MedCrave
Step into the World of Research
International Journal of Radiology & Radiation Therapy

Mini Review

Open Access

Breast screen reader assessment strategy: transforming breast cancer diagnosis globally: a mini review

Keywords: mammography, breast cancer, misdiagnosis

Volume 4 Issue 1 - 2017

Tapia K, Lee W, Brennan PC
Faculty of Health Sciences, University of Sydney, Australia

Correspondence: Brennan PC, Faculty of Health Sciences, University of Sydney, Lidcombe, NSW 2141, Australia, Email patrick.brennan@sydney.edu.au

Received: May 23, 2017 | **Published:** August 24, 2017

Mini review

Mammography remains the front-line tool for early detection of breast cancer reducing mortality by up to 40%.[1] However 30% of cancers are missed across all women with this figure rising to over 50% for younger women and individuals with high density breasts.[2,3] With 800,000 mammography studies performed in Australia annually, and one million new breast cancer cases being reported each year globally, the impact of radiologic misdiagnosis on public health is a hugely important issue. Currently in Australia, quality assurance programs offered to mammography screening readers are heavily reliant on clinical audit which provides feedback on cancers detected and cancers missed by individual reader.[4] This feedback suffers from the low prevalence of cancer in the screening population. Furthermore it may take two years of data from clinical audit to obtain meaningful feedback on reader performance.[5]

In 2011, a research team at the University of Sydney showed that 44% of lesions for women of all ages were missed by 116 Australian and New Zealand breast imaging readers,[6] and the median level of sensitivity was below 70%.[3] It was data such as these that led to the development of the Breast Screen Reader Assessment Strategy (BREAST), a strategy unique to Australia and the world. Through BREAST, we have shown that performance figures are even less favourable in countries outside Australia thereby precipitating the enthusiastic adoption of BREAST in other countries such as New Zealand, Singapore, Vietnam, Mongolia, Jordan, and Iran. To date, BREAST has engaged 80% of Australian breast screen clinicians and over 800 radiologists across the globe.

BREAST has two objectives:

a) To transform the mammographic detection of breast cancer by providing an online, self-assessment tool with immediate feedback for screen-reading mammography radiologists and

b) To identify reasons for errors and create innovative evidence-based solutions that will enable expert evaluation of novel breast imaging technologies and reduce error rates.

BREAST maintains readers' abilities at the highest level. Readers participating in BREAST have online access to de-identified case sets in which they are asked to classify each case as normal or abnormal and assign a lesion site and lesion type for the latter cases. At the end of each set, they receive instant feedback on their performance including receiver operating characteristics (ROC & JAFROC), sensitivity, location sensitivity, specificity, true positive, true negative, false positive and false negative scores. Readers are also presented with image files for each case with the correct answers outlined enabling specific correct and incorrect decisions to be examined in detail. BREAST test sets contain an enhanced numbers of positive cases, exposing readers to a greater case load from which to learn and obtain instantaneous feedback on performance. Good correlation between BREAST mammography test set performance and clinical audit has been demonstrated indicating that the BREAST test is an appropriate tool to assess clinical performance,[7,8] and that clinicians who regularly participate in BREAST improve their performance by up to 34%.[9]

The strategy has enabled breast screen radiologists to diagnose mammographic images online in a geographically limitless way with each image interaction being instantly recorded, analysed and viewable by the individual readers, groups of scientists and regulatory bodies. Through our platform we can bring together world-leading experts to evaluate new technologies in numbers never previously achieved. The alternative is local assessment often involving non-experts in a non-optimised laboratory setting resulting in equivocal findings. In six years of operation BREAST has collected one million data points that have led to the following research outputs:

i. 80 Publications and presentations in the highest ranked journals,

ii. 35 Research projects involving world-leading institutions in Australia, Asia, North America, and Europe,

iii. 11 Major research prizes and awards,

iv. 20 PhD student projects and

v. 10 International research partnerships across 4 continents with universities such as Harvard Medical School, Fudan University, National Cancer Centre in Vietnam, National University of Singapore, Jordan University of sciences and technology, and Tehran University of Medical Sciences.

Furthermore, as part of meeting its aim of developing a research hub, BREAST has implemented an outreach program involving high schools in New South Wales. Students in the final three years of high school have been involved in analyzing various BREAST outputs under the mentorship of BREAST researchers and local teachers. Through this type of initiative, a cohort of young, motivated and able researchers should emerge, underpinning future needs around breast cancer research and other scientific endeavours.

Over the next few years and in addition to the core activity described above, BREAST aims to introduce innovations reflecting recent technological advancements, social responsibilities and educational needs. Moving forward BREAST intends to:

i. Incorporate the latest revolutionary imaging innovations such as phase contrast imaging and digital breast tomosynthesis (DBT);

ii. Evaluate transformative diagnostic tools such as altocumulus and perception-based computed aided diagnosis;

iii. Develop image sets relevant to culturally diverse groups of women;

iv. Transform educational regimen;

v. Become an integrated, multi-speciality platform that will involve pathology, histology, oncology and radiology

The continuation of BREAST's achievements and introduction of creative innovations to reflect changing technologies and practices will ensure that BREAST remains the world's foremost breast cancer detection research tool.

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

References

1. Lauby-Secretan, Chiara Scoccianti, Dana Loomis, et al. Breast-Cancer Screening-Viewpoint of the IARC Working Group. *New England Journal of Medicine.* 2015;372:2353–2358.
2. Ganry O, J Peng, A Dubreuil. Influence of abnormal screens on delays and prognostic indicators of screen-detected breast carcinoma. *Journal of Medical Screening*. 2004;11(1):28–31.
3. Rawashdeh M, Roger M Bourne, Elaine A Ryan, et al. Quantitative Measures Confirm the Inverse Relationship between Lesion Spiculation and Detection of Breast Masses. *Academic Radiology.* 2013;20(5):576–580.
4. *Breastscreen Australia National Accreditation Standards*. Breast Screen Australia, Australia; 2016.
5. Soh BP, Lee W, Kench PL, et al. Assessing reader performance in radiology, an imperfect science: lessons from breast screening. *Clin Radiol.* 2012;67(7):623–628.
6. Warren M Reed, Warwick B Lee, Jennifer N Cawson, et al. Malignancy Detection in Digital Mammograms. *Academic Radiology*. 2010;17(11):1409–1413.
7. Soh BP, Lee W, McEntee MF, et al. Test set data can reasonably describe actual clinical reporting in screening mammography. *Radiology.* 2013;268(1):46–53.
8. Soh BP, Lee WB, Mello-Thoms C, et al. Certain performance values arising from mammographic test set readings correlate well with clinical audit. *J Med Imaging Radiat Oncol.* 2015;59(4):403–410.
9. Suleiman WI, Rawashdeh MA, Lewis SJ, et al. Impact of Breast Reader Assessment Strategy on mammographic radiologists' test reading performance. *J Med Imaging Radiat Oncol*. 2016;60(3):352–358.