Trajectory of Breast Cancer Screened Women in Unified Health System

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Trajetória de Mulheres Rastreadas para o Câncer de Mama na Rede Pública de Saúde

Trayectoria de Mujeres Rastreadas para el Cáncer de Mama en la Red Pública de Salud

Jeane Glaucia Tomazelli[1]; Isabel dos-Santos-Silva[2]; Gulnar Azevedo e Silva[3]

Abstract

Introduction: Knowing the times between the steps of a screening program is important to track the cancer control actions. **Objective:** Estimate the time interval between the suspected result of malignant mammography and the beginning of the first treatment, and to identify associated factors with its onset, among women screened for breast cancer, in services of the Unified Health System (SUS) in the city of Rio de Janeiro. **Method:** The records of the Information System of Breast Cancer Control for women aged 40-69 years, with a screening mammography carried out in july-december/2010, and whose results revealed suspicious (BI-RADS® 4 or 5) were related to Hospital, Outpatient and Mortality Information Systems for 2010-12. The time was estimated by Kaplan-Meier method, and its determinants were identified through Cox regression. **Results:** 158 women with altered mammography, records were identified, with breast cancer diagnosis, in the other databases for 66 (41.8%). Of these, 12.1% had information on biopsies. The median time between mammography and the start of treatment was 206 days, being lower for women aged 40-49 years (138 days) than for older women (190 for women aged 50-59; 234 days for women of 60-69 years) (Log rank, p<0.05). Women who repeated the mammography (*hazard ratio*: 0.36; 95% confidence interval 0.19-0.72) presented a longer time. **Conclusion:** There are few biopsies registered in the SUS and long time until the beginning of treatment, even when mammographies are requested by specialized hospitals, which demonstrates the need for SUS to improve the follow-up of women with suspected mammography.

Key words: Mass Screening; Breast Neoplasms; Time-to-Treatment; Early Detection of Cancer; Health Information Systems.

Resumo

Introdução: Conhecer os tempos entre as etapas do programa de rastreamento é importante para acompanhar as ações de controle de câncer. **Objetivo:** Estimar o intervalo de tempo entre o resultado suspeito de malignidade pela mamografia e o início do primeiro tratamento, e identificar fatores associados ao seu início, entre mulheres rastreadas para câncer de mama, nos serviços do Sistema Único de Saúde (SUS) do município do Rio de Janeiro. **Método:** Registros do Sistema de Informação do Controle do Câncer de Mama para mulheres de 40-69 anos, com uma mamografia de rastreamento efetuada em julho-dezembro/2010, com resultados suspeitos (BI-RADS® 4 ou 5), foram relacionados com os Sistemas de Informação Hospitalar, Ambulatorial e de Mortalidade para 2010-2012. O tempo foi estimado pelo método de Kaplan-Meier, e seus determinantes identificados pela regressão de Cox. **Resultados:** Entre 158 mulheres com mamografia alterada, foram identificados registros de 66 (41,8%) casos de câncer de mama. Destes, 12,1% tinham informações sobre biópsias prévias. O tempo mediano entre a mamografia e o início do tratamento foi de 206 dias, sendo menor para mulheres entre 40-49 anos (138 dias) do que para as mais idosas (190 para mulheres de 50-59 anos; 234 dias para mulheres de 60-69 anos) (Log-rank, p<0,05). Mulheres que repetiram mamografia apresentaram maior atraso (*hazard ratio*: 0,36; intervalo de confiança de 95% 0,19-0,72). **Conclusão:** Há poucas biópsias registradas no SUS e longo tempo até o início de tratamento, mesmo quando as mamografias são solicitadas por hospitais especializados, demonstrando necessidade de o SUS melhorar o seguimento de mulheres com mamografia suspeita.

Palavras-chave: Programas de Rastreamento; Neoplasias da Mama; Tempo para o Tratamento; Detecção Precoce de Câncer; Sistemas de Informação em Saúde.

Resumen

Introducción: Conocer los tiempos entre las etapas de programa de rastreo es importante para controlar las acciones de control del cáncer. **Objetivo:** Estimar el intervalo de tiempo entre resultado sospechoso de malignidad de la mamografía y inicio del primer tratamiento, y identificar factores asociados, entre mujeres rastreadas para cáncer de mama, en servicios del Sistema Único de Salud (SUS), municipio de Río de Janeiro. **Método:** Registros del Sistema de Información del Control del Cáncer de Mama para mujeres de 40-69 años, con una mamografía de rastreo efectuada en julio-diciembre/2010, cuyos resultados revelaron alteraciones sospechosas (BI-RADS® 4 o 5) relacionados con Sistemas de Información Hospitalaria, Ambulatorial y de Mortalidad para 2010-12. El tiempo fue estimado pelo método Kaplan-Meier, y sus determinantes identificados por la regresión de Cox. **Resultados:** Entre 158 mujeres con mamografía alterada, fueron identificados registros, con diagnóstico de cáncer de mama, en otras bases para 66 (41,8%). Dellas, 12,1% tenía informaciones sobre biopsias. Tiempo medio entre la mamografía y inicio del tratamiento fue de 206 días, siendo menor para mujeres entre 40-49 años (138 días) que para ancianas (190 para mujeres de 50-59 años, 234 días para mujeres de 60-a 69 años) (Log-rank, p <0,05). Mujeres que repitió la mamografía (*hazard ratio*: 0,36, intervalo de confianza del 95% 0,19-0,72) presentaron mayor tiempo. **Conclusión:** Hay pocas biopsias registradas en SUS y largo tiempo hasta el inicio del tratamiento, incluso cuando las mamografías son solicitadas por hospitales especializados, demostrando la necesidad del SUS de mejorar el seguimiento de mujeres con mamografía sospechosa

Palabras clave: Tamizaje Masivo; Neoplasias de la Mama; Tiempo de Tratamiento; Detección Precóz del Cáncer; Sistemas de Información en Salud.

[1] Instituto Nacional de Câncer José Alencar Gomes da Silva (INCA). Rio de Janeiro (RJ), Brazil. Orcid iD: https://orcid.org/0000-0002-2472-3444
[2] School of Hygiene & Tropical Medicine, Londres. Orcid iD: https://orcid.org/0000-0002-6596-8798
[3] Universidade do Estado do Rio de Janeiro (Uerj). Rio de Janeiro (RJ), Brazil. Orcid iD: https://orcid.org/0000-0001-8734-2799
Address for correspondence: Jeane Glaucia Tomazelli. Rua Marquês de Pombal, 125, 7º andar – Centro. Rio de Janeiro (RJ), Brazil. CEP 22230-240. E-mail: jtomazelli@inca.gov.br

INTRODUCTION

The incidence of breast cancer is higher in the most developed areas of the country than in the less developed areas in Brazil as in other world regions [1], though regional variations may reflect differences in the capacity of diagnosis of the health care services[2]. Despite being the type of cancer with the highest mortality[3] among Brazilian women, a drop was observed in the capitals of the southeast and south regions, possibly because of better access to diagnosis and treatment in these areas[4]. Though the incidence rates are lower than those of high-income countries, the mortality/incidence rate in Brazil is higher than in the United Kingdom, European Unions and the United States of America, given the high lethality still seen in Brazil for this neoplasm[5], which indicates the necessity of more investment in early detection of the disease and treatment [6-8].

In 2015, the municipality of Rio de Janeiro was the capital with the highest mortality rate adjusted per age per the Brazilian population in 2010 (19.59/100 thousand)[3]. The public health network of the City of Rio de Janeiro is divided in ten programmatic areas (PA), with populations of different age ranges: a younger profile in the PA's 4,0, 5,2 and 5,3; intermediate in PA's 3,1, 3,2, 3,3 and 5,1, and older in PA's 1,0, 2,1 and 2,2[9,10]; a high breast cancer mortality was observed in PA's 2,1 and 2,2[10,11].

The flow since the screening mammography until the treatment of the cases involves all levels of health care. The Health Ministry recommends a biennial screening mammography for women between 50 and 69 years old[12]. Depending on the result, based in the classification system BI-RADS®[13], the woman can be advised to return the screening in two years (BI-RADS® 1 or 2), repeat a new image exam (BI-RADS® 0), do mammographies at semester/yearly intervals (BI-RADS® 3) or histopathological investigation (BI-RADS® 4 or 5). Had the result indicated the presence of malignant neoplasm, the woman should move to a treatment at a high complexity specialized hospital.

The timeline between the phases of doing the mammography, results, investigation of a suspected lesion and beginning of the treatment are essential to follow up the impact of the actions of cancer control in several countries [14-17]. In Brazil, the time between the diagnosis and beginning of the treatment starts to be monitored as of 2013, having as goal a lower than 60 days interval [18].

The objective of this study was to estimate the time interval between the malignant suspected and highly suspected result (BI-RADS® 4 or 5) of the screening mammography and the beginning of the treatment and analyze the factors associated to this interval for women living in the Municipality of Rio de Janeiro attended in the Unified Health System (SUS) facilities located in this municipality.

METHOD

It were identified all the women between 40 and 69 years old living in the municipality of Rio de Janeiro with malignant suspected results (BI-RADS® 4 or 5) at the screening mammography in the information registered in the second semester of 2010 in the System of Information of Breast Cancer Control (Sismama). Though the Health Ministry does not recommend the mammography screening for women under 50 years old[12], it was decided to include women between 40 and 49 years old in the study, as nearly 40% of the screening mammography are carried out in this age range group[19]. It was decided to include only women tracked in the second semester of 2010, one year after the system was effective to minimize the problems of data registration in the initial phase of the implementation of the information system.

The data of the participants were related probabilistically through the Reclink Program[20], as described by Tomazelli[21,22], using the Hospital Information Systems (SIH-SUS), Outpatient Information System (SIA-SUS) and Mortality (SIM) database to obtain information about the biopsy, breast cancer treatment and death until December 2012.

For the study, it were selected from Sismama the following variables: age, race/color, repetition of mammography, been submitted to breast clinical exam (BCE) previously, size of the lump, type of the unit requesting the mammography, type of hospital who did the treatment, staging, PA of the units that requested the mammography, the units that conducted the mammography and the treatment units. The information about biopsy was identified in the own Sismama (histopathological lump) or in SIA-SUS. The type of treatment was originated from SIH (surgeries) or from SIA – Authorizations of High Complexity Procedures in Oncology (Apac-Oncology) – and the staging of the Apac-Oncology[21,22]. The variables utilized were those available in the bases used and identified as the ones that could be possibly related with the time the treatment began.

The classifications of the type of unit requesting the mammography and where the treatment was conducted were based in the identification of the profile of these units in the National Register of Health Units (CNES) and according to the ordinance that licensed the specialized hospitals for cancer treatment in the period studied [23]. The variables related to PA's were created from the identification of where these units were located.

The age was categorized in the ranges of 40-49, 50-59, 60-69 years old. The size of the lump was categorized in less than 21 mm and larger or equal to 21mm. The type of unit requesting the mammography was separated in Basic Health Unit (BHU), secondary unit, general hospital and specialized hospital. The type of hospital that did the treatment (general or specialized) and the type of treatment were originated from SIH or from Apac-Oncology. Specialized hospital is the licensed facility for cancer treatment as established in the ordinance effective for the period of the study [23].

Having made BCE, repetition of the mammography (none, once or more) after the altered result and know that the biopsy was made were studied in dichotomized manner.

The variable staging was initially defined as *in situ* (0), early (I and II) and advanced (III and IV) and it was limited to the women who underwent chemotherapy treatment (CT), hormone therapy (HT) or radiotherapy (RT), having being retrieved from Apac-Oncology, even if the treatment was after the surgery.

The variable race/color, which was absent in 100% of the fields in Sismama in the studied cohort was recovered through other Health Information Systems (SIS), which was not possible for eight women. It were used the following criteria when it was present in more than one SIS and were discordant: between Caucasian, brown and Asian, Caucasian was selected and between black and brown, non-Caucasian was chosen.

Initially, it was done a descriptive analysis of the characteristic of the women, and calculated the median and mean times between the date of the result of the altered mammography and the time the treatment began per PA. The distribution of cases per staging and per type of unit that requested the mammography was verified.

It was used the method Kaplan-Meier to estimate the times between the result of the mammography and the beginning of the treatment, the test Log-rank was used to verify possible differences between the strata of the variables selected. The type of unit requesting the mammography was stratified in three categories: BHU, secondary unit or general and specialized hospital; the size of the lump was categorized in non-palpable (<21mm) and palpable (≥21mm).

The hazard time started from the date of the result of the altered mammography (BI-RADS® 4 or 5) and ended in the date when the first breast cancer treatment was received (surgery, CT/HT or RT) or the date of death or the date when the follow up of the present study was interrupted (administrative censoring in 31/12/2012). It was considered as event, the date when the first treatment registered in SIH or in Apac-Oncology began for the women found in these systems. The option of conducting the study until December 2012 considered the replacement of Sismama by other information system[24].

To assess the time-associated factors until the beginning of the treatment, it was used Cox proportional hazards method. It were calculated the raw and adjusted *hazard ratios* (HR) and the respective confidence intervals of 95% (CI 95%). In the multiple analysis, it were included the selected variables: BCE, type of unit that requested the mammography, repetition of the mammography, biopsy and size of the lump adjusted per age in a continuous manner. Based in the standard Schoenfeld residuals the assumption of proportional hazards of the analyzes in time was verified[25].

As in this phase proportionality disruption occurred with the inclusion of the variable type of unit requesting the mammography, this variable was excluded.

It was carried out a third analysis with the inclusion of the variable staging categorized in two groups (*in situ* + early and advanced), because as this information is only available in Apac-Oncology, its introduction in the model creates a differential bias, as these women who underwent only surgery – and because of this, they only appear in SIH whose database do not register the staging – are those that supposedly have the disease in its initial stages.

Yet, it was done an additional analysis including the five deaths that occurred in the cohort in the period studied. For the calculation of the Kaplan-Meier curves, the deaths were treated as loss of follow up and the date of the censoring was considered as the date of the death. Also, it were used Cox proportional hazards model including the same variables selected for the previous model. All the statistical analyzes used the software R version 3.1.1[26].

The Institutional Review Board of "Instituto de Medicina Social (IMS), Universidade do Estado do Rio de Janeiro (UERJ)" (Report 1.105.945), "Secretaria Municipal de Saúde (SMS) do Rio de Janeiro" (Report 1.162.544) and of "Instituto Nacional de Câncer José Alencar Gomes da Silva" (Report 1.139.738).

RESULTS

In Sismama, it were informed 12,183 screening mammographies of women living in the municipality of Rio de Janeiro in the second semester of 2010, being 10,330 mammographies (84.4%) in the age range of 40-69 years old. Among these, it were identified 158 women suspected of breast cancer (BI-RADS® 4 or 5), 45 with 40-49 years old and 113 with 50-69 years old. The association of the registers of the 158 women to the bases of SIA-SUS, SIH-SUS and SIM revealed that, for 67 (42.4%), there was information about the treatment in the

bases reviewed. Of the 91 without register of treatment, 86 were not found in any other register and five were found in SIM. Of the 67 women treated, 66 had breast cancer and one was treated for benign disease. The result of the screening mammography of these women showed that 43 had BI-RADS® 4 and 23 BI-RADS® 5.

The analysis below considered the total of women with confirmed breast cancer diagnosis. Among these the mean age was 55.8 years (standard deviation = 7.2 years) and the median was 56 years (1st quartile = 50 and 3rd quartile= 62); 80.3% were 50-69 years old and 47.0% were Caucasian. Among the information registered in SIS, it was seen that for 86.4% there was information about BCE and in 75.8% of the cases, there were no palpable lump. There were no information about biopsy in SUS for the majority of the patients (87.9%) and for 24.2%, the mammography was repeated. Half of the requests of mammography were originated from a specialized hospital. The most part of the requests and the mammography itself originated in PA 2,2, 53.0% and 75.8%, respectively (Table 1).

The majority of the women (93.9%) was treated in specialized hospital. The surgery was the most frequent treatment (43.9%) and again PA 2,2 was the one that received the higher number of women for treatment (63.6%). Of the cases with staging reported, 57.9% were *in situ* or early (Table 1).

The mean time between the altered mammography and the beginning of the first treatment for breast cancer was 258 days and the median, 206 days, ranging between 19 and 707 days (Figure 1); the mean time was over 6 months in every PA where the treatment was done.

All the mammographies requested by PA 2.2 originated from specialized hospitals. None of the women in treatment had mammography requested by BHU of PA 2,1, 2,2, and 4,0. The staging per type of requesting unit shows that the most advanced stages were lower than the specialized and general hospitals compared to the secondary units (52.9%) and BHU (50.0%); nine cases without information of staging were excluded (non-existing data).

In the stratified analysis with the Kaplan-Meier model the age group, repetition of the mammography and type of unit requesting the mammography presented statistically significant difference (Log-rank <0.05) (Figure 2). The median time to initiate the treatment was lower for women where the specialized hospital requested the mammography (138 days), who informed previous BCE (205 days), who did not repeat the mammography (184 days) and without biopsy information (199 days).

In Cox multiple model where the variables BCE, type of requesting unit of mammography, repetition of

Table 1. Distribution of the characteristics of the women with malignant suspected or highly suspected screening mammography of (BI-RADS® 4 or 5) and confirmed malignancy, Municipality of Rio de Janeiro, 2010-2012

Characteristics Studied	N	%
Age range		
40 to 49 years	13	19.7
50 to 59 years	27	40.9
60 to 69 years	26	39.4
Race		
Caucasian	31	47.0
Non Caucasian	27	40.9
Missing	8	12.1
Type of unit requesting the mammography		
Basic Health Unit	10	15.2
Secondary Unit	18	27.3
Specialized Hospital	33	50.0
General Hospital	5	76
Previous breast clinical exam		
No	9	13.6
Yes	57	86.4
Repetition of the mammography		
None	50	75.8
1 or more times	16	24.2
Biopsy Information		
No	58	87.9
Yes	8	12.1
Size of the lump		
<21mm[1]	50	75.8
≥21mm	16	24.2
Programmatic Area of the unit requesting the mammography		
1.0	19	28,8
2.1	1	1,5
2.2	35	53,0
3.1	3	4,5
3.2	3	4,5
3.3	2	3,0
5.2	2	3,0
5.3	1	1,5
Programmatic Area of the unit that made the mammography		
2.2	50	75,8
2.3	10	15,2
3.2	1	1,5
4.0	5	7,6

Table 1. continue

Characteristics Studied	N	%
Programmatic Area of the unit that made the treatment		
1.0	10	15,2
2.1	1	1,5
2.2	42	63,6
3.1	9	13,6
3.2	3	4,5
4.0	1	1,5
Staging		
In situ	2	3,0
Early	31	47,0
Advanced	24	36,4
Missing	9	13,6
Type of unit that treated		
Specialized Hospital	62	93,9
General Hospital	4	6,1
Type of treatment		
Surgical procedures	29	43,9
Chemotherapy	19	28,8
Hormone therapy	7	10,6
Radiotherapy	11	16,7

Note: [1]31 women included without information about the presence of lumps.

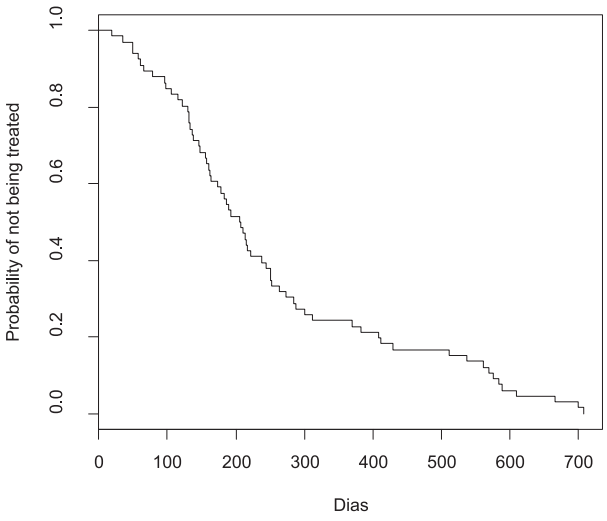
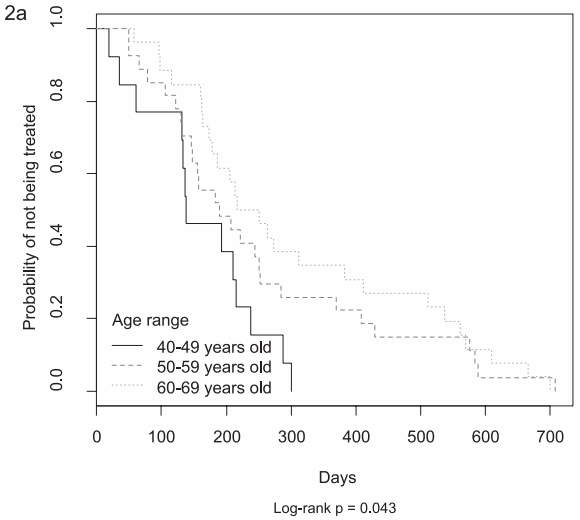
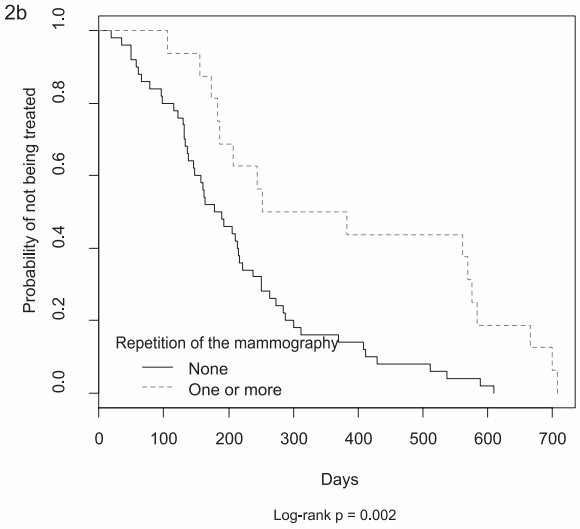


Figure 1. Time between the result of malignant suspected or highly suspected screening mammography (BI-RADS® 4 or 5) and beginning of the treatment for women screened for breast cancer in the second semester of 2010, Municipality of Rio de Janeiro, 2010 to 2012





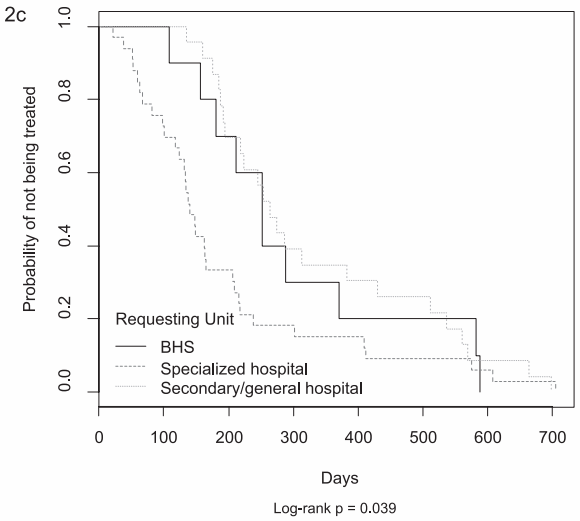


Figure 2. Time between the result of the mammography with malignant suspected or highly suspected lesion and beginning of the treatment in women screened for breast cancer in the second semester of 2010 according to age range (2a), repetition of mammography (2b) and type of requesting unit (2c), Municipality of Rio de Janeiro, 2010 to 2012

the mammography, biopsy and size of the lump were included, the repetition of the mammography (once or more) was the only variable that associated to an extended waiting time-to-treatment (0.39; CI 95%: 0.20-0.78), but standard Schoenfeld residuals pointed out departure of proportionality of the hazard in time (Table 2). The hazards assessment revealed that the departure of proportionality was attributed to the variable type of unit requesting the mammography.

In the analysis of the model, excluding the type of requesting unit of the mammography, the repetition of the mammography (once or more), was the only variable that associated to a longer waiting time-to-treatment (0.36; CI 95%: 0.19-0.72). Having previous BCE, though reaching HR of 1.40, failed to show a statistically significant confidence interval and extremely ample, which makes the estimate very inaccurate (Table 3). The *hazard ratios* of the model with the variable type of requesting unit of mammography did not differ much from the model without this variable.

The analysis of standard Schoenfeld residuals shows that there were no violation of the assumption of proportionality of the hazards in time (p=0.571) in this last model.

Table 2. Median time and *hazard ratio* for the time between suspected or highly suspected malignant mammography and beginning of the treatment associated to selected variables in women screened in the City of Rio de Janeiro, 2010-2012

Characteristics studied	Median Time (days)	Final Model (HR[a] and IC95%)
Previous breast clinical exam		
No	263	1
Yes	205	1.20 (0.50-2.88)
Type of unit requesting the mammography		
Basic Health Unit	251	1
Secondary/general Unit	263	1.63 (0.65-4.07)
Specialized Hospital	138	2.62 (0.98-6.99)
Repetition of mammography		
None	184	1
1 or more times	317	0.39 (0.20-0.78)
Size of the lump		
Non palpable	195	1
Palpable	251	0.81 (0.43-1.51)
Biopsy Information		
No	199	1
Yes	230	0.50 (0.20-1.29)

Notes: [a]Adjusted by age and by all the variables of the table; Schoenfeld residual test: (p<0.05).

Table 3. Median time and *hazard ratio* for the time between suspected or highly suspected mammography and beginning of the treatment associated to selected variables in women screened in the City of Rio de Janeiro, 2010-2012

Characteristics studied	Median Time (days)	Final Model (HR[a] and IC95%)
Previous breast clinical exam		
No	263	1
Yes	205	1.40 (0.67-2.91)
Repetition of mammography		
None	184	1
1 or more times	317	0.36 (0.19-0.72)
Size of the lump		
Non palpable	195	1
Palpable	251	0.80 (0.44-1.45)
Biopsy information		
No	199	1
Yes	230	0.86 (0.39-1.90)

Notes: [a]Adjusted by age and by all the variables of the table; Schoenfeld residual test: (p>0.05).

In the analysis in separate, including the variable staging, the mean time for treatment was 262 days, with median of 214 days (varying between 19-700 days). The Kaplan-Meier staging curves did not show difference (Log-rank=0.747) and the Cox regression proportional hazards did not differ in relation to the previous analysis.

With the inclusion of five deaths, the mean time-to-treatment was 262 days, which would raise in four days the mean time encountered, when these cases were not included in the cohort. The Kaplan-Meier stratified analysis model kept with significant difference the repetition of the mammography and type of unit requesting the mammography. The Cox multiple proportional hazards model continued similar to the model without the inclusion of deaths and in the Schoenfeld residuals analyzes, the assumption of proportionality hazards continued non-violated (p = 0.421) – data not presented.

DISCUSSION

The base of reference for the population of this study was 10,330 screening mammographies in women from 40 to 69 years old registered in Sismama in the second semester of 2010. Of these, it were identified 158 women with BI-RADS® 4 or 5. Using in this group the program parameter that estimates that 2.2% of the total of screening mammographies in the age group of 50-69 years old would demand a diagnosis investigation [27], it would be expected 228 altered cases (68 in the age group

of 40-49 years old and 160 in the 50-69 years old). The number of cases encountered (158, 45 between 40-49 years old and 113 between 50-69 years old) was lower than the estimated. As the parameter was based in the Canadian parameter, where the incidence of breast cancer is higher than in Brazil and how this was established for individuals and that Sismama registers exams and not women, it is possible that the actual difference is smaller than what was found (70 cases). It is worth mentioning that the national parameters utilized were constructed considering the references of another country. Whereas the estimated proportion of breast cancer for non-palpable lesions, of a result BI-RADS® 4 as 20% and of BI-RADS® 5 as 80%[28], 52 cases of breast cancer in the age range of 40-69 years old, lower than the number included in the cohort (66 women) were expected.

The parameter applied, it needs to be emphasized, (2.2%) also included women of 40-49 years old with screening mammography because there is no parameter for this age range. The utilization of this parameter in this segment may have raised the number of cases that would need histopathological investigation.

The main findings of this study were: (i) extended time between the result of the altered mammography and beginning of the treatment – less for younger women, (ii), less median time to initiate the treatment of screening mammography requested by specialized hospital and (iii) extended time when the mammography was repeated.

It needs to be highlighted the low proportion of altered mammographies requested by the BHU and their absence in PA's ,2,1, 2,2 and 4.0. The time-to-treatment was lower, yet elevated, when the mammography was requested by specialized hospitals and longer when requested by secondary/general hospital. Despite the cancer time-to-treatment of until 60 days counted from the histopathological diagnosis [18], there is no norm or parameter established for waiting time between the screening exam that requires diagnosis investigation and treatment. Having a diagnosis prior to entering a specialized hospital provokes impact in the time to begin the breast cancer treatment[29]. The Canadian screening program defines the goal of 90% or more of the patients to have the diagnosis in until five weeks of the altered screening exam for those who confirmed the diagnosis with thin punch needle. For those who had a core biopsy or surgical biopsy, this time can be extended to until seven weeks[14]. The programs of the United Kingdom and England expect that 90% or more of the women are admitted for treatment within two months after the beginning of the investigational diagnosis date [15,16,30]. In the United States, of the women who follow the National Breast and Cervical Cancer Early Detection Program-NBCCEDP, 80% were diagnosed in 60 days from the altered screening mammography and 94% initiated the treatment in until 60 days after the diagnosis [31].

The fact that the women requested for screening mammography by specialized hospitals had less time-to-treatment when compared with those with exams requested by HBU, suggests that part of these women should have been referred to these hospitals after a suspected previous mammography not identified in the study's database. A study in a specialized hospital in the Municipality of Rio de Janeiro[32] identified that, among the women who brought the mammography exam to the medical visit, 68% had done it in private health facilities and only 35.6% of the women had a histopathological diagnosis, of which 67.6% were carried out in private health facilities. Other possible explanations are: (i) women who had a suspected mammography before the beginning of this study; (ii) women who had previous altered mammography result off SUS; or (iii) that had breast cancer in the past and were being followed up in a specialized hospital, but without this information being registered or identified in the care information systems in SUS in the study period.

It was not possible to determine in the present study the motive by which histopathological investigation information for the majority (87.9%) of the women were not found. It is possible that these exams have been carried out in private health facilities or out of the Municipality of Rio de Janeiro, as much as they have not been located in SIS or there were no biopsies. The few cases identified with register of diagnosis investigation hint difficulty to do biopsy in the health public healthcare units, which is consistent with the results of other studies [32-34] and suggests that the pursue for the exam leads to delay to start the treatment. Likewise, it was not possible to explore the fact that the women that had a BI-RADS® 4 or 5 mammography have repeated the mammography since the conduct in these cases is to move on to the histopathological investigation [13].

It was noticed that an elevated proportion of women in treatment was submitted to BCE. Though the current guidelines to early detection of breast cancer in Brazil[12] do not recommend this exam as early breast cancer detection strategy, it was included in the previous screening recommendations. This finding may indicate that, during the years studied, there were more adherence to this practice by the health caregivers. However, nearly one quart of the screening mammographies presented palpable lumps, which, in face of the elevated proportion of BCE's, hints a wrongful request of mammography indicated as "screening", instead of "diagnosis". It should be considered, nevertheless, that having a palpable lump

failed to result in less time between the mammography and the beginning of the treatment.

Prominence should be given yet to the fact that the only condition, which associated to long waiting time between the screening and beginning of the treatment was the repetition of the mammography.

Even though the number of specialized hospitals that requested screening mammography is impressive, some of them provide clinical care to the community, and the screening mammographies are not necessarily originated by a previous alteration identified in the care-providing network.

As seen in other studies in the country, half of the breast cancers detected are stages *in situ* and early[7,32]. The higher proportion of women in stages III and IV, excluded the losses (*missings)*, had screening mammography requested by a secondary unit or general hospital, suggesting difficulty of access to the basic care network. Another possible explanation would be that these women have had mammography done off the network and brought the results to these units that repeated the mammography due the poor quality of the previous test.

The lack of association between staging and the time to wait for treatment must be seen cautiously given the quantity of missing information for this variable. It has been reported that early-diagnosed women have waited more time to have diagnosis confirmation [32] and treatment[29].

The reduced number of women in the cohort was the major limitation of the study, even though it was included all the altered mammographies (BI-RADS® 4 or 5) registered in SUS in the second semester of 2010, corresponding to 206 women. Of this total, 86, between 40 and 69 years, were not located and it is possible that part of these women have done the biopsy and the treatment, if needed, in private facilities. This loss of follow-up could, potentially, introduce a bias of inclusion in the study, where women not found in the database of the systems that were listed in Sismama would have an extended hazard while waiting for the treatment. However, the comparison between the group of women with information about treatment and those not found in the database with information about treatment did not show differences between the characteristics of age, previous breast clinical, type of unit requesting the mammography, PA that requested and done the mammography[34]. This problem, however, contributed to have an insufficient number of women followed up to ensure the accuracy of the results encountered and, consequently, some estimates were unable to reach statistical significance, but can indicate what would have been expected had the subject sample been extended.

Another limiting factor was the quality of the secondary databases because it is not mandatory to fill out some fields, the lack of critique systems that allow validating the information during its register, the non-standardization of the variables between the systems and the non-filling out of some fields as race/color.

Yet as a limitation, it should be mentioned that the design of the relation of the databases that generated the cohort did not foresee the relations with the mammographies of a former period in order to exclude earlier mammographies with altered result [21]. This fact can explain the elevated proportion of requested screening mammographies per specialized hospital: perhaps, part of the women who were requested to do these mammographies already had a previous altered mammography and the mammography detected in the study was a repetition in the specialized hospital.

CONCLUSION

The time between the result of the altered mammography and the beginning of the treatment was considered long, the median time is 206 days (6,8 months).

The results encountered brought up some questions that need to be further investigated as: the motive to repeat the altered mammography, the reduced number of registered biopsies, the time to initiate the treatment is higher than 6 months even when the mammographies are requested by specialized hospitals and the reason why the altered mammographies were poorly identified in BHU. The small number of women followed up does not allow these findings to be extrapolated to the population of women tracked for breast cancer in the Municipality of Rio de Janeiro, but, nevertheless, they serve as an alert for measures to be taken to grant the monitoring of breast cancer control actions and improvement of SUS information systems.

CONTRIBUTIONS

Jeane Glaucia Tomazelli contributed to the conception and design of the study, analysis and interpretation of data, wording and relevant critical revision of the intellectual content of the manuscript. Isabel dos-Santos-Silva and Gulnar Azevedo e Silva contributed to the analysis and interpretation of the data and critical revision of the article. All the authors approved the final version of the manuscript and declared to be responsible for all the aspects of the work, vouching for its accuracy and integrity.

DECLARATION OF CONFLICT OF INTERESTS

No conflict of interests to declare.

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