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Journal
The Breast Journal, 26(6)

ISSN
1075-122X

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Publication Date
2020-06-01

DOI
10.1111/tbj.13691

Peer reviewed

HHS Public Access

Author manuscript

Breast J. Author manuscript; available in PMC 2020 June 23.

Published in final edited form as:

Breast J. 2020 June ; 26(6): 1227–1230. doi:10.1111/tbj.13691.

Identifying tests related to breast cancer care in claims data

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Abstract

To develop a method for calculating rates of testing for breast cancer recurrence in patients who have already undergone initial treatment for breast cancer, we calculated rates in a cohort of Medicare breast cancer patients and an age-matched non-cancer cohort. We first used only tests with claims including diagnosis codes indicating invasive breast cancer and then used all tests regardless of diagnosis code. For each method, we calculated testing rates in the breast cancer cohort above the background rate in the non-cancer population. The two methods provided similar estimates of testing prevalence and frequency, with exception of prevalence of CT.

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Conflict of Interest Notification: None

Keywords

breast cancer; Surveillance Epidemiology and End-Results; test utilization; imaging utilization

Introduction

There is increasing interest in identifying potential low-value healthcare services provided within the cancer patient population, both in the U.S. and worldwide.[1] While cancer screening is fairly well-characterized in the literature, few prospective trials have specifically addressed potential low-value testing services following the cancer diagnosis.[2, 3] Our group, as well as others worldwide, have used large payer claims databases to evaluate variation in post-treatment testing in cancer management and potential areas in which to generate increased value in testing.[4–7]

As opposed to screening modalities, imaging studies used for follow-up breast cancer management can be difficult to differentiate in claims data from studies for other non-cancer indications that use the same imaging modality. While claims associated with diagnosis codes for invasive cancer or personal history of malignancy may identify tests related to cancer surveillance, some surveillance testing may be associated with other diagnosis codes; likewise, some testing associated with diagnosis codes for cancer itself may be testing performed for other purposes similar to that which might be present among the general population.

With the goal of identifying a simple, reproducible methodology for identifying cancer-associated testing in the breast cancer population, we used the breast cancer cohort of the SEER-Medicare linked dataset (2000–2014) to compare the rate of testing associated with breast cancer management calculated using two methodologies. In Method 1, we found the rate of claims for testing on which there was a diagnosis code specific for invasive breast cancer in the breast cancer cohort and subtracted the rate of claims for testing on which there was a diagnosis code specific for invasive breast cancer in the non-cancer cohort. In Method 2, we found the differences in rate of testing in each cohort regardless of the diagnosis codes attached to the claims.

Methods

Data Sources, Data Extraction, and Study Population

Cohort of patients with breast cancer—We utilized HIPAA compliant de-identified patient level data of all newly diagnosed US breast cancer cases from the breast cancer subset of the 2000–2014 Surveillance, Epidemiology and End Results (SEER) – Medicare linked database. Inclusion criteria were: 1) female, 2) aged 65 or older, 3) the reported breast cancer was their first cancer, and 4) having 6 years of consistent and exclusive enrollment in Medicare parts A and B (HMO excluded) following the index diagnosis date (year of diagnosis + 5 years of follow up). Exclusion criteria were: 1) having cancer that was already metastatic at initial diagnosis (because no subsequent testing would be considered

surveillance for metastasis), and 2) developing any cancer other than breast cancer in the 6 years after initial diagnosis.

Cohort of patients without breast cancer (control)—We obtained a 5% random sample of Medicare who do not appear in any SEER cancer registry, 2000–2014, provided by the National Cancer Institute's Division of Cancer Control and Population Sciences. To assemble a cohort of non-cancer patients, two non-cancer patients were matched to every breast cancer patient based upon age (years) and period of years during follow-up.α

All data extraction was performed using SAS 9.4.

Determination of Per Patient Testing Frequency Using Alternative Algorithms for Diagnosis Code Inclusion

For the breast cancer and control cohorts, all Medicare carrier ("NCH") claims and outpatient facility ("OUTSAF") claims from 2000–2014 were examined. All claims for imaging and laboratory tests (as defined by Current Procedural Terminology [CPT] codes in Appendix 1) were extracted for each patient in the control cohort. For patients in the breast cancer cohort, all claims for imaging and laboratory tests from the 6 year period post-cancer diagnosis were extracted. Body imaging modalities included body computed tomography (CT), brain CT, positron emission tomography (PET), body magnetic resonance imaging (MRI), brain MRI, and whole-body bone scans.

We then calculated the net additional rate of testing for breast cancer patients over a background rate determined from age- and follow-up period - matched controls using two methodologies:

Method 1: using only those claims with a diagnosis code for invasive breast cancer (174.x) and/or a personal history of malignant neoplasm of breast (v10.3), we subtracted the rate of testing in the non-cancer background cohort from the rate of testing over the 5 year period following the year of initial treatment in the breast cancer cohort

Method 2: using all testing claims, regardless of diagnosis code, we subtracted the rate of testing in the non-cancer background cohort from the rate of testing over the 5 year period following the year of initial treatment in the breast cancer cohort

Results

Data extraction yielded a total of 50,672 breast cancer patients who had 6 years of follow-up data following initial diagnosis, with a mean of 5.42 claims for tests during a 5 year follow-up period after the initial year of treatment. Within the age-matched non-cancer control patients (N=101,344) there was a mean of 0.050 claims for tests during a 5 year period.

Table 1 summarizes the rate of additional testing (additional tests per patient per year) in breast cancer patients, determined by subtracting the rate of tests in the age-matched cohort from the rate of tests in the breast cancer cohort.

Discussion

In comparing the rate of additional testing in breast cancer patients over the general population using two methodologies, we found that, with the exception of additional rates of CT of the brain, the two methodologies produced nearly identical values.

These methodological findings are important because there are circumstances in studies of testing in cancer patients in which background frequency of test utilization in the general population does not need to be considered. For example, studies of the geographic variation in utilization of testing can arguably get around the need to understand the background frequency as it may be plausible that the background frequency is similar in different parts of the country.[4] However, when determining how much testing is occurring for breast cancer, it is necessary to have a validated method for calculating the magnitude of testing performed for reasons other than breast cancer.

Apart from instances in which researchers have access to patients' medical records (which historically have involved studies with small sample size), [8] differentiating testing services provided to manage cancer care from testing performed for other concomitant health issues has proven challenging. When testing is limited to breast-specific modalities or PET in a breast cancer patient, the answer is easy because the only reason for testing is cancer.[7, 9] Some prior claims-based studies of advanced imaging in breast cancer care have simply ignored the issue of distinguishing between imaging performed for cancer care versus background imaging. [10] Others have defined breast cancer surveillance testing using only those tests originating from a physician visit associated with a diagnosis code for invasive breast cancer or breast cancer in situ.[5]

The utilization of testing in general—and high cost, advanced diagnostic imaging such as CT, MRI, and PET in particular—continues to increase in various phases of breast cancer management. [11–13] As we, and others, pursue research aimed at quantifying from claims data the use and appropriateness of testing in breast cancer management, the differentiation of testing specifically for cancer recurrence in the breast cancer population over background rates of testing in non-cancer populations will continue to be important. In the absence of a "gold standard" it is reassuring that we found similar, if not identical, rates of additional testing regardless of method adopted.

Conclusion

In identifying rates of testing related to the management of breast cancer versus background testing unrelated to cancer care, this study indicates that similar results are likely regardless of whether counting all testing claims or only those with diagnostic codes for invasive breast cancer (174.x) and/or a personal history of malignant neoplasm of breast (v10.3).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowlegements:

This study used the linked SEER-Medicare database. The interpretation and reporting of these data are the sole responsibility of the authors. The authors acknowledge the efforts of the National Cancer Institute; the Office of Research, Development and Information, CMS; Information Management Services (IMS), Inc.; and the Surveillance, Epidemiology, and End Results (SEER) Program tumor registries in the creation of the SEER-Medicare database.

Funding: This work was funded by grant 1R01HS024936-01 from the Agency for Healthcare Research and Quality

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Table 1 –

Net additional testing for breast cancer patients over a background rate determined from age-matched controls using two methodologies: Method 1 – using only those claims with a diagnosis code for invasive breast cancer (174.x) and/or a personal history of malignant neoplasm of breast (v10.3); Method 2 - using all testing claims, regardless of diagnosis code

	Net Excess BC Tests per Patient per Year	
	Method 1	**Method 2**
All testing types	4.39	4.32
Lab tests	3.42	3.50
All imaging	0.97	0.82
Nuclear bone scan	0.27	0.29
CT body	0.39	0.34
CT brain	0.10	−0.03
MR body	0.02	0.02
MR brain	0.06	0.06
PET	0.14	0.14