



Overall survival is similar between women who seek care at one or more institutions after diagnosis of operable breast cancer in the community



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A B S T R A C T

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Background: As breast cancer diagnoses increase, so does the number of patients who are critically evaluating hospital attributes to determine where to receive their treatment. Evidence suggests that complex surgeries have better outcomes in high volume academic centers. Whether clinical outcomes of women diagnosed with operable breast cancer, who are treated by multiple disciplines including non-complex surgical approaches, differ for those received all or part of their treatment at their community cancer center is unclear. We hypothesize that the clinical outcomes do not differ for those who received all or part of their care at their community cancer center. Our aim is to analyze data from the National Cancer Database (NCDB) to assess the clinical characteristics and outcomes of patients who received all their treatment at community cancer center when compared with those who had part or all of their care elsewhere.

Methods: A cohort of 162,803 women diagnosed at a community cancer center with an operable breast cancer (clinical stage I – III) between 2005 and 2014 from the NCDB was evaluated. Demographics, cancer-specific characteristics and overall survival differences between patients who stay at or leave their home institution for breast cancer treatment were compared.

Results: Within this cohort, patients treated at multiple institutions were younger, traveled further from home for their care, and were more likely to have no comorbidities ($p < 0.001$). Overall survival adjusted for demographics and cancer stage and subtype did not differ based on treatment at one or multiple institutions.

Conclusions: The decision for patients to undergo breast cancer treatment in a different institution after being diagnosed in a community center does not appear to impact overall survival.

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1. Introduction

The rates of breast cancer diagnosis have continued to rise over the past decade, and now represent almost one third of cancer diagnoses among American women [1]. As a result, more women at all stages of breast cancer diagnosis and treatment are looking critically at hospital and physician attributes to determine where to receive their treatment. Many subjective factors, including advertising strategies, may serve to increase the patient demand at certain institutions. Objective data are also available that stratify

hospitals based on patient outcome that may drive patient demand. Several studies have demonstrated that high volume and specialty centers improve outcomes after surgery for benign and malignant processes [2], and breast cancer patients specifically [3–6]. Regardless of whether a patient changes institution, it seems as though the primary institution in which they receive treatment impacts survival outcomes [7]. There are also well known disparities related to race, ethnicity and insurance status in both access to breast cancer care and ultimately survival [8,9]. What is not known, however, is if the decision to pursue treatment at a different institution after receiving a breast cancer diagnosis at a community cancer center impacts survival.

The National Cancer Database (NCDB) is a clinical cancer database curating data from more than 1500 Commission on Cancer-accredited facilities and includes approximately 75% of all new

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cancer diagnoses. Our study aim is to use the NCDB to understand the characteristics of patients who chose to stay at their community cancer center for breast cancer treatment and compare their outcome with those who had either part or all of their care elsewhere. We hypothesize that outcomes of breast cancer patients who chose to have all their care at the same institution as where they were initially diagnosed and patients who had part or all of their care elsewhere will be similar.

2. Methods

From the NCDB, we identified 396,588 women diagnosed with operable (clinical stage I–III) invasive breast cancer from 2005 to 2014 with complete data recorded for breast cancer histological subtype (estrogen receptor, progesterone receptor and Her-2) and type of CoC institution (community cancer center (CCC), comprehensive community cancer program (CCCP), academic/research program (ARP), and integrated cancer network (ICN)). The NCDB reporting institution indicates whether the patient was diagnosed at that institution and whether they had their cancer treatment, or a decision not to treat, there. Treatment at the institution is coded as either all treatment (or decision not to treat), part of treatment, or all or part of treatment (a not-otherwise-specified category).

For the analysis cohort, we identified and grouped patients who were diagnosed at either a CCC or CCCP, a total of 233,046 patients. We stratified these patients based on whether they received all their treatment at the diagnosing institution or had part or all of their treatment elsewhere.

Demographic information was extracted from the database. Patient-specific variables included age at diagnosis, race, insurance status and the Charlson-Deyo Score, which describes the number and severity of comorbidities on a scale from 0 to 2. Demographics coded based on the patient's ZIP code were also extracted, including great circle distance (the distance from the reporting hospital to the patient's home ZIP code), average annual income and level of education based on ZIP code data. We also recorded disease-specific data including tumor subtype, pathologic stage and whether they underwent lumpectomy or mastectomy for definitive surgery. Finally, we recorded data for overall survival (OS) based on patient death or last post-diagnosis office visit.

2.1. Statistical analyses

All statistical analyses were carried out with SPSS statistical software (IBM Corp.). Comparisons of patient demographic data were performed using one-way ANOVA and chi-square tests. Linear regression was used to detect trends over time. Univariate and multivariate survival analyses for OS were performed using Kaplan-Meier and Cox-proportional hazard models.

3. Results

3.1. Retention rate for breast cancer treatment differs between institution types

A total of 396,588 patients met all initial inclusion criteria. Fig. 1 summarizes the proportion of patients who were diagnosed and underwent treatment at the reporting institution. Within this group, 260,319 patients (62.4%) had part or all of their cancer treatment at the institution where they were diagnosed and 121,393 patients (29.1%) had all of their treatment in the institution where they were diagnosed. When compared to other institution types, patients diagnosed at ARPs were more likely to remain at that institution for at least part of their treatment (96.3% vs. 93.9–94.8%, $p = 0.02$). ARPs also treated the highest proportion of

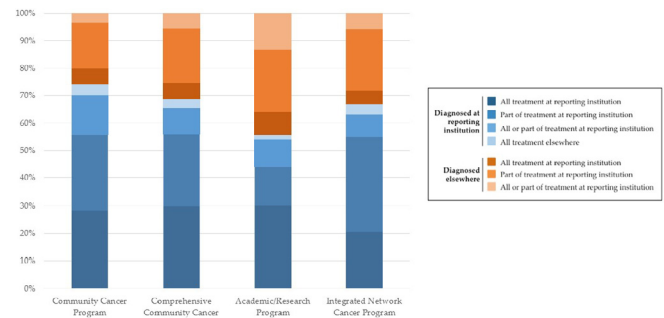


Fig. 1. Proportions of patients diagnosed and treated by reporting institution type. All values are percentages of the total number of patients reported by that program type.

patients that had been diagnosed elsewhere (43.8% vs. 25.4–32.8%; $p < 0.001$).

3.2. Characteristics of patients who were diagnosed and treated partially or entirely at community cancer centers

Patient demographics and cancer-specific characteristics were analyzed after stratifying patients diagnosed in community cancer centers according to whether they had all of their treatment or part of it elsewhere (Table 1). The majority of patients, 93,949 (57.8%), had at least part of their treatment at a second institution. There were statistically but not clinically significant differences between the groups in age and distance traveled to the treatment hospital (both $p < 0.001$). Women who had treatment elsewhere were more likely to have no medical comorbidities ($p < 0.001$). Black women were more likely to remain at their community cancer center for treatment than women of other races (44.2% vs. 42.1%, $p < 0.001$). Patients with private insurance were more likely to receive treatment at a second institution ($p < 0.001$). There were also significant differences in the income and education levels with those in the lowest quartile for each being more likely to remain at their community cancer center (both $p < 0.001$).

Related to cancer-specific data, Stage 1 breast cancers were the most common overall. When examining breast cancer subtype distribution, hormone receptor (HR) positive, Her-2 negative cancers were the most common overall (75.1%). Women with stage 1 cancer were more likely than those with stage II or III to remain at the community cancer center for treatment (43.9% vs. 41.8 and 39.2%, respectively, $p < 0.001$). Similarly, patients with triple negative breast cancer (TNBC) were more likely to not seek treatment at a second institution when compared with those diagnosed with other subtypes (43.4% vs. 39.1–42.5%, $p < 0.001$).

3.3. Analysis of overall survival based on patient demographics and cancer-specific characteristics who were diagnosed and treated partly or entirely at community cancer centers

Mean follow up for all patients in this cohort was 124.3 months with patients remaining at the community cancer center for treatment having a significantly shorter follow up (117.6 vs. 125.4 months, $p < 0.001$) and INPs the shortest (116.7 months, $p < 0.001$).

On univariate analysis, all tested variables had a significant impact on OS (Table 2). Of all demographic covariates, a Charlson-Deyo score of 2 when compared to no comorbidities had the highest hazard ratio as expected (HR 3.59, 95% C.I. 3.41–3.77, $p < 0.001$). Insurance status demonstrated survival benefits for those with private insurance and other government insurance plans (HR 0.44 and 0.71, respectively), while patients with Medicare had higher odds of death when compared to patients without

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