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Influence of race, insurance status, and geographic access to plastic surgeons on immediate breast reconstruction rates

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ABSTRACT

Background: This study evaluates the rates of immediate breast reconstruction (IBR) among racial and insurance status subgroups, in the setting of a changing plastic surgeon workforce.
Methods: Using state level inpatient and ambulatory surgery data, we identified discharges for adult women who underwent mastectomy for breast cancer. This information was supplemented with plastic surgeon workforce data and aggregated to the health service area-level (HSA). Hierarchical linear models were used to risk standardized IBR rates for 8 race-payer subgroups.
Results: The final cohort included 65,246 women treated across 67 HSAs. The plastic surgeon density per 100,000 population directly related to the IBR rate. While all subgroups saw a modest increase in IBR rates, Caucasian women with private insurance realized the largest absolute increase (46%) while African-American and Asian women with public insurance saw the smallest increase (6%).
Conclusion: Significant disparities persist in the provision of IBR according to the form of insurance a patient possesses. Of heightened concern is the novel finding that even within privately insured patients, women of color have significantly lower IBR rates compared to Caucasian women.

1. Introduction

Post mastectomy breast reconstruction for cancer is now universally recognized as an important component of the comprehensive breast cancer treatment. It has been well documented that breast reconstruction following mastectomy can improve a woman's psychosocial well-being after oncologic surgery.[1,2] Since 1998, the Women's Health and Cancer Rights Act, and subsequent state driven legislation, has mandated third party health care payers to cover breast reconstructive procedures at a level commensurate with that of the patient's mastectomy and adjuvant oncologic care.[3,4] Despite this coverage mandate, only 45% of women surgically treated for breast cancer will undergo breast reconstruction nationwide.[5]

Several studies have evaluated factors associated with patients that do not receive breast reconstruction and have found that advanced cancer stage and presence of significant comorbidities to be negatively correlated.[6–8] These clinical etiologies seem relatively easy to rationalize; however, there is growing concern that sociodemographic factors such as race and payer status are also related to the likelihood of a woman undergoing breast reconstruction after mastectomy.[5,6,9,10]

Racial disparities in the delivery of health care have been widely reported including within the field of plastic and reconstructive surgery. It has been well documented that women of color are found to undergo breast reconstruction less frequently than their Caucasian counterparts.[5,9,11,12] Additionally, the impact of payer status can be seen in the variation of reported reconstruction rates when different payer groups are studied.[4,6] It is not surprising to find that in these studies patients with insurance have the highest reconstruction rates, while those that are uninsured have the lowest.

Another factor that has garnered heightened interest is the clinical impact of geographic access to a plastic surgeon on a given population. There is growing evidence, substantiating prior conjecture, that geographic access to a plastic surgeon plays a role in whether a woman will undergo post mastectomy breast reconstruction. These studies demonstrate that women residing in areas in relatively close proximity to a plastic surgeon are significantly more likely to undergo reconstruction than those living in more remote locations.[13]

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When the topic of racial disparities in breast reconstruction has been presented nationally, there has often been the argument that the disparity likely exists because these minority communities have lower rates of insurance and tend to live in areas of lower plastic surgeon density. We hypothesized that the higher rates of breast reconstruction found with an increase in plastic surgeon density may not be realized by all women equally, and that disparities may be seen between women of different racial groups as well as based on the type of insurance (private vs. public), not just the presence of it. Therefore, we conducted this study to evaluate the relationship between rates of immediate breast reconstruction (IBR) among racial and types of insurance subgroups in the setting of a changing plastic surgeon workforce.

2. Methods

We performed a retrospective analysis of the 2008–2012 California (CA), Florida (FL), and New York (NY) state inpatient and ambulatory surgery databases. These databases are available through the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project.[14] The inpatient data is a census of hospital discharges from acute care, non-federal, community hospitals, whereas the ambulatory surgery data is drawn from free-standing, ambulatory surgery centers and hospital-based, outpatient departments. These specific state databases were selected for analysis due to their geographic diversity and large populations, which accounted for approximately 24% of the United States adult population in 2010.[15] In addition, these states provide encrypted patient identifiers which allow a longitudinal analysis of healthcare over time and across settings.

2.1. Patient selection and classification

From the 2009–2011 state inpatient and ambulatory surgery databases, we identified discharges for women at least 18 years of age who underwent mastectomy (*ICD-9-CM 85.4x, 85.33-85.36; CPT 19303, 19305, 19306, 19307*) for a diagnosis of breast cancer (*ICD-9-CM 233.0, 174.x*) with or without concurrent breast reconstruction (*ICD-9-CM 85.33, 85.35, 85.5x, 85.6x, 85.7x, 85.8x, 85.95; CPT 19340, 19342, 19357, 19324, 19361, 19364, 19367, 19368, 19369*). We defined the immediate breast reconstruction rate as the percentage of women who underwent breast reconstruction during the same admission where mastectomy was performed.

Patients were then grouped for subsequent analysis according to race and ethnicity and anticipated primary payer. The available race and ethnicity information is provided in a single variable with the following, mutually exclusive levels: Caucasian, African-American, Hispanic, Asian or Pacific Islander, Native American, Other, or missing. Because of low cell counts and for the purposes of this study, we combined the Asian, Pacific Islander, and Native American (APINA) categories and excluded patients with a race or ethnicity reported as “other” or “missing.” Anticipated primary payer was then defined as public (i.e., Medicare and Medicaid) versus private forms of insurance. This resulted in 4 race and ethnicity and 2 primary payer categories for 8 total patient groups overall.

2.2. Defining geographic access to plastic surgeons

Geographic healthcare data was obtained from the 2013–2014 Area Health Resource File (AHRF). This file is a compilation of multiple sources that provide population and healthcare workforce data at the county-level. From this file, we determined plastic surgeon density as the total number of plastic surgeons per 100,000 population in each U.S. county. The numerator in this ratio was the total number of plastic surgeons in each county as reported in the AHRF via the American Medical Association's Masterfile while the denominator represented the total population within each county according to the U.S. Census (2010). This information was merged with the clinical data based on the county where the treating hospital was located.

2.3. Aggregation of data to health service areas

We aggregated all data from the county-level to the National Cancer Institute's (NCI) Health Service Area (HSA)-level using crosswalk files available from the NCI. HSAs were originally defined by the National Center for Health Statistics as a single county, or cluster of counties, which are “self-contained” in respect to hospital care. The NCI subsequently modified these areas by dividing HSAs that straddled state lines so that all HSAs are contained within a single state's boundaries. The use of HSAs to describe population and physician characteristics at a national level is well-established.

2.4. Covariates for risk-standardization

We defined several patient variables for subsequent risk-standardization that may impact the ability of providers to offer immediate reconstruction. This included a patient's age, diagnosis (in-situ disease, invasive cancer, or metastatic cancer), whether a lymph node procedure was completed (none, sentinel node, or axillary dissection), and degree of medical comorbidity as defined by the enhanced-Elixhauser algorithm described by Quan. For each of the 31 medical conditions, we considered a condition to be present if it was a listed diagnosis during the hospitalization for mastectomy with reconstruction or at any hospital admission in the 12 months preceding surgery. In a similar manner, we assessed whether the patient had a history of tobacco use (*ICD-9-CM 305.1*). The Elixhauser index score was then calculated for each patient based on prior research. In the current databases, no information on post-mastectomy radiation therapy was available.

2.5. Statistical analysis

First, we compared patient characteristics and reconstruction rates across race and ethnicity groups (Caucasian, African American, Hispanic, Asian/Pacific Islander/Native American) using chi-squared and t-tests for categorical and continuous variables, respectively. Next, we created a patient-level, logistic regression model to quantify the relationship between immediate breast reconstruction (*dependent variable*) and race/ethnicity-payer subgroups while controlling for the covariates described above. Results are reported as adjusted odds ratios with 95% confidence intervals. Finally, we evaluated the relationship between a patient's race/ethnicity-payer subgroup and plastic surgeon density. To do this, we calculated risk-standardized, immediate breast reconstruction rates at the HSA-level using a two-level (patient and HSA), hierarchical generalized linear model. In this model, breast reconstruction was the binary outcome and the independent variables are those described above. The model also included HSA random intercepts to account for clustering of patients within HSAs and permit separation within and between HSA variation in breast reconstruction rates after accounting for patient characteristics. The predicted-to-estimated ratio obtained from these models was then multiplied by the mean, unadjusted breast reconstruction rate among all HSAs included in the study to yield the risk standardized rates. To assess the relationship between plastic surgeon density and the risk standardized, breast reconstruction rates, we calculated volume-weighted correlation coefficients.

All analyses were conducted using SAS version 9.4 (SAS

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