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Assessment of the knowledge, attitude, and practice of general surgeons in the management of breast cancer in Rwanda: A cross-sectional survey study

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Abstract

Background: Breast cancer is the second most common cancer among women in Rwanda, and surgery is a central component of its management. Breast surgery for benign and malignant disease is performed predominantly by general surgeons, as specialist breast and surgical oncologists remain few and dedicated breast surgical oncology training was still under development at the time of this study. Assessing general surgeons' knowledge, attitudes, and practices is therefore essential to identify gaps and improve breast cancer care.

Methods: We conducted a cross-sectional electronic survey of general surgeons practicing across referral, teaching, and district hospitals in Rwanda. The survey was distributed among general surgeons via a REDCap-based instrument that assessed training, practice patterns, self-reported confidence (5-point Likert scale), and case-based knowledge, and was informed by national and institutional breast cancer protocols and COSECSA examination questions. Data were analyzed in JASP using descriptive statistics, chi-square or Fisher's exact tests, and Spearman's rank correlation.

Results: From 67 eligible general surgeons, 27 responded (40% response rate; 93% male). Most (78%) had received breast cancer surgical training during residency, predominantly through lectures (70%), and operative exposure was limited: 74% had performed 1–20 breast cancer procedures during training, and 11% had performed none. Breast ultrasound was the most available diagnostic tool (93%), whereas MRI was available in fewer than 20% of facilities, and 38% of surgeons referred more than half of their patients to tertiary centers. Confidence was highest for diagnosing breast cancer (mean; 4.3 of 5) and lowest for treatment (3.6 of 5). The mean case-based knowledge score was 9.5 of 15 (63%), with the largest gaps in management of early-stage disease, non-carcinomatous malignancies, and isolated chest-wall recurrence.

Conclusion: General surgeons deliver the majority of breast cancer surgical care in Rwanda but report limited operative exposure and specific knowledge gaps. Strengthening structured, hands-on breast cancer training during and after residency, establishing multidisciplinary tumor boards, and developing national management guidelines could improve the quality and consistency of care. To our knowledge, this is the first study to assess the knowledge and practice of general surgeons in breast cancer management in Rwanda.

Introduction

Breast cancer is the most diagnosed cancer among women globally, with a high burden of disease affecting low- and middle-income countries (LMICs) (1). This burden is rising in Sub-Saharan Africa (SSA), with higher mortality and morbidity due to delayed diagnosis, late presentation with advanced disease, limited knowledge and access to care due to financial and geographical barriers (2, 3). Among health system factors delaying diagnosis and management of breast care in SSA, human resource and care-related issues, such as shortage of specialized healthcare providers, misdiagnosis, and poor management, are significant contributors (4–6).

In Rwanda, the incidence of all cancer cases has been rising from 635 to 2803 cases annually from 2007 to 2018 (7). According to GLOBOCAN/IARC 2022 estimates, 7122 new cancer cases and 4,887 cancer-related deaths were reported (8). Among these, breast cancer is the most common one affecting, with an incidence of 799 new cases and a 5-year prevalence of 27.2 per 100,000 population (8). A population-based study in Rwanda covering eight leading adult cancer types reports a 90.9% three-year survival rate for early breast cancer cases and 44.8% for advanced cases (9). The Country has employed efforts to address the rising incidence cancer though a concerted National cancer control plan (NCCP) in which it is specified that there is a need to train specialized healthcare workforce to optimize cancer care (10).

Surgical care is a critical component of breast cancer management, with timely surgical care being linked to better outcomes and survival rates (11). Yet globally, fewer than one in four patients with cancer receive safe, affordable, or timely surgery, a gap that is most severe in low- and middle-income countries (12). In Sub-Saharan Africa (SSA), surgeons perform breast surgery with varying levels of specialized training (13). This is often complicated by the variable resource contexts that general surgeons practice in, facing systemic challenges such as inadequate infrastructure, shortage of providers, and a lack of oncology training (13, 14). At the time of data collection, a breast cancer surgery fellowship program was being developed in Rwanda to address specialist workforce gaps.

It is therefore timely to understand current practice through the lens of surgical service providers who are at the forefront of breast cancer surgical treatment. To date, general surgeons provide most breast surgery services in Rwanda. Considering this, it is crucial to assess the capacity of general surgeons to manage breast cancer and identify potential areas in which surgical education and training can be enhanced to improve patient outcomes. Data specifically evaluating general surgeons' knowledge, attitudes, and practices in breast cancer surgical management within the Rwandan context remain limited. This study aims to assess the knowledge, attitude, and practice of general surgeons in breast cancer surgical management.

Methods

A cross-sectional electronic survey was conducted for general surgeons from across national referral, teaching, and district hospitals. We reported this based on the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) and the STROBE checklist for cross-sectional surveys.

Study Setting

Rwanda is a Low-Income Country in East Africa with a pyramidal healthcare system composed of community health workers, primary, secondary, and tertiary healthcare levels (15). The Rwanda Cancer Centre/Rwanda Military Referral and Teaching Hospital, the Butaro Cancer Centre of Excellence located at Butaro Level Two Teaching Hospital, University Teaching Hospital of Butare, University Teaching Hospital of Kigali, and several regional and level 2 teaching hospitals provide surgical interventions for breast cancer.

Study population and Sampling

The study population included all general surgeons in Rwanda who performed any oncologic surgery within the last 5 years. Per data from the Rwandan Ministry of Health and the Rwandan Surgical Society, at the time of this study, there were a total of 67 general surgeons practicing in Rwanda who met the inclusion criteria and were invited for participation through the Rwandan Surgical Society and hospital contacts. Respondents who did not meet the inclusion criteria (e.g. Senior Residents) were excluded from the study. All duplicate and incomplete responses were also omitted.

Data collection

A survey tool was developed in collaboration with experienced experts in breast cancer management in Rwanda and was prepared electronically using REDCap. It included questions exploring general surgeons' training, practice, and knowledge in breast cancer management. The knowledge assessment section was developed utilizing the Butaro Cancer Centre of Excellence Breast Cancer Protocol, the Rwandan National Cancer Control Plan, and COSECSA surgical examination questions, contextualized with on-the-ground experiences of breast cancer management in Rwanda. The assessment covered topics on diagnosis, surgical indications, systemic therapy, additional treatments, and perioperative care.

The survey was piloted with five final-year surgical residents and general surgeons. Feedback was collected through a cognitive interview process with the pilot participants to make the necessary adjustments. With support from the Rwandan Surgical Society, utilizing forums such as member-based WhatsApp groups and a mailing list, we disseminated the survey to general surgeons from multiple hospitals across Rwanda. Participation was voluntary and no financial compensation was provided.

The survey administration period was from October 15, 2024, to February 15, 2025. Outcomes were case-based clinical knowledge scores (15 vignette items) and self-rated confidence in diagnosing, treating, and managing breast cancer patients (inpatient/outpatient). Predictors/exposures included age, sex, training location, years of experience, workplace type, and prior breast-cancer-specific training. The median time of survey completion was 29.5 min.

To provide a criterion-referenced benchmark against which respondents' knowledge scores could be interpreted, a modified Angoff standard-setting exercise was conducted for the 15-item case-based knowledge assessment by a panel of five general surgery specialists and expert educators practicing in Rwanda(16). Panelists were purposively selected for breadth of experience in the surgical training space, including the design of surgical training programs, teaching, and the examination of candidates at university, national, and international regional level with the College of Surgeons of East, Central and Southern Africa (COSECSA). Panelists were first oriented to the concept of the "borderline" general surgeon, defined as a surgeon whose breast cancer knowledge is at the minimum level required to practice safely and independently in the Rwandan context. Each panelist then independently reviewed every item and estimated the proportion of borderline surgeons who would answer that item correctly. For questions where participants had more than 0.2 pts discrepancy, panelists adjudicated through

iteration. Item-level estimates were averaged across panelists to yield an expected item difficulty for the borderline surgeon, and these items were summed and averaged across the 15 items to derive the overall cut score. The resulting modified Angoff cut score was used as a reference standard for interpreting both the overall mean knowledge score and performance on individual items(16) .

Data Analysis

Survey responses were exported from REDCap and analyzed using JASP version 0.19.2. Categorical variables were summarized as frequencies and percentages, and ordinal confidence ratings (5-point Likert) as means together with medians and interquartile ranges. Associations between categorical variables were assessed using Pearson's chi-square test, or Fisher's exact test where any expected cell count was below five. Associations involving ordinal variables (confidence ratings, case-volume categories, and proportion of patients referred) were assessed using Spearman's rank correlation. A two-sided p-value less than 0.05 was considered statistically significant. Responses to the single open-ended question, “Do you have any additional thoughts on breast cancer care in Rwanda that you believe would be relevant to the study and important for the team to consider?”, were analyzed using descriptive thematic content analysis. Two independent reviewers (NG, BF) used an inductive approach to open code and group responses into recurring themes relevant to the knowledge, attitudes, and practices of General Surgeons in the management of breast cancer. Responses were then quantified by theme and presented by frequency and percentage.

Ethical considerations

Ethical approval

was obtained from the Rwanda National Ethical Committee under the IRB number (IRB number: RNEC/447/2024), and all participants had provided informed consent before completing the survey. There were no direct benefits to participants for partaking in the study. To mitigate concerns about employment, participants were assured of confidentiality and were encouraged to respond candidly. All survey data were de-identified, except for the hospital name, and were securely stored on REDCap with restricted access to the research team.

Results

The survey achieved a 40.3% response rate (27 of 67 eligible general surgeons). Respondents were predominantly male (n = 25, 93%) and ranged in age from 31–50, with most aged 31–40 years (n = 17, 63%). Most had completed their surgical training in Rwanda (n = 24, 89%).

Among participants, university teaching hospitals were the most common practice setting (n = 11, 41%), followed by level 2 teaching hospitals (n = 10, 37%) and district hospitals (n = 6, 22%). Most respondents had 5 or fewer years of clinical experience (n = 16, 59%) (Table 1)

Table 1
Summary of respondent characteristics, training, practice, and self-reported confidence (n = 27).

Characteristic N = 27	Frequency (n)	Percentage (%)
Age (years)		
31–40	17	63
41–50	10	37
Sex		
Female	2	7
Male	25	93
Surgical training location		
Rwanda	24	89
Ethiopia	3	11
Work experience (years)		
≤ 5	16	59
6–10	8	30
11–15	3	11
Workplace type*		
Referral hospital	4	15
University teaching hospital	11	41
Level 2 teaching hospital	10	37
District hospital	6	22
Private hospital	1	4
Breast cancer training in residency		
Received training — Yes	21	78
Received training — No	6	22
Mode of delivery of training in breast surgical care*		
Lecture	19	70
Clinical rotation (OR, Ward, OPD)	20	74
Seminar	5	19

Characteristic N = 27	Frequency (n)	Percentage (%)
Simulation	4	15
Breast cancer cases during residency		
0	3	11
1–5	9	33
6–20	11	41
21–50	3	11
51–100	1	4
Breast cancer cases in practice (last 5 years)		
0	3	11
1–5	11	41
6–20	7	26
21–50	4	15
51–100	2	7
Patients referred to tertiary centers		
do not refer	4	15
< 5%	6	22
5–20%	3	11
20–50%	4	15
50–80%	5	19
100%	5	19

*Multiple selections possible.

Most general surgeons (n = 21, 78%) reported receiving training in breast cancer surgery during residency. The most common mode of delivery was lectures (n = 19, 70%), and simulation and other hands-on training were the least used (n = 4, 15%). Of the survey participants, 33% reported having done up to 5 breast cancer surgical procedures and 41% reported having done between 6 and 20 procedures during their general surgery residency training, while only 4 participants (15%) reported doing more than 20 cases.

Only 3 (11%) had not performed breast cancer surgery in their last 5 years of independent practice. The proportion performing more than 20 cases was slightly higher in practice (22%) than during residency

(15%). The number of cases per year in practice did not correlate with the number of cases performed during training (Spearman ρ = 0.15, p = 0.45) or with the number of referrals (ρ = −0.07, p = 0.75; Appendix B).

When asked about diagnostic availability, most surgeons reported that breast ultrasound (93%) was the most accessible diagnostic tool, followed by X-ray (85%) in their facilities (Fig. 1). Only half of the participants had access to mammography, CT, and pathology services at their facilities.

Up to 38% (n = 10) of surgeons referred more than half of their breast cancer patients, with 19% (n = 5) referring to all their patients to a higher-level hospital; 15% of participants managed patients at a tertiary facility and a private hospital and did not refer patients out.

Surgeons reported the highest mean confidence in diagnosing breast cancer (4.3 on the 5-point Likert scale), followed by in-patient perioperative care (3.9) and out-patient follow-up (3.8), and were least confident in treating breast cancer (3.6) (Fig. 2). Self-reported confidence was not significantly associated with the number of cases performed during training (Spearman, all p > 0.15; Appendix B).

Across the 15-item case-based knowledge assessment, surgeons answered a mean of 9.5 of 15 questions correctly (63%; median 10, range 4–14; Appendix A). The most correctly answered case-based questions were related to management of locally advanced, late-stage, and metastatic disease (78–89%), and the timing of administration of adjuvant chemotherapy post-surgery (81%).

On the other hand, key areas of challenge in breast cancer management were evident. The greatest gaps were observed in the management of early-stage breast cancer and the treatment of non-carcinomatous malignancies, particularly angiosarcoma. Additionally, fewer than two-thirds of surgeons answered correctly on defining locally advanced and metastatic disease (59% each), selection of adjuvant systemic therapy for triple-negative, node-positive disease (56%), and management of cancer involving the nipple and areola (59%); the lowest-scoring item was management of an isolated chest-wall recurrence (41%). These findings highlight critical areas for targeted training and capacity-building among general surgeons.

Against the modified Angoff standard, the expert panel set a cut score of 66.6%, corresponding to the performance expected of a borderline general surgeon practicing in Rwanda. The observed overall mean of 63% therefore fell below the panel-defined minimum standard. At item level, 7 of the 15 items were answered correctly by a proportion of respondents at or above the cut score, ranging from perioperative treatment of locally advanced disease (89%) and surgery for late-stage disease and timing of adjuvant chemotherapy (81% each) to the diagnostic procedure for a suspicious breast mass (70%). The remaining 8 items fell below the panel standard, with the widest shortfalls in surgery for early-stage disease (15%), management of isolated chest-wall recurrence (41%), and upfront surgery plus adjuvant therapy in early-stage disease (52%) (Fig. 3).

Mean 63%

*DCIS- Ductal Carcinoma In-Situ; ER- Estrogen receptor; Tx- treatment; TNBC- Triple Negative Breast Cancer;

Free-text responses

Four themes emerged from the data:

1) The need for training and continuing education (9; 69.2% of free text responses)

The most frequently cited theme was the need for training and continuing education, including refresher courses, residency curriculum integration, and subspecialty training in breast/surgical oncology. "Refresher courses are needed to...always keep our surgeons fresh and updated even on new care"; "to organize a refresher course on breast cancer for general surgeons based in rural areas"; and "There is a need of continuous training of surgeons about breast cancer to have a common understanding for its management." (R5, Level 2 referral hospital)

2) The need for multidisciplinary collaboration and tumor boards (4; 30.8% of free text response)

The second most common theme was multidisciplinary collaboration and tumor boards, mentioned in 4 responses (31%), reflecting a desire for closer ties between district hospitals and specialized cancer centres. One surgeon noted it would be "good to involve us in the tumor board for breast cancer management so as we benefit from expertise from cancer centres," while another called for "Collaboration between Butaro Cancer Center and referral/teaching or tertiary hospital." (R5, Level 2 referral hospital)

3) The need to enhance diagnostic and screening infrastructure (4; 23.1% of free text response)

The third theme was diagnostic and screening infrastructure, raised in 3 responses (23%), citing the need for imaging and biopsy equipment and expanded early-detection capacity: "There is a need of diagnostic tools (core needles) and we need to avail mammography in many centres" and "more screening in order to have early cases." (R5, Level 2 referral hospital)

4) The challenge of late-stage presentation, (2; 7.7% of free text response)

A fourth theme, late-stage disease presentation, observed that patients often present with advanced disease requiring extensive surgery: "what is obvious is that our patients present with advanced diseases hence most of them undergo modified radical mastectomy and axillary lymph nodes dissection." (R1, District hospitals)

Discussion

The WHO Global Breast Cancer Initiative (GBCI) training manual establishes a target of 80% completion of multimodal breast cancer treatment among patients (17). This requires a multi-modal approach, with the best outcomes achieved when surgeons work within specialized multidisciplinary teams that

coordinate diagnosis, surgery, and systemic and radiation therapy. Care delivered through centralized multidisciplinary teams and by specialist breast surgeons has been associated with significantly improved outcomes compared with non-specialist care (18). Rwanda, like much of sub-Saharan Africa, has insufficient specialized breast cancer management infrastructure. Breast cancer surgery is performed almost exclusively by general surgeons, few breast oncology surgical subspecialists and limited multidisciplinary tumor boards for breast cancer (13). Our study surveyed general surgeons practicing in Rwanda to assess their knowledge, practice, and attitude towards breast cancer surgical management, characterizing the workforce that currently bears this burden of care.

Most surgeons have received training on breast cancer surgical management via lectures and clinical rotations, with only a few participants receiving hands-on training or simulation-based teaching. Exposure to breast cancer cases and the number of operations performed during residency are critical and have been linked to proficiency of surgeons treating breast cancer during their independent practice (19). Incorporating hands-on training and mentorship for surgical trainees, complemented by innovative teaching methods such as low-cost breast simulation, is essential to develop technical competency and readiness of general surgeons (20, 21). This is particularly important in settings like Rwanda, where resources are limited, and breast surgical oncology training is not readily available. Educators should focus on arranging comprehensive teaching with adequate exposure during surgical residency and create Continuous Professional Development (CPD) avenues to ensure general surgeons are up to date with current practice.

Confidence among general surgeons was higher for diagnosing breast cancer than for treating affected patients. The knowledge assessment revealed a gap in the management of early-stage disease, cancer involving nipple and areola, non-carcinomatous malignancies, and limitations in staging advanced disease and in selecting adjuvant systemic therapy for high-risk subtypes. These deficits mirror gaps reported elsewhere among general surgeons who manage breast cancer without a dedicated oncology curriculum. A survey of general surgery residents found no standardized national curriculum in surgical oncology, with residents underprepared across multiple cancer-related domains regardless of postgraduate year (22, 23). This variability is not confined to low-resource settings. A global survey of breast surgery experts across 25 countries identified substantial heterogeneity in diagnostic and treatment pathways, attributable to differences in training, resource availability, and access to multidisciplinary care (23). This highlights the importance of having a strong curriculum during residency with sufficient case exposure and hands-on experience to improve outcomes and provide quality care.

Our study has found a significant variation in general surgeons' responses and identified knowledge gaps. In general, the standard setting (modified Angoff method) finding shows that the mean score is below the expected standard. A national guideline is expected to standardize training, and practice will ensure consistency of quality of care across facilities. Compared with similar assessments of surgical knowledge in low-resource settings, the general surgeons in this study performed considerably better. A comparable multiple-choice oncology knowledge test administered to surgical residents at Maputo Central Hospital in Mozambique reported a mean correct-response rate of only 37.3%, with the lowest

scores in surgical oncology specifically (24). This study had a comparable sample size and study design. However, the survey in the study targeted the wider scope of surgical oncology and targeted residents who had less experience compared to this cohort.

Lack of diagnostics contributes to increased referrals and delays in care. Half of the respondents stated that they lack access to CT, pathology, and mammography. This finding is consistent with other literature in SSA, where hospitals have reported a lack of access to imaging and pathology services, which are essential for screening, diagnosing, and staging patients (13, 14), and reflects difficulty in translating learning to practice in variable resource contexts. Lack of infrastructure and diagnostic capability is among the reasons for referrals. According to our data, 38% of surgeons referred more than half of their patients to tertiary care centers. This often leads to a delay in diagnosis and care, where patients face significant barriers in the referral process to access these services (25). In Rwanda, studies done at the Butaro Cancer Center of Excellence reveal that patients face significant barriers in perioperative care, particularly at the point of referral pathway (26, 27). To ensure patients are not facing unnecessary delays and expenses, efforts should be made to equip hospitals with the necessary equipment and capacity to diagnose breast cancer patients and strengthen the referral pathways to ensure timely surgical and oncology care.

Participants mentioned the importance of cross-institution collaboration and expressed the need for a multi-disciplinary tumor board (MTB). Similarly, another study assessing general surgeons' utilization of radiation therapy for breast cancer patients associates appropriate referrals for radiation treatment with knowledge, volume of cases, and participation in tumor boards (28). MTBs in oncology have been shown to promote teamwork and improve diagnosis, treatment, and patient outcomes (29). They are important platforms for managing complex oncology cases and reducing delays in care, particularly in developing countries where experts may not be available in rural settings (30). MTBs have been an effective tool in breast cancer care diagnosis and management. Establishing and expanding MTBs for breast cancer care in Rwanda will facilitate knowledge exchange, strengthen the referral process, and address context-specific challenges of both providers and patients by working and advocating in unison to provide timely and patient-centered care.

Limitations

The limitations for our study include self-reporting bias, as general surgeons completed the survey on their own rather than an objective assessment, and response bias, as surgeons who did not take the survey might have different academic backgrounds and experiences, potentially limiting generalizability of findings. In addition, the small sample size (n = 27) limited the statistical power to detect associations in the correlation and subgroup analyses, which should therefore be interpreted as exploratory. Furthermore, the distribution of the online survey possibly is a barrier for the participation of rural surgeons who face internet connectivity issues. To overcome this, we have made deliberate efforts to seek and support rural surgeons to complete the survey and ensure their inclusion in the study.

Recommendations

The findings point to the need for the development of expanded coordinated training of general surgeons in the comprehensive, multidisciplinary approach to breast cancer management within the Rwandan context. Future studies should focus on exploring non-technical skills of surgeons in breast cancer care for an all-encompassing understanding of their knowledge and practice to provide holistic care for patients.

Conclusion

Our study identifies areas of breast surgical oncology knowledge gaps of general surgeons, limitations in their practice, and their suggestions to improve breast cancer service provision. These insights highlight the critical need for the development of a targeted, hands-on, and comprehensive breast cancer curriculum during general surgery residency in Rwanda that continues into their independent practice, including the importance of a comprehensive, multi-disciplinary approach to breast cancer management.

Abbreviations

ALND
Axillary lymph node dissection
CHERRIES
Checklist for Reporting Results of Internet E–Surveys
CI
Confidence interval
COSECSA
College of Surgeons of East, Central and Southern Africa
CPD
Continuous Professional Development
CT
Computed tomography
DCIS
Ductal carcinoma in situ
ER
Estrogen receptor
GBCI
Global Breast Cancer Initiative
GLOBOCAN
Global Cancer Observatory estimates (IARC)
HER2
Human epidermal growth factor receptor 2
IARC

International Agency for Research on Cancer
IRB
Institutional Review Board
JASP
JASP statistical software
LMICs
Low–and middle–income countries
MRI
Magnetic resonance imaging
MRM
Modified radical mastectomy
MTB
Multidisciplinary tumor board
NCCP
National Cancer Control Plan
OPD
Outpatient department
OR
Operating room
RBC
Rwanda Biomedical Centre
REDCap
Research Electronic Data Capture
RMOH
Rwanda Ministry of Health
RNEC
Rwanda National Ethics Committee
RT
Radiotherapy
SLNB
Sentinel lymph node biopsy
SSA
Sub–Saharan Africa
STROBE
Strengthening the Reporting of Observational Studies in Epidemiology
TNBC
Triple–negative breast cancer
Tx
Treatment
UGHE

University of Global Health Equity
UNITAR
United Nations Institute for Training and Research
WHO
World Health Organization

Declarations

Ethics approval and consent to participate

This study received formal ethical approval from the Rwanda National Ethics Committee (RNEC) (IRB number: RNEC/447/2024) and administrative clearance from the institutional review board of Butaro District Hospital (Approval number: 52 BH/EK/DG 2024).

Consent for publication

Identifying images and/or other personal data is not included in the study. All authors have consented to the publication of this manuscript.

Availability of data and materials

All data that was used for this manuscript is available upon reasonable request.

Competing interests

The Authors declare no competing interest

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Authors' contributions

JPM*, NG* BF*: development and design of methodology, Investigation/data collection, quantitative analysis, formal analysis validation, data curation and cleaning, writing of the original draft, writing review and editing, project administration. As co-first authors they made equal contributions to the work. AYZ and PJH: development and design of methodology, investigation/data collection, formal analysis validation, writing review and editing; AGB and MT: contributed on methodology design, manuscript review and editing; AN and AF: responsible for project coordination, methodology, manuscript review and editing. YC and N B-A: conceptualization, methodology design, project coordination, review and editing. MG and NU: survey administration, standard setting, review and edit. WW, conceptualization, supervision, development and design of methodology. RR and AB: conceptualization, supervision,

development and design of methodology, review and editing, and project coordination; GI: conceptualization development and design of methodology, writing review and editing, and supervision, BA: conceptualization, development and design of methodology, investigation/data collection, data analysis, validation, data curation, writing of the original draft, writing review and editing, project administration and provided overall supervision.

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Figures

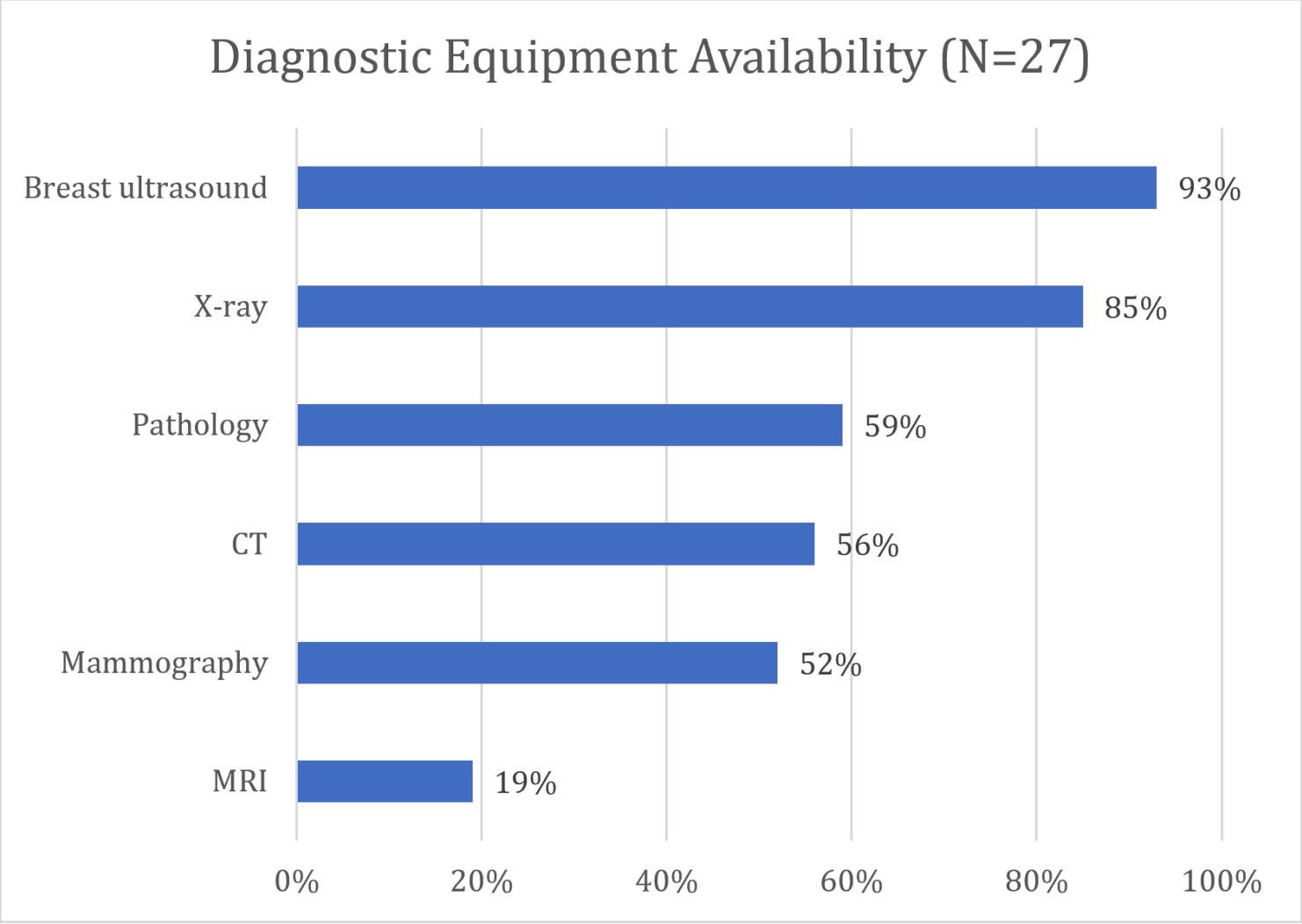


Figure 1

Availability of diagnostic equipment (N = 27).

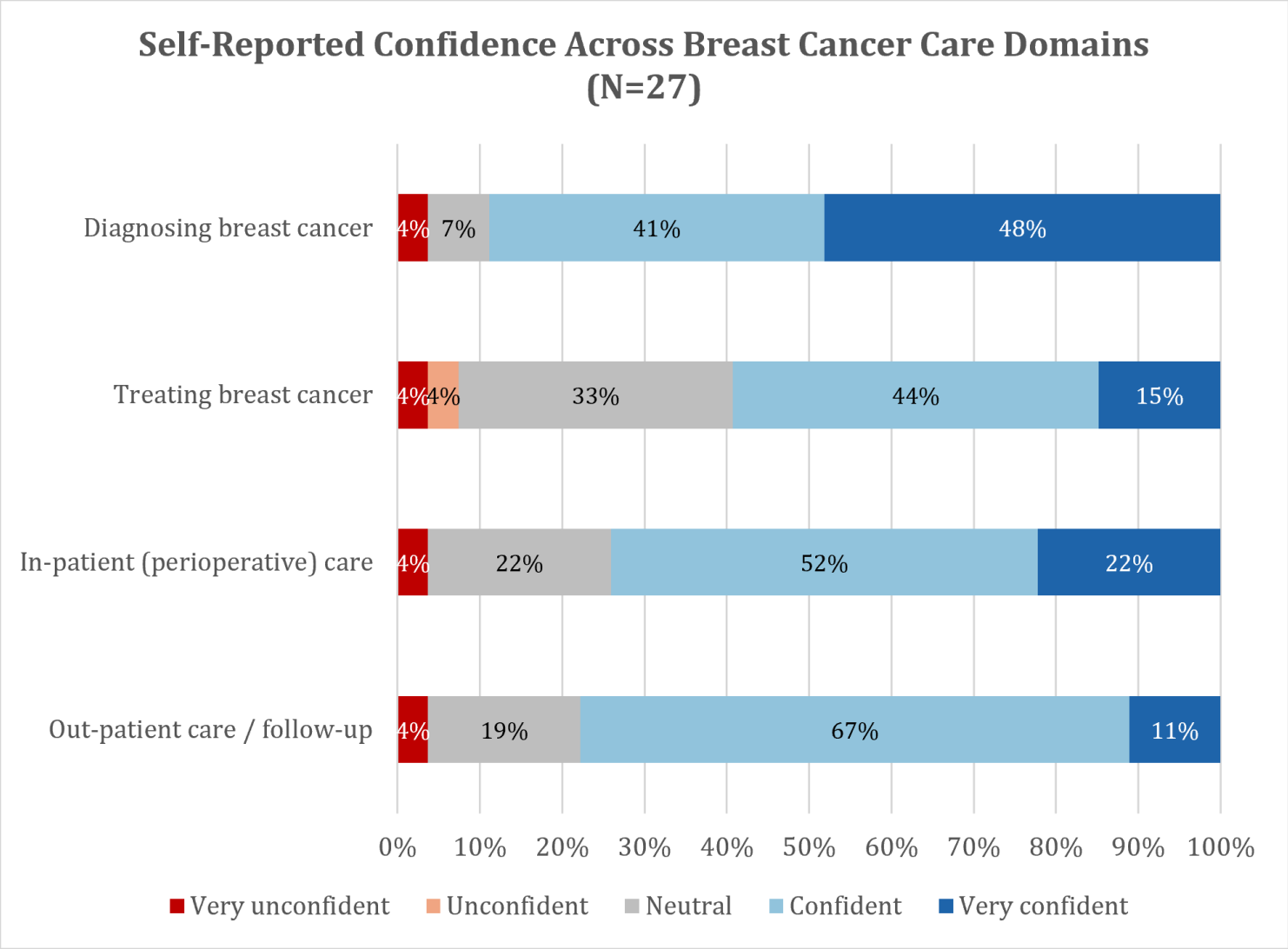


Figure 2

Self-Reported Confidence by Care Domain (N = 27).

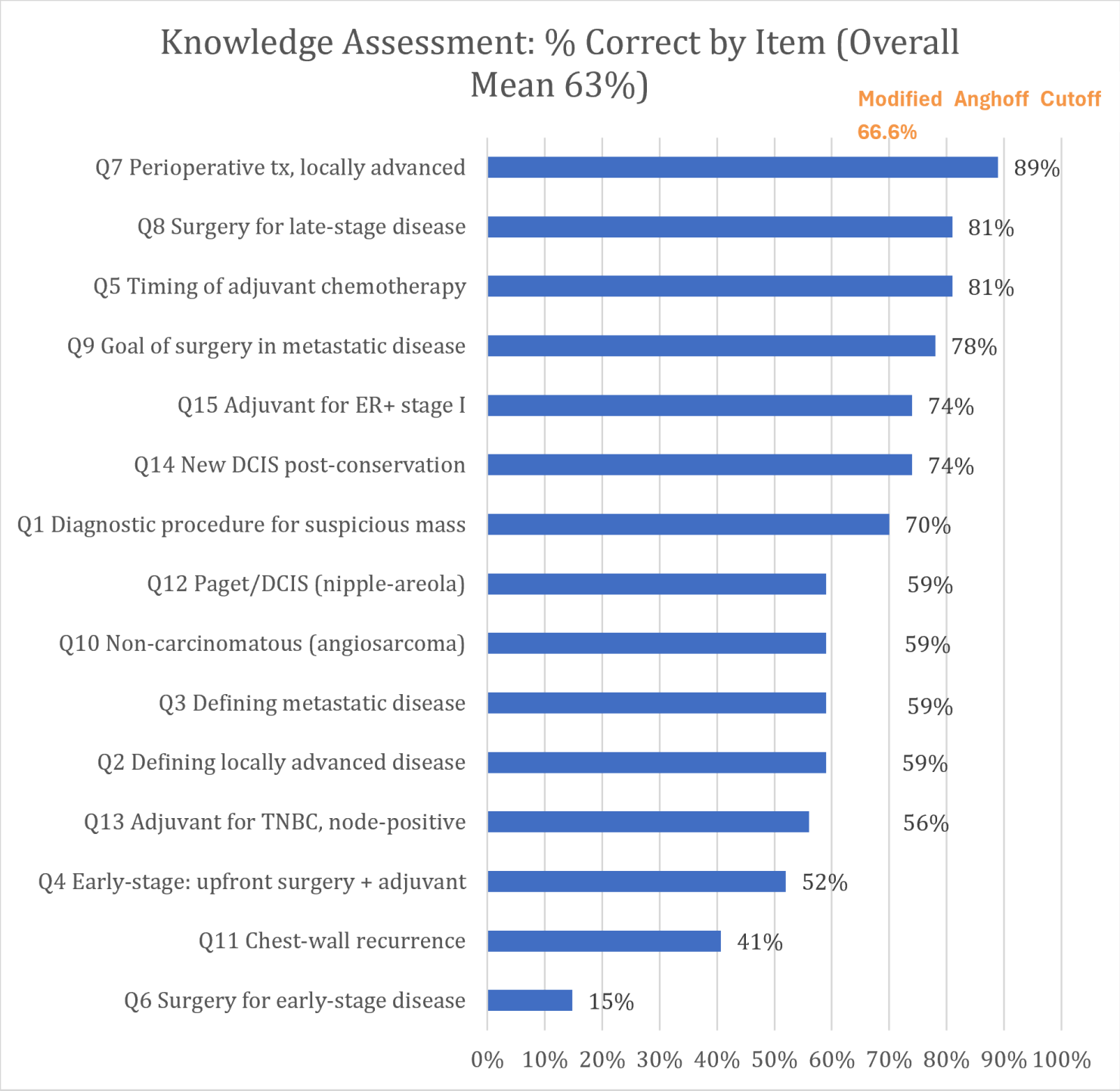


Figure 3

Knowledge assessment Score

*DCIS- Ductal Carcinoma In-Situ; ER- Estrogen receptor; Tx- treatment; TNBC- Triple Negative Breast Cancer;

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- AppendixAKnowledgeassessmentpercentageofcorrectresponsesbyquestionn27Q.xlsx
- AppendixCSTROBEChecklist.xlsx
- AppendixDCHERRIESChecklist.xlsx