Expansion of Screening Mammography in the Veterans Health Administration: Implications for Breast Cancer Treatment

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**IMPORTANCE** Women represent the fastest-growing demographic in the Veterans Health Administration. In 2008, we implemented programmatic changes to expand screening mammography, develop on-site breast care resources, and better coordinate care with non-Veterans Affairs (VA) facilities.

**OBJECTIVE** To determine whether the programmatic changes would increase patient volumes, decrease time to definitive treatment, and increase the rate of breast conservation therapy (BCT).

**DESIGN, SETTING, AND PARTICIPANTS** We performed a retrospective cohort study of all breast cancer cases treated from January 1, 2000, to May 31, 2012, at the Baltimore VA Medical Center.

**MAIN OUTCOMES AND MEASURES** We compared process-of-care metrics before and after 2008, when programmatic changes were implemented. Metrics evaluated included the number of mammograms performed annually, sex shift, the interval from clinical suspicion to tissue diagnosis and definitive treatment, and the rate of BCT.

**RESULTS** From 2000 to 2012, a total of 7355 mammograms were performed and 76 patients with breast cancer received treatment. Most mammograms (n = 6720) were performed after 2008. A median of 1453 (interquartile range [IQR], 592-1458) mammograms were performed and 6.33 patients received cancer treatment annually after 2008, representing 1200% and 49% increases, respectively, compared with the 2000 to 2007 interval. Most patients (86.7%) received screening and diagnostic imaging, biopsy, and surgery between multiple institutions. The interval between screening mammography and tissue diagnosis was 34 days (IQR, 20-52), with no significant difference between study intervals (P = .18). Time from tissue diagnosis to initiation of definitive treatment increased from 33 days (IQR, 26-51) to 51 days (IQR, 36-75) (P = .03) between 2008 and 2012. Thirty-three patients eligible for BCT (67.3%) received it, while 16 patients (32.7%) underwent mastectomy.

**CONCLUSIONS AND RELEVANCE** Our institution has rapidly and successfully expanded screening mammography. Higher mammography volumes have been associated with increased use of non-VA breast care services and increased time to definitive treatment. Appropriate counseling regarding BCT was consistently documented, and mastectomy in BCT-eligible patients was largely the result of patient preference or clinical/social factors. Our data suggest that as patient volumes increase with intensified screening, VA hospitals may benefit from acquiring a full complement of on-site breast care services rather than improving flow between VA hospitals and non-VA breast care centers having specialized resources.

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Breast cancer is the most common cancer in women. Because women represent the fastest growing demographic in the US veteran population, breast cancer is an increasingly significant public health issue for the Veterans Health Administration (VHA). Use of VHA outpatient care resources by women grew by 47% from 2003 to 2009, and this is expected to increase further as thousands of female veterans return from the Iraq and Afghanistan theaters of operation.

Recognizing this sex shift, in 2007 the VHA elevated the Women's Health Program to a Strategic Health Care Group. The implementation of widespread screening mammography and related services for breast cancer care were highly prioritized. However, most Veterans Affairs (VA) medical centers still do not have additional on-site resources beyond screening and diagnostic mammography, including ultrasound-guided and stereotactic biopsy and breast magnetic resonance imaging.

Our purpose was to evaluate the influences of accelerated breast cancer screening and the development of a dedicated breast care program on the time interval from diagnosis to definitive breast cancer treatment and the administration of breast conservation therapy (BCT) in eligible patients. We performed a review of all breast cancer cases managed at a single VA institution from 2000 to 2012. We hypothesized that rapid expansion of screening mammography would increase surgical volumes and the expansion of breast cancer services would decrease the interval from diagnosis to treatment and increase BCT at our VA hospital.

Methods

Location

The Baltimore VA Medical Center is a large, level 1b VA hospital serving the VA Capitol Health Care Network (VISN-5), an area that includes Maryland; Washington, DC; and parts of Virginia, West Virginia, and Pennsylvania. The primary catchment area of the Baltimore VA Medical Center is the VA Maryland Health Care System, a subnetwork of VISN-5 based primarily in Maryland.

VA vs Non-VA Care

The Baltimore VA Medical Center and the Martinsburg VA Medical Center were considered VA institutions. The Baltimore VA Medical Center offers screening and diagnostic mammography, but not breast magnetic resonance imaging or stereotactic or ultrasound-guided biopsy. These are performed at the University of Maryland Breast Center, which is connected to the Baltimore VA Medical Center but is an independent, non-VA institution. The Martinsburg VA Medical Center uses private, non-VA hospitals located in close proximity for specialized breast services.

Breast Conservation Therapy

A woman was considered eligible for BCT if she had no absolute contraindications, including (1) current pregnancy, (2) multicentric breast cancer, (3) diffuse malignant-appearing microcalcifications, (4) history of irradiation to the breast requiring retreatment with an excessively high total-radiation dose, or (5) persistent positive margins after reasonable surgical attempts. Relative contraindications to BCT included (1) active connective tissue disease, (2) tumors larger than 5 cm, or (3) known or suspected genetic predisposition to breast cancer.

Data Collection

The VA OncoTraX database was used to identify all patients receiving a diagnosis of and/or treatment for breast cancer at the Baltimore VA Medical Center from January 1, 2000, to May 31, 2012. The patients had mammographic or clinical findings concerning for cancer, which led to a diagnostic procedure (image-guided or surgical biopsy), followed by definitive treatment; they were considered symptomatic if they reported breast pain, nipple discharge, or a palpable mass.

Time intervals were calculated from dates of (1) suspicion of breast cancer based on abnormal mammographic findings, including microcalcifications or change from previous mammogram or abnormal clinical examination, (2) tissue diagnosis confirming cancer, and (3) index breast cancer treatment (initiation of neoadjuvant chemotherapy or surgery). Cancer was staged postoperatively.

Data on enrollment and use of health care services were obtained by the VHA Support Service Center from a SharePoint database maintained by the VHA central office. Mammography data were obtained from the Department of Radiology (Baltimore VA Medical Center) and the Medical Administration service at the VA Maryland Health Care System.

This study was approved by the University of Maryland School of Medicine Institutional Review Board and the Baltimore VA Medical Center Research Committee.

Time Stratification

Prior to 2008, there was no dedicated surgical breast service at the Baltimore VA Medical Center. In mid-2007, expansion of mammography was designated as a mission-critical performance measure. In 2008, the Baltimore VA Medical Center expanded mammographic screening, recruited surgical oncologists, and began developing a surgical breast clinic. Treatment plans were discussed at a Breast Multidisciplinary Tumor Board. A nurse navigator coordinated care between the Baltimore VA Medical Center and the University of Maryland Medical Center for specialized services not available on-site, including image-guided biopsy. In 2011, a breast radiologist was recruited. Therefore, 2 separate periods were designated for our outcomes analysis. The first was from 2000 to 2007, prior to programmatic changes, and the second was from 2008 to 2012, after the programmatic changes were implemented.

Statistical Analysis

Analysis was performed using commercial software (Excel [Microsoft Corp] and SAS, version 9.1 [SAS Institute, Inc]). Descriptive statistics were calculated for all variables. Fisher exact test and the Cochrane-Armitage test for trend were used to evaluate differences between groups, when appropriate.
Results

There has been a rapid increase in the number of diagnostic and screening mammograms performed annually. Since 2007, with the elevation of the Women’s Health Program to a Strategic Health Care Group, the VA Maryland Health Care System began tracking the enrollment and use of health care services at the Baltimore VA Medical Center by women. Since 2007, enrollment of women 40 years or older (the population eligible for screening mammography) increased from 3283 to 4728 in 2012 (44%). Aside from 2012, yearly use has also increased (Figure 1).

The number of mammograms performed annually has increased even more rapidly. During the study period, a total of 7355 mammograms were performed, with a median of 1453 per year (IQR, 592-1458). Of these, the vast majority were performed after 2008. Since 2009, between 1433 and 1535 mammograms have been performed annually (Figure 1), necessitating increased use of non-VA breast centers for specialized imaging and biopsies. For the past 2 years, we have tracked referrals to non-VA facilities. For calendar year 2011, there were 44 Breast Imaging-Reporting Data System 4 and 5 studies that required biopsy. In 5 of these 44 cases (11.4%), biopsy confirmed cancer. In 2012, there were 65 Breast Imaging-Reporting Data System 4 and 5 studies (a 48% increase from 2011), and biopsy-confirmed cancer in 9 of these (13.8%). These data confirm mammography volumes, and the need to use non-VA breast care resources has significantly increased since 2007.

There has been an increase in the number of breast cancers treated. From 2000 to 2012, breast cancer surgery was performed on 76 patients. Most patients (84.0%) were from the Baltimore metropolitan area, and 12 were referred from the Martinsburg VA Medical Center in West Virginia. Twenty-eight patients received treatment in the 4.4 years from 2008 to mid-2012, nearly as many as the 34 who underwent treatment in the 8 years from 2000 to 2007 (Table 1). There was a 49% increase in the number of women with breast cancer treated from January 1, 2008, to May 31, 2012 (6.33 cases/year), compared with January 1, 2000, to December 31, 2007 (4.25 cases/year).

Compared with men, women more frequently had asymptomatic or nonpalpable lesions. Twenty-five of the 62 women (40.3%) had symptoms that prompted further evaluation, and 37 women (59.7%) presented only with abnormalities on screening mammography. Of the 14 men, 10 patients (71.4) had symptoms, including palpable mass (n = 7) and bloody nipple discharge (n = 3). Most women also presented with early-stage disease (stage 0 or stage I), with 14 patients (22.6%) presenting with stage I (32.3%) or stage II (30.6%) disease, respectively (Table 1). Ten men (71.4%) required image-guided biopsy for confirmation of malignancy, and 4 patients (28.6%) proceeded directly to surgical biopsy. In contrast, of the 58 women for whom biopsy data were available, 55 women (94.8%) underwent image-guided biopsy at non-VA breast centers for tissue diagnosis. These data illustrate the male to female shift in breast cancer cases at our VA. They also suggest that, as more asymptomatic abnormalities are detected through intensified screening mammography, use of specialized imaging and biopsy services will be increasingly required.

Rapid increase in volume is associated with increased times to definitive treatment. Time from clinical suspicion of cancer to definitive treatment was assessed for the 62 women. Because most presented with early-stage disease, all but 2 proceeded directly to surgery (Table 1). The overall median time from symptoms or abnormal mammography to tissue diagnosis was 34 days (IQR, 20-52), and the median time from tissue diagnosis to definitive treatment was 47 days (IQR, 28-
65) (Table 2). From 2000 to 2007, the median time from clinical suspicion to biopsy was 26 days (IQR, 16-42) (Table 2). Despite the efforts to expedite care, time from suspicion to biopsy increased to 41 days in the 2008-2012 period, although this was not statistically significant (IQR, 29-69) (P = .18). The time to index treatment increased from 33 days in 2000-2007 (IQR, 26-51) to 51 days (IQR, 36-74.5) in 2008-2012 (P = .03).

Breast-conservation therapy is appropriately offered for eligible patients. Forty-nine patients were potentially eligible for BCT (Figure 2). Thirty-three patients (67.3%) received BCT and 16 patients (32.7%) underwent a mastectomy. Patients with lower-stage disease were more likely to undergo BCT (Cochran-Armitage test for trend, P = .001).

Of the 16 potentially eligible patients who underwent mastectomy, 12 were offered BCT but declined. The reasons for declining BCT were not clear; however, 2 patients considered the distance they would have to travel for radiotherapy after BCT. For the other 4 patients, multidisciplinary tumor board recommendations were that they undergo mastectomy for patient- and cancer-specific reasons.

Discussion

Our institution has markedly expanded screening mammography services in adherence to national VHA initiatives. Our program has acquired many on-site resources for breast cancer care, including the recruitment of dedicated surgical oncologists, breast radiographers, and nurse navigators. Expanded screening has been accompanied by increased use of non-VA-based imaging and biopsy services, increased breast cancer volumes, and increased time to definitive treatment. Eligible patients have been offered BCT appropriately.

The 44% increase in enrollment of female veterans for health care services since 2007 likely reflects the rapid sex shift occurring in the uniformed services and the prioritization of women’s health initiatives. In 1950, just 2% of uniformed services personnel were female, whereas 14% of current active duty and 18% of reserve forces are women.8,9 The female veterans returning from the Iraq and Afghanistan theaters of operation are expected to use VA health care resources in ever-increasing numbers.10

To its credit, the VHA has been highly successful in expanding screening mammography. Since 2008, our center has experienced a 1200% increase in mammography volume. When evaluating the VHA as a whole, in fiscal year 2011, 87.0% of all eligible women received screening mammograms.11 In comparison, in 2010, only 71.0% of eligible private sector patients, 69.0% of Medicare patients, and 51.0% of Medicaid patients received screening mammograms. It is therefore logical to deduce that the number of breast cancer cases in the VHA will increase with time.

Our surgical caseload of women has increased by 49% since 2008. Although the total number of women with breast cancer who received treatment (n = 62) is low, our detection rate in asymptomatic women (n = 37) is comparable to that reported in previous medical centers.12 Further research is needed to evaluate the outcomes of breast cancer care in VA women’s health initiatives.

Table 1. Demographic and Clinical Characteristics of Patients With Breast Cancer Treated at the Baltimore VA Medical Center

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All Patients (N = 76)</th>
<th>Men (n = 14)</th>
<th>Women (n = 62)</th>
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<tr>
<td>Age at surgery, median (IQR), y</td>
<td>58.8 (47.9-68.4)</td>
<td>68.4 (58.5-71.0)</td>
<td>56.5 (46.8-66.6)</td>
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<tr>
<td>Family history of cancer</td>
<td>19 (25.7)</td>
<td>5 (38.5)</td>
<td>8 (23.5)</td>
</tr>
<tr>
<td>Referred from Martinsburg VA</td>
<td>12 (16.0)</td>
<td>1 (7.1)</td>
<td>5 (14.7)</td>
</tr>
<tr>
<td>Symptomatic</td>
<td>35 (48.0)</td>
<td>10 (83.3)</td>
<td>13 (38.2)</td>
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<tr>
<td>Cancer stage</td>
<td></td>
<td></td>
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<tr>
<td>0</td>
<td>16 (21.6)</td>
<td>2 (16.7)</td>
<td>8 (23.5)</td>
</tr>
<tr>
<td>I</td>
<td>23 (31.1)</td>
<td>3 (25.0)</td>
<td>7 (20.6)</td>
</tr>
<tr>
<td>II</td>
<td>16 (21.6)</td>
<td>1 (7.1)</td>
<td>10 (29.4)</td>
</tr>
<tr>
<td>IIB</td>
<td>12 (16.2)</td>
<td>2 (16.7)</td>
<td>5 (14.7)</td>
</tr>
<tr>
<td>III</td>
<td>7 (9.5)</td>
<td>2 (16.7)</td>
<td>4 (11.8)</td>
</tr>
<tr>
<td>Neoadjuvant chemotherapy</td>
<td>2 (2.6)</td>
<td>0</td>
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Table 2. Time to Definitive Treatment for Women With Breast Cancer

<table>
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<tr>
<th>Time Interval</th>
<th>No. of Patients</th>
<th>Days From Suspicion to Biopsy, Median (IQR)</th>
<th>P Value</th>
<th>Days From Biopsy to Definitive Treatment, Median (IQR)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2012 (All years)</td>
<td>62</td>
<td>34 (20-52)</td>
<td>...</td>
<td>47 (28-65)</td>
<td>...</td>
</tr>
<tr>
<td>2000-2007 (Before programmatic change)</td>
<td>34</td>
<td>26 (16-42)</td>
<td>.18</td>
<td>33 (26-51)</td>
<td>.03</td>
</tr>
<tr>
<td>2008-2012 (After programmatic change)</td>
<td>28</td>
<td>41 (29-69)</td>
<td>.001</td>
<td>51 (36-74.5)</td>
<td>.53</td>
</tr>
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</table>

Abbreviations: IQR, interquartile range; VA, Veterans Affairs.

* Percentages are based on the denominator of patients with that information available in the medical record.
Expansion of Screening Mammography in the VA

Original Investigation Research

Figure 2. Flow Diagram Describing Use of Breast Conservation Therapy (BCT) or Mastectomy in Women With Breast Cancer

76 Patients treated
   22 With other therapies
      5 Underwent bilateral mastectomy
      3 Completed therapy after needle localization
   14 Were male and were not considered for BCT
54 Considered for BCT
   5 Relative contraindications
      1 Prior chest wall radiotherapy
      1 Autoimmune skin/connective tissue disease
      2 Multifocal disease
      1 Active substance abuse
49 Eligible for BCT
   33 Underwent BCT
   16 Had mastectomy after discussion of BCT
   12 Offered BCT but declined
      2 Considered distance travelled
   4 Not offered BCT after consensus of multidisciplinary tumor board
4
5
1
2
1003

This diagram illustrates surgical management in women who received a diagnosis of breast cancer during the study period. Of the 76 patients, 54 were deemed eligible for breast conservation, but not all received it because of medical concerns or patient preference.

In summary, we have shown that our hospital successfully expanded mammography. Intensified screening has increased clinical volumes and the need to use non-VA resources, and screening has been associated with an increase in time to definitive treatment. Although this was a single-center, retrospective study, it is probable that our findings are applicable to other VA hospitals. A recent editorial in *Lancet Oncology* noted that only 32 of more than 1700 VA facilities offer digital mammography. It is likely that these hospitals will need to use non-VA resources as their breast cancer volumes increase over time. Biliomaria and colleagues recently reported that patients with breast cancer (as well as those with other cancers) had significantly longer times to treatment if diagnosis and treatment were performed at separate hospitals. This phenomenon was not restricted to VA hospitals but also was observed at non-VA, National Cancer Institute Comprehensive Cancer Centers. Thus, increased treatment times may also be attributable to the increased complexity of multidisciplinary breast cancer care in the modern era. Although no clear guidelines exist to define the ideal interval from clinical suspicion to definitive treatment, some retrospective data have suggested that wait times longer than 90 days could be associated with cancer progression and worse outcomes.

Other retrospective studies have not supported this assertion; given that there are no prospective data on treatment times and outcomes, the 90-day treatment threshold remains controversial. Our data indicating the median time from clinical suspicion to definitive treatment has increased suggest that the VHA may benefit by developing comprehensive VA-based breast centers offering the full range of diagnostic and treatment services rather than improving patient flow between VA and non-VA hospitals.

Reported in the US population (5.0 cancers per 1000 mammograms vs 4 cancers per 1000 mammograms, respectively). Furthermore, the vast majority of the mammograms (n = 6471) were performed after 2007. Thus, the relatively low number of patients with cancer likely reflects underuse of screening mammography prior to 2008.

The most common reasons that women undergo VA health services are financial barriers, the lack of dedicated women’s clinics, and a perception that the quality of care is inferior. To change these perceptions and improve the quality of care, in 2008 our hospital focused on developing a dedicated breast care program. Surprisingly, the time from diagnosis to definitive breast cancer treatment increased. There are several possible explanations. First, the increased time may simply reflect the increased clinical volume resulting from the successful expansion of screening mammography. Another explanation may be the increased need to use non-VA-based resources for advanced imaging and biopsy. Often, multiple diagnostic studies are required for the workup of breast cancer. Authorization of multiple off-site studies could increase the time required to complete workup. Finally, the successful establishment of a breast care program has resulted in referrals from more remote VA hospitals. The time required for travel, review of tests from outside pathology laboratories, and obtaining additional studies can further increase time to treatment.

Last, we showed that patients were appropriately offered the option of BCT or mastectomy, and the majority of BCT-eligible patients (67.3%) received it. From 1991 to 1997, only 18% of all women veterans with breast cancer received BCT. Additionally, Neumayer and colleagues reported that the incidence of mastectomy in the VA was higher than the national average in fiscal years 2002-2004. They mentioned more advanced disease stage, limited access to radiotherapy, and patient preference as potential reasons for this finding. Of note, at the time of their report, only 31 VA hospitals offered mammography on-site, and even fewer performed on-site biopsy. Most recently, Luther et al demonstrated that the incidence of BCT decreased from 51.5% in 2000 to 42.3% in 2006 in women who received breast surgery at VA hospitals. In contrast, the incidence of BCT increased from 59% to 63% at private hospitals during the same period. Luther and colleagues also showed that female veterans whose operations were performed at private hospitals on a fee basis had a 44% higher incidence of BCT compared with veterans who had all care, including surgery, done at the VA. Although a significant number of our BCT-eligible patients chose mastectomy (16 of 33 [32.7%]), there are no definitive data indicating that a lack of VA-based resources contributed to their decision. Two patients did consider the distance they would need to travel to receive radiotherapy, suggesting that access to care might factor into the decisions about BCT. Other possible reasons to choose mastectomy over BCT include avoiding radiotherapy and the anxiety associated with surveillance examinations, follow-up biopsies, and the possibility of ipsilateral tumor recurrence.

In summary, we have shown that our hospital successfully expanded mammography. Intensified screening has increased clinical volumes and the need to use non-VA resources, and screening has been associated with an increase in time to definitive treatment. Although this was a single-center, retrospective study, it is probable that our findings are applicable to other VA hospitals. A recent editorial in *Lancet Oncology* noted that only 32 of more than 1700 VA facilities offer digital mammography. It is likely that these hospitals will need to use non-VA resources as their breast cancer volumes increase over time. Biliomaria and colleagues recently reported that patients with breast cancer (as well as those with other cancers) had significantly longer times to treatment if diagnosis and treatment were performed at separate hospitals. This phenomenon was not restricted to VA hospitals but also was observed at non-VA, National Cancer Institute Comprehensive Cancer Centers. Thus, increased treatment times may also be attributable to the increased complexity of multidisciplinary breast cancer care in the modern era. Although no clear guidelines exist to define the ideal interval from clinical suspicion to definitive treatment, some retrospective data have suggested that wait times longer than 90 days could be associated with cancer progression and worse outcomes.

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To become a comprehensive breast center, our institution continues to expand the complement of on-site breast cancer resources. In November 2012, we became the first VA hospital in the United States to offer digital breast tomosynthesis. The increased sensitivity and specificity (compared with conventional digital mammography) has the potential to reduce the need for additional imaging studies and unnecessary biopsies, allowing for faster diagnosis and treatment of truly suspicious lesions. Additionally, we are developing the capacity to perform ultrasound-guided biopsy, and we project that radiation oncology services will be available on-site by 2014. Through these efforts, we hope to provide the highest quality of care to the expanding population of women in the VHA.

**REFERENCES**