EJMO

DOI: 10.14744/ejmo.2023.93033
EJMO 2023;7(4):402–403

Letter to the Editor

Catalyzing Breast Cancer Diagnosis: Ai Advancements in Mammography

Sawera Haider

Department of Surgery, Dr. Ruth K. M. Pfau, Civil Hospital Karachi, Dow University of Health Sciences (DUHS), Sindh, Pakistan

Cite This Article: *Haider S. Catalyzing Breast Cancer Diagnosis: Ai Advancements in Mammography. EJMO 2023;7(4):402–403.*

Breast cancer is a pressing global health concern, impacting the lives of millions of women around the world. Early detection remains a pivotal factor in improving patient outcomes, emphasizing the significance of accurate and timely diagnosis. However, traditional mammography methods have inherent limitations, including missed cancer cases and false positives. To address these challenges, the medical community has turned to artificial intelligence (AI) algorithms to augment mammography interpretation. Thus, I intend to explore the remarkable potential of artificial intelligence (AI) in reshaping the field of breast cancer diagnostics - investigating recent studies, discussing the pros and cons, and envisaging the future of AI in mammography.

Limitations of Traditional Mammography: Clinical Realities

Mammography has historically served as the gold standard for breast cancer screening. Nevertheless, it is not without its pitfalls. False positive results can trigger needless additional imaging or invasive biopsies, causing patients undue anxiety and inflating healthcare costs. On the flip side, false negative results can unleash severe consequences for patient outcomes. Admittedly, in an effort to enhance the sensitivity and specificity of mammography, the practice of double reading by two human readers has been introduced.[1] While this approach shows promise, it is labor-intensive and poses challenges due to workforce shortages in the healthcare sector. This particular problem becomes even more acute during a health crisis like the covid pandemic, straining already thin resources available.

AI's Diagnostic Augmentation: A Medical Breakthrough

Artificial intelligence has emerged as a propitious solution. AI algorithms can scrutinize vast amounts of data and discern patterns that might elude the human eye. By employing machine learning and deep learning techniques, AI algorithms can aid in the interpretation of mammograms, thereby improving the detection of breast cancer while simultaneously reducing false positives.

Recent studies have sought to compare the diagnostic performance of AI algorithms with that of human readers in the interpretation of mammograms. One noteworthy study, published in Radiology, evaluated the performance of a commercially available AI algorithm using the Personal Performance in Mammography Screening (PERFORMS) assessment.[2] This particular study involved 552 human readers, including radiologists, radiographers, and breast clinicians. These professionals were asked to interpret mammograms from two PERFORMS test sets.

The results of this study demonstrated that both the AI algorithm and human readers achieved similar high levels of performance. Human readers exhibited a sensitivity of 90 percent and specificity of 76 percent, while the AI algo-

Address for correspondence: Sawera Haider, MD. Department of Surgery, Dr. Ruth K. M. Pfau, Civil Hospital Karachi, Dow University of Health Sciences (DUHS), Sindh, Pakistan
Phone: +92-336-3438378 **E-mail:** Sawerahaider99@gmail.com

Submitted Date: October 11, 2023 **Accepted Date:** November 13, 2023 **Available Online Date:** December 29, 2023

rithm demonstrated a sensitivity of 91 percent and specificity of 77 percent.[2] These findings strongly suggest that AI algorithms hold the potential to perform on par with, if not better than, human readers in the interpretation of mammograms.

Accurate Diagnosis: AI's Clinical Edge

The integration of AI algorithms into mammography interpretation brings forth several potential benefits. First and foremost, AI algorithms can analyze mammograms with remarkable agility and precision, potentially reducing the time required for diagnosis. This enhanced efficiency can lead to quicker initiation of treatment, ultimately improving patient outcomes. Furthermore, AI algorithms can learn from extensive datasets, enabling them to identify subtle patterns and abnormalities that may escape the notice of medical professionals.[3] This heightened sensitivity can significantly enhance the early detection of breast cancer, increasing the likelihood of successful treatment.

Moreover, AI algorithms have the potential to diminish false positives, thereby reducing the need for excessive imaging and biopsies. This not only alleviates patient anxiety but also mitigates healthcare costs. By offering an additional layer of support to human readers, AI algorithms can augment the diagnostic accuracy and confidence of healthcare professionals, leading to more informed and precise treatment decisions.

Navigating Challenges: Ensuring Innovative Success

While the potential of AI in mammography is promising, several challenges and considerations must be thoughtfully addressed. One significant concern is the necessity for the ongoing monitoring and validation of AI algorithms. AI performance can be influenced by factors such as algorithm drift and variations in the operating environment.[4] Regular updates and retraining of AI algorithms are imperative to ensure their safety and effectiveness in clinical practice.

Another challenging aspect is the potential for bias in AI algorithms. The datasets used to train AI algorithms must be diverse and representative of the population to avoid skewed outcomes.[5] Additionally, the ethical implications of AI in healthcare, encompassing issues of privacy, data security, and patient consent, require careful consideration and thorough resolution.

Future of Mammography Diagnosis: A Medical Prognosis

The future of AI in mammography holds immense substance. As technology continues to propagate, AI algorithms can be further honed and optimized. Integration with other imaging modalities, such as ultrasound and magnetic resonance imaging (MRI), can amplify the accuracy and comprehensiveness of breast cancer diagnosis. AI algorithms can also be incorporated into picture archiving and communication systems (PACS) to streamline workflow and facilitate seamless integration into clinical practice.[6]

Furthermore, AI algorithms can be harnessed for risk stratification and personalized screening recommendations. By analyzing patient-specific data, such as age, family history, and genetic markers, AI algorithms can provide tailored screening strategies, optimizing the balance between early detection and minimizing unnecessary interventions.

The integration of artificial intelligence (AI) algorithms in mammography interpretation holds immense potential for revolutionizing breast cancer diagnosis. AI offers benefits such as enhanced sensitivity, faster diagnosis, and reduced false positives. Recent studies have demonstrated that AI algorithms can perform on par with, or even surpass, human readers in mammography interpretation. However, challenges such as concept drift, prejudice, and ethical considerations must be addressed. The future of AI in mammography promises personalized screening recommendations, integration with other imaging modalities, and improved patient outcomes. As technology advances, the safe and effective deployment of AI algorithms will play a pivotal role in transforming breast cancer diagnosis.

Disclosures
Conflict of Interest: None declared.

References

1. Taylor-Phillips S, Stinton C. Double reading in breast cancer screening: Considerations for policy-making. Br J Radiol 2020;93:20190610.
2. Chen Y, Taib AG, Darker IT, James JJ. Performance of a breast cancer detection ai algorithm using the personal performance in mammographic screening scheme. Radiology 2023;308:e223299.
3. Chen Z, Lin L, Wu C, Li C, Xu R, Sun Y. Artificial intelligence for assisting cancer diagnosis and treatment in the era of precision medicine. Cancer Commun 2021;41:1100–15.
4. Razak A, Nirmala CR, Sreenivasa BR, Lahza H, Lahza HFM. A survey on detecting healthcare concept drift in AI/ML models from a finance perspective. Front Artif Intell 2023;5:955314.
5. Mittermaier M, Raza MM, Kvedar JC. Bias in AI-based models for medical applications: Challenges and mitigation strategies. Npj Digit Med 2023;6:1–3.
6. Erickson BJ, Kitamura F. Magician's corner: 8: How to connect an artificial intelligence tool to PACS. Radiol Artif Intell 2021;3:e200105.