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Comorbidities, Therapy, and Newly Diagnosed Conditions for Women with Early Stage Breast Cancer

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Abstract

Purpose—To describe comorbidities in breast cancer patients at diagnosis and examine factors associated with self-reported comorbidities 30 month post-diagnosis.

Methods—941 of 1171 women had a medical record abstract and a follow-up survey in the Health, Eating, Activity and Lifestyle Study.

Results—We compared our breast cancer cohort to a contemporaneous nationally-representative sample of age, race/ethnicity and education matched women without cancer (n=865). Breast cancer patients did not have substantially more comorbidities than women without breast cancer. Women with a hospital record of congestive heart failure significantly less often received chemotherapy or radiation following breast conserving surgery. In multivariate analysis, women who received chemotherapy alone (OR=3.2; 95% CI: 1.5–6.8), chemotherapy plus radiation (OR=1.9; 95% CI: 1.02–3.7) or radiation plus tamoxifen (OR=1.9; 95% CI: 1.1–3.2) were significantly more likely to report at least one new comorbid condition following breast cancer diagnosis than women who received no chemotherapy, tamoxifen or radiation. Overall, women who received adjuvant therapy were more likely to have new comorbidities.

Conclusions—Comorbidities were not substantially different in breast cancer patients than the non-cancer matched controls. Future research should focus on efforts to minimize comorbidities related to chemotherapy and other combination therapy.

Keywords

therapy; comorbidity; healthcare; disparities; heart disease; hypertension; diabetes

Introduction

In 2008, approximately 182,460 women will be diagnosed with breast cancer.¹ Breast cancer incidence increases with age from 1.4/100,000 for women ages 20 through 24 years to 465/100,000 for women ages 70 through 74 years. Mortality from breast cancer also increases with age, as does the presence of comorbid conditions. Several studies have shown that health conditions present at the time of cancer diagnosis influence the selection of treatment. Many researchers,^{2,3,4,5,6} although not all,⁷ have reported receipt of less aggressive therapy for older patients and those with comorbid conditions.

Increased comorbidity has been associated with higher mortality in breast cancer patients. West, et al. examined survival in a group of breast cancer patients and found an increased risk of death in those with higher Charlson comorbidity scores.⁸ In a 30-month follow-up of a cohort of breast cancer patients, those aged 75 years or older were more likely to die from their comorbid conditions than from their breast cancers.³

Few studies have examined comorbidity in breast cancer patients at more than one time point. We investigated comorbidities in a cohort of women enrolled in the Health, Eating, Activity and Lifestyle (HEAL) study funded by the National Cancer Institute. These women were diagnosed with early stage breast cancer and followed prospectively. We assessed comorbidities at breast cancer diagnosis and approximately 30 months afterward. We compared the number and type of comorbid conditions of the breast cancer patients with a matched group of women without cancer, derived from a nationally-representative sample to determine whether breast cancer patients at diagnosis have significantly more comorbidities. In addition, we investigated the influence of specific treatments on the number and types of comorbid conditions reported for the breast cancer patients. We also examined factors associated with an increase in post-diagnosis comorbidities.

Methods

Study Population

HEAL is a population-based, prospective study of 1,183 women with early stage (in situ through stage IIIB) breast cancer diagnosed between September 1996 and September 1999. Participants were selected from Surveillance Epidemiology and End Results (SEER) registries in New Mexico, Western Washington, and Los Angeles County. The aims of the study were to examine the effects of lifestyle factors, endogenous hormones, and prognostic factors on early stage breast cancer.⁹ The HEAL study was carried out with the approval of the Institutional Review Board at each participating site, in accord with an assurance filed with and approved by the U.S. Department of Health and Human Services.

Data

Data for these analyses were obtained from 1) hospital medical records abstracted for the hospitalization at the most definitive treatment of breast cancer, 2) a follow-up survey, and 3) SEER program data. Hospital records were available for 1,171 of the 1,183 participants. On average 30-months following diagnosis and 24 months from the initial contact, February 1999 through July 2001, 944 (80%) women completed the follow-up in-person interview or mailed questionnaire. A total of 941 participants had both a medical record abstract and a follow-up survey.

Comorbid Conditions

Comorbid conditions were abstracted from the medical record at the hospital location of the most definitive therapy. All conditions mentioned in the record for that hospitalization were

recorded on a standardized abstract form. For all three study sites a single Registered Health Information Technologist coded each of the comorbidities listed on the abstracts. These data were analyzed as individual conditions and also using the Charlson Comorbidity Score.¹⁰ The Charlson Comorbidity Score is composed of 19 conditions, weighted by the seriousness of each, which when present in hospitalized patients were associated with increased mortality over the following year and the next 10 years. We excluded the condition of any cancer from the Charlson Score calculation since all HEAL women had breast cancer.

At the follow-up survey, HEAL participants were asked “Has a doctor ever told you that you have (name of the specific medical condition)?” Conditions included in the survey were angina/chest pain, arthritis, bone loss/osteoporosis, chronic lung disease/emphysema/bronchitis, diabetes/high blood sugar, gallbladder disease, heart attack/myocardial infarction, heart failure or congestive heart failure, high blood pressure or hypertension, endometriosis/cystic ovaries, liver disease, kidney disease, deep vein thrombosis/blood clot in legs, pulmonary embolism/blood clot in lungs, stroke, thyroid disease, depression, bowel disease, bleeding from ulcers, peripheral vascular disease, dementia, rheumatologic disease, hemiplegia/paraplegia, AIDS and cancers other than breast cancer. Participants were then asked the age at or year in which they were first told they had the specific condition. Using the reported age or year and the date of diagnosis of breast cancer, we calculated whether each condition reported was diagnosed before or after the breast cancer diagnosis.

We compared the comorbid conditions abstracted from the hospital record to the conditions reported by the women at the follow-up survey and to those reported by women without cancer. The cancer-free women were selected from the National Health and Examination Survey, III (NHANES III fielded in 1988–1994).¹¹ We used a 1 to 1 matching (age ± 1 year; same race/ethnicity and education (less than a high school diploma, high school diploma, more than high school)) of HEAL participants to women from this national survey. This provided us with baseline prevalence estimates of comorbid conditions for a contemporaneous, nationally-representative sample of women with similar demographic characteristics, but who were cancer free.

Certain questions on the two surveys were asked differently and the hospital record used medical terminology. The term “thyroid disease” asked of HEAL participants and the NHANES sample would not be used by a physician in a medical record. Instead a clinical diagnosis would be recorded. When we compared thyroid disease reported by patients to the medical record we constructed a “thyroid disease” variable using the clinical diagnosis of hypothyroidism, hyperthyroidism, Grave’s disease, thyroiditis, etc. Chest pain could not be compared between the two surveys. The chest pain question on the NHANES survey was “have you ever had”; the HEAL survey asked, “has a doctor ever told you.”

Other Variables

Data on race/ethnicity were self-reported. Clinical and tumor characteristics were obtained from the hospital medical record. Stage of disease was classified based on the American Joint Committee on Cancer (AJCC) as in situ, Stage I or Stage II-IIIb. Estrogen receptor (ER) status was categorized as positive/borderline, negative, or unknown. The type of surgery was categorized as no surgery, breast conserving surgery (BCS); simple/total mastectomy; radical mastectomy; and mastectomy, not otherwise specified (NOS)/surgery, NOS. Adjuvant therapy was obtained from two sources: the medical record and the participant's treating physician. Participants were classified as having received tamoxifen if 1) they reported receiving tamoxifen at baseline or 2) treatment with tamoxifen was recorded in their medical record and/or reported by their physician.

Statistical Analysis

We used multivariate logistic regression models to examine the association between comorbid conditions and receipt of specific therapies. Each multivariate model also included age (<50, 50–69, 70+ years), geographic area (New Mexico, Los Angeles County, Western Washington), stage (in situ, stage I, stage IIA, stage IIB-II not otherwise specified, stage III, Unknown stage,), and ER status (positive + borderline, negative, other). We calculated the Charlson Comorbidity Score using the hospital medical record abstract data. We estimated the multivariate regression models first using the Charlson Comorbidity Score and then substituting the specific comorbid conditions reported by the participant on the follow up questionnaire as present at or before their diagnosis of breast cancer.

A second set of multivariate analyses were conducted to identify variables that were associated with an increase in post-diagnosis comorbidities. These models included only women who completed the survey (n=941). Variables in the models were type of therapy (chemotherapy only, radiation only, tamoxifen only, chemotherapy plus radiation, chemotherapy plus tamoxifen, radiation plus tamoxifen, chemotherapy plus radiation plus tamoxifen vs. none of these therapies), age, geographic area, stage, and number of pre-diagnostic comorbid conditions (none; 1 or more). We ran additional models that excluded women diagnosed with a recurrence or a second primary breast cancer (n=122) as these women might have health status changes related to the recurrence or second primary. Statistical tests were considered significant if the p-value was <0.05. All p-values were two-sided. Analyses were conducted using the Statistical Analysis Software (SAS, Research Triangle Institute, Research Triangle Park, NC), version 8.2.

Results

Demographic and clinical characteristics of women with early stage breast cancer are shown by geographic area (Table 1). Most participants were 50–69 years of age. Women from Los Angeles were more likely to have positive lymph nodes, larger tumors, and negative estrogen receptors than women from the other two sites. They were also more likely to have no comorbidities recorded in their hospital medical record. However, all women from Los Angeles County were Black and, on average, they were younger.

Breast Cancer Participants' Comorbidities at Diagnosis vs. Matched controls

We compared conditions reported by breast cancer patients with an age, race/ethnicity, and education matched population-based sample of women without cancer (Table 2). Hypertension was the most commonly reported comorbidity in both groups. However, it was reported significantly less often in the hospital record (28%) than the NHANES data (34%) ($p<0.05$). HEAL participants' reports of osteoporosis before breast cancer diagnosis (7%) were not significantly higher than the matched control group (4%). The hospital record (8%) and the pre-diagnosis report of diabetes (8%) were similar in breast cancer patients and in women without cancer (8%). Gallbladder disease was reported significantly more often by women in NHANES (16%) than by breast cancer patients pre-diagnosis (11%) ($p<0.05$). Thyroid disease was recorded significantly less often in the medical record compared to self-reported pre-diagnosis (17%) ($p<0.05$) and reported nearly half as often in the NHANES sample (9%) than by breast cancer patients ($p<0.05$). Although angina/chest pain was reported much more frequently in the NHANES sample, the questions were not asked in the same way on the two surveys. The women in the NHANES sample were asked "have you ever had;" in the HEAL cohort, the question was, "has a doctor ever told you."

Comorbidity at diagnosis

The most commonly reported comorbid condition among breast cancer patients was hypertension (Table 2). Nearly 28% of the patients' hospital records and 30% of the patient pre-diagnostic self-reports indicate hypertension, a non-significant difference. Arthritis was the second most frequently reported condition in the hospital record and in the self-reported pre-diagnostic conditions. However, it was recorded less than half as often in the hospital record ($p<0.05$). From the hospital record and the retrospectively collected pre-diagnosis conditions reported by the breast cancer patients chronic lung disease, diabetes and congestive heart failure were reported with similar frequency (Table 2). Although nearly twice as many women reported being told by a doctor that they had had a heart attack as was found in the hospital record, the difference was not statistically significant. Kidney disease was less often recorded in the hospital record than reported by HEAL participants ($p<0.05$). We found that the prevalence of most of the conditions increased substantially with age regardless of the data source (data not shown).

Pre-diagnostic Comorbidities and Therapy

Type of therapy for breast cancer varied by geographic region (Table 3). Women in Western Washington more often received BCS than did women in Los Angeles. The use of radiation was lower in Los Angeles. Most women did not receive chemotherapy. Women in Los Angeles were significantly more likely to receive chemotherapy and women in Western Washington were more frequently prescribed tamoxifen. Slightly over 26% of patients received tamoxifen with no chemotherapy (data not shown). More than 6% received 5-FU, cyclophosphamide, and methotrexate with an additional 6% receiving the same 3 agents plus tamoxifen. Nearly 5% received cyclophosphamide plus doxorubicin and another 5% cyclophosphamide, doxorubicin plus Tamoxifen. Less than 1% of patients refused adjuvant therapies.

In multivariable regression, after adjusting for age, geographic location, stage, estrogen receptor status, congestive heart failure significantly affected therapy (data not shown). Among women who had BCS those with congestive heart failure recorded in their hospital medical record were significantly less likely ($p<0.01$) to receive radiation following BCS. Women with invasive breast cancer and congestive heart failure were also less likely to receive chemotherapy ($P<0.01$).

New comorbidities following diagnosis

Increased comorbidity following the diagnosis and treatment of breast cancer is of concern. Arthritis was the most frequently self-reported comorbidity to be newly diagnosed in the time period between the diagnosis of breast cancer and the follow-up survey (Table 2). Osteoporosis and hypertension were the next most frequent.

We examined comorbidities reported by participants following the diagnosis of breast cancer by type of therapy (Table 4). Arthritis was the most frequently diagnosed new comorbidity among all types of therapy. Hypertension and osteoporosis were the next most frequently diagnosed conditions. Although the ordering of the conditions was similar, a smaller percentage of women who received no adjuvant therapy were diagnosed with the new conditions.

In multivariate models to determine factors associated with the diagnosis of new comorbid conditions older age was a strong predictor of new comorbid conditions reported by women following breast cancer diagnosis (Table 5). In addition, women treated with chemotherapy only (OR = 3.2, 95% CI 1.5, 6.8) were significantly more likely than women who received no adjuvant therapy to report a new post-diagnosis comorbid condition. This variable

remained significant when we excluded the number of comorbid conditions pre-diagnosis and stage at diagnosis from the model (OR = 2.8, 95% CI 1.4, 5.5). Women treated with chemotherapy plus radiation (OR = 1.9, 95% CI 1.02, 3.7) or radiation plus tamoxifen (OR=1.9, 95% CI 1.1, 3.2) were at increased risk of new post-diagnosis comorbidities compared with women receiving none of these therapies. The use of chemotherapy plus tamoxifen ($p = 0.08$) and chemotherapy plus radiation plus tamoxifen ($p = 0.06$) were positively associated with new comorbidities, but these did not reach statistical significance. Neither the use of radiation alone ($p=0.27$) nor tamoxifen alone ($p=0.35$) was significantly associated with new post-diagnosis comorbidities. Geographic area, stage at diagnosis and number of pre-diagnostic conditions were not significantly associated with subsequent comorbidities.

We excluded women who had a breast cancer recurrence or who were diagnosed with a new primary cancer from this model to identify factors associated with new comorbid conditions. The association between use of chemotherapy (OR = 2.4, CI 1.03, 5.4) and radiation plus tamoxifen (OR= 1.8, 1.04, 3.0) and the diagnosis of new comorbidities remained significant. Although still positive, chemotherapy plus radiation ($p=0.07$) was no longer statistically significant.

We also examined the association between therapy, stage, age, and geographic area and the self-reported diagnosis of new comorbid conditions in women who had no comorbid conditions recorded in their hospital record at treatment or self-reported before diagnosis ($n=223$). All therapies were positively associated with the self-reported diagnosis of new conditions, but none reach statistical significance. Age was no longer significant.

Discussion

In this population-based sample of breast cancer patients, we found that women with breast cancer did not have substantially more comorbid conditions at the time of their diagnosis than a matched group of women without cancer. Compared to women who received no chemotherapy, radiation or tamoxifen, women treated with chemotherapy, chemotherapy plus tamoxifen or radiation plus tamoxifen had a significantly greater likelihood of being diagnosed with a new self-reported comorbidity after their diagnosis and treatment for breast cancer.

Breast Cancer Participants vs. Matched Population Sample

Comorbidities in breast cancer patients have been associated with poorer outcomes.^{12,13} We compared comorbidities in our cohort of breast cancer patients at the time of diagnosis to an age, race/ethnicity, and education matched, nationally-representative sample of women without cancer to determine whether women who are diagnosed with breast cancer have more comorbidities at the time of diagnosis than similar women without breast cancer. The most remarkable finding was that most of the comorbid conditions were reported with similar frequency.

There was a very small difference (0.5%) in the reports of diabetes in the breast cancer patients compared to the cancer free population. A slight increased risk of breast cancer in women with diabetes has been noted previously. Lipscombe found that women with diabetes were at a small, but significant increased risk of breast cancer compared to non-diabetics.¹⁴ The Nurses' Health Study also reported that women with type 2 diabetes were at an increased risk of breast cancer.¹⁵ This association was seen in post-menopausal, but not in pre-menopausal women. Our study included both pre- and post-menopausal women. We found that nearly twice as many patients treated with chemotherapy, radiation or tamoxifen

reported a new diagnosis of diabetes compared to women who did not receive any of these therapies.

In our study, breast cancer patients reported twice as much thyroid disease (16.9%) as the population-based matched sample of women without cancer (8.6%). This is counter to a study at MD Anderson Cancer Center that found 7% of breast cancer patients had primary hypothyroidism, whereas 14.9% of a breast cancer screening population without breast cancer reported this condition.¹⁶ The two population-based samples we analyzed, the HEAL patients and the NHANES controls, were asked a more general question about thyroid disease rather than about hypothyroidism. However, when we examined the medical record data, hypothyroidism was recorded for 9.1% of the breast cancer patients, closer to the NHANES III estimate and to the MD Anderson breast cancer cases. These two study populations may not be comparable. MD Anderson is a single referral center, while the patients in our study were treated in many types of facilities throughout their communities.

Hospital Records Compared to Participant Self-report

We compared participant-reported comorbid conditions to those listed in the hospital record. We believe that conditions listed in the medical record were likely to be those considered by the physician to be important in the care of the patient. The concordance between patient report and medical record was good for some of the more serious conditions, including chronic lung disease, diabetes and congestive heart failure. Others, however, such as chest pain, arthritis, thyroid disease, and kidney disease, were less often found in the hospital record compared to self-report. Concordance between self-report and medical records as reported by Klabunde, et al. suggests that patients can reliably report on comorbid conditions.¹⁷ In addition, patients in that study were able to consistently report comorbidities over 6-, 12-, and 24 month surveys. It may be that the women in our study did not report these conditions to the physician or that it was not clear to the physician that the woman actually had the reported condition. Arthritis, a common comorbidity with a wide range of severity, was noted substantially less often in the hospital record. The presence of arthritis was perhaps not considered significant enough to influence care.

Comorbidity and Treatment

Comorbid conditions, as well as age, have been reported to influence the treatments received by patients with various types of cancer.²⁻⁶ Physicians must balance the benefit of more aggressive therapy against current health status and the possible decrease in quality of life that may occur during aggressive cancer treatment. The issue of comorbidities and age is complicated by the fact that comorbidities generally increase with age. In addition, since many of the clinical trials have not included substantial numbers of older cancer patients, physicians do not have a strong evidence base to guide treatment decisions for older women. In fact, the 2000 NIH Consensus Development Conference on adjuvant therapy for breast cancer stated that too few women had been included in prospective research trials to determine the effectiveness of adjuvant therapy in women 70 years or older.¹⁸ We found that age was consistently associated with less aggressive therapy in this study, although in a study of older breast cancer patients, toxicity was predicted more by the chemotherapeutic agents given than the age or health status of the patients.¹⁹

Congestive heart failure was associated with less aggressive therapy. In the current analyses, after adjusting for age, geographic area, stage, and ER status, women with congestive heart failure recorded on the hospital record significantly less often received radiation following BCS or chemotherapy. We do not have information on referral patterns or patient preference, but physicians did not report that women with congestive heart failure more often refused therapy. Physicians may be reluctant to give patients with congestive heart

failure radiation and chemotherapy because of concerns about cardiac-toxic effects. An association between heart failure and lack of chemotherapy in colon cancer patients was reported by Gross, et al.⁶ These investigators also examined mortality in the colon cancer patients and found that even patients with heart failure benefited significantly from the use of adjuvant chemotherapy, and they were not significantly less likely to complete chemotherapy than patients without heart failure.

New Comorbidities Following Therapy

We found a significant increase in new comorbid conditions diagnosed in the period between initial breast cancer diagnosis and the follow-up survey for women who were treated with chemotherapy. Arthritis and osteoporosis were the most frequently self-reported newly diagnosed conditions. The substantial increase in osteoporosis may be due in part to the side effects of breast cancer treatment. Geiger, et al. reported that chemotherapy was associated with an increased risk of stroke.²⁰ These investigators also found that the association was stronger in pre- and peri-menopausal women. We did not find an increase in stroke in our study cohort, although we only have data for an average of 30 months of follow-up. Because there are no clear recommendations for the use of chemotherapy in women aged 70 years or older, we excluded these women and found that the association between chemotherapy and increased comorbid conditions remained. As is the case with many comorbid conditions, increased contact with the medical care system following a diagnosis of cancer enhances the opportunity for identifying new comorbidities.

Limitations

This study has several limitations. Racial/ethnic groups varied by geographic location. All Black patients were from Los Angeles county and all Hispanics from New Mexico. Only New Mexico enrolled patients 70 years or older; while Los Angeles County enrolled patients age 35–64 years. We do not have information on the dose or duration of therapy and we do not know the longer-term effect of chemotherapy or radiation in this group. Tamoxifen is typically given over 5 years and our follow-up data are on average 30 months after diagnosis. Additional comorbidities may develop as a result of the continued use of tamoxifen or the longer term effects of chemotherapy and radiation. Despite these limitations, this study has several strengths, including longitudinal data on comorbid conditions and comorbid conditions recorded by physicians in the hospital record as well as reported by patients in a survey. The study also includes non-Hispanic white, Black and Hispanic women with early stage breast cancer followed prospectively and treated in a variety of community settings in 3 distinct geographic regions.

In conclusion, the comorbidity profiles of breast cancer patients at diagnosis in this study were comparable to a nationally-representative, matched sample of women without cancer. Breast cancer patients who had congestive heart failure were significantly less likely than those who did not have this condition to receive chemotherapy or radiation following BCS. Women treated with certain adjuvant therapies were more likely to be diagnosed with at least one condition post-diagnosis. Future research should focus on efforts to minimize comorbidities related to therapy, particularly chemotherapy and combination therapies.

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Table 1

Demographic and Clinical Characteristics of Total HEAL Population of Women Diagnosed with Non-Distant Breast Cancer by Registry

	Western Washington n=202 17.1%	New Mexico n=615 52.0%	Los Angeles County n=366 30.9%
Age at Diagnosis			
<50	36.6	26.2	48.9
50–69	63.4	51.4	51.1
70+	0.0	22.4	0.0
Race/ethnicity			
Non-Hispanic White	86.1	75.0	0
Black	0.5	0	100.0
Hispanic	3.0	24.4	0
Other	10.4	0.6	0
Number of positive lymph nodes			
Negative lymph nodes	50.0	52.5	42.6
Positive lymph nodes	18.3	19.7	32.8
No nodes examined	25.7	26.3	24.6
Unknown, not stated	5.9	1.5	0.0
Grade			
Well differentiated	15.4	29.6	9.8
Moderately differentiated	27.2	31.7	25.1
Poorly differentiated	23.8	24.2	41.5
Undifferentiated	15.4	0.7	6.6
Unknown	18.3	13.8	16.9
Not stated	13.8	2.8	14.5
Estrogen receptor status			
Positive/borderline	56.9	57.9	46.5
Negative	10.4	14.2	31.2
Not done, results unknown	32.6	27.9	22.4
Number of Comorbid Conditions at diagnosis (identified in hospital records)			
0	22.8	15.1	32.8
1	17.8	16.4	17.2
2	22.3	20.2	17.8
3	13.4	15.4	10.9
4	9.4	13.2	7.7
5+	8.5	19.6	13.6
Missing	5.9	0.0	0.0
Charlson Score			
0	96.3	82.6	87.2
1	3.7	14.6	11.2
2 +	0	2.8	1.6

Percentage of HEAL participants with comorbid conditions from the baseline hospital record, the 24 month survey and the percentage of participants in the National Health and Nutrition Examination Survey (NHANES III) reporting the condition

Table 2

	Hospital record (n=1171)	24 month Follow-up Patient Survey (n=941)				NHANES III 1988-1994 (n=865)
		Pre Diagnosis	Post Diagnosis	Yes, Unknown		
Angina or chest pain & ^φ	1.0 (12)	5.3 (50)	1.8 (17)	-	32.1 (278)	
Arthritis ^φ	13.7 (161)	29.5 (278)	9.1 (86)	0.2 (2)	30.4 (263)	
Bone loss or osteoporosis	0	6.6 (62)	6.3 (59)	-	4.4 (38)	
Chronic lung disease ^φ	10.4 (122)	11.7 (110)	2.0 (19)	0.1 (1)	10.8 (89)	
Diabetes/high blood sugar ^φ	8.3 (97)	8.4 (79)	2.3 (22)	-	7.8 (67)	
Gallbladder disease	0	10.6 (100)	2.2 (21)	0.2 (2)	16.3 (141)	
Heart attack ^φ	1.4 (16)	2.6 (24)	0.7 (7)	0.1 (1)	3.4 (29)	
Congestive Heart failure ^φ	1.2 (14)	1.9 (18)	0.5 (5)	-	2.1 (18)	
Hypertension ^φ	27.8 (325)	30.1 (283)	4.9 (46)	0.1 (1)	33.8 (292)	
Endometriosis/cystic ovaries	0	15.0 (141)	1.7 (16)	-	-	
Liver disease ^φ	2.5 (29)	2.1 (20)	0.2 (2)	-	-	
Kidney disease ^φ	0.3 (4)	2.2 (21)	0.4 (4)	-	-	
DVT/blood clot your legs	0	3.6 (34)	0.9 (8)	0.1 (1)	-	
Pulmonary embolism	0	0.7 (7)	0.2 (2)	-	-	
Stroke/Cerebrovascular disease ^φ	1.4 (16)	2.0 (19)	1.0 (9)	-	1.9 (16)	
Thyroid disease	-	16.9 (159)	2.6 (24)	0.2 (2)	8.6 (74)	
Hypothyroidism	9.1 (106)					
Depression ^φ	4.1 (48)					
Rheumatologic disease ^φ	1.5 (17)					
Bowel Disease ^φ	0.9 (10)					
Bleeding ulcers ^φ	0.4 (5)					
Peripheral vascular disease ^φ	0.3 (3)					
Hemiplegia or paraplegia ^φ	0.1 (1)					

	24 month Follow-up Patient Survey (n=941)			NHANES III 1988–1994 (n=865)
	Hospital record (n=1171)	Pre Diagnosis	Post Diagnosis	
Dementia ^φ	0			
AIDS ^φ	0			

^δ Question on NHANES was “have you ever had;” HEAL was “has a doctor ever told you.”

^φ Charlson Conditions Hospital record = Abstracted from the hospital or surgi-center medical record at the time of most definitive therapy Calculated using 24 month self reported data; age (Los Angeles County/Western Washington) or year (New Mexico) “first diagnosed with” condition subtracting age or year at diagnosis of breast cancer. Prior to or younger than Diagnosis = pre-diagnosis. Older or later than breast cancer = post-diagnosis. Same year or age=pre-diagnosis.

Table 3

Percentage of Women Diagnosed with Non-Distant Breast Cancer Receiving Primary and Adjuvant Therapy by Registry

	Western Washington n=202 Percent	New Mexico n=615 Percent	Los Angeles County n=366 Percent
Surgery			
None	0.5	2.3	2.2
Breast conserving surgery	71.8	65.5	53.3
Mastectomy (simple/mod radical)	27.7	31.7	43.2
Radical	0	0.5	0.6
Mastectomy NOS *, surgery NOS *	0	0	0.8
Chemotherapy			
None	65.4	76.4	55.5
Chemotherapy, NOS *	3.5	1.1	3.6
Chemotherapy single agent	3.0	0	1.6
Multiagent chemotherapy	22.8	20.5	39.3
Refused	3.0	1.0	0
Recommended, unknown if given	2.5	1.0	0
Radiation			
None	35.6	39.5	62.6
Radiation given	54.0	57.6	37.5
Refused	0	0.5	0
Recommended, unknown if given	10.4	2.4	0
Tamoxifen	52.0	46.0	30.6

* NOS = not otherwise specified

Table 4
Self-reported Comorbid Conditions Newly Diagnosed Following the Diagnosis of Breast Cancer*

	Any chemotherapy n=323		Any Tamoxifen n=414		Any XRT n=549		No systemic therapy n=188	
	n	%	n	%	n	%	n	%
Angina or chest pain	5	1.5%	9	2.2%	10	1.8%	3	1.6%
Arthritis	32	9.9%	45	10.9%	54	9.8%	12	6.4%
Bone loss or osteoporosis	16	5.0%	26	6.3%	43	8.0%	7	3.7%
Chronic lung disease (emphysema or bronchitis)	8	2.5%	11	2.7%	8	1.5%	5	2.7%
Diabetes or high blood sugar	9	2.8%	12	2.9%	15	2.7%	3	1.6%
Gallbladder disease	11	3.4%	8	1.9%	12	2.2%	2	1.1%
Heart attack or myocardial infarction	3	0.9%	3	0.7%	3	0.5%	2	1.1%
Endometriosis or cystic ovaries	8	2.5%	7	1.7%	7	1.3%	1	0.5%
Heart failure or congestive heart failure	2	0.6%	4	1.0%	1	0.2%	1	0.5%
High blood pressure or hypertension	18	5.6%	23	5.6%	25	4.6%	9	4.8%
Liver disease	1	0.3%	0	0.0%	2	0.4%		0.0%
Kidney disease	0	0.0%	2	0.5%	2	0.4%	2	1.1%
Deep vein thrombosis or a blood clot in your legs	3	0.9%	5	1.2%	3	0.5%		0.0%
Pulmonary embolism or a blood clot in your lungs	1	0.3%	1	0.2%	1	0.2%		0.0%
Stroke	3	0.9%	1	0.2%	5	0.9%	3	1.6%
Thyroid disease	7	2.2%	13	3.1%	14	2.6%	3	1.6%

* Reported on the 24-month follow-up survey as being diagnosed after the breast cancer diagnosis; categories are not mutually exclusive

Table 5

Clinical and Non-clinical Characteristics Associated with Self-reported Post-Breast Cancer Diagnosis of Comorbid Conditions in Early Stage Breast Cancer Patients

Independent Variable/Referent Group	Number of Post-Diagnosis Conditions (None vs. 1+)
Age	
<50	1.0
50–69	1.8 (1.3, 2.5)
70+	2.7 (1.5, 4.8)
Geographic Area	
New Mexico	1.0
Los Angeles County	0.9 (0.6, 1.3)
Western Washington	0.9 (0.6, 1.3)
Stage	
Stage I	1.0
In situ	1.3 (0.8, 2.0)
Stage IIA	1.1 (0.7, 1.8)
Stage IIb, II not otherwise specified	1.0 (0.6, 1.8)
Stage III	0.5 (0.2, 1.7)
Unknown	1.2 (0.6, 2.7)
Adjuvant Therapy	
No adjuvant therapy	1.0
Chemotherapy only	3.2 (1.5, 6.8)
Radiation only	1.3 (0.8, 2.2)
Tamoxifen only	1.3 (0.7, 2.5)
Chemotherapy and Radiation	1.9 (1.02, 3.7)
Chemotherapy and Tamoxifen	1.9 (0.9, 4.1)
Radiation and Tamoxifen	1.9 (1.1, 3.2)
Chemotherapy, Radiation and Tamoxifen	1.9 (1.0, 3.6)
Number of Pre-diagnostic conditions	1.0 (0.9, 1.1)