Rapid mixed-method evaluation of implementing Artificial Intelligence in chest diagnostics for lung disease

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1 Background

- Artificial intelligence (AI) is being used in radiology to support the early detection of cancer [1].
- Existing evidence suggests that AI may have benefits, such as improving detection accuracy. However, findings are mixed and there are limitations in the current evidence base (e.g., mainly retrospective studies, limited evidence in real-world settings) [2, 3].
- In June 2023, NHS England announced the AI Diagnostic Fund (AIDF), investing £21 million to accelerate the implementation of AI diagnostic tools for chest X-rays and CTs [4].

Study aim: To evaluate the early deployment and implementation of AI for chest diagnostics, being rolled out as part of AIDF.

2 Research Questions

1. How were AI tools for chest diagnostics ***procured***, ***deployed***, and ***implemented*** at network and trust level?
2. What were stakeholder ***experiences*** of the use of AI in chest diagnostics and associated care pathways?
3. How can services ***best measure*** the ***impact*** of AI deployment on patients and the clinical pathway?
4. What were the key ***cost components*** of AI tools for chest diagnostic that are necessary for an economic evaluation?
5. Which ***factors influenced*** implementation?

3 Methods

- 10-month rapid mixed-methods study
- Data from 10 networks & 3 case study sites (hospital trusts)
- 49 interviews, 57 meeting observations
- Analysed 166 key documents
- Interview data was analysed using Rapid Assessment Procedure (RAP) sheets [5].

4 Main Findings

Implementation and use of AI tools

- Used as a second reader. Varied across networks and trust in terms of AI focus (e.g., X-ray/ CT), supplier and function (e.g., lung cancer diagnoses/other, prioritisation)
- Variation in the AI pathway (e.g., referral, eligibility)
- Several tasks had to be completed across various stages prior to implementation which took longer than originally planned

Factors influencing implementation

- *Contextual factors:* Network maturity and system pressures influenced the need for implementation and AI purpose
- *Barriers:* Time, resources/capacity, complexities of tailoring AI to local contexts (e.g., lack of organisational readiness)
- *Facilitators:* Stakeholder engagement, shared learning, champions/experts (e.g., with more advanced knowledge of AI) and having resources to support implementation

Experience of using AI tools

- Unable to evaluate this in detail due to delayed implementation
- A range of perceived benefits for staff (e.g., faster reporting), patients (e.g., quicker care) and trusts (e.g., cost savings) but some unintended consequences (e.g., additional workload)
- Mixed views on implementation (excitement vs scepticism)
- Some gaps/inconsistencies in training

Measurement and evaluation

- A range of sources could be used to measure the impact of AI tools (e.g., local radiology datasets, linked data and data from suppliers)
- But - need to consider data availability and granularity, challenges isolating impact, varied implementation and comparators
- Need to measure costs relating to the AI tool, staff capacity and productivity

5 Conclusions and implications

- AI for chest diagnostics is being implemented in various ways across England, with different aims, pathways and approaches. Many networks are learning on the job, given the innovative and complex nature of AI.
- Many factors can influence implementation, including barriers such as time and facilitators such as stakeholder engagement and support.
- Monitoring the impact and cost-effectiveness of AI is constrained by data gaps and limitations of data infrastructure.

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References

(1) Chiu, HY. Chao-HS. Chen YM. Application of artificial intelligence in lung cancer. Cancers. 2022; 14(6): 1370. Doi: 10.3390/cancers14061370.
(2) National Institute for Health and Care Excellence. Artificial Intelligence-derived software to analyse chest X-rays for suspected lung cancer in primary care referrals: early value assessment.
(3) He, C.L., W. Xu, Jing. Huang, Y. Dong, Z. Wu, Y., Efficiency, accuracy, and health professional's perspectives regarding artificial intelligence in radiology practice: A scoping review. IRadiology, 2024. 2(2): p. 156-172.
(4) https://transform.england.nhs.uk/ai-lab/ai-lab-programmes/ai-in-imaging/ai-diagnostic-fund/https://transform.england.nhs.uk/ai-lab/ai-lab-programmes/ai-in-imaging/ai-diagnostic-fund/
(5) Vindrola-Padros, C. Chisnall, G. Cooper, S. Dowrick, A. Djellouli, N. Symmons, SM. et al. Carrying out rapid qualitative research during a pandemic: emerging lessons from Covid-19. Qualitative health research. 2020;30(14):21920294. DOI: 10.1177/1049732309151526.