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The impact of AI on reader behaviour in cancer detection: a scoping review protocol

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We use this protocol and it's working

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Abstract

This protocol outlines a scoping review methodology to map existing literature on the impact of artificial intelligence (AI) on reader behaviour in cancer detection. It focuses on how AI influences the cognitive and decision-making processes of radiologists, pathologists, and other healthcare professionals during diagnostic interpretation. The review is expected to identify key themes, gaps, and trends in how AI affects diagnostic confidence, workflow efficiency, and the interaction between human readers and AI-assisted systems. Findings will provide an evidence base for understanding behavioural and cognitive implications of AI integration in diagnostic practice and guide future research directions in oncology imaging and pathology.

Guidelines

The proposed scoping review will be conducted in accordance with PRISMA-SCR guidelines.

Before start

The data extraction tool will be trialled on a small subset of relevant studies to assess its feasibility and appropriateness. It will be refined as necessary based on the trial and as the review progresses. The finalised tool will be included in the scoping review report.

Background

- 1 Artificial intelligence (AI) refers to the ability of machines to replicate human cognitive functions¹. It continues to play an increasingly significant role in healthcare, with growing emphasis on machine learning. Machine learning, a subset of AI, is an iterative process that enables computers to make predictions based on input data. In oncology and diagnostic interpretation, deep learning, particularly neural networks, has emerged as a promising area within machine learning. Numerous studies have explored the expanding role of neural networks in diagnostic detection, although disparities in adoption between radiology and pathology persist. While radiology inherently involves image-based diagnosis, pathology faces unique challenges related to the digitisation of slide views².

AI has demonstrated significant potential to improve diagnostic accuracy and streamline workflows, with studies frequently comparing human readers, AI-assisted readers, and fully autonomous AI systems³. In radiology, computer-aided diagnosis (CAD) systems continue to enhance tumour detection through image analysis. AI tools have successfully integrated data from various imaging modalities, including CT, MRI, and PET, to provide comprehensive diagnostic insights⁴. Similarly, advancements in whole slide imaging (WSI) have enabled deep learning applications in pathology, supporting the field's transition toward AI-assisted workflows⁵.

While the focus of most studies has been on diagnostic accuracy, model effectiveness, and efficiency, fewer have investigated the impact of AI on the behaviour and decision-making of human readers. As AI continues to evolve, understanding its influence on cognitive processes, workflow efficiency, and human reader performance becomes increasingly important, particularly in the high-stakes context of cancer detection. Moreover, differences in the adoption and integration of AI between radiology and pathology raise questions about potential disparities in its impact on readers across these fields.

Reader behaviour in this review refers to the cognitive and decision-making processes of radiologists, pathologists, and other healthcare professionals when interpreting and evaluating medical images or pathology slides. Specifically, we are interested in whether the presence of AI impacts these processes, including how the reader approaches the task, the areas of focus, and the confidence levels in their decisions. Considering reader behaviour is important as the rapidly evolving integration of AI can significantly affect how diagnostic practices are carried out. Given the novelty of AI technologies in cancer diagnostics, long-term impacts on behaviour and psychology may not yet be fully understood, but this remains a potential area for future exploration. This scoping review aims to map the available literature on the impact of AI on reader behaviour in cancer detection.

Research Questions

- 2 RQ1: How does AI integration in cancer detection influence the decision-making behaviour of human readers?
- 3 RQ2: What impact does the integration of AI have on the workflow and efficiency of human readers?
- 4 RQ3: Does the behaviour of human readers differ between radiologists and pathologists in AI-assisted cancer detection, and is there a disparity in the strength of evidence between these fields?

Inclusion criteria

- 5 Studies addressing the involvement of radiologists or pathologists in cancer diagnosis. Studies focusing exclusively on AI applications within oncology or including oncology as one of the applications in broader AI contexts. Studies investigating or providing data on the impact of AI on reader behaviour, including areas such as decision-making and diagnostic accuracy. Studies conducted between 2014 and 2024, with no restriction on study design or publication status.

Exclusion criteria

- 6 Studies focusing solely on AI model performance without considering impact on reader behaviour or measuring human reader performance. Studies investigating AI models that do not incorporate any aspects of machine learning. Studies that report hypothetical opinions or theoretical discussions about AI without empirical evidence or experience using AI. Studies published in languages other than English, which will be excluded during the full-text screening stage.

Participants

- 7 All participants must be clinical radiologists or pathologists involved in cancer diagnosis.

Methods

- 8 The proposed scoping review will be conducted in accordance with PRISMA-SCR guidelines ⁶. The following electronic databases will be searched:
 - Pubmed/MEDLINE

- IEEE
- Embase
- Web of Science
- clinicaltrials.gov
- ISRCTN registry
- BioRxiv
- MedRxiv

9 An example search strategy is found below.

("Artificial Intelligence"[MeSH] OR AI OR artificial intelligence*[Title/Abstract] OR machine learn*[Title/Abstract] OR deep learn*[Title/Abstract] OR "Neural Networks, Computer"[Mesh] OR neural network*[Title/Abstract] OR "Diagnosis, Computer-Assisted"[Mesh]) AND ("Neoplasms"[MeSH] OR cancer OR tumor OR tumour OR oncology) AND (radiologist OR pathologist OR reader OR observer) AND (behaviour[Title/Abstract] OR behavior[Title/Abstract] OR "Observer Variation"[MeSH] OR decision-mak*[Title/Abstract] OR diagnostic interpret*[Title/Abstract] OR efficiency[Title/Abstract] OR workflow[Title/Abstract])

Other Sources of Information

- 10 Grey literature:
- Google Search
 - Professional bodies (e.g., Royal College of Radiologists, Royal College of Pathologists)
 - Web of Science
 - National Screening Committee
 - Royal Marsden AI Imaging Hub

Study selection

- 11 Titles and abstracts of studies will initially be screened against the inclusion and exclusion criteria by two independent reviewers. To ensure consistency, 10% of all studies will undergo double screening, with any disagreements discussed between the two reviewers. If discrepancies remain unresolved, a third reviewer will be consulted. If agreement between reviewers is high during this phase, the remaining studies will be screened by a single reviewer. Relevant studies will then proceed to full-text screening, again with 10% double screening and disagreement resolution through the same process. The study selection process will be documented and presented using a PRISMA-Scr flow diagram in the final report. All screening will be conducted using Covidence⁷.

Data extraction

- 12 The data extraction tool will be trialled on a small subset of relevant studies to assess its feasibility and appropriateness. It will be refined as necessary based on the trial and as the review progresses. The finalised tool will be included in the scoping review report.

Data Analysis and Presentation

- 13 Data will be analysed descriptively, with frequency analysis and percentages being utilised to summarise key findings. The analysis will separate data into conceptual themes as outlined in Tables 1 to 3. Methods for data presentation may evolve throughout the review process to adapt accordingly.

Table 1: Study Characteristics

	Title	RefID	Study Type	Population	Cancer Type	Imaging Modality	AI Model Type

Table 2: Key Findings – AI Integration

	RefID	Accuracy	Efficiency	Error Rate	Role of AI	Role of Human

Table 3: Key Findings – Human Reader Behaviour

	RefID	Accuracy	Efficiency	Error Rate	Decision-Making Behaviour	Other Findings



Protocol references

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