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EPIDEMIOLOGY

Breast cancer screening in transgender patients: findings from the 2014 BRFSS survey

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Abstract
Purpose Transgender patients undergoing transitions often receive cross-sex hormonal therapies, placing them at uncertain risk for developing breast cancer. There is limited population-based information about the extent to which transgender patients undergo mammography screening. Our purpose was to determine the extent to which transgender patients undergo mammography screening using nationally representative survey data.
Methods Transgender participants between ages 40–74 in the 2014 Behavioral Risk Factor Surveillance System survey were included. Proportions undergoing mammography screening in the last year or two years were calculated stratified by age category and transition status [male to female(MtF), female to male(FtM), non-conforming]. For each transition status, predictors of mammography screening were calculated using logistic regression.
Results 220 transgender patients were within 40–74 years old(35% were MtF, 51% were FtM, 14% were non-conforming). 60.0% underwent mammography screening within the last year (MtF—54.5%, FtM—64.3%, non-conforming—58.1%). 74.1% underwent screening within the last two years(MtF—70.1%, FtM—75.9%, non-conforming—77.4%). For all transgender patients, income category (OR 1.16, 0.82–1.64), higher education category (OR 1.09, 0.31–3.86) and health insurance (OR 0.38, 0.10–1.41) were not associated with increased adherence to mammography screening. Transgender patients were comparably likely to undergo mammography screening compared with non-transgender patients (Adjusted OR 0.97, 0.58–1.62).
Conclusions High proportions of transgender survey respondents undergo mammography screening (57.9–66.1% within the last year, 71.9–74.4% within the last two years) in our sample, proportions comparable to non-transgender survey respondents.

Keywords Breast cancer · Transgender · Screening · Mammography

Introduction

Transgender patients often receive cross-sex hormonal therapies, placing them at uncertain risk for developing breast cancer. There is limited population-based information about the extent to which transgender patients undergo mammography screening. Our purpose was to determine the extent to which transgender patients undergo mammographic screening using nationally representative survey data.

Methods

We utilized the 2014 Centers for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS), the largest continuously conducted health survey in the world [1]. The 2014 survey was conducted by landline and cellphone with oversampling for under represented groups and adjustment for non-responders (response rate 48.7% landline, 40.5% cellphone). IRB approval was not required as the study utilized publically available information.

Participants were asked if they were transgender and how they would describe their transition status [male to

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female (MtF), female to male (FtM), or non-conforming]. Non-conforming refers to people who do not follow societal notions how they should look or act based on the sex they were assigned at birth [2] with this category encompassing a mix of male and female birth sex individuals. Survey participants who identified their sex as female were asked if they have ever had a mammogram (if so, how long since their last mammogram). Subjects included transgender participants aged 40–74 with no history of prior breast cancer.

The major outcome variable was the proportion of transgender survey participants reporting undergoing screening mammography within the last year or two years, stratified by age category and transition status.

Baseline demographic included race/ethnicity (White only, non-Hispanic; Black only, non-Hispanic; American Indian or Alaskan Native only, Non-Hispanic; Asian, Native Hawaiian or other Pacific Islander only, Non-Hispanic; Other race only, non-Hispanic; Hispanic), income group (Less than $15,000, $15,000 to less than $25,000, $25,000 to less than $35,000, $35,000 to less than $50,000 and $50,000 or more), education (did not graduate high school, graduated high school, attended college/technical school, graduated college/technical school), employment status (unemployed, employed, out of the labor force) and indices of access to health care (health insurance (yes/no), personal doctor (yes/no), trouble with medication costs (yes/no), last checkup (within past year, within past 2 years, within past 5 year, 5 or more years ago)). These variables were considered as independent variables in the analysis of transgender participants alone and considered as confounders in the analysis of transgender versus non-transgender patients.

Proportions of women obtaining screening mammography within the last year or two years were calculated, stratified by transition status. Logistic regression was used to compare proportions of transgender participants undergoing mammography screening within 1 or 2 years with baseline demographic variables (5 year age category, race/ethnicity, income, employment status, indices of access to health care). Logistic regression was used to compare proportions of transgender participants undergoing mammography screening within 1 or 2 years in transgender versus non-transgender survey participants, adjusting for the previously described baseline demographic variables. Odds ratios with 95% confidence intervals were reported with two-tailed p values less than 0.05 considered statistically significant. Analyses were conducted using STATA 11(StataCorp, College Station, TX) taking into account survey weights and clustering by sampling unit.

Results

In 2014, 169,774 women aged 40–74 responded to the BRFSS with 5.8% missing data (9,895/169,774) and 0.4% with prior history of breast cancer (756/169,774) of whom 689 identified as transgender. For the 338 patients who indicated their sex as female (and were asked questions about mammography screening), 220 patients were within the ages of 40–74 years old of whom 77 (35%) were MtF, 112 (51%) were FtM and 31 (14%) gender non-conforming (Table 1).

Table 1 Transgender Survey Participant Demographics

Survey participant demographics ($n = 220$)	Percentage
Transition status	
Male to female	35.0
Female to male	50.9
Gender non-conforming	14.1
Age category	
40–44	12.2
45–49	12.2
50–54	14.4
55–59	19.8
60–64	19.8
65–69	10.8
70–74	10.8
Race/ethnicity	
White	68.5
Black	14.0
Native American	1.8
Asian/Pacific Islander	2.7
Other	13.1
Income category	
Less than $15,000	20.7
$15,000 to less than $25,000	19.8
$25,000 to less than $35,000	8.6
$35,000 to less than $50,000	11.7
$50,000 or more	29.3
Don't know/not sure/missing	9.9
Education category	
Did not graduate high school	10.8
Graduated high school	38.7
Attended College/Technical School	30.6
Graduated from College/Technical School	19.8
Health insurance?	
Yes	89.2

Overall, 60.0% of transgender survey participants underwent mammography screening within the last year (74.1% within the last two years). For MtF respondents, 54.5% of women underwent mammography screening within the last year (70.1% within last two years) (Fig. 1). For FtM respondents, 64.3% underwent mammography screening within the last year (75.9% within the last two years). For gender non-conforming transgender patients, 58.1% underwent mammography screening within the last year (77.4% within the last two years).

For all transgender patients, income category (OR 1.16, 0.82–1.64), higher education category (OR 1.09, 0.31–3.86), and health insurance (OR 0.38, 0.10–1.41) were not associated with increased adherence to mammography screening. Adjusted for age, education, race, and income, transgender patients were comparably likely to undergo mammography screening compared with non-transgender patients (OR 0.97, 0.58–1.62).

Conclusions

In our study, we found high proportions of transgender survey respondents undergoing mammography screening (54.5–64.3% within the last year, 70.1–77.4% within the last two years), proportions comparable to non-transgender survey respondents. In one of the prior studies evaluating mammography screening in transgender patients, Bazzi et al. reviewed the medical records of 41 transgender patients and found lower percentages of transgender participants undergoing mammography screening compared with non-transgender participants [3]. Although there are limited data about screening practices in transgender patients, validation studies in underserved patient populations have found that self-reported studies tend to overestimate mammography screening adherence in underserved patient populations [4]. Additionally, we note that baseline characteristics of transgender survey respondents were similar to characteristics of non-transgender survey participants in our study, results which differ from previously reported surveys of transgender survey participants. In a nationally representative survey of 6,450 transgender individuals with dedicated outreach at homeless shelters and mobile health clinics, Grant et al. found that approximately one quarter of transgender participants postponed medical care due to discrimination and that transgender individuals were four times more likely to live in extreme poverty and twice as likely to be unemployed [5]. Compared with participants in our study, they also found higher proportions of survey participants without health insurance (19 to 11%). Additionally, we found higher proportions of transgender males in our study (51 vs 40%). Although higher proportions of transgender males could potentially influence overall adherence estimates, we found that transgender males were comparably likely to undergo screening compared with transgender female, gender non-conforming, and non-transgender survey participants ($p = 0.953$). These studies suggest that our study likely overestimates adherence to mammographic screening in transgender individuals.

In addition to limitations of self-reported survey data, our study was limited by the fact that our analyses are cross-sectional. Women may have undergone mammographic screening within the last year or two years; however, they may not present consistently for annual or biennial screening [6]. Additionally, our survey response

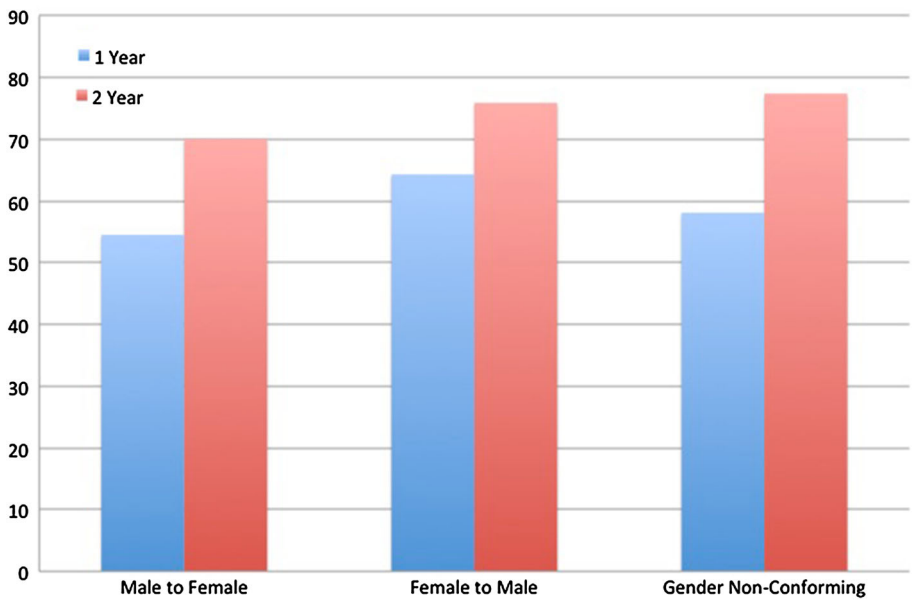

Fig. 1 Percentage of transgender survey respondents undergoing mammography screening by transition status

rates (49% for landline and 41% for cellphones) raise the possibility of non-response bias; however, our conclusions about mammographic screening are similar to previously reported population-based surveys with higher response rates [7].

Moreover, our study was limited by the lack of information regarding hormonal therapy usage and prior surgeries, limiting our ability to assess adherence to breast cancer screening recommendations in transgender patients. Exposure to differing types of exogenous and endogenous hormonal therapies has been associated with elevated risks of breast cancer [8]. Female transgender patients (undergoing male to female transition) often receive estrogenic supplements to enhance feminization as well as anti-androgens to suppress masculinizing features [9]. Prior meta-analysis of epidemiologic studies has found that increased lifetime exposure to estrogen (lower age at menarche, higher age at menopause) has been associated with elevated risk for breast cancer [10]. In postmenopausal women in the Women's Health Initiative clinical trial, estrogen and progesterone combinations were associated with elevated risks of breast cancer compared with placebo [11] however estrogen only combinations were not associated with associated with elevated breast cancer risks on long term follow up [12]. Male transgender patients female to male transition) often undergo androgenic hormonal treatments to induce masculinization [9]. Prior studies have demonstrated elevated risks of breast caner in post-menopausal women with higher circulating levels of androgens compared with women with lower levels of circulating androgens. Despite evidence from prior cohort studies suggesting that estrogenic or androgenic therapies are associated with elevated breast cancer risk, limited, preliminary retrospective cohort data suggest that transgender patients undergoing cross-sex hormonal therapy do not have an elevated risk of breast cancer compared with non-transgender patients [13, 14]. Gooren et al. studied 3,102 transgender patients in the Netherlands from 1975 to 2006 with mean ages below 30 and found that cross-sex hormonal therapy was not associated with an elevated risk of breast cancer [13]. Similarly, Brown et al. studied 5,135 transgender veterans undergoing care in the Veterans Health Administration from 1997 to 2013 and also found that cross-sex hormonal therapy was not associated with elevated breast cancer risk [14]. Both of these cohorts noted that transgender patients, whether or not they received cross-sex hormonal therapy, were not at elevated risk of breast cancer compared with the general population.

Though high-quality prospective studies are not available currently, several health care organizations have provided recommendations regarding mammography screening in transgender patients based on retrospective cohort data and inference from other studies. Breast cancer screening recommendations from the Fenway Health clinic suggest routine screening in transgender women (male to female transition) who have undergone estrogen and progestin therapy for greater than 5 years, and routine screening in transgender men (female to male transition) who have not undergone bilateral mastectomies [15]. For transgender men (female to male transition), screening guidelines recommend routine screening in transgender males with natal breast tissue or history of reductions. However screening guidelines do not recommend routine mammographic screening in patients who have undergone mastectomies as prior studies have estimated that bilateral mastectomies reduce breast cancer risk by approximately 90% [16]. The lack of information about hormonal therapy usage and prior surgeries limits our ability to provide accurate assessments about overall adherence to mammography screening recommendations. Despite these limitations, our study is one of the first to provide population-based estimates about the frequency of mammography screening in transgender patients. Additional research is required to evaluate optimal strategies for breast cancer prevention, diagnosis and treatment in transgender patients.

Compliance with ethical standards

Funding No sources of funding were obtained for the performance of this study.

Conflict of interest Anand Narayan, Lizza Lebron-Zapata and Elizabeth Morris declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. IRB approval was not required as our study utilized publicly available information.

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