Epidemiology

The effect of race/ethnicity and insurance in the administration of standard therapy for local breast cancer in Florida

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Abstract

Objectives. Assess the effect of race/ethnicity and insurance coverage on the receipt of standard treatment for local breast cancer.

Methods. Local breast cancers diagnosed between July 1997 and December 2000 and reported to Florida's registry were linked to the Agency of Healthcare Administration inpatient and outpatient databases, resulting in 23,817 female local breast cancers with informative treatment. Standard treatment was defined as mastectomy or breast-conserving surgery followed by radiation therapy and it was modeled as a function of health insurance and race/ethnicity accounting for age at diagnosis, marital status and facility type.

Results. Approximately 88% of the local breast cancers received standard treatment. The likelihood of standard treatment decreased by 3% per year of increase in the age at diagnosis. Compared to white non-Hispanic, black non-Hispanic women were 19% less likely to receive standard treatment (OR = 0.81, 95%CI = 0.68, 0.97) and Hispanics were 23% less likely (OR = 0.77, 95%CI = 0.66, 0.89). Local breast cancers diagnosed in non-teaching facilities were 21% more likely to receive standard treatment compared to those diagnosed in teaching facilities (OR = 1.21; 95%CI = 1.05, 1.38)). Compared to single, married women were 51% more likely to get standard treatment (OR = 1.51, 95%CI = 1.31, 1.75), followed by separated or divorced women that were 37% more likely (OR = 1.37, 95%CI = 1.13, 1.66). Compared to the privately insured, Medicare beneficiaries were 36% more likely to receive standard treatment (OR = 1.36, 95%CI = 1.22, 1.51) whereas the uninsured were 24% less likely (OR = 0.76, 95%CI = 0.59, 0.96); Medicaid insured women were 29% less likely to receive standard treatment compared to the privately insured (OR = 0.71, 95%CI = 0.53, 0.96).

Conclusion. Future efforts should target the elderly, Hispanic and black women, the uninsured, and those on Medicaid in order to reduce treatment disparities.

Introduction

The treatment of early stage breast cancer has changed drastically in the past 20 years after clinical trials were published indicating that breast-conserving surgery with radiation therapy (BCSR) produced similar results to mastectomy with regards to long-term survival [1–4]. As a result, these 2 treatment modalities have become the standard of care for early breast cancer, and multiple medical societies have recommended that women should be given a choice between these 2 therapies when diagnosed with local breast cancer [1–3,5]. More recently, in their 2003 update, the steering committee of Health Canada's Breast Cancer Initiative recommended that

unless there is increased risk of local recurrence, physical disabilities, contraindication for radiotherapy or large tumor size compared to breast size, BCSR is generally recommended for patients with stage I and II breast cancer and that the choice between BCSR and mastectomy be made according to the patient's circumstances and personal preferences [6].

Despites the general agreement of clinical guidelines treatment patterns have not been uniform. Researchers have found that race–ethnic minorities, the poor, and the uninsured are less likely to receive standard therapy, due to access to fewer medical resources, lower socio-economic status or cultural barriers [7–11]. It has been reported, for example, that Black non-Hispanic

women received radiation therapy for local breast cancer less frequently compared to white non-Hispanic women [12–13], and a California study reported substantially lower rates of breast-conserving surgery among Hispanic and Asians compared to white, non-Hispanics [14].

Breast cancer treatment has also been shown to vary by type of health insurance. Studies have found that women with Medicaid and the uninsured were less likely to receive radiation therapy following breast-conserving therapy for local breast cancer compared to women with private insurance or Medicare [9, 15]. In a study of systemic therapy for regional breast cancer, Richardson et al. [Richardson, *in press AJPH 2005*] found that teaching hospitals were able to modulate the effect of insurance by providing more guideline-based therapy to the uninsured and those insured by Medicaid.

A Commonwealth Fund study has found that for many services, major teaching hospitals provide better quality of care than non-teaching hospitals, with these differences arising primarily from more consistent use of standard physician services and drugs [16]. The quality of breast cancer treatment, in particular, has been found to be associated with the type of facility where the cancer was diagnosed [17, Richardson *in press AJPH 2005*].

Finally, several studies have shown that women who are married are more likely to receive radiation therapy after BCS [13,16]. Factors, such as the availability of social support networks for the patient, may also impact treatment [18,39]. In the absence of social support network information, marital status at the time of diagnosis has been used as a surrogate.

We evaluated the impact of health insurance, race–ethnicity, age at diagnosis, marital status, and type of healthcare facility on the likelihood of receiving standard treatment for local breast cancers diagnosed in Florida in the period July, 1997 to December, 2000.

Materials and methods

Data sources

The Florida Cancer Data System (FCDS) is the state-wide population-based incident registry and a member of the North American Association of Central Cancer Registries (NAACR), collecting all newly diagnosed primary cancers in Florida since 1981. Past audits of the FCDS conducted by NAACCR have estimated case reporting to be 99.4% complete [19].

The Florida Agency for Health Care Administration (AHCA) maintains two data bases [Hospital Patient Discharge Data (HPDD) and Ambulatory Outpatient Data (AOD)] on all patient encounters within hospitals and freestanding ambulatory surgical and radiation therapy centers in Florida [20]. All hospitals have been required to report all discharges and outpatient encounters to AHCA since 1987. The AHCA data sets used in this study contained diagnoses and procedures performed during every hospitalization or outpatient encounter in the state of Florida, for the period 1997–2000.

Study population

The initial study population included 26,423 primary breast cancers diagnosed at local stage (using SEER summary stage classification [21]) in female Florida residents between July 1997 and December 2000. The FCDS collects all components of first course of treatment (including site specific surgery, radiation therapy, chemotherapy and endocrine therapy) administered in the first four to twelve months of a breast cancer diagnosis [22]. Various studies have raised concerns regarding the completeness of the registry-collected treatment data and warned for the implications on pattern of care studies [23–26]. To enhance the completeness of the Registry's treatment data, we linked the FCDS data to the AHCA ambulatory and discharge databases and supplemented the FCDS-provided treatment information.

The data linkage was carried out at the patient level, using a probabilistic algorithm. It was based on social security number, date of birth, sex, race and county of residence at the time of diagnosis. Approximately 94% of the local breast cancer records were linked to either an inpatient or an outpatient AHCA record via this procedure.

Of the 26,423 eligible local breast cancer cases, 2,606 records had missing information in the variables used in the modeling of standard treatment, or their combinations (0.8% missing race/ethnicity, 3.9% missing marital status, 1.7% missing age at diagnosis, 3.9% missing insurance, 0.1% missing surgery or radiation therapy). We limited our analysis to a subset of the enhanced data set containing 23,817 local breast cancer records, with informative treatment and non-missing demographic data.

Study variables

Standard treatment for local breast cancer was defined as partial mastectomy with radiation therapy or mastectomy (with or without adjuvant radiation). The FCDS surgery and radiation therapy data were used for this analysis when available; if they were unavailable (missing or coded as no treatment administered) or uninformative (non-specified surgery) then the corresponding linked AHCA inpatient records were examined for surgery and radiation data separately. In turn, if the inpatient record was unavailable or had uninformative treatment then the outpatient record was examined.

Two enhanced surgery and radiation therapy variables were thus created, containing the most complete and informative breast cancer treatment administered to the patient. For this analysis, the final breast cancer surgery variable was categorized into 3

broad categories: no surgery, breast-conserving surgery, and mastectomy. Breast-conserving surgery included the range of procedures encompassing less than a full mastectomy. The mastectomy category included simple, modified radical, radical, and extended radical mastectomy. All forms of radiation therapy were combined into a dichotomous variable, for the creation of the final radiation therapy variable. The surgery and radiation treatment variables were in turn combined into a dichotomous variable, indicator of mastectomy or breast-conserving surgery combined with radiation therapy (i.e. 'standard treatment') versus all other treatment modalities (including non-treatment).

The age at diagnosis was used as a continuous variable in the analysis. Race and ethnicity were combined into one race/ethnicity variable containing the mutually exclusive categories: white non-Hispanic, black non-Hispanic, Hispanic, and others. Marital status was classified as: single, married, separated or divorced, and widowed. Insurance was grouped into four categories: uninsured, private, Medicare, and Medicaid. The reporting facilities were classified into American Association of Medical College training programs of (i.e. teaching facilities) versus all others.

Data analysis

Cross-tabulations were used to describe the demographic distribution of the study population, by each treatment modality. In turn, we fit a multiple logistic regression model to estimate the likelihood of receiving standard treatment after a diagnosis of local stage breast cancer. The model included the covariates: age at diagnosis, race/ethnicity, marital status, health insurance type, and facility type. Interactions of these factors were also tested in the model. The statistical software, SAS version 8, was used to perform all the analyses [27].

Results

The vast majority of the 23,817 local breast cancers in the study population received standard treatment (87.6%) (Table 1). More specifically, breast-conserving surgery alone was administered to 11.6% of the cases, and breast-conserving surgery combined with radiotherapy was administered to 48.5%. Thirty nine percent of local breast cancer cancers were treated with mastectomy (with or without radiation therapy).

Table 1. Characteristics of N = 23,817[a] patients diagnosed with Local Breast Cancer, by Type of Treatment Florida, July 1, 1997–December 31, 2000

	Total		Standard Treatment[b]		Lumpectomy with Radiation		Mastectomy without radiation		Mastectomy with Radiation		Lumpectomy without Radiation		No surgery	
	N	%[c]	N	%[d]	N	%[d]	N	%[d]	N	%[d]	N	%[d]	N	%[d]
Total	23,817		20,875	87.6	11,546	48.5	7576	31.8	1753	7.4	2762	11.6	180	0.8
Race/ethnicity														
White, NH	20,620	86.6	18,146	88.0	10,251	49.7	6443	31.2	1452	7.0	2336	11.3	138	0.7
Black, NH	1316	5.5	1133	86.1	587	44.6	419	31.8	127	9.7	163	12.4	20	1.5
Hispanic	1881	7.9	1596	84.8	708	37.6	714	38.0	174	9.3	263	14.0	22	1.2
Marital status														
Single	2059	8.6	1756	85.3	929	45.1	665	32.3	162	7.9	283	13.7	20	1.0
Married	13,932	58.5	12,490	89.6	7233	51.9	4180	30.0	1077	7.7	1,354	9.7	88	0.6
Separated/divorced	2272	9.5	2018	88.8	1126	49.6	699	30.8	193	8.5	237	10.4	17	0.7
Widowed	5554	23.3	4611	83.0	2258	40.7	2032	36.6	321	5.8	888	16.0	55	1.0
Insurance type														
Uninsured	620	2.6	533	86.0	252	40.6	219	35.3	62	10.0	64	10.3	23	3.7
Private	11,234	47.2	9990	88.9	5855	52.1	3224	28.7	911	8.1	1193	10.6	51	0.5
Medicare	11,539	48.4	9998	86.6	5282	45.8	3988	34.6	728	6.3	1447	12.5	94	0.8
Medicaid	424	1.8	354	83.5	157	37.0	145	34.2	52	12.3	58	13.7	12	2.8
Facility type														
Non-teaching	21,480	90.2	18,862	87.8	10,351	48.2	6910	32.2	1601	7.5	2485	11.6	133	0.6
Teaching	2337	9.8	2013	86.1	1195	51.1	666	28.5	152	6.5	277	11.9	47	2.0
Age at diagnosis (years)														
Mean	65.2		64.7		63.9		66.5		61.9		68.9		67.4	
Median	67.0		69.0		66.0		69.0		63.0		71.5		70.5	
Range	14–101		20–101		20–100		22–101		23–93		14–99		34–101	

[a]Excluding cases with missing values in any of the variables.
[b]Lumpectomy with radiation, or mastectomy with or without radiation.
[c]Column percent.
[d]Row percent.

The average age of the patients at diagnosis was 65.2 years. The study population consisted of 86.6% white non-Hispanics, followed by 7.9% Hispanics and 5.5% Black non-Hispanics. At diagnosis, 58.5% of the women were married, 23.3% were widows, 9.5% were separated or divorced and 8.6% were single. Almost 10% of the local breast cancers were diagnosed at teaching facilities. At diagnosis, 47.2% of the patients had private insurance and 48.4% had Medicare; only 4.4% of the patients were uninsured or insured by Medicaid.

There was variability in the treatment of local breast cancers diagnosed among various sub-groups. Women who received standard treatment were slightly younger, with a mean age of 64.7 years at the time of diagnosis (compared to 65.2 years). Approximately 85% of the cancers diagnosed among Hispanics were treated with standard treatment, 86.1% in the Black non-Hispanics, and 88% in the White non-Hispanics. Local breast cancers diagnosed among widows or single women were less often treated with standard treatment (83 and 85.3%, respectively) compared to those diagnosed among married and separated or divorced women (89.6 and 88.8%, respectively). Type of insurance at the time of diagnosis played an important role as well, with women insured by Medicaid being the least likely to receive standard treatment (83.5%); those with Medicare and the uninsured faired equally in that respect (86 and 86.6%); the privately insured were the most likely to get standard treatment (88.9%). Local breast cancers diagnosed in non-teaching facilities received more often

standard treatment compared to those diagnosed in teaching facilities (86.1 and 87.8%, respectively).

To further explore the findings and the joint effect of all these factors on the likelihood of receiving standard treatment, we tested various logistic regression models. We tested for joint effects of some of these factors as well, as reflected through interaction terms between race/ethnicity and insurance, race/ethnicity by facility type and insurance by facility type, but none of them were statistically significant. The model that best fit the data included: age at diagnosis, race/ethnicity, facility type, marital status and insurance type (Table 2).

According to this model, the age at diagnosis was a significant predictor, with a 3% reduction in the likelihood of standard treatment per year of increase in age (OR = 0.97, 95%CI = 0.96, 0.97). Compared to white, non-Hispanics, black, non-Hispanics were 19% less likely to receive standard treatment (OR = 0.81, 95%CI = 0.68, 0.97) and Hispanics were 23% less likely (OR = 0.77, 95%CI = 0.66, 0.89). Married women were the most likely to receive standard treatment, namely, 51% more likely than single women (OR = 1.51, 95%CI = 1.31, 1.75) and separated or divorced women were 37% more likely (OR = 1.37, 95%CI = 1.13, 1.66). There was a tendency for widows to get standard treatment less frequently than single women, but this finding was not statistically significant (OR = 1.29, 95%CI = 0.96, 1.33).

In non-teaching facilities, the likelihood of getting standard treatment was 21% higher than in non-teach-

Table 2. Frequency of receiving standard treatment and odds ratio estimates local breast cancers diagnosed in Florida, July 1, 1997 through December 31, 2000 N = 23,817[a]

	No of cases	% Received standard treatment	Odds ratio[b]	95%CI
Age at diagnosis				
Per one-year increase			0.97	(0.96, 0.97)
Race/ethnicity				
White, NH	20,620	88.0	1	
Black,NH	1316	86.1	0.81	(0.68, 0.97)
Hispanics	1881	84.9	0.77	(0.66, 0.89)
Marital status				
Single	2059	85.28	1	
Married	13,932	89.65	1.51	(1.31, 1.75)
Sep/Divorced	2272	88.82	1.37	(1.13, 1.66)
Widows	5554	83.02	1.29	(0.96, 1.33)
Facility type				
Teaching	2337	86.1	1	
non-Teaching	21,480	87.8	1.21	(1.05, 1.38)
Insurance type				
Private	11,234	88.93	1.00	
Uninsured	620	85.97	0.76	(0.59, 0.96)
Medicare	11,539	86.65	1.36	(1.22, 1.51)
Medicaid	424	83.49	0.71	(0.53, 0.96)

[a]Excluding cases with missing values in any of the variables used in the analysis.
[b]Odds ratio estimates of the likelihood of receiving standard treatment are based on a logistic regression model that includes age, race/ethnicity, facility type, marital status and insurance.

ing facilities (OR = 1.21; 95%CI = 1.05, 1.38). Medicare patients had higher likelihood of receiving standard treatment than the privately insured (OR = 1.36, 95%CI = 1.22, 1.51), whereas the uninsured and Medicaid insured women had lower likelihood (OR = 0.76, 95%CI = 0.59, 0.96 and OR = 0.71, 95%CI = 0.53, 0.96, respectively).

Discussion

The goal of this study was to describe patterns of care for local breast cancer diagnosed in Florida, and the factors involved with the receipt of guideline-based therapy. Health insurance, had been shown to impact receipt of quality health care, and can vary by income and race–ethnicity in the US [28–30]. In our study, we assessed the role of race/ethnicity and we quantified the effect of health insurance on the likelihood of receiving standard treatment for local breast cancer among women in Florida. We accounted for other factors shown to affect the receipt of guideline-based treatment, namely, age at diagnosis, marital status, and the type of facility in which these cancers were diagnosed. Overall 87.6% of local breast cancers diagnosed in Florida between July 1997 and December 2000 received standard treatment. Of these cases, 48.5% received breast-conserving therapy combined with radiation therapy.

Health insurance has a differential effect on guideline based treatment. A number of studies have demonstrated that the uninsured and Medicaid enrollees receive less health-related services, ranging from lesser screening to less thorough staging of breast cancer [31] or less vigorous treatment once the cancer is detected [8,32]. In a population-based study of breast cancer patients, Ayanian, et al. [7] demonstrated that the uninsured and the indigent women had worse outcomes (survival) than the privately insured. They questioned if insurance was responsible for this through its impact on getting quality treatment. In this study, we found that the uninsured and women on Medicaid were less likely to get standard treatment for local breast cancer compared to the privately insured, whereas women in Medicare were more likely that the privately insured to get guideline-based treatment. In our previous study of regional breast cancer treatment, we observed lower use of chemotherapy or systemic treatment among Medicare insured patients, compared to the privately insured [Richardson, *in press AJPH 2005*]. In contrast, in this present study, Medicare patients received standard treatment or breast-conserving surgery and radiation more often than the privately insured, as Young et al. found in their study [15]. It is possible that this contrast is related to the nature of the treatment, or alternatively, it may reflect the different reimbursement schedules for the range of available treatment modalities covered by the different health insurance options for the particular time period.

Standard treatment was found to vary among different subgroups of the study population. Consistent with other studies [33–35], local breast cancers diagnosed in older women were less likely to receive standard treatment, compared to younger women. This phenomenon may be attributable to co-morbid conditions associated with older age, although others have reported a persistent bias associated with the treatment of breast cancer in the elderly, even after accounting for comorbidity [34–36].

Contrary to our findings in our study of regional breast cancer [Richardson *AJPH in press* 2005], local stage breast cancers diagnosed in teaching facilities in Florida were overall less likely to receive standard treatment than those diagnosed in non-teaching facilities. A careful inspection of the administration of the different treatment modalities in the current study revealed that compared to non-teaching facilities, local breast cancers diagnosed in teaching facilities were treated more frequently with breast-conserving surgery and radiation (51.1% versus 48.2%) and less frequently with mastectomy (28.5% versus 32.2%). Additionally, cancers treated with breast-conserving surgery without radiation were equally prevalent for cases diagnosed in either facility type (11.6% in non-teaching and 11.9% in teaching facilities). Therefore, the difference we found is mostly driven by the higher percentage of untreated local breast cancers reported from teaching facilities and to a lesser extend by the higher percentage of local breast cancers treated with mastectomy and radiation reported from non-teaching facilities. Indeed, when we excluded from the data set the 180 cases that had no surgery (or radiation), the facility type dropped out of the model (Wald χ^2 = 2.09, df = 1, p = 0.148, OR = 1.11, 95%CI = (0.963, 1.281)) supporting our hypothesis. We are unsure why we observed a higher percentage of cases that had no surgery in teaching facilities compared to non-teaching facilities. It is unlikely that it reflects a reporting bias since teaching facilities tend to keep very good records in general. This puzzling finding needs further investigation, starting with a treatment validation study to confirm that these cases were indeed untreated and shed light to the reasons why this happened.

Married, and separated or divorced women with local breast cancer were much more likely to get guideline-based treatment than single women and widows did not significantly differ to single women in that respect. In two studies comparing the use of specific treatment modalities for local breast cancer (breast-conserving surgery versus mastectomy), marital status has not been found to be a significant predictor [37,38]. However, other researchers have reported that the availability of social support networks for the patient can also impact treatment [18,39].

It is noteworthy that Hispanics had the highest rate of mastectomy and the lowest rate of breast-conserving surgery with radiation compared with any other race–ethnic group. At the same time they had the highest rate of incomplete treatment of all race/ethnic groups, namely breast-conserving surgery without radiation therapy. Several studies have reported that Hispanics

face barriers in getting treatment, including insurance problems, difficulties with language, transportation, child care, immigration status, and cultural differences [11,40,41]. A study based on 11 population-based cancer registries in the United States [10] reported that black, non-Hispanics and Hispanics were somewhat more likely to have surgery 'not recommended' or to refuse surgery and were less likely to be treated with radiation than white, non-Hispanics. Our study supports these findings of Li et al. [10] and it demonstrated additionally that even after accounting for other factors associated with treatment administration, including insurance type, the odds of standard treatment for black non-Hispanics and Hispanics were lower compared to white, non-Hispanics for the time period 1997–2000, revealing disparities in the treatment of local breast cancer, with Black, non-Hispanic and Hispanic women being less likely to receive standard treatment compared to white, non-Hispanics.

Strengths and limitations

One limitation of the study arises from the fact that the registry or AHCA 'recorded' treatments may differ from the actual treatment administered. Validation studies are needed to confirm and quantify the concordance between the two.

Another limitation arises potentially from the mobility of the population for receipt of health care. There is always the possibility that some Floridian women may have sought treatment in other states and their treatment data are missed both from the registry and from AHCA.

Insurance changes may occur from the time of diagnosis to the time of treatment. In our study we used the insurance information at the time of diagnosis, disregarding changes that may have occurred during the treatment-to-diagnosis period.

Despites these limitations one of the strengths of our study lies on the enhanced treatment data. We used the cancer registry in addition to administrative databases to create a more complete treatment profile. Through the AHCA data sets, we found surgery information for 362 of the 502 cases that had no surgery according to the FCDS records; specific surgery information was retrieved for 3,488 records (13%) with uninformative surgery (non-specified surgery) and for 7 out of 15 cases with missing surgery data. The major improvement of the registry's treatment data was observed for radiation therapy. In the AHCA datasets we found radiation therapy information for 5,938 (35%) of the 16,900 cases that did not have radiation therapy reported, and for 194 of the 389 cases with missing radiation treatment information, according to the FCDS records. As a result, the improvement in the radiation therapy data reached 36% for all local breast cancers combined. For the cases that underwent breast-conserving surgery in particular, 76% were found to have been administered radiation therapy in addition to surgery, compared to 47% according to the registry records alone.

Conclusions

The same race/ethnic gap that we observed in the treatment of local stage breast cancer was observed in a different, yet relevant, context: in the usage of mammography screening. According to the National Health Interview Survey for the year 2000, 72.1% of White non-Hispanic women 40 years or older had a mammogram within the past 1–2 years, followed by 68.1% of Black non-Hispanic and 62.6% of Hispanic women [42]. In Florida, and during the study period, there are indications of a gap in meeting the healthcare needs of the Hispanics and the black, non-Hispanics with regard to local breast cancer. Therefore, there is a need for enhancement and expansion of breast cancer preventive and treatment services (education, consultation with specialists, mammography screenings etc.) that will promote the receipt of guideline-based recommendations, tailored to the needs of primarily the Hispanics and of the black, non-Hispanics. This effort should not only include patients but providers and health care systems as well [43]. Since this is a dynamic situation, there is a continuous need for population-based patterns of care studies to monitor changes in the treatment of cancer, identify populations in need, design programs to address these needs, and when the programs mature, quantify their impact. Cancer registry data combined with administrative data offer a unique opportunity for these types of studies, which can eventually tie the process of care to the improvement of the healthcare system [43].

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