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Trends in Breast Cancer Screening:

Impact of U.S. Preventive Services Task Force Recommendations

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Abstract

Introduction—Although there is general agreement among various guidelines on benefits of routine screening mammography, the age of screening initiation and the optimal frequency of the test remain controversial. In 2009, the U.S. Preventive Services Task Force (USPSTF) recommended against routine breast cancer screening in women younger than age 50 years. In this study, we explore screening mammography guideline adherence among U.S. women by examining patterns in rates of mammography age of initiation and utilization in years prior to and following 2009 USPSTF guideline implementation.

Methods—We used U.S. population-based data from the 2007, 2008, 2010, and 2012 Behavioral Risk Factor Surveillance System surveys to measure the overall proportion and rate of change in the proportion of women who underwent screening mammography within the last year, by age and survey year. Data were accessed and analyzed in July 2014.

Results—Rates of mammography screening were lower in 2010 and 2012 compared with 2007 and 2008 ($p < 0.0001$). The rate of screening initiation at age 40 years increased over time and was the highest in the years following USPSTF guideline changes ($p = 0.012$).

Conclusions—These data support no perceptible change in U.S. women's patterns of screening mammography age at initiation within 3 years of the USPSTF guideline revision. Whether this finding reflects a delayed effect of guideline revision in population trends or rather health provider practice and patient preference for more frequent screening is unclear and requires further investigation.

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Introduction

Although there is general agreement among various guidelines on benefits of routine screening mammography, the age of screening initiation and the optimal frequency of the test remain controversial. In 2009, the U.S. Preventive Services Task Force (USPSTF) recommended against routine breast cancer screening in women aged <50 years.¹

A number of recent studies assessing the impact of the 2009 USPSTF recommendations on rates of screening and outcomes have had inconsistent findings.^{2–5} These analyses have focused on changes in mammography screening among aggregated age groups (e.g., 40–49 years) and have lacked attention to age-specific mammography use, which is important if age of initiation shifts within the age group in response to the USPSTF guidelines.

We explored screening mammography guideline adherence among U.S. women by examining patterns in rates of mammography age of initiation and utilization in years prior to and following 2009 USPSTF guidelines.

Methods

Study Sample

We used population-based data from the Behavioral Risk Factor Surveillance System (BRFSS) to compare self-reported mammography screening within last 12 months among U.S. women in 2007 and 2008 (preceding revised USPSTF recommendations) versus 2010 and 2012 (following revised recommendations).

The BRFSS, which is described in detail elsewhere,^{6,7} is an annual random telephone survey that uses stratified sampling methods for data collection and provides estimates that are representative of U.S. non-institutionalized residents aged ≥18 years. BRFSS produces a large dataset of information regarding health, health risk behaviors, and health service utilization, which for many states is the only source of data available to policymakers.⁸

Measures

The primary outcome was the proportion of women aged 30–70 years who underwent screening mammography within the last year, by specific age and survey year. The secondary outcome was the rate of change in the proportion of women who underwent screening mammography by year across specific ages.

Statistical Analysis

All analyses were conducted with the statistical package R version 3.0.0 and used sampling weights to adjust for the complex survey sampling design. We used descriptive statistics to estimate the age-specific screening mammography rates for each survey year and the sign test to compare the proportion of women screened from age 30 to 70 years by study period (2007 and 2008 versus 2010 and 2012).

To estimate the rate of change in mammography screening by age, we fit B splines using functional data analysis to the age-specific mammography data for each of the survey years.

A large positive first derivative value at a given age indicates a rapid increase in screening mammography rates at that specific age. Therefore, we considered the age with the largest positive first derivative value as the age of mammography screening initiation. We also conducted the same analysis, stratified by health insurance status.

Results

Trends in screening mammography rates were similar in survey years 2007–2008 versus 2010–2012 (Figure 1) and had four main features:

1. low but consistent rates among women aged 30–35 years;
2. a sharp increase in rates at age 35 years;
3. another sharp increase in rates at age 40 years; and
4. a consistently high rate among women aged 50 years.

The sign tests supported significant decreases in screening rates in 2010–2012 compared with 2007–2008 ($p<0.001$). Age group differences in declines were noted, with decreased screening rates in 2010–2012 compared with 2007–2008 for women aged 30–39 ($p<0.001$), 40–49 ($p=0.006$), 50–59 ($p<0.001$), and 60–70 ($p=0.003$) years. Age-specific and age group mammography rates are presented in Appendix Tables 1 and 2.

A small first-order derivative was noted at age 35 years and a larger first-order derivative at age 40 years. At later ages, particularly 50 years, the first-order derivatives approximated zero (Appendix Figure 1). Finally, the rate of screening initiation at age 35–36 years declined over the 4 years ($p=0.048$), whereas the rate of screening initiation at age 40 years increased over time ($p=0.012$). Across all evaluated survey years, similar screening mammography trends were observed in insured women.

Discussion

Our study builds upon prior work to provide a more nuanced examination of mammography screening initiation patterns by individual ages. We found no significant shift in age of initiation across the study periods, consistent with previous results.^{2,3} However, examining age-specific rates enabled us to demonstrate a general decline in screening among women in all age groups between 2007 and 2012. In a study of National Health Interview data, researchers found no changes in self-reported rates of mammography utilization among any age groups between 2008 and 2011.² In a recent study using statewide mammography registry data, Sprague et al.⁵ found that the proportion of Vermont women aged 40 years screened in the past year decreased 3.7 percentage points from 2009 to 2011, which did not appear to be compensated by an increase in biennial screening rates.

Our data demonstrated a decrease in mammography screening rates at age 35–36 years and an increase at age 40 years between 2007 and 2012. This may reflect the American Cancer Society's (ACS's) prior recommendation for mammogram initiation to begin at age 40 years rather than age 35 years.⁹ For the most recent USPSTF recommendations, the impact may similarly not be realized for years to come. Additionally, our findings were robust in the

subanalysis of insured women, which may point to insurance coverage as one factor potentially promoting continued use of screening mammography among younger women. Indeed, 45 states have adopted health insurance mandates requiring coverage of screening mammograms for women aged 40 years.^{10,11}

Moreover, the influence of inconsistent guidelines for screening mammography may be evident in these data. The ACS, American College of Radiology, and American College of Obstetricians and Gynecologists still recommend annual mammograms for women beginning at age 40 years.^{12–14} Differing recommendations by professional societies may shape both provider and patient knowledge, attitudes, and behaviors regarding conservative cancer screening approaches. A 2009 survey showed that a majority of physicians, especially obstetrician–gynecologists, favor aggressive breast cancer screening starting at age 40 years.¹⁵ In a recent study on patient's cervical cancer screening practices and beliefs following updated guidelines, Hawkins and colleagues¹⁶ concluded that patients' lack of knowledge and unfavorable attitudes may serve as barriers to extending screening intervals.

Limitations

Our study is not without limitations. These data reflect screening trends over time and do not provide information on causal effects of mammography guidelines on screening rates. Data are collected cross-sectionally each year, which precludes our ability to examine within-year changes. We are unable to adjust for important confounding variables, such as health history and patient preference, which likely impact mammography needs and behaviors. BRFSS relies on self-reported information and does not differentiate between mammograms performed for screening versus diagnosis, which may overestimate rates. Finally, our findings may not be generalizable to all U.S. women, especially those under-represented in the BRFSS (e.g., poor and uninsured women).

Conclusions

Our study suggests that screening mammography utilization has declined in the years following the implementation of the 2009 USPSTF guidelines, but not for women who are the focus of the guideline revision. Future research is warranted to continue monitoring and evaluating trends in mammogram screening in the context of changing practice guidelines and healthcare climates, including the impact of the Affordable Care Act.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Proportion of women who have had a routine mammogram within the last 12 months.