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Influence of Patient, Physician, and Hospital Characteristics on the Receipt of Guideline-Concordant Care for Inflammatory Breast Cancer

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CONFLICT OF INTEREST

S.A.S. has stock ownership in Pfizer.

AUTHORSHIP CONTRIBUTIONS

Conception and design: JFW, ATD

Collection and assembly of data: JFW, ATD, JMW, RAD

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Abstract

Purpose—Inflammatory breast cancer (IBC) is an aggressive subtype of breast cancer for which treatments vary, so we sought to identify factors that affect the receipt of guideline-concordant care.

Methods—Patients diagnosed with IBC in 2004 were identified from the Breast and Prostate Cancer Data Quality and Patterns of Care Study, containing information from cancer registries in seven states. Variation in guideline-concordant care for IBC, based on National Comprehensive Cancer Network (NCCN) guidelines, was assessed according to patient, physician, and hospital characteristics.

Results—Of the 107 IBC patients in the study without distant metastasis at the time of diagnosis, only 25.8% received treatment concordant with guidelines. Predictors of non-concordance included patient age (< 70 years), non-white race, normal body mass index (BMI 18.5–25 kg/m²), patients with physicians graduating from medical school >15 years prior, and smaller hospital size (<200 beds). IBC patients survived longer if they received guideline-concordant treatment based on either 2003 (p=0.06) or 2013 (p=0.06) NCCN guidelines.

Conclusions—Targeting factors associated with receipt of care that is not guideline-concordant may reduce survival disparities in IBC patients. Prompt referral for neoadjuvant chemotherapy and postoperative radiation therapy is also crucial.

Keywords

inflammatory breast cancer; breast cancer; guideline; healthcare disparities; epidemiology

1. INTRODUCTION

Inflammatory breast cancer (IBC) is an aggressive and lethal form of locally advanced breast cancer, with median overall survival being less than 4 years [1–4]. IBC is also a relatively rare subtype, comprising approximately 1–5% of all breast cancers among women in the United States [5–9]. Even though IBC accounts for a low percentage of breast cancer cases, it accounts for 7% of all breast cancer deaths since IBC patients have poorer survival than non-IBC breast cancer patients [5,10–12]. IBC patients tend to be younger than other breast cancer patients, with a median age at diagnosis of 57 years compared to 62 for all breast cancers combined [7,8]. Diagnosis of IBC is made clinically based on diffuse erythema, edema, and fine dimpling (*peau d'orange*) [2,13]. Other associated findings include skin thickening, nipple inversion, increased breast density, and stromal coarsening

[13]. Underlying palpable masses are not always seen and are not required for diagnosis [14]. The clinical appearance of inflammation is due to the lymphatic obstruction that results from the tumor emboli invading the dermal lymphatic vessels in the breast [15]; this inflammation does not appear to result from the infiltration of lymphocytes or other inflammatory mediators [16–18].

Treatment for IBC is typically multi-modal [12], but outcomes remain worse than for stage-matched non-IBC breast cancer patients. Currently the National Comprehensive Cancer Network (NCCN) recommends neoadjuvant chemotherapy with an anthracycline-based regimen with or without taxanes followed by mastectomy and axillary lymph node dissection. Optimal dose and fractionation of radiotherapy is a topic of disagreement among experts. Tamoxifen and other hormone therapies may also be considered for women with hormone receptor-positive tumors. In the past, attempts to treat IBC with surgery alone or surgery combined with radiation therapy resulted in median overall survival times of less than 15 months and local recurrence rates as high as 50% [19]. Results from a large retrospective single-institution study of patients with IBC performed over a 20-year period demonstrated that initial treatment with an anthracycline-based regimen followed by local therapy resulted in 5 - and 10-year survival rates of 40% and 33%, respectively [20].

Because IBC is such a rare breast cancer subtype, studies have been challenged to demonstrate patterns of IBC treatment and whether treatment differs based on various patient, physician, or institution characteristics. It is imperative to understand the factors behind variation in the treatment of IBC. Using a multi-state, population-based sample of IBC patients, we examined factors that may have potentially affected receipt of care that was concordant with NCCN guidelines and how the receipt of guideline-concordant care affected survival.

2. MATERIALS AND METHODS

2.1 Patient Population and Data Sources

The Breast and Prostate Cancer Data Quality and Patterns of Care Study (POC-BP), a comprehensive patterns of care study from the National Program of Cancer Registries of the Centers for Disease Control and Prevention (CDC), collected information on breast and prostate cancer cases diagnosed in 2004 in seven states (California, Georgia, Kentucky, Louisiana, Minnesota, North Carolina, and Wisconsin). Cancer registry data were supplemented by re-abstracting hospital records and obtaining information about human epidermal growth factor receptor 2 (HER2) status, adjuvant treatment, and comorbidity from physicians and outpatient facilities and linkages with secondary files such as census data or information on hospitals and physicians. Of the 9,142 POC-BP breast cancer patients, 170 (1.9%) had inflammatory breast cancer (defined as T4d, N0–3, M0 using the 6th edition American Joint Committee on Cancer tumor-node-metastasis system for staging). 63 IBC cases with distant metastatic disease were excluded because their patterns of care would be markedly different (e.g. more likely to receive palliative care), leaving 107 cases for analysis.

2.2 Concordant Care

Definitions of “concordant care” were based on NCCN Clinical Practice Guidelines. In 2003, the following regimen was considered “guideline concordant” for the treatment of IBC: anthracycline neoadjuvant chemotherapy; mastectomy; radiation to the chest wall and supraclavicular nodes; and hormone therapy if estrogen receptor (ER)- or progesterone receptor (PR)-positive (NCCN Guidelines, 2003). In 2013, the following regimen was considered “guideline concordant” for IBC: taxane neoadjuvant chemotherapy plus trastuzumab if HER2+; anthracycline neoadjuvant chemotherapy unless TC (docetaxel and cyclophosphamide) or TCH (docetaxel, carboplatin, and trastuzumab) is used; mastectomy; radiation to the chest wall and supraclavicular nodes; hormone therapy if ER/PR-positive (NCCN Guidelines, 2013). Therefore, the only major change from 2003 to 2013 was the neoadjuvant chemotherapy guideline. We evaluated survival based on receipt of concordant care at the time of the study based on 2003 guidelines as well as receipt of care concordant with current 2013 guidelines. We analyzed overall concordance (the combination of all treatment modalities) as well concordance with individual treatment modalities.

2.3 Covariates of Interest

Racial/ethnic information was obtained from medical records and categorized into the following groups: non-Hispanic white, non-Hispanic black, Hispanic, and other. Insurance status at diagnosis was categorized into five groups as follows: private, Medicaid, Medicare/other public, none, and unknown. The private insurance group also included cases with Medicare with supplemental private insurance. Other public insurance comprised women with TRICARE, other military insurance, Veterans Affairs, or Indian Health Service coverage. The Medicaid group also included women on Medicare with Medicaid eligibility and other government programs. Body mass index (BMI) at the time of diagnosis was categorized into three groups: 18.5–24.9 kg/m² (normal), 25–30 kg/m² (overweight), and >30 kg/m² (obese). Zero cases had BMI <18.5 kg/m². Area socioeconomic measures were constructed from 2000 U.S. census data linked to the census tract of the patient’s residence at the time of diagnosis. Poverty and education at the residential census tract level were categorized into less than 20% (low poverty) versus 20% of persons (high poverty) with an income below the federal poverty level, and less than 25% (high education) versus 25% (low education) of adults (>25 years old) with less than a high-school education, as done previously [21]. Another ecological measure included percent of the population that was in an urban area (100% urban, 100% rural, urban/rural mix). Comorbidities were assessed using the Adult Comorbidity Evaluation (ACE)-27, which includes conditions relevant to cancer treatment choice and outcome, and the severity of these conditions that were present at or before diagnosis [22,23]. Overall comorbidity index (none, low, moderate, or severe) was allotted based on the comorbidity with the highest level of decompensation.

The year of medical school graduation and primary specialty were obtained for all physicians from the Medicare Physician Identification and Eligibility Registry (MPIER) File, maintained by the US Centers for Medicare and Medicaid Services.

Institutional Commission on Cancer (CoC) status was determined based on the facility in which the patient received breast cancer surgery regardless of the location of other

treatments because the surgeon usually determines the initial course of treatment and since most referrals for adjuvant therapy are made by a surgeon [24]. Information on hospital teaching status and number of beds was obtained from the American Hospital Directory.

For survival analysis, vital status and underlying cause of death were obtained from linkages with state death certificate files and National Death Index from the US National Center for Health Statistics. Person-time follow-up was calculated from the date of diagnosis through either the date of death or 5 years after diagnosis (1826 days), whichever occurred first. Patients were classified as having a breast cancer-related death if the death certificate indicated the underlying cause of death as C50 breast cancer (International Classification of Diseases ICD-10).

2.4 Statistical Analysis

We assessed the association of the covariates of interest with receipt of guideline-concordant care using χ^2 tests. Kaplan-Meier survival curves were drawn to compare patients based on guideline concordance. Log-rank tests were calculated to compare all-cause and breast cancer-specific survival curves. All significance tests were two-sided; p-values less than 0.05 were considered statistically significant. All statistics were weighted by the sampling fractions used by each state registry for the respective sampling stratum to represent the source population. SAS procedures for survey data were used [25]. Due to the small sample size, multivariable analysis of predictors of guideline concordance was not performed.

3. RESULTS

3.1 Guideline Concordance

Table 1 displays the characteristics of the 107 IBC patients that were included in this analysis. The average age at diagnosis was 57.8 years. 74.0% of patients were white, and 37.6% of patients were obese. Most patients (90.9%) had some form of insurance.

Figure 1 demonstrates the NCCN guidelines for treating IBC and where IBC patients deviated from this course. IBC is generally treated with neoadjuvant chemotherapy, mastectomy, radiation to the chest wall and supraclavicular nodes, and appropriate hormonal therapy. The advent of neoadjuvant chemotherapy in IBC treatment has improved surgery and locoregional control of the disease [26–28]. Only 25.8% of IBC patients received guideline-concordant treatment based on 2003 NCCN guidelines (Supplemental Table 1). 90.4% were concordant for surgery, 51.9% for chemotherapy, 40.7% for radiation, and 78% for hormone therapy if hormone receptor-positive (Supplemental Table 1). For chemotherapy, the timing of treatment (e.g. neoadjuvant or adjuvant) was taken into consideration for guideline concordance. Of the 40 patients that did not receive guideline-concordant care, 13 received an anthracycline in the adjuvant setting rather than neoadjuvant, while 27 did not receive any anthracycline therapy. Of the patients not receiving guideline-concordant radiation therapy, most did not receive any radiation at all, and some received radiation only to the chest wall or supraclavicular nodes but not both.

IBC tumors are more commonly HER2-positive compared to other breast cancers [29]. Of the 107 IBC patients, 41 were HER2-positive. 16 of these HER2-positive IBC patients received trastuzumab, 7 in the neoadjuvant and 9 in the adjuvant setting.

We examined whether guideline-concordant care differed based on different patient, physician, and institutional characteristics (Table 2). Regarding overall concordance (i.e. concordant care for all treatment modalities), 28.7% of patients under the age of 50 received guideline concordant care compared to 23.8% of patients 50–59 years, 49.7% of patients 60–69 years, and 8.4% patients aged 70 years. Furthermore, 34.2% of white patients received guideline-concordant care compared to 15.2% of black patients ($p=0.03$). IBC patients with normal BMI values were less likely to receive guideline-concordant care ($p=0.003$); 13.0% of patients with a BMI between 18.5 and 25, 22.5% of patients with a BMI between 25 and 30, and 47.2% of patients with a BMI over 30 received concordant care. There were no significant differences in receipt of concordant care based on census-tract poverty or education. Receipt of concordant care did not vary significantly with comorbidity index ($p=0.85$); while the sample size was small, the results suggest that women with severe comorbidities may be less likely to receive guideline concordant surgery, chemotherapy, or radiation.

When analyzing differences based on physician characteristics (Table 2), we found that IBC patients were less likely to receive overall guideline-concordant care for all treatment modalities if their surgeon had completed their medical degrees more than 15 years prior ($p=0.02$). Receipt of guideline-concordant care was not related to time from graduation for the physicians administering radiation or chemotherapy ($p=0.37$ and $p=0.72$, respectively).

Results suggested that IBC patients who had their surgery at a small (less than 200 beds) hospital were less likely to receive guideline concordant care overall ($p=0.02$). 32.6% of IBC patients seen at CoC-accredited hospitals received guideline-concordant care compared to 22.8% of patients seen at hospitals not accredited by CoC ($p=0.50$). Furthermore, 31.7% of IBC patients seen at a teaching hospital received guideline-concordant care compared to 24.3% of patients seen at a non-teaching hospital ($p=0.62$).

3.2 Survival after IBC Diagnosis

We compared the survival among IBC patients based on guideline concordance for radiation, chemotherapy, and hormone therapy. We assessed both breast cancer-specific survival (Figure 2) and overall survival (Supplementary Figure 1) using the Kaplan-Meier method. For breast cancer-specific survival, IBC patients survived longer if they received guideline-concordant treatment based on 2003 NCCN guidelines (Figure 2A; $p=0.06$). We also assessed whether patients receiving care that is now concordant with 2013 NCCN guidelines had longer breast cancer-specific survival. The only difference between 2003 and 2013 guidelines was the addition of taxane and trastuzumab (if HER2+) for neoadjuvant therapy and possible substitutions for anthracycline neoadjuvant therapy. These were all available in 2004 when these patients were treated. Indeed, we found that IBC patients receiving such care appeared to have longer survival (Figure 2B; $p=0.06$). When examining guideline concordance for the individual treatment modalities, there was no significant difference in breast cancer-specific survival when comparing IBC patients that did or did not

receive guideline-concordant chemotherapy ($p=0.28$), radiation ($p=0.27$), or hormone therapy ($p=0.92$, Figure 3). Likewise, no significant differences in all-cause survival were observed when examining guideline concordance in the individual treatment modalities (Supplementary Figures 2, 3, and 4). We did not compare patients based on receipt of guideline-concordant surgery because nearly all patients (90.4%) received guideline-concordant mastectomy.

4. DISCUSSION

IBC is one of the rarest yet most lethal types of breast cancer. To our knowledge, this study provides the most comprehensive analysis of the receipt of guideline-concordant care in IBC patients. Understanding of this disease has been limited by the different definitions used to classify IBC (i.e. clinical, pathological, epidemiologic) as well as the lack of effective treatments. Treatment decisions are complicated, as evidenced by our finding that only 25.8% of IBC patients were concordant with NCCN guidelines. Reasons for this lack of concordance are unclear and multifactorial, but may reflect a nihilistic attitude amongst providers about the prognosis of patients with IBC. Here we report that patients who received care that followed 2003 NCCN guidelines had significantly improved survival. Similarly, a recent study demonstrated that IBC patients with stage III disease had an overall median survival of 66 months, while the subgroup that received multimodal therapy had a median survival of 107 months [12], a survival rate that compares favorably to other malignancies commonly treated with curative intent.

Despite the publishing of guidelines and recommendations, receipt of guideline-concordant care varies based on many factors. In our series, black race, low BMI, longer time since graduation for the surgeon, and small hospital size were associated with decreased likelihood of receiving guideline-concordant care. Furthermore, patients over 70 years old and with higher comorbidity indices were less likely to receive guideline concordant care, although these were not statistically significant. These findings are largely consistent with previous breast cancer studies, but they are important to report for IBC given the paucity of studies on this population. For example, we found that black IBC patients were less likely to receive guideline-concordant care, and previous studies have shown similar racial disparities in receipt of guideline-concordant care for breast cancer [23,30–32]. Specific to IBC, black women tend to be diagnosed at a younger age and also have worse outcomes compared to their white counterparts [33]. One explanation for the racial disparities identified in our data series is that minority status and socioeconomic status are strongly correlated, and poorer patients generally have limited access to care, limited treatment options, and difficulty with treatment compliance [31]. A second explanation is that mistrust in the medical delivery system is greater among minorities [34].

With regard to age, in older women comorbid conditions and lessened ability to tolerate treatment (i.e. performance status) could have impacted treatment decisions. Previous studies have also shown that increased patient age is associated with non-concordant treatment for cancer [23,35,36]. The 2003 NCCN guidelines state that there is insufficient data to make chemotherapy recommendations for those over 70, and such decisions need to be made on an individual basis; therefore, the standard of care was less clear for these older

patients. Furthermore, there is generally a lack of women over 70 that participate in clinical trials [37]. Regarding comorbidities, a recent analysis of patients with early stage breast cancer from this same data set similarly found that increased comorbidity burden correlated with decreased likelihood of receiving guideline-concordant care [23].

IBC patients were less likely to receive guideline concordant care if their surgeon had completed their medical degree more than 15 years prior. This may suggest that some physicians are not keeping up to date with NCCN guidelines, or may be favoring therapy choices based on clinical experience. A previous report of physician survey data showed that a greater proportion of younger physicians rated themselves as “heavy users” of clinical guidelines compared to older physicians [38]. Based on the finding that 16.9% of patients received adjuvant rather than neoadjuvant chemotherapy, it is possible that the surgeon was not promptly referring the patient to medical oncology prior to surgery. Given the data demonstrating improved survival with neoadjuvant chemotherapy in IBC [28], timely referral to medical oncology is essential for IBC patients. Similarly, there was very low concordance with administration of radiation therapy. Optimal radiation technique has been associated with improved local control for patients with IBC, and series reporting the most favorable outcomes for this population have utilized tri-modality therapy (chemotherapy, surgery and radiation) [39–41].

When analyzing differences based on hospital characteristics, we found that IBC patients treated at a small (less than 200 beds) hospital were less likely to receive guideline concordant care overall. Small hospitals rarely see IBC patients and therefore are not as familiar with the NCCN guidelines for IBC. Previous studies have demonstrated improved outcomes for patients treated at higher volume centers [42–44].

A major strength of this study is its large-scale population-based design, including data from seven states and from individuals of all ages, making the sample size larger than most other IBC studies. Additional strengths are the inclusion of National Program of Cancer Registries that did not participate in previous patterns of care studies and the inclusion of comprehensive treatment information. One limitation is the relatively small number of IBC cases, which precluded multivariate analyses; however, all previous IBC research has had to deal with this challenge.

5. CONCLUSION

In conclusion, this is the only study to our knowledge that analyzed disparities in the receipt of guideline-concordant care in IBC patients based on patient, physician, and hospital characteristics. Our data suggest the need for efforts to improve concordance with NCCN guidelines for treating IBC. In addition, results strongly suggest that IBC patients may benefit from seeking care from board-certified specialists with experience at this rare disease and recent training. Prompt referral for neoadjuvant chemotherapy and post-operative radiation therapy is also crucial. In the absence of new, more effective therapies, interventions targeted to physicians are warranted to reduce variation in the treatment of IBC patients and to improve survival for these women.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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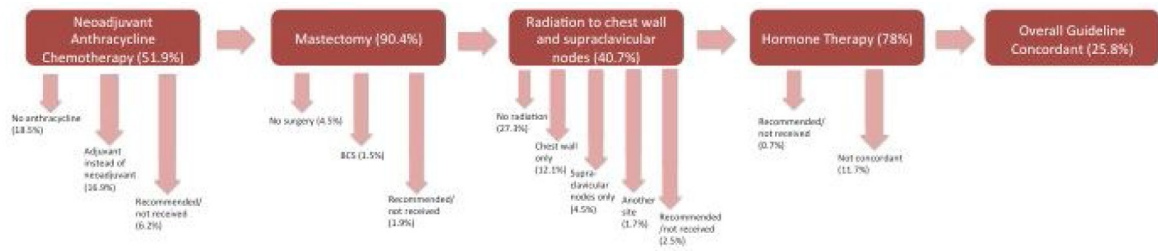


Figure 1. Flow diagram demonstrating the NCCN guideline-concordant treatment regimen for inflammatory breast cancer in 2004. Arrows indicate where patients diverted if they were not concordant for the indicated treatment modalities. Patients for whom treatment data were not available for a certain modality are included in the percentages but are not displayed in the figure. BCS = breast conserving surgery (alias lumpectomy).

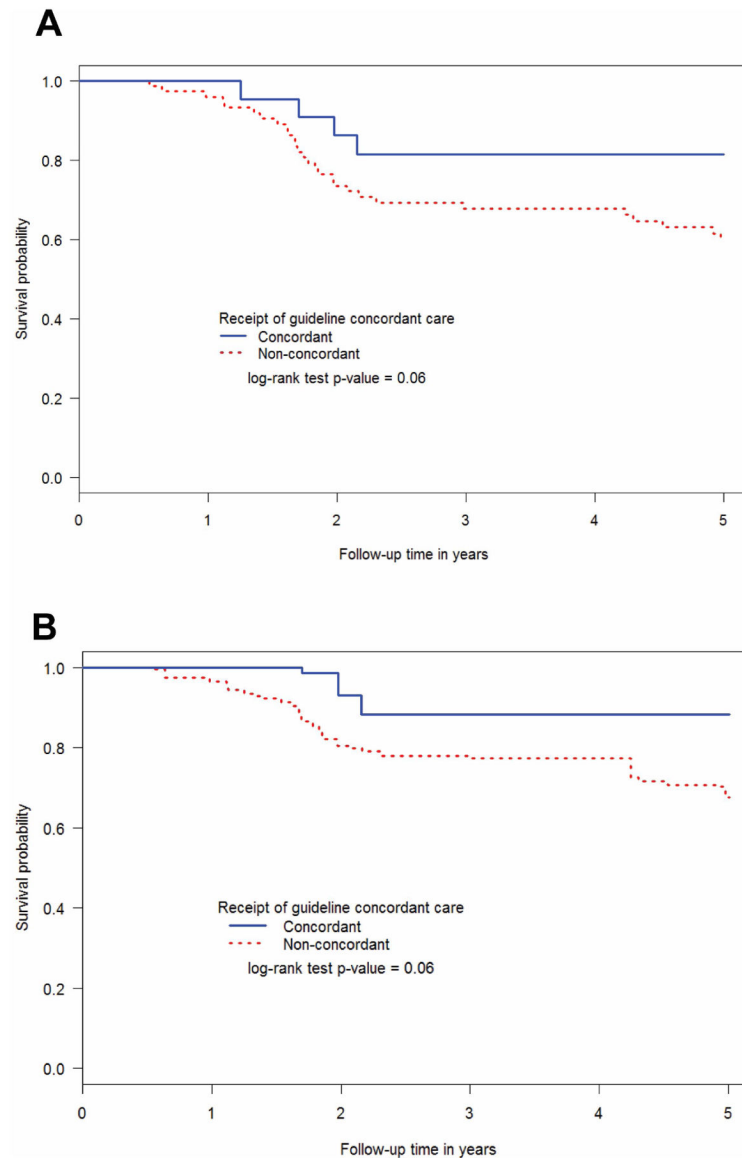


Figure 2. Breast cancer-specific survival among inflammatory breast cancer patients based on receipt of care concordant with (A) 2003 or (B) 2013 NCCN guidelines using the Kaplan-Meier method. NPCR POC-BP, 2004–2009.

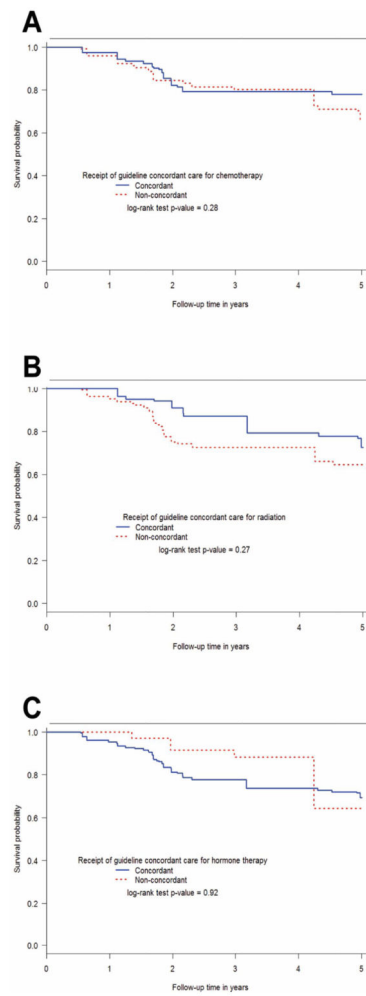


Figure 3. Breast cancer-specific survival among inflammatory breast cancer patients based on whether they did or did not receive guideline-concordant care based on 2003 NCCN guidelines for (A) chemotherapy, (B) radiation, and (C) hormone therapy using the Kaplan-Meier method. NPCR POC-BP, 2004–2009.

Table 1

General characteristics of inflammatory breast cancer patients, NPCR POC-BP, 2004

Characteristic	Number (N=107)	Weighted* %
Age at diagnosis, years		
<50	33	27.8
50–59	31	32.6
60–69	20	22.5
70	23	17.0
Race/ethnicity		
White, non-Hispanic	56	74.0
Black, non-Hispanic	40	19.1
Hispanic	9	6.2
Other	2	0.7
Body mass index (kg/m ²)		
18.5–24.9	16	13.3
25–30	20	19.2
>30	41	37.6
Unknown	30	29.9
Participating State		
California	18	19.8
Georgia	34	22.4
Kentucky	5	7.7
Louisiana	18	8.1
Minnesota	9	7.8
North Carolina	16	26.3
Wisconsin	7	7.9
Patient health insurance		
Private	51	52.1
Medicare only/public	27	24.5
Medicaid	22	14.4
No insurance or unknown	7	9.1
Poverty (census tract)		
Low (<20% of residents below poverty)	74	80.2
High (20% of residents below poverty)	32	19.4
Education (census tract)		
High (20% adults with a high school degree)	55	63.8
Low (<20% adults with a high school degree)	51	35.8

Abbreviation: NPCR POC-BP, National Program of Cancer Registries Breast and Prostate Cancer Data Quality and Patterns of Care Study.

* Percentages weighted to reflect the sampling design.

Receipt of NCCN guideline-concordant treatment among inflammatory breast cancer patients based on patient, physician, and institution characteristics, CDC POC-BP, 2004*

Table 2

	Overall		Surgery		Chemotherapy		Radiation		Hormone Therapy	
	Number	%	Number	%	Number	%	Number	%	Number	%
Total	107	22	93		54		35		86	
Patient Characteristics										
Age at diagnosis		P=0.19								
<50	33	6	29	92.9	20	62.5	13	54.9	28	88.8
50-59	31	7	28	95.9	16	49.9	11	39.3	25	82.7
60-69	20	8	19	98.5	13	74.0	9	70.8	16	88.9
70	23	1	17	72.2	5	24.8	2	14.5	17	85.0
Race		P=0.03								
White, NH	56	15	51	94.5	31	56.0	23	54.5	45	86.0
Black, NH	40	6	33	83.0	19	54.6	11	26.3	33	84.8
Hispanic	9	0	8	94.1	3	52.7	0	0.0	7	93.8
Other	2	1	1	50.4	1	50.4	1	50.4	1	100.0
Body mass index (kg/m ²)		P=0.003								
18.5-24.9	16	1	14	94.9	5	25.8	4	52.3	13	89.4
25-30	20	5	16	88.5	11	53.2	7	34.7	15	62.2
>30	41	12	38	96.8	24	69.1	18	59.6	36	95.1
Unknown	30	4	25	86.3	14	53.1	6	30.5	22	91.0
Insurance		P=0.63								
Private	51	13	47	92.6	26	53.0	19	43.3	40	85.4
Medicare	27	4	22	93.2	12	50.5	7	56.6	22	95.8
Medicaid	22	3	17	82.3	10	53.9	6	28.9	18	69.9
None/Unknown	7	2	7	100.0	6	83.8	3	55.5	6	93.7
Census-tract poverty		P=0.42								
<20% below poverty	74	17	67	93.9	37	53.8	26	47.1	57	84.2
20% below poverty	32	5	25	83.7	16	62.4	9	41.7	28	94.5
Census-tract education		P=0.91								

	Overall		Surgery		Chemotherapy		Radiation		Hormone Therapy	
	Number	%	Number	%	Number	%	Number	%	Number	%
<25% w/o HS degree	55	29.3	51	94.1	30	51.8	23	47.6	43	84.7
25% w/o HS degree	51	27.7	41	88.1	23	62.1	12	43.0	42	88.9
Comorbidity index		P=0.85								
None	38	33.6	35	97.6	20	56.7	13	50.1	32	86.6
Mild	43	23.8	37	87.4	24	58.6	12	36.5	32	86.1
Moderate	19	33.4	17	96.2	8	51.8	9	64.9	15	82.3
Severe	7	18.2	4	71.8	2	33.0	1	18.2	7	100.0
Physician Characteristics										
Time from graduation										
Surgeon		P=0.02								
<15 years	18	51.2	17	96.4	10	74.0	8	63.9	14	89.8
>15 years	39	31.5	39	100.0	24	62.0	15	52.2	33	91.4
Unknown	39	16.8	37	97.7	20	47.4	12	38.8	31	76.5
Radiation oncologist		P=0.37								
<15 years	16	60.1	16	100.0	11	72.2	12	86.0	15	100.0
>15 years	32	38.1	30	96.4	23	74.6	16	56.8	28	89.7
Unknown	17	33.0	17	100.0	11	65.7	7	64.0	15	94.0
Chemotherapy oncologist		P=0.72								
<15 years	15	31.3	11	83.1	8	73.9	4	36.5	15	100.0
>15 years	58	36.4	53	95.8	35	64.6	23	53.8	46	87.8
Unknown	19	24.8	19	100.0	11	56.6	7	54.7	16	89.7
Hospital Characteristics										
CoC Accredited										
Yes	57	32.6	51	91.4	33	57.6	22	49.2	46	89.8
No	38	22.8	33	93.0	16	54.0	9	36.7	31	79.1
Teaching status		P=0.62								
Teaching	48	31.7	43	94.9	30	65.5	14	39.3	36	81.1
Non-teaching	45	24.3	40	89.7	18	43.0	16	51.3	38	91.2
Size (number of beds)		P=0.02								
<200	24	6.0	18	70.7	5	13.2	5	27.9	18	85.0

	Overall		Surgery		Chemotherapy		Radiation		Hormone Therapy		
	Number	%	Number	%	Number	%	Number	%	Number	%	
200-299	12	4	44.5	12	100.0	7	75.0	5	62.0	10	84.2
300-399	15	2	8.0	15	100.0	8	39.7	5	49.9	11	79.5
400	42	11	38.2	38	95.2	28	70.3	15	43.1	35	88.2

Abbreviations: CoC, Commission on Cancer; NH, non-Hispanic; NPCR POC-BP, National Program of Cancer Registries Breast and Prostate Cancer Data Quality and Patterns of Care Study.

* Percentages weighted to reflect the sampling design. Chemotherapy oncologist refers to the physician that determined the chemotherapy regimen; it was not a medical oncologist in all cases. Time from graduation refers to graduation from medical school. Calculation of chi-square test p-values excluded categories of unknown status. For race, p-value compares non-Hispanic White to all others.