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Critical assessment of resource waste in staging and follow-up of breast cancer

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SUMMARY

BACKGROUND: Breast cancer is a public health problem with both high incidence and cure rates. After treatment, patients are monitored for long periods of time due to the risk of recurrence. Thus, staging and follow-up strategies should consider not only the best results for the patient but also its costs for the public health system.

OBJECTIVE: The objective of this study was to quantify the waste of resources on breast cancer follow-up and evaluate its impact on the public health system.

METHODS: This is a retrospective analysis of consecutive medical records to identify the intervals between consultations and tests used for staging and during the first 2 years of follow-up of patients with breast cancer treated at a public hospital in Brazil. Data were compared with the guidelines of the main international consensus.

RESULTS: Medical records of 60 consecutive patients treated in 2018 were selected, of whom 52 had 2 or more years of follow-up, and 8 had only 1 year of complete follow-up. A total of 34 patients (56.67%) underwent excessive examinations for stating. During follow-up, 125 surplus consultations were performed (33.6%). In this phase, 111 surplus exams were also performed, representing an increase of 100.9%. A total of 423 laboratory tests were performed for 18 patients in the first year and 229 tests for 14 patients in the second year.

CONCLUSION: Excessive tests and consultations significantly burdened the Unified Health System without any benefit to patients. Better adherence to staging and follow-up recommendations could reduce costs and optimize the limited resources used in the public health system.

KEYWORDS: Breast cancer. Public health. Cancer care facilities. Continuity of patient care. Brazil.

INTRODUCTION

Breast cancer (BC) is a challenging public health problem. According to the International Agency for Research on Cancer (IARC), it is classified as the second highest in global incidence, with lung cancer being the first when both men and women are considered[1,2]. In 2018, BC had an incidence of 2,088,849 cases, which corresponds to more than 11% of the total number of cancer cases worldwide[2]. In Brazil, data from GLOBOCAN 2018 show that the incidence of BC was 62.9 per 1,00,000 inhabitants, which is second only to prostate cancer. By 2023–2025, the National Institute of Cancer estimates more than 73,000 new cases[2,3] in the country.

Brazil is well-known for the largest public health system in the world, which ought to provide free tests and treatment to everyone in the country, and it comes with a cost[4]. Regarding tests for BC diagnosis, which are usually performed in medium- and high-complexity centers, the Federal Court of Auditors disclosed the staggering amount of BRL 41,174,464,206.19 or USD 7,952,729,981.49 allocated for these procedures in 2018[5-7].

Given the limited resources—human and physical—presented in the public health setting, their poor distribution among national states, and their high costs, patients do not always have access to the best medical practice. Therefore, it is imperative to discuss cost-effective methods for conducting oncology patients, especially those treated with curative intent. Thus, this study aims to observe and quantify the use of resources outside the international recommendations and to evaluate the temporal and financial impact of such waste of resources in the public health system.

METHODS

Study design and data collection

Patients who underwent consultation with clinical oncology from January 1, 2018, to December 31, 2018, were consecutively selected in the hospital database using the International Code of Diseases (ICD-10) for BC (C50, C50.8, and C50.9)[8].

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Their records were consulted, and all descriptive and relevant data were collected. Patients receiving molecular targeted therapy or those with metastatic disease were excluded.

Initially, an analysis was performed on imaging tests requested for staging of each patient to verify whether they were in accordance with the main oncological guidelines[9]. Excess tests requested due to clinical complaints were excluded.

Then, the first and second years of follow-up were evaluated, and the frequency of medical consultations with the Oncology and Mastology teams was verified. Patients who needed to anticipate appointments and undergo tests due to clinical complications were excluded. Imaging tests requested during both years of follow-up were also analyzed. The requested exams were compared with those indicated by guidelines. Those exceeding the recommendations, except for the tests requested upon complaints or physical findings, were counted.

In addition, laboratory tests performed during both years of patient follow-up were also evaluated. Patients who needed to undergo additional tests or tests commonly requested due to specific oncological medications were excluded. Once laboratory tests are only indicated if symptoms are present, all tests performed outside this condition were considered surplus. Tests with positive findings that led to changes in conduct and those usually requested during follow-up for patients using certain oncological medications were disregarded.

Statistical analysis

A total of 522 consecutive medical records were evaluated, of which 462 were excluded for not meeting the inclusion criteria. The remaining 60 medical records were included. Data were tabulated using Microsoft Excel® and analyzed with descriptive statistics using the Stata/IC® software. Numerical values are expressed as mean and standard deviation when applicable. Comparisons between the number of exams and consultations recommended and performed were made with frequencies and absolute numbers. To test the alternative hypothesis that there was an actual difference between the ideal and real amount of exams and consultations performed, the Wilcoxon signed-rank test was used. Confidence level was set at 95%.

RESULTS

Sample characteristics

A total of 60 female patients aged between 40 and 95 years (mean±SD=62.68±12.51) were included. Table 1 shows the distribution of the relevant characteristics of the sample in absolute and percentage values.

Table 1. Characteristics of the sample.

Patients (n=60)	
Characteristics	**N (%)**
Age	
Up to 65 years	34 (57)
>65 years	26 (43)
Menopause	
Pre	23 (38)
Post	37 (62)
Clinical staging	
I	4 (7)
II	33 (55)
III	23 (38)
Molecular subtype	
Luminal A	10 (17)
Luminal B	33 (55)
Luminal Hybrid	7 (12)
Triple-negative	6 (10)
HER-2 +	4 (7)
Neoadjuvant therapy	
Yes	38 (63)
No	22 (37)
Length of follow-up (years)	
1	8 (13)
2 or more	52 (87)

Resources used for staging

In the absence of symptoms, clinical staging I and II are not indicated for requesting imaging tests; therefore, 121 surplus tests were performed for these groups. For stage III, imaging tests requested are in accordance with the BC guidelines. However, one of these patients had no information about staging tests in their medical records, and one patient underwent fewer tests than indicated.

First year of follow-up

A total of 237 consultations were performed with oncology and 145 consultations were performed with mastology. Disregarding 11 patients who needed additional consultations, a total of 288 consultations were performed for 49 patients, representing 5.88 consultations per patient or a surplus of 46.94%.

Of the 60 patients in the first year of follow-up, 6 underwent one excess mammogram but one of them was excluded from the analysis because she showed positive findings that justified its conduction. Thus, five mammograms were performed

in excess; however, as three patients did not undergo the recommended exam, the result was an increase of 3.39% over the ideal amount.

Regarding the performance of breast ultrasound exams, 59 exams were performed; of these, 3 were excluded because they were performed for patients with positive findings. Thus, 56 additional tests were performed.

There were 18 patients with data described in medical records who underwent a total of 423 surplus laboratory tests (Table 2).

Second-year follow-up procedures

A total of 171 consultations were performed with oncology and 106 consultations with mastology. Disregarding 8 patients who needed additional consultations, a surplus of 33 consultations was performed, which represents an increase of 18.75%.

Of the 52 patients in the second year of follow-up, there were 7 surplus mammograms, resulting in a 13.73% increase over the ideal number. Regarding breast ultrasound, one patient was excluded from the analysis because she had a positive finding that justified the performance of the additional examination—i.e., not only she had suggestive clinical symptoms, but also the imaging exam confirmed the disease. A total of 46 breast ultrasounds were performed in excess of the recommendations of the main guidelines.

There were 14 patients with data described in medical records who underwent a total of 229 surplus laboratory tests (Table 2).

Excessive follow-up expenses

For staging, 121 exams were performed in excess, resulting in a surplus of 101%. In the first year of follow-up, there was an increase of 98.3% in imaging tests and 46.9% in consultations. A total of 423 laboratory tests were performed. During the second year, the surplus was 103.9% in imaging tests and 18.75% in consultations, and 229 more laboratory tests were performed than expected (Table 2).

The ideal number of consultations and examinations recommended by BC guidelines and the amount performed in excess for the period are shown in Figure 1.

DISCUSSION

This study found a waste of public resources during the first 2 years of follow-up of BC patients. It is important to note that data were collected from a university service, where there should be a greater concern in following the main consensus and guidelines. Thus, it is reasonable to assume that costs may be even higher for services not linked to educational institutes.

Both the waste of resources and the time spent in consultations were higher than ideal at all times, with the greatest

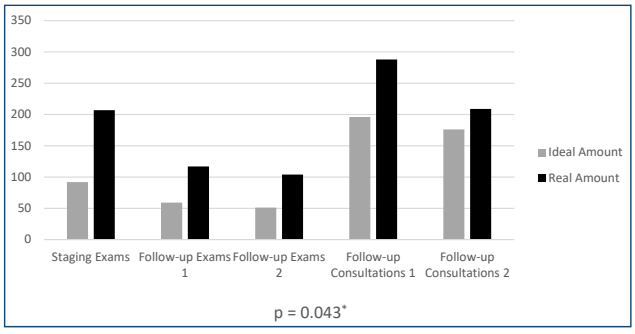

Figure 1. Actual vs. ideal quantity of staging exams, consultations, and exams performed in the first- and second-year follow-up. *Based on Wilcoxon signed-rank test.

Table 2. Optimal and actual number of consultations and complementary tests performed during the first 2 years of follow-up of breast cancer patients.

Procedures during the first year of follow-up	Optimal	Actual amount	Surplus	Surplus percentage
Consultations (n=60)*	196	288	92	46.49%
Mammography (n=57)*	59	61	2	3.39%
Breast ultrasound (n=48)*	0	56	56	–
Procedures during the second year of follow-up	**Optimal**	**Actual amount**	**Surplus**	**Surplus percentage**
Consultations (n=52)*	176	209	33	18.75%
Mammography (n=49)*	51	58	7	13.73%
Breast ultrasound (n=48)*	0	46	46	–
Surplus blood tests run during follow-up				**Absolute number**
First year (n=18)*				423
Second year (n=14)*				229

*Number of patients for whom surplus blood tests were performed.

difference seen at the staging phase, where imaging tests are recommended only for symptomatic patients or those in clinical stage IIIA or higher[10,11]. According to several studies and the American Society of Clinical Oncology, a complete diagnostic investigation for the detection of metastases is unnecessary for most newly diagnosed BC patients[12-15].

Breast cancer is a disease with high incidence and increasingly effective treatments, resulting in longer survival for affected patients. According to Tiezzi et al., the survival rate is 90% in 5 years; therefore, a good follow-up strategy is imperative, and the optimization of public resources to meet this growing demand is of great importance[16].

Besides, 40% of women are diagnosed with locally advanced or metastatic disease, partly due to a lack of guidance and preventive tests in some locations in the country. The lack of resources to acquire and maintain a mammography unit as well as a professional to operate it means that, despite the law to offer it to women as old as 40 years of age, only 30% of the 16 million Brazilian women in the recommended age range underwent mammograms between 2017 and 2018[17,18].

Furthermore, there is difficulty in implementing prevention strategies when primary care services are overloaded[19]. In this sense, this study showed no greater efficacy in performing tests more frequently than indicated in guidelines, as most asymptomatic patients also did not require a different medical approach. In the first year of follow-up, only 4 of 60 patients analyzed had positive imaging findings. In the second year, 1 of 52 patients had positive imaging findings. It should be noted that there is a risk of exposure to ionizing radiation used in imaging tests such as CT and mammography, which, although small, can be harmful[20]. Besides, more imaging does not equal better results. For instance, the routine use of breast ultrasound is not recommended because it is expensive, may not alter survival outcomes, and its addition to mammography may increase the diagnostic yield as well as false-positive rates even in a high-risk population[21,22].

In this study, special attention must be given to the frequency of consultations, which are often performed to evaluate the requested tests that frequently focus on health problems unrelated to cancer. The cost-benefit ratio of performing additional consultations and requesting tests should be evaluated frequently. Specialized medical evaluation is essential for treatment and unrelated conditions should be monitored in primary health care. Thus, the number of consultations could and should be improved to reduce waiting lists and provide better care for cancer patients. One way to do it would be by alternating follow-up consultations between specialties (clinical oncology and mastology) totaling four consultations per year, aiming for better use of the services.

Study limitations

This study was performed in only one service, with a small number of patients, and over a period of 1 year of care. Its retrospective nature also limits the information found, as only the exams available in the medical records were considered, and it is not possible to infer information that may exist but was not recorded.

CONCLUSION

This study showed that laboratory tests and imaging were performed at a higher frequency than recommended by both BC guidelines. Better adherence to staging and follow-up recommendations, regarding the number of consultations performed and tests requested, could reduce costs and optimize the limited resources used in the public health system to benefit a larger number of citizens.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by our institutional review board (Faculdade de Medicina do ABC) on May 4, 2021. It must be noted that only secondary data were gathered for this research, and therefore, the institutional review board waived the duty to apply consent forms for any participant. All methods were carried out ethically as approved by aforementioned the institutional review board.

AVAILABILITY OF DATA AND MATERIALS

All data will be available upon reasonable request to the corresponding author through the email danielcubero@me.com.

AUTHORS' CONTRIBUTIONS

JVBB: Conceptualization, Investigation, Methodology, Project administration. **CVMS:** Conceptualization, Investigation, Project administration. **PXS:** Conceptualization, Investigation, Project administration. **AG:** Conceptualization, Investigation, Project administration. **DIGC:** Conceptualization, Investigation, Project administration. **JHMS:** Methodology.

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