CLINICAL RESEARCH STUDY

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Mammography Screening Among the Elderly: A Research Challenge

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ABSTRACT

BACKGROUND: Randomized trials demonstrate clear benefits of mammography screening in women through age 74 years. We explored age- and race-specific rates of mammography screening and breast cancer mortality among women aged 69 to 84 years.

METHODS: We analyzed Medicare claims data for women residing within Surveillance, Epidemiology and End Results geographic areas from 1995 to 2009 from 64,384 non-Hispanic women (4886 black and 59,498 white) and ascertained all primary breast cancer cases diagnosed between ages 69 and 84 years. The exposure was annual or biennial screening mammography during the 4 years immediately preceding diagnosis. The outcome was breast cancer mortality during the 10 years immediately after diagnosis.

RESULTS: After adjustment for stage at diagnosis, radiation therapy, chemotherapy, comorbid conditions, and contextual socioeconomic status, hazard ratios (and 95% confidence intervals) for breast cancer mortality relative to no/irregular mammography at 10 years for women aged 69 to 84 years at diagnosis were 0.31 (0.29-0.33) for annual mammography and 0.47 (0.44-0.51) for biennial mammography among whites and 0.36 (0.29-0.44) for annual mammography and 0.47 (0.37-0.58) for biennial mammography among blacks. Trends were similar at 5 years overall and stratified by ages 69 to 74 years, 75 to 78 years, and 79 to 84 years.

CONCLUSIONS: In these Medicare claims and Surveillance, Epidemiology and End Results data, elderly non-Hispanic women who self-selected for annual mammography had lower 10-year breast cancer mortality than corresponding women who self-selected for biennial or no/irregular mammography. These findings were similar among black and white women. The data highlight the evidentiary limitations of data used for current screening mammography recommendations.

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KEYWORDS: Breast cancer screening; Geographic disparities; Mortality; Racial disparity

Randomized trials demonstrate clear benefits of mammography screening in women up to age 74 years.[1] After age 74 years, there are no cogent data from randomized trials.[1] Data from minority populations are especially sparse. The Surveillance, Epidemiology, and End Results (SEER) program file linked to the Medicare administrative claims file allows us to identify screening mammography use.[2] These linked files also permit exploration of breast cancer

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mortality differences between elderly black or white women who self-selected for regular annual or biennial mammography screening.

MATERIALS AND METHODS

Detailed methods of the SEER-Medicare linked file have been published.[2] The SEER program, composed of 17 highly qualified cancer registries reflecting 26% of the US population, includes diagnostic information for up to 10 diagnosed cancer cases per person. Medicare is a health insurance program that enrolls approximately 93% of noninstitutionalized US men and women aged 65 years and older.[3] The SEER-Medicare linked file consists of SEER data that were linked successfully to the Medicare enrollment file for 94% of persons appearing in SEER registries. Information on socioeconomic status indicators at the census tract level from the US Census Bureau is included in the database.[2,4]

CLINICAL SIGNIFICANCE

- Black and white women aged 75 to 84 years who had an annual mammography had lower 10-year breast cancer mortality than corresponding women who had biennial or no/irregular mammography.

All primary female breast cancer cases diagnosed between the ages of 69 and 84 years from 1995 to 2009 according to Medicare claims information[4] were eligible for inclusion. Age 69 years was chosen because Medicare coverage of the general population begins at age 65 years, and the exposure of interest was regular mammography screening in the 4 years immediately preceding diagnosis. Three mutually exclusive exposure categories were defined: (a) no or irregular mammography screening; (b) biennial mammography; and (c) annual mammography. Eligibility criteria included female, non-Hispanic white or black race, and complete consecutive months of Medicare Parts A and B coverage with no health maintenance organization coverage (because health maintenance organization data are not provided to Medicare) during the 4-year period before primary breast cancer diagnosis. Hispanics were not included because Hispanic whites have substantially lower mortality than non-Hispanic whites, and the number of Hispanic blacks is small.[5] Algorithms developed by Smith-Bindman et al[6] and Fenton et al[7] were used to differentiate screening from diagnostic mammograms.

The women were categorized into 3 mutually exclusive age groups at breast cancer diagnosis: Group 1 included women ages 69 to 74 years, because the American Cancer Society (ACS)[8] and the United States Preventive Services Task Force (USPSTF)[1] recommend regular mammography for women aged 65 to 74 years. Group 2 included women aged 75 to 78 years, because they did not fit in the other 2 age categories. Group 3 included women aged 79 to 84 years, because the ACS and USPSTF mammography recommendations are for case-by-case decisions in the group aged 75 to 84 years.

The SEER-Medicare case file was used to determine breast cancer mortality among women diagnosed with primary nonmetastatic breast cancer. The initial sample included all persons with a history of breast cancer identified from SEER between 1991 and 2009 (n = 552,948). Exclusions included male cases (n = 4344); non-white, non-black cases (n = 67,483); women with diagnoses before 1995 (n = 83,838); women with nonprimary breast cancer (n = 14,711); cases diagnosed by autopsy or death certificate alone (n = 2630); women with American Joint Committee on Cancer (AJCC) stage IV cancer (n = 7278); women with less than 45 months of Medicare claims before diagnosis (n = 234,972); women with a previous diagnosis of cancer (n = 17,618); women with a breast cancer diagnosis before 2006 (to allow for the possibility of detecting at least 5-year postdiagnosis survival) (n = 38,454); and women who were not aged 65 to 74 years or 75 to 84 years during the 4 years before breast cancer diagnosis (n = 17,236), leaving 64,384 for the analyses (group 1, 69-74 years, n = 26,862; group 2, 75-78 years, n = 17,897; group 3, 79-84 years, n = 19,625). Cox proportional hazards regression was used to estimate the risk of breast cancer mortality at 5 years (in 3 age groups separately) and 10 years (all women aged 69-84 years combined) postdiagnosis associated with screening mammography rates 4 years prediagnosis while stratifying by race and controlling for confounding factors.[9] Cause of death was available from the SEER file. Survival time was calculated in months from the date of diagnosis to the date of death or the date of last follow-up (December 31, 2010, indicated in the Medicare file). Cases lost to follow-up, those still alive at the end of the follow-up period, or those who died of causes other than breast cancer were censored. No assumptions were made about the nature or shape of the hazard function. Survival curves were generated using the Kaplan-Meier procedure and compared using the log-rank test.

Because stage at diagnosis and treatment may modify the effect of mammography screening on breast cancer mortality, we added interaction terms between mammography screening rates and AJCC stage (coded as 0/I or II/III), radiation therapy, and chemotherapy to proportional hazards models and performed likelihood ratio tests in order to examine effect modification.[10] There was no evidence of effect modification, so AJCC stage and treatment were then assessed as confounders. Variables examined and excluded as confounders were age at diagnosis, diagnosis year, urban/rural residence, and type of surgery as categorized in **Tables 1** and **2**. Comorbid conditions, ascertained from Medicare inpatient, outpatient, and carrier claims through diagnoses made or procedures undergone 1 year before the diagnosis of breast cancer as described previously,[11-14] were classified as 0, 1, ≥2, or unknown. To measure contextual socioeconomic status, we calculated quartiles of a composite variable consisting of census tract-level