ORIGINAL ARTICLE

Evaluation of the Results of Services Provided in Breast Cancer Counseling and Screening Clinics in Babol, 2012-2017

Fatemeh Jafari[1#], PhD student; Sepideh Mohseni Heidari[2#], MSc; Layla Shojaie[3], MD; Mohebat Vali[1], PhD Candidate; Fatemeh Jahani[4], BSc; Seyed-Mostaffa Mirzad[4], MSc; Hossein-Ali Nikbakht[2], PhD; Soheil Hassanipour Azgomi[5], PhD; Mousa Ghelichi-Ghojogh[6], PhD; Haleh Ghaem[7], PhD

[1]Student Research Committee,Shiraz University of Medical Sciences, Shiraz, Iran
[2]Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran
[3]Division of GI/Liver, Department of Medicine, Keck school of Medicine, University of Southern California, Los Angeles, CA, USA
[4]Department of Health, Babol University of Medical Sciences, Babol, Iran
[5]Gastrointestinal and Liver Diseases Research Center, Guilan University of Medical Sciences, Rasht, Iran
[6]Neonatal and Children's Health Research Center ResearchCenter, Golestan University of Medical Science, Gorgan, Iran
[7]Non-Communicable Diseases Research Center, Department of Epidemiology, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
#These two authors contributed equally to this work

Correspondence:
Haleh Ghaem, PhD;
Department of Epidemiology, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
Tel: +98 71 37256007
Email: ghaemh@sums.ac.ir
Received: 08 January 2023
Revised: 16 February 2023
Accepted: 17 March 2023

Abstract

Background: Successful treatment of breast cancer (BC) depends on its early detection, which has a significant role in reducing its mortality. The purpose of this study was to evaluate the services provided and the results in women referred to Babol Health Center Breast Cancer Screening Clinic.

Methods: This cross-sectional study was performed on 1421 individuals. Data were collected using a questionnaire, including demographic information, health history, and screening questions. Initial examinations were performed by midwives at the centers, and suspected or family history cases were referred to counseling centers and then to a physician for mammography. All follow-up was recorded by an expert in the center.

Results: The mean age of the subjects was 46.19±8.84 years, and that at first delivery was 21.08±4.38; 93 (6.5%) of them had a history of infertility and 253 (17.8%) had a family history of BC. Of those who did a clinical examination, mammography and ultrasound, 580 (40.9%), 171 (12%), and 441 (31.1%) had BIRADS above two, respectively, and 12 of those who performed biopsy had a positive mass result. Among the other variables studied, history of benign tumor (OR=2.86, P<0.001) and changes in breast skin (OR=2.96, P=0.021) and change in the breast size (OR=2.92, P. value=0.020).) was observed in predicting effective mammography. In the random forest chart, the history of benign tumors showed 20.34% of mammographic predictions. Breast self-examination with 12.06% and then hormonal drugs with 10.45% were in the second and third ranks.

Conclusion: Using two methods of clinical examination and mammography will identify most people in stage 2 who have a good prognosis. Given the proper functioning of the center, it is suggested that more extensive screening should be done to reduce the prevalence and costs of treatment.

Please cite this article as: Jafari F, Mohseni Heidari S, Shojaie L, Vali M, Jahani F, Mirzad SM, Nikbakht HA, Hassanipour Azgomi S, Ghelichi-Ghojogh M, Ghaem H. Evaluation of the Results of Services Provided in Breast Cancer Counseling and Screening Clinics in Babol, 2012-2017. J Health Sci Surveillance Sys. 2023;11(2):308-316.

Keywords: Breast neoplasms, Mass screening, Mammography, Breast self-examination

Introduction

Cancer is one of the most significant health obstacles in the world. In developed countries, 55% of the disease burden is associated with cancer.[1] Breast cancer (BC) accounts for 23% of the total cancers diagnosed in women and is the most prevalent cancer among women in both developed and developing countries.[2]

BC is a multifactorial disease, and various factors play a role in its occurrence. Changes in risk factors lead to an increase in the prevalence of BC, which is increasing every day.[3] Worldwide, in 2018 about 2.1 million new BC cases were diagnosed in women. Almost 1 out of 4 cases of cancer among women is BC.[4] Over 1.1 million women annually in the world are imperiled with this cancer, about one-eighth of whom have the risk factors of BC, and one third are at the risk of death.[5, 6] The incidence of BC is variable from 89.7 to 100 thousand in East Africa to 19.4 per 100 thousand people in Western Europe.[1] Although the rate of incidence is lower in Asian countries than in Europe and the United States, the mortality rate in Asia is particularly evident.[7] The results of the study in Iran revealed that 23% of BCs were observed in women under 40 years, and 70% of women succumb to their lives during a short period.[8] According to a meta-analysis conducted in Iran, the age-standardized incidence of this cancer was 26 in 100000,[9] and its mortality was reported 1200 people per year.[8] BC can be treatable in the case of early diagnosis. Early detection by using a variety of screening methods increases the survival rate.[10]

There are two main components in the early diagnosis of BC, training, and screening.[11] The diagnosis of BC is critical to reducing mortality and is achieved through mammography, clinical examination, and self-care.[12] In one study, mammography was the most desirable method for achieving an early diagnosis of BC and led to a reduction of 15-25% of women's mortality.[13] Evidence shows that mammography and clinical examination of women in Iran and Middle East countries are low.[14]

The survival rate of BC in Iran has been estimated to be 67.6%, according to studies.[15] This low survival rate in less developed countries is mainly due to the lack of early diagnostic programs and therapeutic facilities, and it leads to a large percentage of women to be diagnosed in advanced stages.[11] The purpose of screening programs is to diagnose the disease after the onset of disease and before the emergence of disease symptoms. Therefore, given that screening can be beneficial in reducing BC mortality, this study aimed to examine the services provided and the results of the women referred to the counseling and screening clinics of BC in Babol Health Center. It is hoped that with the aid of the results of this study, screening services can be more broadly employed for diagnosing BC and thus reducing the burden and cost of the disease.

Methods

This cross-sectional study was conducted to determine the state of screening and case finding of BC and its outcomes in the women of Babol in 2012 to 2017. The present study was approved by the ethics committee with the code of 18268-42-01-97 in Shiraz University of Medical Sciences. The study population consisted of all women who resided in Babol, 1421 patients that in the mentioned period were referred to the counseling and screening for BC in facilities affiliated to Babol University of Medical Sciences. This screening program began in the mentioned centers since 2012. Ten centers were selected as a pilot, and midwives centers performed preliminary examinations. The data collection tool was a checklist that was provided by health deputy experts based on national screening guidelines. The data collection tool was a researcher-made questionnaire.The checklist includes ten sections, and the questionnaire includes personal information, demographic and health history, as well as questions related to BC screening status, which includes five questions about mammography, clinical examination, age at onset, the intervals of consultation, and the booked date for the next visit. These checklists were completed by an expert in BC advice and screening center.

In the implementation process, the initial information of the women referred was completed by the midwifery specialist in the family physician program.

Women who were over 40 years old and those under 40 who were suspicious cases such as cases with a positive family history or equivocal findings in initial examinations based on the current screening guidelines were referred to the Counseling and BC screening center in Babol. They all subsequently underwent mammography. Experts in Counseling and BC screening center conducted all necessary follow up, and the results were documented.

Currently, based on the country's health system protocols, a variety of methods are used for early detection of BC, including Self-Breast Examination (SBE), breast examination by a midwife or doctor, mammography, breast ultrasound, and Magnetic resonance imaging (MRI). SBE must be performed monthly after age 20. The best time to perform a breast examination is the first week of menstruation. Findings of any bulge, hollows in the skin or nipple, redness, secretion, wound, or skin blemishes in the physical exam are considered as a suspected case for further evaluation. The interpretation of mammography is based on the Breast Imaging-Reporting and Data System (BIRADS) reporting system. It is a tool for qualitative interpretation and the level of risk in mammography, ultrasound, and MRI of the breast. The grading of this system is as follows:

Group Zero: It represents an incomplete assessment and requires further diagnostic measures.

Group One: The breasts have a natural and healthy view.

Group Two: Represents benign masses.

Group 3: The possibly benign region necessitates repeated mammography in six months to one year.

Group 4: It is recommended to perform a biopsy. It does not typically indicate cancer, but it is possible.

Group 5: Cancer is suggested, a biopsy is recommended.

Ultrasound is usually performed in cases where the doctor considers undergoing more investigation. MRI is utilized to evaluate further cases that had suspicious mammography or ultrasonography results or had an underlying hereditary background.

SPSS software version 18 was used to analyze the data. To display descriptive statistics for quantitative variables that were verified based on a standard test with the Kolmogorov-Smirnov test, the mean and standard deviation were reported, and for qualitative variables frequency and percentages were reported.

Results

The results revealed that mean age, body mass index, and the number of children of the participants was 46.19±8.48, 29.2±6.7, and 2.7±1.3, respectively, and 93 people (6.2%) were single. The demographic characteristics of the participants are shown in Table 1.

The study of clinical records of our subjects revealed that 574 (40.4%) patients had a history of taking hormonal drugs, 93 (6.5%) patients had a history of infertility, and 253 (17.8%) subjects had a family history of BC (Table 2).

The mean age of the participants who were in their first menstrual period was 13.1±1.5, those with one delivery 21.08±4.38 and those who had their menopause 44.93±11.54. Furthermore, 411 (28.9%) patients had reported breast pain, 75 (5.3%) breast

Table 1: Demographic characteristics of the women referred to Babol screening centers (2012-2017)

Variable	Subgroups	Frequency (%)
Marital status	Non-married (Widow, Divorce(	93 (6.2)
	Married	1328 (93.8)
Literacy	Diploma and less	956 (67.4)
	Higher than diploma	465 (32.6)
Living place	Urban	643 (45.2)
	Rural	778 (54.8)
Job	Housewife	171 (12)
	Other (Employee, Farmer, Unemployed, Retired, self-employment)	1196 (84.2)
	No answer	54 (3.8)
Body Mass Index (kg/m^2)	Underweight[1]	3 (0.2)
	Normal weight[2]	230 (16.2)
	Overweight[3]	542 (38.1)
	Obese[4]	493 (34.7)
	No answer	153 (10.8)

[1]Under weighr:16-18.5; [2]Normal weight: 18.5-25; [3]Overweight: 25-30; [4]Obese:BMI >30

Table 2: Characteristics of health behavior records in the women referred to Babol screening centers (2012-2017)

Variable	Subgroups	Frequency (%)
History of trauma	No	1412 (99.4)
	Yes	9 (0.6)
History of Surgery	No	1380 (97.1)
	Yes	41 (2.9)
History of cancer in itself	No	1403 (98.7)
	Yes	5 (0.4)
	No answer	13 (0.9)
Family history of breast cancer	No	1168 (82.2)
	Yes	253 (17.8)
History of hormonal drugs	No	839 (59)
	Yes	574 (40.4)
	No answer	8 (0.6)
History of radiation therapy	No	1401 (98.6)
	Yes	9 (0.6)
	No answer	11 (0.8)
History of breastfeeding	No	57 (4)
	Yes	1307 (92)
	No answer	57 (4)
History of benign mass	No	1245 (87.6)
	Yes	164 (11.5)
	No answer	12 (0.8)
History of infertility	No	1287 (90.6)
	Yes	93 (6.5)
	No answer	41 (2.9)

Table 3: Health profile of the women referring to Babol screening centers (2012-2017)

Variable	Subgroups	Frequency (%)
Breast pain	No	998 (70.2)
	Yes	411 (28.9)
	No answer	12 (0.8)
Type of Pain	Periodic	166 (11.7)
	Non-periodic	173 (12.2)
Menstrual type	Regular	792 (55.7)
	Irregular	213 (15)
	No answer	416 (29.3)
Nipple changes	No	1372 (96.6)
	Yes	34 (2.4)
	No answer	15 (1.1)
Types of nipple changes	Sunk	24 (1.7)
	Other (wound, itching, flaky)	10 (0.7)
Secretion	No	1333 (93.8)
	Yes	75 (5.3)
	No answer	13 (0.9)
Type of secretion	Watery	18 (1.3)
	Milky	23 (1.6)
	Other (bloody, automatically, unilateral, black, yellow, green)	29 (3.1)
	No answer	1351 (94)
Changes in skin of the breast skin	No	1393 (98)
	Yes	15 (1.1)
	No answer	13 (0.9)
Types of changes in breast skin	Redness	7 (0.5)
	Other (Sunk, flaky(	8 (0.5)
	No answer	1406 (99)
Changes in breast size	No	1395 (98.2)
	Yes	13 (0.9)
	No answer	13 (0.9)
Mass in the breast	No	1271 (89.4)
	Yes	136 (9.6)
	No answer	14 (1)
Enlargement of the lymph node	No	1372 (96.6)
	Yes	35 (2.5)
	No answer	14 (1)
Swelling of the arm	No	1395 (98.2)
	Yes	13 (0.9)
	No answer	13 (0.9)

secretions,and 136 (9.6 %) breast mass (Table 3). In reviewing health behavior records, 511 (36%) patients performed SBE, and a doctor examined 760 (55.3%) patients.

Out of the 1421 participants in our study, 1000 (70%), 1111 (78.2 %), and 596 (38%) underwent examination, mammography, and sonography, respectively. Among our patients who underwent these three methods, 580 (40.9%), 171 (%12), and 441 (31.1%) had BIRADS scores, above two, respectively, and 12 of the patients who were biopsied had positive results as illustrated in Figure 1.

Logistic regression and Random Forest for Mammography

Among the variables, history of benign tumor (OR=2.86, P<0.001) and changes in breast skin (OR=2.96, P=0.021) and changes in breast size (OR=2.92, P=0.020) were effectively observed on mammographic prediction. In the random forest, the history of benign tumors represented 20.34% of mammographic predictions and was the most important variable in terms of significance based on the mean decrease in GINI. After this variable, breast self-examination with 12.06% and then hormonal drugs with 10.45% were in the second and third place in terms of importance. Random forest details can be seen in the supplement.

Discussion

In the present study, a significant percentage of participants used clinical examination and mammography for early detection of cancer; according to previous studies, these two methods have a good prognosis in reducing disease mortality due to early diagnosis.[16, 17] All the individuals who had successful mass identification by these two methods were 40.9% and 12%, which indicates their effectiveness. This number was 31.1%, 92.3%, 50%, and 85.7% in ultrasonography, biopsy, MRI, and surgical methods, respectively.

The mentioned indicators in this study are divided into demographic and clinical sections, which are

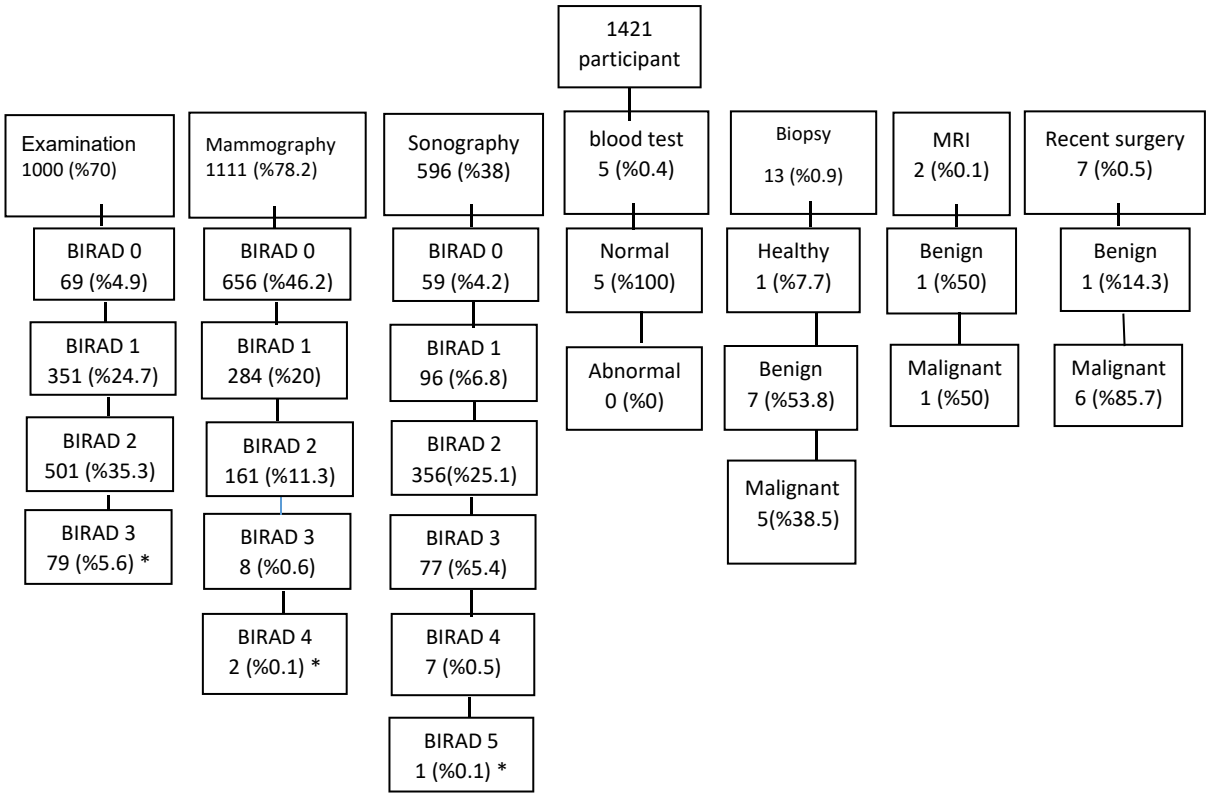

Figure 1: Frequency and percentage of service delivery to study participants and diagnosis of BIRAD breast cancer based on the services received in the women referred to Babol screening centers (2012-2017), Breast Imaging Reporting & Data System (BI-RADS). *Due to the missing data, the total percentage was not 100%.

similar to those of other studies, including Bahrami et al.'s research.[18] However, in terms of each section, variation is noted. In our study, the mean age of the participants was 46 years. However, in the study of Bahrami et al., the mean age was reported to be 36 years. This could be due to the fact that the existing resources for screening reduce mortality mainly in women aged 50 to 74 years, and the results are insignificant in women 40 to 49 years old.

In our study, 67.4% of the participants had a diploma or lower level of education; this percentage was reported lower in Yusof et al.'s study.[19] This could be because most participants in our study were from the primary urban population, so the majority had moderate education.

In the present study, participants used breast self-examination and mammography to explore the presence of breast masses and then hormonal drugs. Monthly and regular breast self-examination is an uncomplicated and inexpensive method for all women. Breast self-examination is a screening method that is efficient, reliable, non-invasive, does not require any specialized instruments, and can be done instantly. Although SBE is not sufficient for early detection of BC, it allows women to be responsible for their health, be familiar with their breast structure, and adopt preventive health behavior. Approximately 80 to 90% of the breast masses are discovered by the patients themselves.[20, 21] In the study of Provencher et al., the diagnosis of the disease through mammography, clinical examination and both methods was 36.5, 8.7, and 54.8%, respectively.[22]

In Nojumi et al.'s study, clinical examination and mammography were performed in 22% and 7% of women, respectively,[23] which is less common compared to the results of the present study. Also, in a study by Branigan et al. on patients with breast cancer, the use of hormonal drugs was associated with a reduction in those who received it.[24]

Breast cancer always develops gradually. Most patients discover their disease during routine screening. In our study, variables, history of benign tumors and changes in breast skin, and changes in the breast size were observed in predicting effective mammography; other studies had results similar to our study. Others may present with an accidentally discovered breast mass, breast deformity or size and skin changes. If the tumor has a history of even benign tumors, it tends to spread to the lymph and blood, leading to distant metastasis and poor prognosis. This explains and emphasizes the importance of CBE program.[25-27]

Other studies have considered that BC screening by mammography is the best method of secondary prevention, and it is considered as a treatment intervention that causes early detection at the asymptomatic stage; therefore, screening significantly reduces the mortality rate which is caused by a delay

in diagnosis. The exact determination of the reduced mortality rate can be determined exclusively for screening for BC improvement or modifications in risk factors.[28-32]

In Takkar et al.'s study, in 500 participants who performed the clinical examination, 53 (10.6%) had masses identified; this number was 40.9% in our study population, which had 580 participants. Moreover, with the use of mammography, 292 (58.4%), 173 (34.6%), and 35 (7%) were divided into BIRADS scores of 1, 2, and 3, respectively.[33] In their results, two people had BIRADS 4, which means the possibility of malignancy was very high in these two subjects. The same study reported 170 patients (52.5%) with identified mass by ultrasound, which in our study was reported to be 441 (31.1%).

In our study, a limited number of participants underwent breast ultrasound. However, sonography diagnosed more patients in the last stage, compared to SBE and mammography. For example, during stage two of the disease, the masses are more benign, and their diagnosis can be significantly beneficial for the treatment of patients; more patients were diagnosed. One of the reasons for this observation could be the accuracy of ultrasound in diagnosis. In the study carried out by Wendi et al., 30% of cancers were identified through mammography, 29% with ultrasound, and 8% with MRI.[34] Likewise, in our study, new screening methods have been used. One of these methods is MRI, which compared to ultrasound, was employed less in numerous studies. Perhaps, one of the reasons for the more widespread use of ultrasound is its less radiation and ease of work than MRI.

In all cases, one of the limitations of this study was that it was cross-sectional. The patients were not followed up; therefore, we were unable to assess the efficacy of different modalities of BC screening in the long term. It is suggested that patients should be examined and followed up in future to evaluate the increase in patients' survival rates with early detection. Also, the other limitation of our study was that the number of patients who had undergone other screening modalities such as blood tests, biopsy, surgery, and MRI had been scarce, so it was unreliable and difficult to assess their effectiveness as most of these methods are aggressive.

Conclusion

BC screening in our population led to increased detection of BC in the treatable and manageable stages, indicating the proper functioning of the centers covered by this study. However, there should be a long-term follow-up to confirm the effectiveness of BC screening. The result of this study can lead to preventive measures and increased awareness to reduce the prevalence of this cancer and reduce the treatment costs for the female population, primarily those at higher risk.

Acknowledgment

Researchers thank all the staff of health deputy and health centers and healthcare bases of Babol University of Medical Sciences.

Funding/Support

This study was supported financially by Shiraz University of Medical Sciences, Shiraz, Iran. (Grant Number: 97-01-42-18268).

Conflict of Interest: None declared

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Supplementary:

Binary Logit: Mammography

	Estimate	Standard Error	z	p
(Intercept)	-2.72	1.26	**-2.16**	**.031**
History of trauma: 1	-17.66	5,576.17	0.00	.997
History of surgery: 1	-18.01	2,509.55	-0.01	.994
Hormonal drugs: 1	-1.13	0.70	-1.62	.105
Thyroid: 1	0.94	0.86	1.10	.273
Family history of breast cancer: 1	-1.71	1.17	-1.46	.144
Breast pain: 1	-0.61	0.72	-0.85	.394
Radiotherapy: 1	-15.58	3,545.49	0.00	.996
Benign history: 1	2.86	0.69	**4.13**	**< .001**
Breastfeeding history: 1	-0.99	1.28	-0.78	.437
Breast self-examination: 1	-0.12	0.63	-0.19	.852
Nipple changes: 1	-15.54	2,662.99	-0.01	.995
Secretion: 1	1.39	0.99	1.40	.160
Breast skin changes: 1	2.96	1.28	**2.32**	**.021**
Breast size changes: 1	2.92	1.25	**2.33**	**.020**
Large lymph nodes: 1	1.24	1.68	0.74	.460
Swelling of the arm: 1	-16.81	4,070.40	0.00	.997

Figure S1: Logistic regression for mammography

Random Forest: Mammography

Correct predictions (based on out-of-bag sample): 97.03% (0: 100%; 1: 0%)

	0	1	MeanDecreaseAccuracy	Importance (MeanDecreaseGini)
Benign history	**0.004**	0.005	0.004	1.77
Breast self-examination	**0.001**	-0.005	0.001	1.05
Hormonal drugs	0.000	-0.004	0.000	0.91
Breast pain	0.000	**-0.013**	-0.001	0.79
Family history of breast cancer	**0.001**	**0.003**	0.001	0.74
Breast size changes	**0.000**	-0.001	0.000	0.70
Secretion	**0.000**	0.001	0.000	0.65
Large lymph nodes	0.000	0.000	0.000	0.57
Breast skin changes	**-0.001**	-0.001	-0.001	0.54
Breastfeeding history	**0.000**	0.000	0.000	0.50
Thyroid	0.000	0.001	0.000	0.44
History of surgery	**0.001**	0.000	0.001	0.42
Nipple changes	0.000	0.000	0.000	0.06
Swelling of the arm	0.000	0.000	0.000	0.04
History of trauma	0.000	0.000	0.000	0.03
Radiotherapy	0.000	0.000	0.000	0.03

Figure S2: Random Forest for mammography