, Medicare data were obtained from HCFA (renamed The Centers for Medicare and Medicaid Services [CMS]) to identify women undergoing initial treatment for breast cancer in 1992, 1993, and 1994. The sample selection has been described in detail elsewhere.[13] Briefly, a random sample of women with codes for breast cancer and breast procedures noted in the HCFA 5% file were selected. Because this sample included only approximately 6% black women, we oversampled black women. The sample was limited to women receiving care in fee-for-service settings, because Medicare does not have claims from capitated health plans.

Following algorithms used by other researchers to identify breast cancer cases from claims data,[14,15] we first excluded women whose claims indicated prior breast cancer (ie, women with recurrences or second primaries; 4.5%), carcinoma-in-situ without invasive disease (3.0%), metastatic disease (0.6%), bilateral breast procedures (0.1%), or breast cancer without a surgical

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procedure code (4.0%). We also excluded women for whom breast surgery (16.2%) or diagnosis (13.9%) were not the primary procedure codes and women younger than 67 years (14.2%). The lower age limit was selected to have available up to 2 years of prior Medicare claims to measure comorbidity. Finally, we excluded women whose claims were missing a physician identifier (1.7%) or physician provider number (5.5%).

To focus on outcomes in clinical situations where the efficacy of breast conservation and radiation or mastectomy would be considered equivalent,[7] we limited eligibility to women with newly diagnosed, unilateral, histologically confirmed stage I or II breast cancer (corresponding to T1 or T2; N0, N1, or Nx; M0). We contacted surgeons to review their records to determine stage (which is not available from claims) and confirm diagnoses of primary breast cancer. Women with distant stages, isolated in situ disease, bilateral cancer, or multicentricity were excluded. We conducted a mail survey (two mailings with telephone follow-up) of surgical providers: 80.7% provided information for 8,978 patients; 10.6% were unable to supply the information, and only 8.7% refused. From the surgeons' reviews of their medical records, 3,851 women were eligible.

Between September 1997 and May 1998, women were contacted to assess posttreatment quality of life. Among the 3,851 women, a random sample of 855 (22%) were not contacted at all because of budget constraints and 895 (23%) were deceased (more black women had died than white women: 24.2% *v* 13.6%, respectively; $P < .001$). Among the remaining sample of 2,101 surviving women who were contacted, 1,812 (86%) consented. There was no difference in consent rates by race (78.4% for black patients and 82.3% for white patients; $P = .14$) or years since surgery (not shown), and nonparticipants were similar in region, stage, and health, but tended to be older (74.2 *v* 73.3 years; $P = .07$) than participants. Consenting women were sent a letter from HCFA introducing the study, followed by letters from the OPTIONS team explaining the project and outlining the nature of the interview. Trained multiracial staff contacted women for the 30-minute structured, computer-assisted, English-language telephone interview.

Data Sources and Variable Definition

Most variables were derived from the telephone interview by a staff of professional, trained interviewers using a computer-assisted telephone interviewing structured interview. All basic variables and physical and mental health outcomes were measured for the entire sample (n = 1,812). In addition, women diagnosed in 1994 underwent a more in-depth exploration of additional outcomes (arm problems, satisfaction, impact) and predictors (eg, perceptions of ageism and racism). The Medicare claims history file, which contains all inpatient and outpatient claims, was used to define treatment and measure prediagnosis health. The 1990 Census File and 1993 and 1995 data from the Area Resource File[16] were used to characterize areas of residence (urban or rural).

Definition of Variables

We examined several domains of patient-reported symptoms and quality of life: arm functioning, overall physical and mental functioning, role and social functioning, vitality, general health, general satisfaction and satisfaction with the medical care system, and holistic impact of breast cancer on women's lives. Difficulties with arm functioning were defined as having either swelling in the arm on the side of surgery, loss of arm movement on the side of surgery, or limitations in the full use of hands and fingers (yes or no).

Physical functioning was summarized using the physical components summary score from the Medical Outcomes Study (MOS) SF12.[17] This score summarizes items related to physical function and the impact of physical limitations on work or other usual activities, social relationships, and mental health. The summary values yield standardized scores with a population mean of 50 and SD of 10, in which higher scores reflect better function. Mental functioning was measured using the mental health components summary scale, which is scored in the same manner as the physical components summary, and includes emotional state (eg, feeling depressed, anxious, or worn out), and limitations in work activities or social relationships as a result of emotional problems. All scales had excellent reliability in our population (Cronbach's alpha > 0.90).

Social and role function, vitality, and general health were also examined using the individual scales from the MOS SF 36.[18] General satisfaction was measured using a one-item Likert scale question, "Overall, how satisfied are you with your breast cancer care?" (categorized as very satisfied *v* other). Satisfaction with medical care was measured using the 18-item MOS Patient Satisfaction Questions scale (Cronbach's alpha = 0.91). The holistic impact of breast cancer was assessed using responses to the single item, "Considering your overall health, how would you rate the impact of breast cancer on your life?"

Predictor Variables

The primary predictor of outcome was initial treatment. Briefly, women who had a mastectomy less than 6 months after breast conservation were classified as having received mastectomy (eg, includes women undergoing breast conservation with positive margins requiring mastectomy). Breast-conserving procedures included excisional biopsy (with no follow-up procedures), lumpectomy, partial or segmental mastectomy, tylectomy, quadrantectomy, and wedge resection. Women who received breast conservation were classified as having radiation if they had more than two claims for radiation in the period from 3 months before to 6 months after the date of surgery. Use of axillary node dissection after breast conservation was defined as having any claims for axillary procedures within the 3 months after breast conservation.[7,16,19] Because a small proportion of women received simple mastectomy ($< 6\%$), it was assumed that all women having a mastectomy had some degree of axillary dissection. The dates of surgery (1992 to 1994) predated use of sentinel node biopsy. Chemotherapy use was defined as having any chemotherapy procedures or drugs specific to breast cancer within the 3 months before or 6 months after the date of surgery. Data on tamoxifen use were not included in HCFA files but were obtained from the interviews. We compared self-reported therapy to treatment as coded from the Medicare claims data in a subset of the surviving women. The concordance between surgical, radiation, and chemotherapy was high (96.5% to 98.8%).

Controlling Variables

The factors that were postulated to effect the relationship between treatment and subsequent quality-of-life outcomes included clinical factors, baseline comorbidity, and among the subsample of women treated in 1994, perceptions of ageism and racism in the health care system and reporting having a choice of therapy. Clinical status at the time of treatment was defined by pathologic summary stage (or, if unavailable, clinical staging). Because there were few women with stage IIb disease, stage was collapsed into two categories for analysis: stage I versus II. We also queried women about recurrences of their cancer (yes or no). We did not have data on estrogen receptor status or other tumor makers. Comorbidity was measured using the Charlson index[20] using claims for the period from 2 months to 2 years before surgery.[21,22] We also considered arthritis (yes or no) separately as a comorbidity that could affect physical function and axillary dissection results. Using supplemental funding, perceptions of racism and ageism were evaluated in the 1994 sample using previously developed scales (Cronbach's alpha of 0.76 and 0.72, respectively).[23,24] Perception of having a treatment choice was assessed in a yes or no format.

We also measured age (as a continuous variable), race (black *v* other; there were $< 4\%$ nonwhite in other), education ($<$ high school *v* $\geq$ high school), and insurance (beyond Medicare). Because having supplemental or Medicaid insurance (in addition to Medicare) was not related to any outcomes, it was not included in subsequent models. Social support was measured using questions from the MOS scale. The year of initial surgery was 1992, 1993, or 1994. Data from the Area Resource File were used to classify the county where a woman lived along an urban or rural continuum (where zero was the most sparse area and nine the most populous).[25] Finally, geographic region was included to control for the effects of unobserved factors that could influence practice and outcomes.

Statistical Analysis

χ^2 and *t* tests were first used to evaluate bivariate relationships between outcomes and treatment and covariates. Linear regression models were then constructed for each continuous outcome (physical and mental health scales, impact, satisfaction with medical care); logistic regression was used for categorical outcomes (arm problems, yes or no). All variables were entered

Table 1. Demographic Characteristics of Breast Cancer Survivors (N = 1,812)

Measure	Total Sample (N = 1,812)		1992		1993		1994	
	No.	%	No.	%	No.	%	No.	%
Age, years								
Mean		72.8		71.9		72.8		73.3
SD		5.45		5.45		5.44		5.4
Ethnicity								
White	1430	78.9	528	95.7	497	93.6	401	54.8
Black	382	21.1	24	4.4	34	6.4	331	45.2
Education								
High school	1163	64.2	324	58.7	330	62.1	508	69.4
≤ High school	649	35.8	228	41.3	201	37.9	224	30.6
High school graduate								
%		67.4		68.0		68.1		66.3
SD		7.18		6.55		7.33		7.4
Income, $ per month								
<500	129	7.1	28	5.1	30	5.7	70	9.6
500–999	482	26.6	153	27.7	124	23.3	205	28.0
1,000–1,999	451	24.9	143	25.9	129	24.3	180	24.6
2,000+	329	18.2	99	17.9	96	18.1	135	18.4
Don't know	421	23.2	129	23.4	152	28.6	142	19.4
Elderly living below poverty								
%		12.2		11.3		11.8		13.3
SD		6.0		5.32		5.73		6.7
Marital status								
Married	976	53.9	266	48.2	266	50.1	290	39.6
Single	836	46.1	286	51.8	265	49.9	442	60.4
Stage								
I	1109	61.2	356	64.5	346	65.2	417	43.0
II	703	38.8	196	35.5	185	34.8	315	57.0
Treatment								
MST	1184	65.3	358	64.9	318	59.9	506	69.1
BCSRT	475	26.2	130	23.5	173	32.6	171	23.4
BCSO	153	8.4	64	11.6	40	7.5	55	7.5
Axillary node dissection								
No	207	11.4%	59	10.7%	70	13.2%	82	11.2%
Yes	1605	88.6	493	89.3	461	86.8	650	88.8
Arm problem								
No	1743	96.2	529	95.8	512	96.4	585	79.9
Yes	69	3.8	23	4.2	19	3.6	147	20.1
Arthritis								
No	1232	68.0	421	76.3	366	68.9	452	61.8
Yes	580	32.0	131	23.7	165	31.1	280	38.3
Charlson Index		0.90		0.67		0.85		1.11
SD		1.39		1.20		1.30		1.5
Recurrence								
No	1746	96.4	524	94.9	512	96.4	709	96.9
Yes	66	3.6	28	5.1	19	3.6	23	3.1

Abbreviations: MST, mastectomy; BCSRT, breast-conserving surgery and radiotherapy; BCSO, breast-conserving surgery only.

into the models. Sociodemographic and clinical variables were retained in the final models, but to obtain parsimonious models, other variables were only retained if they were statistically significant in one or more models. Model fit was assessed by the R^2 value.[26]

RESULTS

The majority of women received mastectomy (65.3%), and few (3.6%) reported recurrence of disease (Table 1). Black women had lower socioeconomic status and were diagnosed with stage II disease more often than white women (not shown).

Does Treatment Affect Quality of Life?

Contrary to our hypothesis, adjusted summary physical or mental function, physical or emotional role function, general health, or vitality scores were not significantly different by treatment group (Tables 2, 3, 4, and 5). Receipt of chemotherapy (yes *v* no) was not related to any long-term outcomes except for having a perception that breast cancer had a greater effect on one's life ($P = .03$) (Table 5).

How Does Axillary Dissection Affect Outcomes?

For all women, axillary dissection was the only treatment modality that affected outcomes (Table 3). Women who received axillary surgery had a risk of long-term arm problems that was four times (95% confidence interval [CI], 1.56 to 10.51) higher than women without this treatment, adjusting for other factors. Having posttreatment arm problems in turn exerted a consis-

Table 2. Adjusted* Cross-Sectional Health-Related Quality-of-Life Scores 3 to 5 Years Posttreatment Among a Random Sample of Medicare Beneficiaries With Stage I/II Breast Cancer by Treatment (N = 1,812)

Domain	Total	Treatment		
		BCSRT (n = 475)	MST (n = 1184)	BCSO (n = 153)
Physical function summary score, mean ± SD†	42.99 ± 4.69	44.50 ± 4.54	42.83 ± 4.7	41.93 ± 4.87
Subscales, mean ± SD				
Physical function	66.13 ± 10.42	67.56 ± 9.87	66.03 ± 10.47	62.44 ± 10.47
Role physical	63.27 ± 11.82	64.18 ± 11.27	63.30 ± 11.94	63.30 ± 11.94
Bodily pain	69.17 ± 7.49	69.36 ± 7.35	69.51 ± 7.45	66.00 ± 2.56
General health	61.62 ± 8.46	64.12 ± 8.26	60.93 ± 8.27	59.18 ± 8.88
Mental function summary score, mean ± SD‡	53.58 ± 0.73	53.59 ± 0.66	53.58 ± 0.76	53.32 ± 0.71
Subscales, mean ± SD				
Mental health	72.04 ± 2.30	72.63 ± 5.81	72.15 ± 5.95	69.29 ± 6.23**
Role emotional	83.11 ± 7.03	83.93 ± 6.67	83.21 ± 7.66	79.84 ± 6.97
Vitality	59.86 ± 6.01	60.23 ± 2.06	60.10 ± 2.16	56.86 ± 2.15
Arm problems§				
Yes				
No	0.20 ± 0.08	0.20 ± 0.09	0.20 ± 0.07	0.24 ± 0.12
Impact, mean ± SD‖	0.57 ± 0.15	0.64 ± 0.13	0.55 ± 0.15††	0.51 ± 0.17
Overall satisfaction¶	0.76 ± 0.16	0.80 ± 0.15	0.75 ± 0.16	0.69 ± 0.17
Satisfaction with medical care#	68.72 ± 3.97	69.43 ± 3.86	68.56 ± 3.98	67.90 ± 3.91

Abbreviations: BCSRT, breast-conserving surgery and radiation; MST, mastectomy; BCSO, breast-conserving surgery only.

*Adjusted for age in linear and logistic regression analyses.

†Physical function values are based on the physical components summary score from the SF36. Scores range from zero to 100, with 100 being the best function. Population norms for women ≥ 65 are 50 ± 20 (two SDs).[17]

‡Mental function values are based on the mental components summary score from the SF36. Scores range from zero to 100, with 100 being the best function. Population norms for women ≥ 65 are 50 ± 20 (two SDs).[17]

§Arm problems are defined as having either swelling in the arm on the side of surgery, loss of arm movement on the side of surgery, or limitations in the full use of hands and fingers (yes/no). This domain was only measured in the 732 women interviewed in 1994, 3 years posttreatment.

‖Impact is defined by responses to the question, "Considering your overall health, how would you rate the impact of breast cancer on your life?" Responses range from 1 (least impact) to 4 (most impact). This domain was only measured in the 732 women interviewed in 1994, 3 years posttreatment.

¶This domain was only measured in the 732 women interviewed in 1994, 3 years posttreatment.

#This domain was only measured in the 732 women interviewed in 1994, 3 years posttreatment.

**Significance < .05 (BCSRT was the reference group).

††Significance < .1 (BCSRT was the reference group).

tently negative influence on all domains (impact, satisfaction, satisfaction with care, physical function, physical role function, bodily pain, vitality, general health, emotional function, and emotional role function [$P = <.001$]), controlling for other covariates (Tables 3, 4, and 5).

Does the Past Predict the Future?

Arthritis and women's general premorbid level of illness were consistent significant predictors of all posttreatment physical functioning domains, independent of age and other factors (Table 3). The best-educated women consistently reported better physical outcomes (Table 3) but felt that breast cancer had a greater impact on their lives than did their less-educated counterparts (Table 5). The oldest women rated breast cancer as having less of an impact on their lives than younger women (Table 5).

What Predicts Long-Term Satisfaction?

As postulated, overall long-term satisfaction and satisfaction with health care were largely independent of the actual treatment received, whereas measures of the perceived processes of care were associated with satisfaction (Table 5). For example, women who perceived high levels of ageism (*v* lower levels) in the health care system ($P = .003$) or felt that they had no choice of treatment (*v* those with a choice) ($P = .0001$) reported significantly less general satisfaction, more bodily pain, and lower mental health scale scores. There was also a tendency for women who perceived more racism to be less satisfied ($P = .08$). Experiences outside the health care system, such as having less social support, were also associated with being less satisfied ($P = .04$). These same factors plus perceived racism significantly diminished satisfaction with the medical care system after considering treatment and other factors.

DISCUSSION

This is one of the first studies of long-term breast cancer outcomes in a national sample of Medicare beneficiaries with stage I and II disease. We found that with the exception of axillary dissection, treatment itself did not affect outcomes, whereas the processes of care, particularly having a choice of treatments and perceptions of care on the basis of age and race, were associated with better long-term general physical and mental function, impact of breast cancer, and satisfaction.

In our prior research with a convenience cohort of older women, we observed that having a choice of therapy increased women's short-term self-rated health.[27] Other investigators have also noted that women who share in the decision-making process are more likely to report being satisfied, have better posttreatment adjustment to cancer,[28-32] and have improved functional status and disease control[33-36] than women who feel that they did not participate. Our current results confirm and extend these results in a large, nationally representative population sample of

Table 3. Adjusted Estimates of the Effects of Treatment and Other Variables on 3-, 4-, and 5-Year Physical Outcomes in a Random Sample of Medicare Beneficiaries With Stage I and II Breast Cancer (N = 1,812)

Variable	Arm Problems		Physical Component Score, Regression Coefficient ± SE	Physical Function Subscale Score, Regression Coefficient ± SE	Role Physical Subscale Score, Regression Coefficient ± SE	Bodily Pain Subscale Score, Regression Coefficient ± SE	General Health Subscale Score, Regression Coefficient ± SE
	OR	95% CI					
Age	1.04	1.01 to 1.08†	−.180 ± .056*	−.586 ± .12†	−.594 ± .164†	.127 ± .117	−.136 ± .127
Ethnicity, black versus white	1.26	.83 to 1.91	.310 ± .79	−.097 ± 1.72	1.84 ± 2.35	.394 ± 1.68	.646 ± 1.81
Education, ≥ high school versus high school	.95	.628 to 1.44	2.54 ± .613†	5.89 ± 1.34†	5.84 ± 1.84†	2.90 ± 1.31‡	8.37 ± 1.42†
Stage, II versus I	1.12	.753 to 1.67	−1.37 ± .616‡	−3.11 ± 1.34‡	−1.11 ± 1.84	−1.62 ± 1.31	−3.40 ± 1.42‡
Treatment							
MST versus BCSRT	1.30	.804 to 2.10	.286 ± .686	1.09 ± 1.51	1.34 ± 2.06	.523 ± 1.47	−1.11 ± 1.59
BCSO versus BCSRT	.59	.257 to 1.37	−.509 ± 1.15	−2.34 ± 2.51	−1.46 ± 3.43	−2.92 ± 2.45	−2.70 ± 2.65
Axillary dissection, yes versus no	.34	.144 to .783†	—	—	—	—	—
Chemotherapy, yes versus no	.77	.399 to 1.47	1.97 ± 1.13	4.19 ± 2.47	2.29 ± 3.37	2.04 ± 2.41	3.03 ± 2.60
Arm problem, yes versus no	—	−8.43 ± 1.51†	−19.9 ± 3.28†	−31.0 ± 4.49†	−14.0 ± 3.21†	−9.62 ± 3.47†	
Arthritis, yes versus no	.74	.497 to 1.10	−5.33 ± .639†	−9.94 ± 1.39†	−10.4 ± 1.91†	−11.4 ± 1.36†	−6.71 ± 1.47†
Charlson index	.89	.792 to 1.01	−1.44 ± .215†	−3.00 ± .469†	−3.06 ± .641†	−1.77 ± .458†	−3.26 ± .495†
Recurrence, yes versus no	.38	.155 to .952†	−3.48 ± 1.58†	−8.09 ± 3.36	−16.6 ± 4.60†	−2.95 ± 3.29	−7.83 ± 3.55
Region							
Atlantic	.47	.131 to 1.68	−.325 ± 1.42	−1.74 ± 3.05	−2.40 ± 4.18	−4.73 ± 2.98	−2.43 ± 3.23
Central	.36	.103 to 1.29	−2.42 ± 1.41	−4.93 ± 3.05	−6.73 ± 4.16	−8.07 ± 2.97	−3.54 ± 3.22
Mountain	.42	.086 to 2.11	−.851 ± 1.85	.526 ± 4.01	−4.30 ± 5.49	−3.97 ± 3.92	−.508 ± 4.24
Pacific	.36	.089 to 1.47	−.656 ± 1.64	.164 ± 3.55	−3.49 ± 4.85	−7.06 ± 3.47	−1.26 ± 3.75
Urbanicity	.97	.865 to 1.08	.223 ± .170	.748 ± .370	.889 ± .507	−.507 ± .362	.426 ± .392
Months between surgery and review	.99	.953 to 1.04	−.029 ± .030	−.044 ± .065	.056 ± .089	−.074 ± .064	−.055 ± .069
R^2	*C* statistic	.65	13.6%	13.4%	9.6%	7.7%	8.4%

Abbreviations: OR, odds ratio; CI, confidence interval; MST, mastectomy; BCSRT, breast-conserving surgery and radiation; BCSO, breast-conserving surgery only.

*Estimates based on linear and logistic models controlling for all variables in table.

†Significance < .001.

‡Significance < .05.

older breast cancer patients. Recently, Keating et al[37] demonstrated that the concordance between desired and actual decision making was more important than the actual process itself. We have no data to address this issue, but it is worthy of further patient preference research.

We also found that other dimensions of women's interactions with their care providers, such as perceptions of age- and race-related attitudes, were negatively associated with satisfaction with medical care. Perceptions of ageism were also negatively correlated with general, physical, and mental health and satisfaction. Perceptions of racism, but not race per se, were also associated with lower long-term satisfaction, suggesting that some black women may be having a different experience in receiving care for their disease than white women. This will be an important area for future exploration of persistent race-linked disparities in cancer outcomes. Unfortunately, given our cross-sectional design, we cannot assess the mechanisms of action or causality of these processes and outcomes. Prospective research evaluating beliefs at the time of surgery and then linked to future outcomes will be necessary to confirm that perceptions of age or race bias affect outcomes.

Experiences outside of the health care system, such as having less social support, were also independently associated with being less satisfied in our study. Silliman et al[38] also found that older women with inadequate social support had poor psychosocial outcomes after breast cancer treatment.

The physical outcome domains were most strongly associated with prior health. This result is consistent with prior research demonstrating that comorbidity affects subsequent function and survival after breast cancer diagnosis.[12,39-42] In our prior work on short-term outcomes, we also noted that axillary node dissection negatively impacted physical functioning.[43] The current findings extend that work and confirm that axillary node dissection and postdissection arm problems have a persistent long-term negative impact on physical functioning. These findings are also consistent with results using other methodologies. For instance, using a decision-analytic approach, Parmigiani et al[44] noted that axillary dissection had an overall negative impact on the quality-adjusted survival of 60-year-old women. Other researchers have noted that long-term decrements in physical function can affect activities of daily living that are critical to an older woman's ability to live independently.[41,42,45,46] Thus, in a Medicare population, the risks of axillary surgery may outweigh any benefits in guiding adjuvant therapy or of more detailed knowledge of prognosis.[6,44,47-57] Final conclusions about the value of axillary dissection will rest on assessments of quality-adjusted survival on the basis of women's preferences.

Contrary to expectation, there were no differences in the outcomes we measured as a function of loss or preservation of the breast. In previous investigations, younger women reported better body image after breast conservation than women who had a mastectomy.[28] Unfortunately, we were not able to measure this domain because of time constraints. Use of adjuvant tamoxifen and/or chemotherapy was not related to the long-term outcomes we evaluated, except that the small number of women who received chemotherapy felt that breast cancer had a

Table 4. Adjusted Estimates of the Effects of Treatment and Other Variables on 3-, 4-, and 5-Year Mental Health Outcomes in a Random Sample of Medicare Beneficiaries with Stage I and II Breast Cancer*

Variable	Mental Health Component Score, Regression Coefficient ± SE	Mental Function Subscale Score, Regression Coefficient ± SE	Role Emotional Subscale Score, Regression Coefficient ± SE	Vitality Subscale Score, Regression Coefficient ± SE
Age	−.048 ± .03	.161 ± .06†	−.156 ± .14	−.189 ± .10
Ethnicity, black versus white	−.867 ± .37‡	.936 ± .87	−4.22 ± 2.0‡	3.79 ± 1.5†
Education, ≥high school versus high school	.198 ± .29	2.23 ± .68†	7.53 ± 1.5†	3.28 ± 1.1†
Stage, II versus I	−.364 ± .29	.250 ± .68	−1.53 ± 1.5	−1.95 ± 1.1
Treatment				
MST versus BCSRT	.315 ± .32	−.577 ± .76	1.52 ± 1.7	1.09 ± 1.3
BCSO versus BCSRT	−.003 ± .54	−3.52 ± 1.3†	−2.06 ± 2.9	−2.23 ± 2.1
Axillary dissection, yes versus no	—	—	—	—
Chemotherapy, yes versus no	−.802 ± .53	−.100 ± 1.3	−5.21 ± 2.8	−.344 ± 2.1
Arm problems, yes versus no	−.600 ± .71	−4.41 ± 1.7†	−13.94 ± 3.7†	−10.10 ± 2.8†
Arthritis, yes versus no	.363 ± .30	.298 ± .71	−.536 ± 1.6†	−5.13 ± 1.2†
Charlson index,	−.045 ± .10	−.475 ± .24†	−1.67 ± .53†	−2.18 ± .40†
Recurrence, yes versus no	−.248 ± .74	−2.67 ± 1.7	−6.91 ± 3.8	−7.12 ± 2.9
Region				
Atlantic	−.434 ± .66	−2.50 ± 1.6	−8.14 ± 3.5	−1.86 ± 2.6
Central	.306 ± .66	−1.56 ± 1.6	−3.60 ± 3.5	−3.14 ± 2.6
Mountain	.308 ± .87	1.09 ± 2.0	.121 ± 4.6	1.32 ± 3.4
Pacific	−.532 ± .77	−1.45 ± 1.8	−6.34 ± 4.0	2.41 ± 3.0
Urbanicity	.214 ± .08	−.263 ± .19	.631 ± .42	.717 ± .32
Months between surgery and interview	−.009 ± .01	.039 ± .03	−.020 ± .07	.037 ± .06
R^2	1.7%	2.8%	5.2%	6.6%

Abbreviations: HS, high school; BCSRT, breast-conserving surgery and radiation; MST, mastectomy; BCSO, breast-conserving surgery only.

*Estimates based on linear models controlling for all variables in table.

†Significance < .001.

‡Significance < .05.

greater impact on their lives than the majority of women who did not have chemotherapy. It is possible that women who received chemotherapy were more likely to die of their disease and were not included in the sample, possibly underestimating these effects.

Our study benefited from being able to analyze treatment outcomes in a large, national, random sample of Medicare beneficiaries with confirmed stage I and II breast cancer. Our consent rates were excellent, minimizing selection biases. Nevertheless, there are several caveats that should be noted in interpreting our results, including potential misclassification of treatment from claims, effects of uncontrolled confounding factors, sensitivity of measures, ability to draw conclusions about causality, focus on the fee-for-service sector, and potential survival biases.

Although it is possible that Medicare claims might misclassify treatment, there is no reason to believe that any misclassification was systematic with regard to future outcomes. In addition, there was high agreement between self-report and claims. Overall, in analyses linking Medicare claims to the Surveillance, Epidemiology, and End Results data, there is a high concordance between the two sources for treatment.[19]

There were a number of factors that we were unable to measure or may have captured incompletely, such as tumor characteristics, unobservable selection of women to treatments, and patient preferences. Each of these categories of variables could be related to treatment and outcomes. However, our results were quite robust across different domains, suggesting that results were not due to lack of control from important confounding variables.

We chose to use general measures of quality of life to be able to compare our cohort to populations of older women in the general United States population for cost effectiveness and other analyses. It is possible that breast cancer–specific measures may have been more sensitive to detecting small long-term treatment effects; unfortunately, we were not able to include these. In addition, as noted above, we did not measure the impact of therapy on sexual function and body image.

The evaluation of ageism, racism, and perceptions of having had a treatment choice took place during the same interview that measured outcomes. It is possible that women's scores on these scales may have been influenced by adverse quality-of-life sequelae or other experiences occurring after surgery. Alternatively, women who are not satisfied with their care for any reason may attempt to look more deeply for causes for their unhappiness compared with women who feel more satisfied. Thus, it is not possible to attribute any causal relationship between these variables and satisfaction outcomes. We also did not measure other variables that may mediate satisfaction after breast cancer treatment, such as coping style, personality, or the quality of communication with providers. However, the ageism and racism scales used in this study were reliable and seemed valid (eg, black women reported higher levels of perceived racism than did white women). The choice construct also seemed valid (eg, women with higher choice perceptions also had higher levels of social support). It will be important to conduct qualitative research to explore the prospective effects of perceived bias and shared decision making on the quality of cancer care; other factors should be carefully considered.

Table 5. Adjusted Estimates of the Effects of Treatment and Other Variables on 3-, 4-, and 5-Year Satisfaction Outcomes in a Random Sample of Medicare Beneficiaries With Stage I and II Breast Cancer* (n = 732)

Variable	General Satisfaction		Satisfaction With Medical Care, Regression Coefficient ± SE	Impact	
	OR	95% CI		OR	95% CI
Age	.99	.95 to 1.0	−.121 ± .06†	.97	.94 to 1.0
Ethnicity, black versus white	.84	.56 to 1.3	.573 ± .68	.68	.48 to .96
Perceived ageism	.87	.79 to .95†	−1.14 ± .16†	1.1	.97 to 1.1
Perceived racism	.92	.84 to 1.0	−.338 ± .15†	1.0	.95 to 1.1
Education, ≥ high school versus high school	1.2	.81 to 1.9	1.27 ± .68	2.2	1.6 to 3.2
Social support	1.0	1.0 to 1.1	.161 ± .05†	1.0	.99 to 1.0
Stage, II versus I	1.3	.86 to 1.9	.548 ± .64	1.4	.97 to 1.9
Treatment					
MST versus BCSRT	.88	.55 to 1.4	−.029 ± .75	.71	.48 to 1.1
BCSO versus BCSRT	.75	.36 to 1.6	−.028 ± 1.3	.66	.34 to 1.3
Chemotherapy, yes versus no	.70	.36 to 1.4	−1.52 ± 1.2	2.0	1.1 to 3.8
Perception of having a choice of therapy	2.8	1.9 to 4.2†	2.03 ± .70†	1.3	.88 to 1.8
Arm problems, yes versus no	.60	.39 to .93†	−3.26 ± .76†	1.9	1.2 to 2.8
Arthritis, yes versus no		—	—	1.2	.84 to 1.7
Charlson index	.94	.84 to 1.1	−.076 ± .20	.92	.83 to 1.0
Recurrence, yes versus no	.17	.06 to .47†	−1.86 ± 1.8	1.3	.48 to 3.7
Region					
Atlantic	.73	.24 to 2.2	−1.47 ± 1.7	1.0	.46 to 2.4
Central	.50	.17 to 1.5	−2.52 ± 1.7	1.0	.45 to 2.3
Mountain	2.8	.42 to 18.0	1.42 ± 2.3	1.5	.46 to 4.9
Pacific	.62	.18 to 2.2	−.718 ± 1.9	.90	.34 to 2.4
Urbanicity	.98	.88 to 1.1	.274 ± .18	1.0	.94 to 1.1
Months between surgery and interview	1.0	.96 to 1.1	−.013 ± .07	.99	.95 to 1.0
R^2	*C* statistic	.74	20%	*C* statistics	.68

Abbreviations: OR, odds ratio; CI, confidence interval; MST, mastectomy; BCSRT, breast-conserving surgery and radiation; BCSO, breast-conserving surgery only.

*Estimates based on linear and logistic models controlling for all variables on table.

†Significance < .001.

‡Significance < .05.

Another limitation involves our inability to directly attribute arm problems to axillary dissection. Although this surgery was a strong predictor of arm difficulties after treatment, other factors may also have contributed.

The sample was limited to women in Medicare's fee-for-service program. At the time of patient treatment, up to 8.1% of Medicare beneficiaries were cared for in non–fee-for-service settings.[58] Although this proportion has been increasing recently, breast cancer treatment patterns are similar for older women in managed care and fee-for-service settings.[59]

Women who died before the follow-up interview were not included in our sample. It is possible that treatment had greater effects on function in these nonsurvivors. Although it is much more likely that non–breast cancer causes accounted for the death of these women, our results should only be generalized to long-term survivors.

Overall, breast conservation and mastectomy yield equivalent survival in women of all ages with early-stage tumors.[59] This national study shows that, apart from axillary dissection, these two approaches also result in comparable long-term general physical and mental function, and that attempts to improve the quality of care should focus on improving the process and not the patterns of care for this growing population of breast cancer survivors.

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APPENDIX

The appendix is available online at www.jco.org.

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