INTRODUCTION

Developed by The University of Sydney and Cancer Institute NSW in Australia, BREAST is designed to improve the diagnostic efficacy of radiologists and breast imaging specialists all over the world. Since 2011 BREAST has made it possible for individuals to assess their performance on clinically relevant mammography test sets in their own reading environment, and receive immediate feedback with scores in lesion sensitivity, specificity and receiver operating characteristic (ROC). Personalised image files are also instantly provided showing correct decisions and any errors made. De-identified data on performances are stored centrally and further studied for quality assurance and research purposes. These features make BREAST a powerful, personalised radiology training and research tool that is being used in Australia, New Zealand, Asia, Middle East, and Europe.

MISSION
To enhance health outcomes globally by transforming the radiologic detection of breast cancer through intelligent, innovative, interactive, and personalized education.

VISION
Accurate and early breast cancer diagnosis is critical for patients. We know that radiologists and breast imaging specialists strive for excellence, and BREAST will support them to optimise their diagnostic skills.

GOALS
- Provide an online platform that enables self-assessment with immediate personalised feedback wherever a reader is located
- Define standards for performance and support QA programs
- Identify reasons for errors and create innovative, evidence-based solutions to reduce error rates
- Enable expert evaluation of novel breast imaging technologies in geographically limitless way
Mammography is the primary diagnostic tool for detecting breast cancer with over 800,000 women screened in Australia each year. Though mammography has served us well for over three decades, a significant number of cancers are still being missed. In a recent study where we tested the performance of expert readers, a median value of 39% of lesions was missed by 129 Australian and New Zealand breast imaging experts. Median value for specificity was 73% [1]. These studies reflect the clinical situation where sensitivity of screening mammography is in the order of 70% and the positive predictive value of recall to assessment may be as low as 10%. These lead to numbers of women being unnecessarily recalled and undergoing invasive examinations [2]. In the 40-49 year-old group, almost 50% of cancers are missed, meaning that almost half of cancers present as interval cancers.

Currently, quality assurance programs offered to screen readers are heavily reliant on clinical audit which provides feedback on cancers detected and cancers missed by individual readers. This feedback suffers from the low prevalence of cancer in the screening population and may take up to 2 years before meaningful feedback on reader performance can be reported. This is where BREAST can be very useful.

BREAST maintains readers’ abilities at the highest level. Readers access real case sets and receive instant feedback together with personalised image files showing their decision on each case alongside clinically validated "truth" data. Good correlation between BREAST test set performance and clinical audit has been shown, indicating that BREAST is a viable tool for assessing clinical performance [3, 4], and that clinicians who regularly participate in BREAST improve their performance by up to 34% [5].
2018 PARTICIPATION RATE
Up to 80% of BreastScreen Australia and New Zealand radiologists have completed at least one test set.

80%

USERS WORLDWIDE
Radiologists and breast imaging specialists who have completed at least one test set between 2011-18.

925

"BREAST is an excellent tool for radiologists' continuing professional development, individual feedback and comparison with peers."
- Program Manager
HOW DOES IT WORK?

BREAST is an educational, web-based program with immediate feedback that allow radiologists and medical trainees ("readers") to diagnose sets of images wherever in the world they are located. Being online allows our readers to access BREAST easily and enables us to instantly record and report their interactions with each case in a way that facilitates effective learning.

Our clinically relevant cases mean that readers look at actual but de-identified medical images in exactly the same way as they would in clinic with all the relevant drop down menus and post-processing tools.

A reader is given a unique login to the BREAST website and independently judges each image and marks on a site where they perceive a lesion, giving the lesion a score: 2 = benign finding, 3 = indeterminate/equivocal finding, 4 = suspicious finding of malignancy, and 5 = malignant finding. If the reader decides that the case has no significant abnormality, he/she clicks on the NEXT icon and the next case is displayed. Readers can go back to any image or case and correct a previous decision prior to submitting their answers.
Since each case in our test sets have been rigorously validated as being cancerous or cancer-free, instant feedback can be given to each reader on their performance and any diagnostic errors. When a reader submits the answers at the end of the test, our system instantly and intelligently analyses the data and immediately presents a range of performance values including sensitivity, specificity, location sensitivity, and receiver operating characteristic (ROC). In addition, reader-specific image files are instantly generated so that correct and incorrect decisions can be examined in detail on each image.
Test sets
Our digital mammography test sets consist of 60 screening cases with 4 images per case (CC and MLO views) and prior images are provided in most. The cases are clinically relevant with malignancies validated by pathology findings and normal cases were confirmed by 2 radiologists and remained normal 2 years later. The DICOM files are for viewing and can be installed at clinics via a download link from a cloud server. The online software displays jpeg files of the same cases for recording the answers.

Outputs
All data are collected with readers' consent and de-identified. Data generated by BREAST can facilitate programs of research around variations in performance, potential levels of good performance, and so on. To date, the BREAST platform has enabled research that improves our understanding of types of missed cancers and characteristics of false positive cases, the impact of novel imaging technologies, and radiologists' characteristics and practices that promote accurate diagnoses. There have been over 80 published works arising from BREAST and over 45 PhD students.

CPD points
BREAST is recognised by the Royal Australian and New Zealand College of Radiologists as a continuing education activity attracting CPD points within the College's Continuing Professional Development program.

Support
To help you set up the test sets at your workstation we will work in partnership with a custodian at your clinic to implement, promote and maintain the program. We are available to provide troubleshooting and technical support Monday to Friday from 8am to 6pm.
Readers said that test sets were important for their professional development.

"Fun and a good chance to get rapid feedback. An enjoyable way to learn"
- NSW Radiologist

94%

SATISFACTION RATE

An improvement in sensitivity scores were shown in 2016 [5] for radiologists who participated in BREAST over a 3 year period.

34%

IMPROVED SENSITIVITY

"I get to see more cancers in one session than may be seen in months of reading and clinical practice."
- NZ Radiologist
REFERENCES


