MAMMOGRAM REJECT RATE ANALYSIS AND CAUSE IN REGIONAL HOSPITAL IN SAUDI ARABIA

The title needs to be edited

No abstract

INTRODUCTION:

Breast cancer is the most commonly diagnosed cancer, accounting for 23% of all cancer cases, and the primary cause (14%) of cancer deaths in women worldwide [2]. Mammography is used as a first-line examination in the detection of breast cancer, as it has the potential to recognize this disease at an early stage, resulting in improved survival rates.

Imaging is essential to be of optimal quality to obtain the required diagnostic information, without adverse effects on the health of women, maintaining the "as low as reasonably achievable" (ALARA) principle and keeping patients safe from unnecessary ionizing radiation.

Too long!

Therefore, rigorous quality assurance (QA) and quality control (QC), in the form of mammography audits in dedicated breast centers are essential in achieving high quality images, whilst controlling associated risks [3].

One of the recommended QC tests is reject analysis (RA), as this is an inexpensive method of attaining information related to image quality (IQ), exposing deficits in practice and consequently resulting in reduction in rejected images, doses, discomfort to patients and unnecessary financial costs [4,5].

No studies investigating mammography reject and repeat imaging in Saudi Arabia had been previously undertaken. Therefore, this study aimed to investigate whether mammography is being performed at a satisfactory level, through the assessment and analysis of reject rates [3].

Our objectives included critical appraisal of the rate of rejection, the causes of recurrence, and the most commonly repeated views.

1. A brief explanation of reject analysis is needed
2. Can reject analysis and reject rate analysis be used interchangeably?
3. Explain the highlighted paragraph

METHODS:

Retrospective data collection was obtained from the Hologic Selenia Dimensions Mammography System. The mammography RA log was reviewed from 1. September 2021, through 31. August 2024, on the permanently installed units in the hospital-based breast imaging center, resulting in a total sample of 20792 images performed. The inclusion criteria consisted of all mammographic studies completed during the chosen period.

Only the relevant data to this study was extracted from the RA report logs: including medical record number, the date of the mammography exam, the rate and reason for technical repeat and the views rejected. The reason of image rejection was selected by the performing technician from the following categories: positioning/excluded tissue, patient motion, artifacts, detector (under/overexposure), incorrect patient ID, x-ray equipment failure and wire localization.

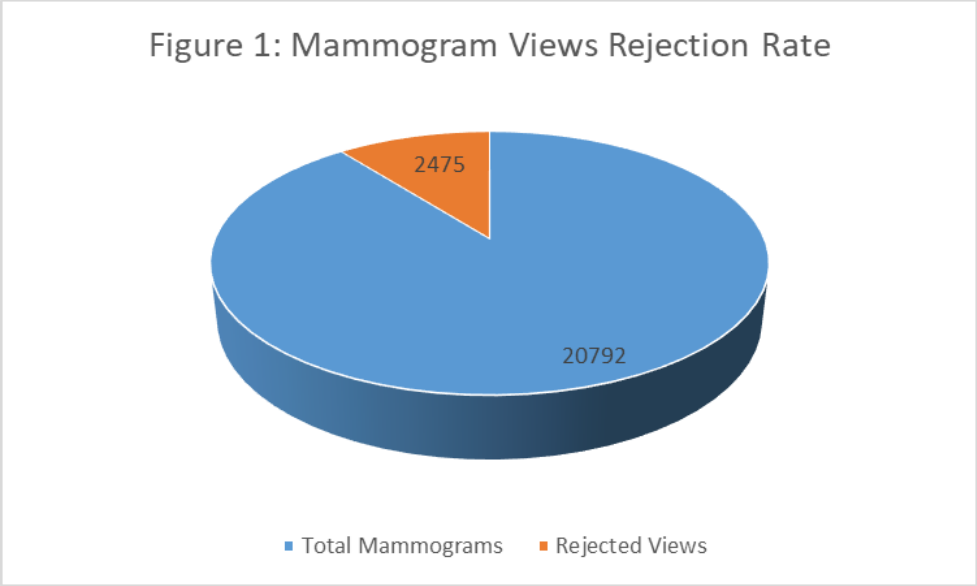
Well-explained

RESULTS:

Sample size

A total of 20792 mammograms performed in the 3-year period (Sept 2021 to August 2024) were included in this study. There were 2475 repeat-rejections, translating into an average repeat-rejection rate of 11.9 %, which was found to be higher than the 3% acceptable range [1,6].

This sample size was deemed to be sufficient as for the repeat rates to be meaningful, a volume of at least 250 clinical examinations is needed. [3,7]. Analysis of rejects and the individual reasons revealed rates ranging from 0.1% to 76.1%, details of which are summarized in (Figure 1).

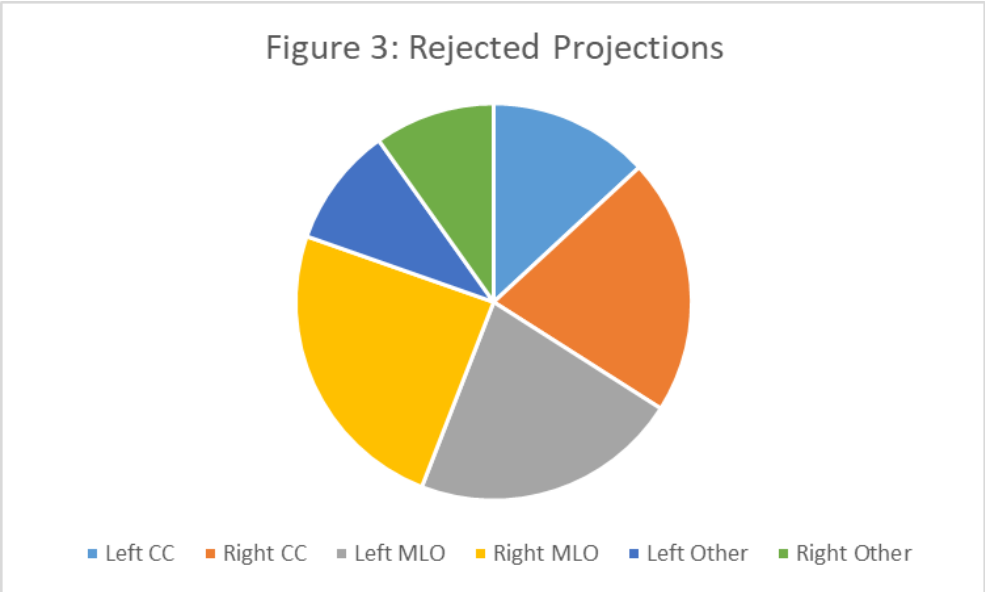


Repeated images by reasons and factors

Technical deficiencies were assigned a technical recall category. Eight main reasons for rejection emerged, namely: positioning/excluded tissue, patient motion, detector underexposure (excessively noisy images), improper detector exposure (saturation), artifacts, incorrect patient ID, x-ray equipment failure, and wire localization. Positioning was the most common technical recall category (1884/2475, 76.1%). X-ray equipment failure was the second most common reason (249/2475, 10.1%) (Figure 2).

Repeated images by anatomical area

The examinations most frequently repeated were related to anatomical projections, with mostly the RMLO view, accounting for 605/2475, 24.4 % and the LMLO view for 542/2475, 21.9 % of cases. (Figure 3).



Explain abbreviations here or mention that it is explained in the discussion

DISCUSSION:

The standard mammogram includes craniocaudal (CC) and mediolateral oblique (MLO) views of each breast. Occasionally, there are images obtained that are with inadequate diagnostic value regarding IQ, for technical reasons, such as patient motion, inadequate tissue coverage, artifacts, or equipment issues, etc. If the technologist recognizes these deficiencies in real time, the image can be rejected and another image taken.

Rejects, deletions, and repeated images in radiological imaging raise concerns for both unnecessary radiation exposure to patients and inefficiency in the imaging operation, highlighting potential shortcomings in QC [8]. Therefore, it is vital to actively reduce the need for image retakes, as it helps minimize X-ray exposure, lessens patient inconvenience, and optimizes the allocation of medical resources for QA purposes in healthcare settings.

A study conducted in Saudi Arabia [9] aimed to analyze the digital radiography rejection rates and found a rate of 8.96%, however, no previous studies on mammography RA specific to Saudi Arabia have been identified.

The RA in our study was around 11.9 %. A similar study [7] showed an optimistically very low reject rate on digital mammography of 2.62%; within the 3% acceptable range [1,6]., with patient positioning as the main cause[3,8]. Positioning was also reported as the main rejection cause in our study, indicating the need for further radiographer training. The second most common reason for high rejection was recorded due to ‘X Ray Equipment Failure’ indicating the need either for active routine servicing or for more equipment-related training.

The analysis of rejected images should be included as part of all QC and assurance programs in

hospitals[4]. Risk analysis helps identify other underlying problems, such as lack in staff training, and in increasing the department's workflow by decreasing retakes to reduce waiting time [2].Technologists can receive individual feedback with a performance improvement plan.

CONCLUSION:

Mammography audits are a standard part of accreditation and QA programs in breast centers [4,5] to produce consistent high-quality mammograms at a minimum exposure to the patient. One component of mammography audits is evaluation of reject-repeat logs to identify the rate and the most common reasons for technical repeats [10]. Images are being rejected at a higher than acceptable rate; at the cost of extra radiation, added discomfort and financial burden.

Factors contributing to improper rates and poor IQ should be controlled to target a reject rate of at most 3%. In the absence of local guidelines, adherence to European Guidelines is strongly recommended [1]. We highly recommend establishing a RA specifically in Saudi Arabia, covering all breast imaging units in government and private hospitals and clinics, to improve performance and improve patient dose optimization. Mandatory and concentrated radiographer's training for quality improvement is needed. More detailed results could have been obtained if each radiographer, together with her training experience and reject rate had been studied individually. Further research studying the effects of this study on recall rates would also be suggested.

Plagiarism is unacceptably high

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REFERENCES:

[1] Perry N, Broeders M, De Wolf C, Törnberg S, Holland R, Von Karsa L. European guidelines for quality assurance in breast cancer screening and diagnosis. 4th ed. 2006. Belgium: European Communities.

[2] Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global cancer statistics. CA Cancer J Clin 2011; 61:69-90.

[3] Mercieca N, Portelli JL, Jadva-Patel H. Mammographic image reject rate analysis and cause-A National Maltese Study. Radiography 2017 Feb;23(1):25-31.

[4] Khalid A. Alyousef, Shatha Alkahtani, Raghad Alessa, Hajar Alruweili. Radiograph Reject Analysis in a Large Tertiary Care Hospital in Riyadh, Saudi Arabia. Global Journal on Quality and Safety in Healthcare. May 2019; 2(2):30.

[5] Erturk SM, Ondategui-Parra S, Ros PR. Quality management in radiology: Historical aspects and basic definitions. J Am Coll Radiol 2005 Dec; 2(12):985-91.

[6] Reis C, Pascoal A, Sakellaris T, Koutalonis M. Quality assurance and quality control in mammography: a review of available guidance worldwide. Insights Imaging. 2013 Oct; 4(5): 539–553.

[7] Li Y, Poulos A, McLean D, Rickard M. A review of methods of clinical image quality evaluation in mammography. Eur J Radiol 2010; 74(3): 122-31.

[8] Hofmann B, Rosanowsky TB, Jensen C, Wah KH. Image rejects in general direct digital radiography. Acta Radiol Open. 2015 Oct 8; 4(10).

[9] Alashban Y, Shubayr N, Alghamdi AA, Alghamdi SA, Boughattas S. An assessment of image reject rates for digital radiography in Saudi Arabia: A cross-sectional study. Journal of Radiation Research and Applied Sciences. 2022;15(1):219–223.

[10] Martaindale S, Moseley T, Santiago L, Huang M, Sullivan C, Bassett RL, Whitman G. Analysis of Technical Repeat Studies in Screening Mammography. Journal of Breast Imaging, 2023, Vol. 5, Issue 4, P.416-424.

Comments

Interesting article; minor changes needed. Please check red remarks and highlighted points