Navigating Bias When Using AI in Oncology

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OPTIMISING patient care and survival with AI is a rapidly advancing field of medical research. During the 2024 American Society of Clinical Oncology (ASCO) Annual Meeting, a symposium titled "Using 'Artificial' Intelligence to Achieve 'Real' Improvements in Cancer Care" explored the use of innovative AI algorithms in oncology. Experts presented breakthroughs in diagnostic and predictive AI, whilst increasing awareness of inherent bias in AI models that can perpetuate into clinical outcomes.

HOW AI IS TRANSFORMING ONCOLOGY

James Zou, Standford University, California, USA, began the session by explaining some of the AI techniques used to change the care and outcomes of patients with cancer. Two of the main uses of AI in oncology are to, firstly, diagnose, and secondly, to predict specific outcomes or trajectories. Zou explained that a standard regression or classification AI model, often referred to as predictive AI, produces a single output, such as whether a patient does or does not have cancer. In contrast, generative AI models generate richer and more flexible outputs, such as detailed descriptions of diseases and specific molecular structures (which can be helpful during drug discovery). Both predictive and generative AI have numerous applications in oncology research. Predictive AI is employed in diagnosing cancer and predicting treatment responses, whilst generative AI can be utilized in designing more inclusive clinical trials, acting as a co-pilot for clinicians, and a source of medical information for patients.

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One example highlighted by Zou is the development of an AI algorithm called Trial Pathfinder, an AI framework designed to systematically evaluate clinical trial eligibility criteria.[1] The analyses revealed that many common criteria had minimal impact on trial hazard ratios. By adopting a data-driven approach to broaden these restrictive criteria, the pool of eligible patients more than doubled, and the hazard ratio for overall survival decreased by an average of 0.05. This indicates that many patients previously deemed ineligible under the original trial criteria, often due to age, health, or gender, could potentially benefit from the trial treatments. The use of this AI model not only directly provides more treatment options for patients, but also addresses the issue of insufficient participant recruitment in clinical trials, which often leads to less conclusive results. With more patients participating in trials, research can advance more rapidly, ultimately improving patient outcomes.

An example of how AI can diagnose patients with cancer was presented by Daniel Kates-Harbeck, University Hospital LMU, Munich, Germany. Kates-Harbeck and colleagues developed the first research-grade prognostic model for distant metastasis risk in HR+/HER2- early-stage breast cancer. Specifically, the AI model combines histopathology image data from pre-treatment breast biopsy and surgical hematoxylin and eosin slides, with clinical prognostic factors (age, tumor stage, node stage, and tumor size) to predict the risk of distant recurrence. There was a significant association with the risk of distant recurrence in the validation cohort (sub-distribution hazard ratio: 2.3; 95% CI: 2.0–2.8) and remained significant after adjusting for the clinical factors (sub-distribution hazard ratio: 2.2; 95% CI: 1.7–2.8). With this strategy, there is no need for additional tissue biopsy, therefore it may reduce diagnosis times. Kates-Harbeck noted that the future work aims to generalize this research-grade model to clinical-grade utility across diverse demographics and clinical settings.

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USING AI TO MITIGATE DISPARITIES IN HIGH-RISK POPULATIONS

Alyson Moadel, Montefiore Einstein Comprehensive Cancer Center, Bronx, New York, USA, engaged the audience with an abstract presentation showcasing how AI can go beyond predicting diagnosis and outcomes. Moadel presented 'MyEleanor', an algorithm that aims to increase patient engagement in high-risk populations.[2] She began by explaining that engagement is key to improving patient outcomes, as patient adherence increases when they have a better understanding of the medical procedures involved. For example, at an NYC cancer center serving ethnically minoritized and disadvantaged populations, 59% of patients either canceled or did not show up for their colonoscopy appointments in 2022. Barriers to colorectal cancer screening uptake can contribute to late-stage diagnosis and poor outcomes, which lead to the development of MyEleanor. This is an AI-enabled virtual care assistant that makes thousands of highly personalized phone calls each day, with the ability to detect subtle changes in a patient's voice. MyEleanor not only increases patient engagement, but is able to detect targeted needs, triage patients, and send actionable information to healthcare professionals.

Through this project, it was revealed that the most significant barriers to screening were lack of perceived need (19%), time constraints (18%), insufficient encouragement from physicians (16%), medical mistrust (14%), concerns about findings (13%), and cost (12%). With MyEleanor, the completion rate for patients who did not show up for initial appointments nearly doubled from 10% to 19% from 2022 to 2023, and overall patient volume increased by 36% (41% of which were Hispanic and 33% were Black). This project demonstrates the potential of AI to mitigate disparities in cancer screening through increased engagement. The next phase of the project will examine the impact on patient preparation adherence, staff burden, and revenue, as well as other screening programs such as those for breast and lung cancer.

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Another way AI can reduce disparities in oncology healthcare is by using language models to simplify medical documentation for patients, as a lack of medical understanding may prevent appointment and treatment adherence in certain individuals. Using AI to generate patient-accessible consent forms has recently been recently implemented at Lifespan, the largest healthcare system in Rhode Island, USA.[3]

NAVIGATING INHERENT RACIAL AND GENDER BIASES IN AI

Whilst AI can be used to mitigate disparities in healthcare, Judy Gichoya, Emory University, Atlanta, Georgia, USA, gave a highly insightful talk on the inherent bias in data used to develop AI models, and how this bias perpetuates into healthcare decisions. For example, clinical notes made by healthcare professionals, which may be racially biased, are becoming an increasingly common source of data for machine learning and AI algorithms in healthcare. Gichoya described a recent study revealing that AI models can infer patient race from clinical notes even after removing explicit racial indicators, and those models trained on race-redacted notes can still perpetuate existing biases in clinical treatment decisions.[4] Gichoya advocated that increased transparency and accountability regarding bias that is implicitly embedded in data, and the real-world implications of this are vital when implementing AI into oncology.

Alexander T. Pearson, University of Chicago, Illinois, USA, further emphasized this point by highlighting that, whilst AI can offer the potential of improved performance with minimal increased time or cost, without an accurate and transparent description of AI model feature importance, there is limited understanding and therefore mitigation of inherent bias in the model.

References

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