

# Understanding age and race disparities in the application of sentinel lymph node biopsy in breast cancer

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Accepted 11 July 2016  
Published Online First 27 July 2016

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## ABSTRACT

Sentinel lymph node biopsy (SLNB) is the standard of care for surgical evaluation of early-stage breast cancer and is being employed as a quality metric for accreditation of breast centers. Previous studies report disparities in SLNB receipt. The goal of this study is to determine SLNB rates and explore rationale for non-receipt of SLNB. Patients with early-stage breast cancer diagnosed between 2010 and 2011 were identified from the University Hospitals Case Medical Center tumor registry. Multivariable logistic models were used to identify clinical and demographic risk factors for patients who did not receive SLNB. We performed chart reviews to elucidate reasons for the lack of SLNB. Our total sample was 479 patients; of them 432 (90.2%) received SLNB. On average, patients who received SLNB were younger than those who did not receive SLNB (61 compared to 79 years, respectively). Patients  $\geq 80$  years were 96% less likely to receive SLNB compared to patients  $< 65$  years (OR 0.04; 95% CI 0.00 to 0.14). There were no differences in SLNB by race, between patients undergoing Medicare or Medicaid and managed care, by surgeon specialty, or across medical centers. Chart review determined that 45/47 patients did not have SLNB, because it was a clinical decision-making; advanced age ( $> 80$  years) was cited in 27/47 women. Older women had much lower odds of receiving SLNB; however, non-receipt of SLNB was often due to a clinical reasoning. Our study highlights the importance of clinical reasoning in receiving SLNB, whereas other studies solely employing administrative databases do not.

## INTRODUCTION

In 2005, the American Society of Clinical Oncology (ASCO) recommended the use of sentinel lymph node biopsy (SLNB) for surgical evaluation and staging in early-stage breast cancer.<sup>1</sup> Clinical trials conducted in the preceding decade have found that SLNB is not inferior to axillary lymph node biopsy and associated with fewer complications, including neuropathic pain, lymphedema and limited arm mobility.<sup>2–7</sup> Annual rates of SLNB consideration and performance are increasingly used as quality indicators, such as for accreditation of breast cancer centers.<sup>8</sup>

## Significance of this study

### What is already known about this subject?

- ▶ Sentinel lymph node biopsy (SLNB) is non-inferior to axillary lymph node biopsy for breast cancer staging.
- ▶ Rates of SLNB use are used as a quality metric for breast cancer center accreditation.
- ▶ Previous studies using large databases found disparities in age and race.

### What are the new findings?

- ▶ In our single institution, we did not find differences in rates of SLNB between black and white patients with breast cancer.
- ▶ Older women were less likely to receive SLNB compared to younger women.
- ▶ Through chart reviews, among those women who did not receive SLNB, the decision reflected clinical decision-making.

### How might these results change the focus of research or clinical practice?

- ▶ Understanding the factors influencing receipt of SLNB is important, especially if rates of SLNB are to be used for quality metrics.
- ▶ Large registry-based databases can be used to identify racial and age disparities; however, they lack detailed clinical decision-making, which may be important for determining compliance with quality metrics.

While the utilization rates of SLNB have increased dramatically over time,<sup>9–11</sup> disparities persist in the receipt of SLNB. Studies employing large, insurance claims data demonstrate that patients who are older and of a racial/ethnic minority have lower odds of receiving SLNB.<sup>10–11</sup> Other factors that have been associated with decreased receipt of SLNB include lower socioeconomic status, lack of healthcare insurance or having government-provided insurance, and treatment at a community or non-National Cancer Institute-affiliated hospital.<sup>9–11–12</sup>



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## To cite:

Radhakrishnan A, Silverman P, Pollack CE, et al. *J Invest Med* 2016;**64**:1241–1245.

While large databases provide invaluable information regarding population health, they lack clinical detail that may explain why in part some women do not receive SLNB. Understanding non-receipt of SLNB and the disparities that exist is essential in assuring that patients receive clinically appropriate care. Therefore, we conducted a retrospective chart review of patients with breast cancer at a diverse, metropolitan cancer center, to ascertain the rates of SLNB receipt and examine the clinical reasons for why patients did not receive SLNB.

## MATERIALS AND METHODS

This study is a retrospective chart review involving patients from three clinical sites, including one main academic medical center and two community affiliates. The Case Comprehensive Cancer Center Institutional Review Board approved this study.

### Patient cohort

Women who were diagnosed with breast cancer from January 1, 2010 through December 31, 2011, and had their information recorded in the tumor registry at University Hospitals Case Medical Center had their medical chart reviewed to determine whether they met study inclusion criteria. Inclusion criteria included: (1) having early stage I or II breast cancer; (2) being clinically lymph node negative; (3) having primary breast cancer surgery performed at one of the three clinical study sites; and (4) having self-reported black or white race. Patients were excluded if they were diagnosed with ductal or lobular carcinoma in situ, late stage III or IV breast cancer or were male.

### Dependent variable

For the outcome variable, patients were classified as having received SLNB or not during their primary breast cancer surgery.

### Covariates

Data abstracted through chart review included patient demographics (race, age and sex), medical center (academic vs community) and surgeon specialty (breast vs general). Self-reported race was categorized as white or black. Insurance was classified as managed care, Medicaid, Medicare and other/none. The other category includes patients with private, Indian/Public Health Service, Tricare military insurance and insurance not otherwise specified. Age was categorized as an ordinal variable (<65, 65–69, 70–74, 75–79 and ≥80 years). These variables have previously been identified in studies as factors influencing SLNB receipt.<sup>11 12</sup>

### Medical chart review

To understand the rationale for non-compliance with SLNB receipt,<sup>9–12</sup> electronic medical records of all patients who did not receive SLNB, including all inpatient admissions and outpatient visits with specialists, were reviewed (N=47). Specific documentation regarding treatment plans involving surgical procedures was reviewed from the surgeons' outpatient clinic notes, and used to extract reasons for why patients did not have SLNB (AR). In instances in which there was uncertainty regarding the reason for

deferral, due to lack of explicit documentation in the medical record, a second reviewer (PS) examined the chart, and consensus between the two reviewers was reached. Reasons cited for deferrals were tabulated.

### Statistical analysis

Bivariate analyses were used to compare characteristics (race, age, insurance type, medical center and surgeon specialty) of patients who did and did not receive SLNB using  $\chi^2$  statistics for categorical variables and t-tests for continuous variables. We conducted unadjusted and multi-variable logistic regression analysis to assess whether patient characteristics (age, race and insurance status) were associated with the receipt of SLNB after controlling for medical center and surgeon specialty. A p value <0.05 was considered statistically significant. Analyses were conducted with Stata V13.0.

## RESULTS

Between January 2010 and December 2011, 479 patients with breast cancer meeting the eligibility criteria were identified from the tumor registry (table 1).

Average age of the population was 62.3 years. There were 109 black patients (22.8%) and 370 white patients (77.2%). SLNB was performed in 90.2% (432/479) of the total patients (table 1).

Receipt of SLNB differed significantly by age and insurance categories in the unadjusted analysis. The average age of patients who had SLNB was 60.5 years (SD=12.7) when compared to 79.2 years (SD=13.6) for those who did not (p<0.001). Correspondingly, significantly lower rates of SLNB were observed among Medicare beneficiaries compared to patients in managed care (80% vs 99%, p<0.001), who tended to be younger. SLNB was

**Table 1** Patient characteristics by receipt of SLNB

	Total population	Yes (N, 100%)	No (N, 100%)	p Value
Age (years)				
<65	271	264 (97.4)	7 (2.6)	<0.001
65–69	54	53 (98.1)	1 (1.9)	
70–74	46	45 (97.8)	1 (2.2)	
75–79	44	39 (88.6)	5 (11.4)	
≥80	56	23 (41.1)	33 (58.9)	
Race				
Black	109	98 (90)	11 (10)	0.91
White	370	334 (90.3)	36 (9.7)	
Insurance type				
Managed care	175	173 (98.9)	2 (1.1)	<0.001
Medicaid	32	30 (93.8)	2 (6.2)	
Medicare	183	146 (79.8)	37 (20.2)	
Other/none	89	83 (93.3)	6 (6.7)	
Surgeon				
General	80	69 (86.3)	11 (13.7)	0.20
Breast	399	363 (91)	36 (9)	
Medical center				
Academic	366	332 (90.7)	34 (9.3)	0.49
Community	113	100 (88.5)	13 (11.5)	

SLNB, sentinel lymph node biopsy.

**Table 2** Multivariable regression model of factors influencing SLNB

Variables	Unadjusted OR (95% CI)	p Value	Adjusted OR* (95% CI)	p Value
Age (years)				
<65	1 (reference)		1 (reference)	
65–69	1.41 (0.17 to 11.66)	0.75	2.04 (0.21 to 19.69)	0.54
70–74	1.19 (0.14 to 9.93)	0.87	1.80 (0.18 to 17.63)	0.61
75–79	0.21 (0.06 to 0.68)	0.01	0.32 (0.07 to 1.48)	0.14
≥80	0.02 (0.01 to 0.06)	<0.001	0.04 (0 to 0.14)	<0.001
Race				
White	1 (reference)		1 (reference)	
Black	0.96 (0.47 to 1.96)	0.91	1.08 (0.44 to 2.66)	0.86
Insurance type				
Managed care	1 (reference)		1 (reference)	
Medicaid	0.17 (0.02 to 1.28)	0.09	0.18 (0.02 to 1.52)	0.12
Medicare	0.05 (0.01 to 0.19)	<0.001	0.21 (0.04 to 1.20)	0.08
Other/none	0.16 (0.03 to 0.81)	0.03	0.16 (0.03 to 0.89)	0.04
Surgeon				
General	1 (reference)		1 (reference)	
Breast	1.61 (0.78 to 3.31)	0.20	0.65 (0.22 to 1.92)	0.44
Medical center				
Community	1 (reference)		1 (reference)	
Academic	1.27 (0.64 to 2.50)	0.49	1.14 (0.42 to 3.10)	0.80

\*OR adjusted for race, age, insurance type, surgeon and medical center.  
SLNB, sentinel lymph node biopsy.

**Table 3** Reason for SLNB non-receipt documented in medical record

Reason	N=47 (100%)
Advanced age (≥80 years old)	27 (57.4)
Breast cancer recurrence with previous axillary lymph node dissection	10 (21.2)
Not chemotherapy candidate due to serious comorbidities	4 (8.5)
Patient declined	3 (6.4)
Attempted	1 (2.1)
SLNB should have been performed	2 (4.3)

SLNB, sentinel lymph node biopsy.

performed at a similar rate across both race groups ( $p=0.86$ ), with 98 black patients (90.0%) and 334 white patients (90.3%) receiving SLNB.

In multivariable logistic regression that included race, age, insurance type, surgeon and medical center (table 2), patients in the oldest age category (≥80 years) had decreased odds of having SLNB compared to patients in the youngest age category (<65 years) (OR 0.04; 95% CI 0.00 to 0.14). Black and white patients had similar odds of SLNB receipt (OR 1.08; 95% CI 0.44 to 2.66). We no longer observed a statistically significant difference in odds of SLNB between patients with Medicare and managed care. Neither surgeon specialty nor type of medical center was significantly associated with receipt of SLNB.

Chart review determined that of the 47 patients who did not have SLNB, 45 met the medical standard of care (table 3). The most common reasons for SLNB deferral were advanced age (57.4%, average age 88.6 years,

SD=4.8) and breast cancer recurrences with previous axillary lymph node dissections (21.2%). Other reasons for deferral included the patient not being a chemotherapy candidate due to serious comorbidities, patient declining the procedure and the procedure being attempted, but not completed successfully. Four women who did not receive SLNB did have axillary lymph node dissection.

## DISCUSSION

In our cross-sectional study of 479 women with clinically node-negative, early-stage breast cancer, SLNB was performed in 90% of the patients. Women 80 years and older had significantly lower odds of receiving SLNB compared to women younger than 65 years. However, there was no difference in receipt of SLNB between black and white women. Detailed chart review found that there was an appropriate medical reason for why all but two women did not receive SLNB. These findings suggest that, in our population, lack of SLNB did not represent a disparity but rather reflected appropriate clinical decision-making.

In nearly all cases, patients who did not receive SLNB did so for a reason that was based on clinical judgment. Reasons found for the deferrals include advanced age, breast cancer recurrences with previous axillary node dissections, comorbid conditions or patient declining the procedure. While previous surgery and comorbidity are often available from administrative claims data, the level of detail may not be adequate to know which patients are not receiving SLNB for a medically appropriate reason; further, patient decision-making is not captured in claims data. The results suggest that using SLNB as a quality indicator solely using administrative claims data may be inappropriate. If SLNB is used as a quality indicator, it will be necessary to have strict exclusion criteria to avoid unwarranted

penalization; patient preferences (especially among older and sicker women) and provider medical decision-making (which should be rooted in the best available evidence) must be incorporated into criteria evaluating adherence with quality guidelines.

Similar to previous findings, we found differences in SLNB receipt based on insurance status and age. The most recent ASCO clinical guidelines for SLNB specifically state that age should not be a determining factor for SLNB (or axillary lymph node dissection) consideration, citing insufficient evidence showing difference in outcomes by age.<sup>13</sup> Similar disparities were previously seen with axillary lymph node dissection, as older women were less likely to undergo the procedure.<sup>14–15</sup> In these studies, reasons given by surgeons for not offering axillary lymph node dissections in their older patients included the belief that lymph nodal status would not alter subsequent treatment decisions and the potential morbidity outweighing the potential benefits.<sup>14</sup> It is likely that surgeons hold similar beliefs with SLNB utilization in the older patient population, judging it to not be clinically appropriate, accounting for the observed differences.

In contrast to prior studies, we did not observe a racial disparity in the receipt of SLNB within our single institution. Many of the previous studies demonstrating racial differences in the use of SLNB use older data.<sup>9–12</sup> Since the rate of SLNB has grown dramatically over time,<sup>9–11</sup> disparities in access to SLNB may have decreased over time. An overlapping explanation is that racial disparities in the receipt of SLNB may be driven, at least in part, by where patients receive care.<sup>16–19</sup> Prior research has found that black and white patients tend to receive care from different primary care providers who have different access to specialty resources.<sup>20–22</sup> In cancer care, racial differences in the receipt of prostatectomy for localized prostate cancer are due, in part, to where patients receive care. In particular, patients treated at hospitals with a larger proportion of non-white patients were significantly less likely to receive surgery.<sup>23</sup> Lending credence to this explanation in the case of SLNB is a prior work finding that institutional features, such as NCI Cancer Center affiliation, are associated with the receipt of SLNB.<sup>9–11–12</sup> Disaggregating the observed disparities in SLNB into those that exist between institutions versus those that occur within institutions is an important next step. If disparities are indeed due to different sites of care, then it is critical to examine what factors drive patients to receive care from different surgeons and institutions.

There are limitations to our study. Data were obtained only from single healthcare system, using a relatively small sample, which limits the generalizability of the findings. The smaller sample size, however, allowed us to conduct an extensive chart review to identify why patients did not receive SLNB. Although a priori power analyses did validate the size, some differences that could be clinically meaningful may have not have reached statistical significance. Lastly, we relied on the accuracy of chart documentation to obtain reasons for SLNB deferral.

In our study population of patients with early-stage breast cancer within a single institution, we found that women 80 years of age and older had the lowest rate of receiving SLNB. Importantly, most patients who did not

receive SLNB had a clinically justified reason for deferral. Advanced age was the reason most commonly documented by physicians for not receiving SLNB in the medical record. Although large registry-based data may be useful in identifying issues such as age and racial disparities in SLNB, lack of detailed clinical reasoning makes it difficult to evaluate potential reasons for differences and use as the sole source for determining compliance with quality metrics associated with breast center accreditation.

**Funding** AR's salary is supported by the National Heart, Lung, and Blood Institute (T32HL007180). CEP's salary is supported by the National Cancer Institute and Office of Behavioral and Social Sciences (K07 CA151910). ERP's salary is supported by the Institutional National Research Service Award (T32HP10025B0).

**Competing interests** None declared.

**Ethics approval** Case Comprehensive Cancer Center Institutional Review Board.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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