Session J2

J2.1 Keeping abreast of the 2 week wait breast referrals - mammographer led triaging service at a DGH

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Background: The "two week wait" symptomatic breast pathway was launched in 2010 to provide guidance for general practitioners to formulate referrals that can be enacted in a timely manner. Overtime, increased numbers of primary care referrals have continued to rise instigating a mismatch between capacity and demand.
Method: We analysed our mammographer led triaging service of the 2WW referrals that are streamlined into 2-stop pathways. These include triaging "direct to breast clinic" or "direct to imaging with follow up in breast clinic".
Results: Over 8 weeks, a total of 761 patients were referred via the 2WW pathway. Of these, 431 patients were referred with lumps (57%) and were sent direct to imaging +/- biopsy with follow up in breast clinic for review and results. Those with benign imaging were taken off the 2WW pathway and seen in clinic at the next availability. 147 patients presented with mastalgia (19%), 64 patients with axillary symptoms, 48 with nipple symptoms, 27 with skin concerns and 27 were male patients who were all triaged direct to breast clinic with some avoiding the need for imaging. The remaining 17 patients presented with other concerns related to implants, incidental findings on imaging and HRT advice.
Conclusion: Our results highlight the effective services provided by a mammographer led pathway to accelerate those with true red flag symptoms. It also highlights the need for segregating certain patient cohorts such as those with mastalgia, being redirected out of the cancer diagnostic pathway via specialist nurse practioners to ease capacity.

J2.2 A world-first interactive self-assessment educational tool to improve breast cancer diagnosis with MRI technologies

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Introduction: Breast cancer remains a global health concern. Magnetic resonance imaging (MRI) has emerged as a valuable adjunct to traditional breast cancer screening and diagnostic modalities, offering enhanced sensitivity and specificity. However, the full potential of breast MRI has yet to be fully realized, as its interpretation needs optimised reader expertise. To address this need, Australian and UK clinicians and scientists have collaborated with industry to develop an innovative interactive and clinically realistic on-line education platform to improve breast MRI diagnosis.
Methods: A cloud-based platform was developed to display high-resolution images and administer diagnostic responses to readers with immediate feedback on performance. The interface is designed to completely reflect individual behaviour when interpreting breast MRI. High-quality, MRI breast cancer cases with ground truths have been fed to the platform and AI algorithms are tailoring education to the individual clinician.
Results: A world-first breast MRI educational platform has been developed. Radiologists read each case, mark findings and answer specific questions that typify a clinical decision-making process. Then, sensitivity, specificity, lesion sensitivity, ROC and JAFROC scores are presented to the radiologist and specific image-based feedback is provided where ground truth is compared to truth. CME/CPD certification is automatically provided and algorithms are being implemented to provided tailored recommendations to accelerate learning.
Conclusion: Intelligent platforms designed for improving radiologists' performance in detecting breast cancer in mammography, ultrasound and digital breast tomosynthesis are available. We now have the equivalent for MRI diagnosis and our novel platform is currently undergoing clinical validation.

J2.3 Perception and understanding of the risks of cardiovascular late effects following radiotherapy for early left-sided breast cancer

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Adjuvant radiotherapy for early left-sided breast cancer (BC) plays a major role in its treatment. There is an increase of lifelong risk of cardiovascular disease (CVD) from adjuvant radiotherapy, and survivors must live with this burden1.
A qualitative study was undertaken to explore UK patients with BC perceptions and understanding of the risks of CVD late effects following adjuvant left-sided radiotherapy. Higher Education Institution ethical approval was granted for the use of guided online semi-structured interviews. Participants were recruited through Breast Cancer Now, expressions of

interest were stratified to ensure diversity across the sample. Interviews were, audio-recorded, transcribed in-verbatim and thematically analysed following the principles of Braun and Clarke 2.
Ten semi-structured interviews were completed with female participants aged between 42-56, across four UK regions and with academic qualifications ranging from GCSE through to postgraduate and doctoral level. Each had left-sided radiotherapy for BC between 2014 – 2021. Analysis established four themes: Knowledge and perception of risk, Heart-health follow-up, Heart-healthy behaviours and Needs and preferences. Crucially, participants were only indirectly aware of CVD risks because they had been informed of heart volume mitigation techniques by their radiotherapy healthcare professionals. The participants reported a lack of direct information and felt a sense of 'downplay' of the risks.
The provision of timely information can support the process of informed consent and support patients to be active in their own self-management and care, helping to mitigate long term CVD risk. Radiotherapy professionals must consider and review how this information is communicated.

References

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J2.4 Can Artificial Intelligence (AI) assist with improving breast cancer patient care? A three-way observer performance study between radiology and surgical trainees and AI

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Introduction: The perception, interpretation and location guidance of cancers with medical imaging allows for both diagnosis and surgical planning for women with breast cancer, the most common female cancer worldwide. This study explores the observer performance of radiology and surgical trainees and compares their performance against four trained artificial intelligence (AI) models.
Methods: A test set of 20 mammography cases (6 cancer, 14 cancer free) was created from BreastScreen Australia (BSA) and 18 surgical trainees and 32 radiology final year trainees reviewed the cases via the Breast Screen Reader Assessment Strategy (BREAST) platform. Transfer learning was undertaken with the AIs with different Australian cases, and then deployed on the BSA test set[1]. The performances of participants and AIs were calculated in term of sensitivity, specificity, location sensitivity, Receiver Operating Characteristics (ROC) Area Under Curve (AUC) and Jackknife Alternative Free Response Receiver Operating Characteristics (JAFROC).
Results: No significant differences were observed between surgical and radiology trainees in sensitivity or lesion sensitivity, with higher performance by radiology trainees in specificity ($P < 0.01$). AI models had higher average specificity, sensitivity, lesion sensitivity, ROC and JAFROC than those from surgical and radiology trainees ($P < 0.01$).
Discussion: Higher AI performance suggests supportive AI tools could enhance radiologists and surgeons' own perception and performance, with re-excision rates as high as 30% in Australia.[2] AI in the surgical theatre has potential to guide surgeons to excision areas, especially in detecting difficult cancer margins, non-palpable cancers and real-time imaging, with the potential to improve patient care.

References

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J2.5 Deep learning-based segmentation of breast arterial calcification to enhance cardiovascular risk assessment in women

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Background: Cardiovascular disease (CVD) is a leading cause of death globally, with a significant impact on women (Ibrahim et al., 2023). Breast Arterial Calcification (BAC), identifiable through mammography, is a promising marker for CVD risk(Bui and Daniels, 2019). Traditional manual methods for BAC assessment are inefficient, requiring substantial time and resources. Existing deep learning approaches for BAC segmentation have been limited by small datasets and the use of mammograms from a single brand of scanners or manufacturers, lacking clinical validation for CVD prediction (Ibrahim et al., 2023). This study introduces a deep learning model designed to segment BAC and assist in predicting the risk of CVD in women.
Method: A deep learning model was developed, harnessing a dataset of 2500 mammograms, where BAC was present in each image. A subsequent case-control study of over 7000 women evaluated the model's effectiveness in CVD risk

prediction, employing the Cox proportional hazards model to analyse the association between BAC presence/severity and CVD risk.

Results: The model achieved notable performance metrics: Jaccard similarity of 0.567, accuracy of 0.991, Precision of 0.755, F1-score of 0.739, and Recall of 0.727, confirming its capability in accurately identifying and grading BAC. Additionally, the Cox proportional hazards model analysis revealed a significant association between BAC severity and an increased risk of CVD in women.

Conclusion: This research provides a validated deep learning framework for automated BAC segmentation, offering a novel method for CVD risk assessment in women.

References

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