

Utilization of the Breast Cancer Risk Assessment Tool in the Identification and Screening of Women at Increased Risk of Breast Cancer

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Abstract

Objective: The average woman in the US has a 12.5% lifetime risk of being diagnosed with breast cancer. The key to survival is early diagnosis and treatment, which is why several guidelines currently recommend women at high risk be screened with breast MRI in addition to annual mammography. This study uses the Breast Cancer Risk Assessment Tool (BCRAT) to identify high-risk women and evaluate the utilization of breast MRI in a rural teaching hospital.

Method: A retrospective chart review of 1,144 patients who received mammography or breast MRI in a six-month period. Males, women <35 years, women >85 years, and women previously diagnosed with breast cancer were excluded. The BCRAT was used to calculate each patient's 5-year and lifetime risk of being diagnosed \geq with 19. Breast-cancer Patients with 5% lifetime risk were determined to be high risk and their screening process was evaluated and compared to guideline recommendations for breast MRI.

Results: Twenty patients were identified as high-risk, with lifetime and 5-year risks averaging 23.9% and 4.25%, respectively. The remaining 1,036 patients had lifetime and 5-year risks averaging 7.85% and 1.49%. Three (15%) high-risk patients were appropriately identified and recommended a risk assessment for breast MRI. Zero breast MRIs were performed on high-risk patients. Six average risk patients received breast MRI, with mean lifetime and 5-year risks of 9.55%, and 0.67%.

Conclusion: The BCRAT can aid physicians in identifying women at increased risk of breast cancer. There is continued opportunity for physicians to identify high-risk women and implement breast cancer screening as recommended by current guidelines. In this facility, breast MRI may be underutilized in breast cancer screening for women at increased risk of developing breast cancer.

Keywords: Breast cancer; Lifetime risk; Breast cancer risk assessment tool; Breast MRI; Mammography; Screening; Risk factors; Guidelines; Gail model

Introduction

The average woman living in the US has approximately a 12.5% lifetime risk of being diagnosed with invasive breast cancer [1,2] In the US, it is the leading cause of cancer related mortality among women, and leads to over 39,000 deaths each year [2] With the majority of new cases diagnosed as a result of an abnormal screening study, clinical guidelines are placing increasing emphasis on appropriate screening methods [1-3] Since 2007, the American Cancer Society has recommended annual breast magnetic resonance imaging (MRI), in addition to mammography, for women at increased risk of developing breast cancer. Women defined at increased risk include: women with a known breast cancer susceptibility gene (BRCA) mutation, the first degree relative of a woman with a known BRCA mutation, and women with a lifetime risk over approximately 20%, according to risk prediction models primarily using family history [3].

The Breast Cancer Risk Assessment Tool (BCRAT) is an online, interactive tool used to calculate the 5-year and lifetime risk of being diagnosed with invasive breast cancer. Based on the Gail model, which predominantly relies on family history, the BCRAT is widely reputable and validated in US populations of white women [4-7]. The BCRAT combines medical, reproductive, and family history to estimate a woman's 5-year and lifetime risk.

In this study, the BCRAT was utilized to calculate the 5-year and lifetime risk of being diagnosed with breast cancer for each patient that received mammography or breast MRI within a six-month period at a rural teaching hospital. The objective of the study was to determine how

many women receiving mammography or breast MRI met designation criteria to be considered high risk and if their screening process reflected current guideline recommendations.

Material and Methods

A retrospective chart review of 1,144 mammograms and 9 breast MRIs performed between January 1st and June 30th, 2014 at a rural teaching facility, were included in the study. Patients with insufficient clinical information to complete the BCRAT were excluded from risk calculation analysis. Males, women <35 years, women >85 years, and women previously diagnosed with breast cancer, ductal carcinoma in situ (DCIS), lobular carcinoma in situ (LCIS), or prior chest radiation therapy were also excluded from the study. Following exclusions, 1,054 mammograms and 6 breast MRIs were analyzed.

For each woman included in the study, mammography, breast MRI images and radiology reports were reviewed. Medical and family history was collected from the referring physician's orders,

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outpatient admission forms, and the radiology department breast imaging intake form as documented by the mammography technician. Necessary patient information included: personal history of breast cancer/DCIS/LCIS/chest radiation, BRCA mutation status, age, age at first menses, age at first live birth, number of first degree relatives with breast cancer, previous breast biopsy, number of previous biopsies, results of previous biopsies (benign, atypical dysplasia, or malignancy), and race.

Medical and family history was entered into the BCRAT and used to calculate the 5-year and lifetime risk of being diagnosed with invasive breast cancer. The BCRAT then compares a woman's 5-year and lifetime risks to those of an average risk age-matched female. Based on individual lifetime risks, women were divided into two groups. Women with lifetime risks less than 19.5% were considered low or average risk and women with lifetime risks greater than or equal to 19.5% were designated high-risk. For women in the high-risk group, the individual screening process was evaluated to determine if at any point a physician identified them as having increased risk of developing breast cancer, recommended lifetime risk calculation or breast MRI, or if breast MRI was subsequently performed.

Results

1,054 mammograms and 6 breast MRIs, performed over a 6-month period and were included in the analysis (Figure 1). Patient demographics revealed an average age of 58.8 years, with 99.3% of women reporting.

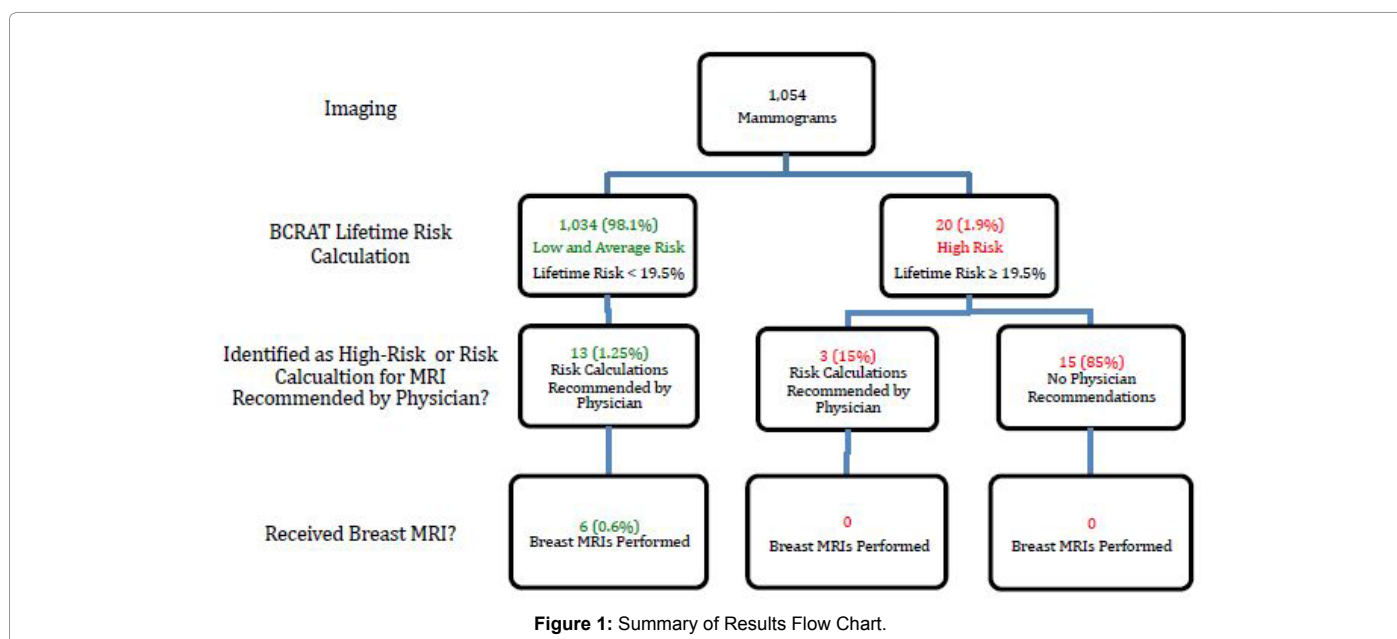
White or non-Hispanic race. Twenty (1.9%) women were identified as high risk of developing breast cancer, with lifetime risks averaging 23.9% and 5-year risks averaging 4.25%. Of the 20 high-risk women, three (15%) were appropriately identified by a physician and recommended a risk assessment for possible breast MRI. We used a multivariate regression model to assess the association of the 5-year and lifetime risks on whether a risk calculation or breast MRI was recommended by a physician. The multivariate regression model determined the 5-year and lifetime risks were 1.5% and 7%

(respectively) higher for patients recommended a risk calculation or breast MRI. Zero breast MRIs were performed on the 20 high-risk patients (Figure 1). The remaining 1,034 women who received mammograms were considered low-average risk, with lifetime and 5-year risks averaging 7.85% and 1.49%, respectively. Thirteen of the low-average risk women were recommended a risk assessment for breast MRI by a physician. Six of the low-average risk women received breast MRI, with their average lifetime and 5-year risks of 9.55%, and 0.67% (Figures 2A-2C, 3A&3B).

Discussion and Conclusions

Several evidence based guidelines including the American Cancer Society and American College of Radiology [3,8-11] recommend breast MRI as an adjunct to annual mammography for women with lifetime risks greater than approximately 20%. Breast MRI is beneficial in these high-risk women, as it is more sensitive than mammography and can help detect cancer earlier in the disease process [8]. There is ongoing research and discussion regarding the risks and benefits of performing breast MRI on women with intermediate lifetime risks between 15-20%, have dense breasts, or history of abnormal breast biopsy [8,9]. Current recommendations do not support breast MRI for women with less than 15% lifetime risk [9]. In this study, all the women who received breast MRI had lifetime risks less than 15%, and chart review was unsuccessful in determining the medical decision making process or other risk factors leading to breast MRI. In these women with low-average risk, breast MRI has no proven benefit and may lead to false positives or unnecessary further testing. Of the twenty women with lifetime risks greater than approximately 20%, the attending radiologist recognized three as being potentially high-risk, and recommended the use of a risk assessment tool for possible breast MRI. The twenty women determined to be high-risk did not receive breast MRI as recommended by current guidelines. This is unfortunate, as this group of high-risk women would receive the greatest benefit from breast MRI as they are the group most likely to have cancer.

In this rural teaching facility, breast MRI may be over utilized in



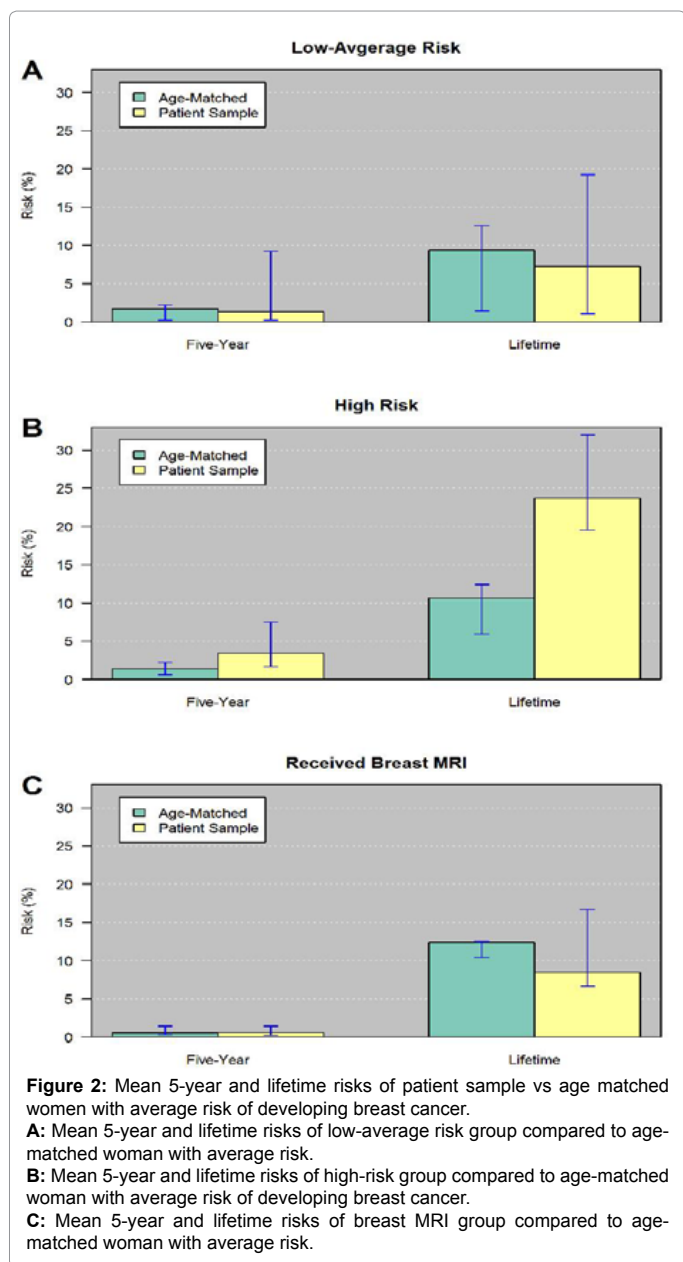


Figure 2: Mean 5-year and lifetime risks of patient sample vs age matched women with average risk of developing breast cancer. **A:** Mean 5-year and lifetime risks of low-average risk group compared to age-matched woman with average risk. **B:** Mean 5-year and lifetime risks of high-risk group compared to age-matched woman with average risk of developing breast cancer. **C:** Mean 5-year and lifetime risks of breast MRI group compared to age-matched woman with average risk.

women with low or average risk, and underutilized in women with increased risk of developing breast cancer. It may be beneficial for the patient and hospital if breast MRI were performed on women with increased risk, but it seems there is a lack of awareness regarding which patients are considered high risk. One possible solution would be to have the mammography technician calculate a lifetime risk assessment using the BCRAT prior to performing the imaging, so the radiologist and referring physician would be able to access the risk assessment. There is a continued opportunity for referring physicians and radiologists to identify women at increased risk of developing breast cancer, and implement annual breast MRI in addition to mammography as recommended by current guidelines. To aid physicians in identifying women at increased risk, the BCRAT is a simple online tool designed to incorporate a woman's individual risk factors and estimate a 5-year and lifetime risk. It can educate both patient and provider as to the risk factors for breast cancer and direct patient care towards current breast cancer screening recommendations.

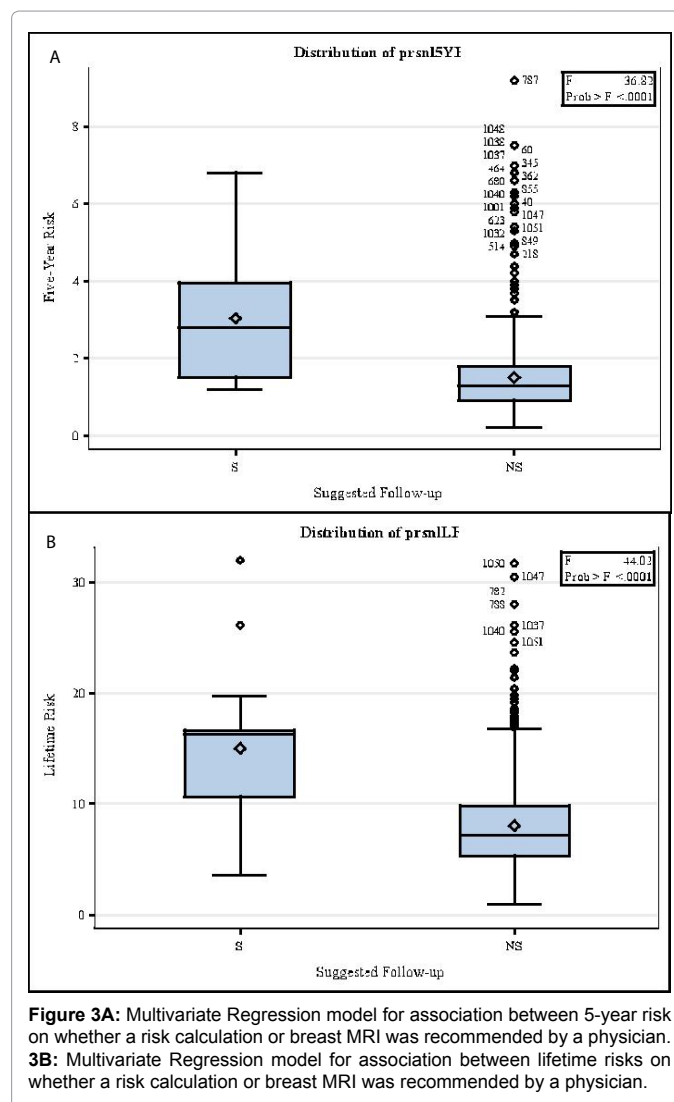


Figure 3A: Multivariate Regression model for association between 5-year risk on whether a risk calculation or breast MRI was recommended by a physician. **3B:** Multivariate Regression model for association between lifetime risks on whether a risk calculation or breast MRI was recommended by a physician.

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