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Citation for published version:

Faric, N, Hinder, S, Williams, R, Ramaesh, R, Bernabeu, MO, van Beek, EJR & Cresswell, KM 2023, Early Experiences of Integrating an Artificial Intelligence-Based Diagnostic Decision Support System into Radiology Settings: A Qualitative Study. in M Giacomini, L Stoicu-Tivadar, G Balestra, A Benis, S Bonacina, A Bottrighi, TM Deserno, P Gallos, L Lhotska, S Marceglia, AC Pazos Sierra, S Rosati & L Sacchi (eds), *Studies in Health Technology and Informatics: Telehealth Ecosystems in Practice. Proceedings of the EFMI Special Topic Conference 2023*. vol. 309, Studies in Health Technology and Informatics , vol. 309, IOS Press, Amsterdam, pp. 240-241, European Federation of Medical Informatics Special Topic Conference 2023, Torino, Italy, 25/10/23. <https://doi.org/10.3233/SHTI230787>

Digital Object Identifier (DOI):

[10.3233/SHTI230787](https://doi.org/10.3233/SHTI230787)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Studies in Health Technology and Informatics

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Early Experiences of Integrating an Artificial Intelligence-Based Diagnostic Decision Support System into Radiology Settings: A Qualitative Study

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Abstract: Background: Artificial Intelligence (AI) based clinical decision support systems to aid diagnosis are increasingly being developed and implemented but with limited understanding of how such systems integrate with existing clinical work and organizational practices. We explored the early experiences of stakeholders using an AI-based e-learning imaging software tool Veye Lung Nodules (VLN) aiding the detection, classification, and measurement of pulmonary nodules in computed tomography scans of the chest. We performed semi-structured interviews and observations across early adopter deployment sites with clinicians, strategic decision-makers, suppliers, patients with long-term chest conditions, and academics with expertise in the use of diagnostic AI in radiology settings. We coded the data using the Technology, People, Organizations and Macro-environmental factors framework (TPOM). We conducted 39 interviews. Clinicians reported VLN to be easy to use with little disruption to the workflow. There were differences in patterns of use between experts and novice users with experts critically evaluating system recommendations and actively compensating for system limitations to achieve more reliable performance. Patients also viewed the tool positively. There were contextual variations in tool performance and use between different hospital sites and different use cases. Implementation challenges included integration with existing information systems, data protection, and perceived issues surrounding wider and sustained adoption, including procurement costs. Tool performance was variable, affected by integration into workflows and divisions of labor and knowledge, as well as

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technical configuration and infrastructure. These under-researched factors require attention and further research.

Keywords. Artificial Intelligence; Radiology; Clinical Decision Support; Diagnostic

1. Introduction

There is limited understanding of how Artificial Intelligence (AI) systems integrate with existing work and organisational practices. We explored early experiences of stakeholders using a deep-learning imaging software tool Veye Lung Nodules (VLN) (Aidence/RadNet).

2. Aims

Explore attitudes, and existing processes before the system was introduced, understand how AI system VLN was integrated with existing work practices over time, and extracting lessons for wider scale-up. Interviews included a combination of in-depth semi-structured interviews, focus groups and observations across deployment sites. Ethical approval was obtained from the School of Social and Political Science at the University of Edinburgh. Data analysis comprised of interviews which were audio-recorded, transcribed, and uploaded into NVivo 12 software for analysis. We used the Technology, People, Organizations and Macro-environmental factors framework (TPOM) to code the data [1].

3. Results

N=39. 22 interviews were conducted with clinicians, 12 interviews involved patients with long-term chest conditions, and five with experts in the field (e.g., academic researchers with a background in radiology AI). The themes included: Perceived drivers and benefits; Design of the tool and integration; Appropriation of the tool by expert labor; Clinical governance, quality assurance, maintenance, and post-market surveillance.

4. Conclusions

VLN use is co-evolving, as the tool is cautiously exploited by skilled professionals learning how they may appropriately utilise AI strengths and compensate for its weaknesses. There is a need to develop clear models for how VLN should be incorporated into the division of labor and workflows in the future.

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