Creating Conditions for Success: How to Successfully Implement CXR AI

Our experience at NHS Greater Glasgow & Clyde

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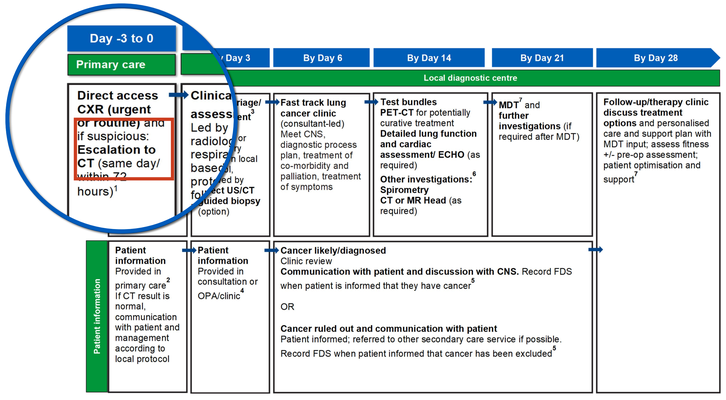
Purpose

To describe key factors contributing to successful implementation of artificial intelligence (AI) in chest X-ray (CXR) imaging. With AI's potential to enhance diagnostic accuracy and workflow efficiency[1], it is crucial to establish a framework for effective clinical integration[2]. We highlight the conditions necessary for deploying CXR AI successfully and achieving meaningful improvements in radiological services.

Background

The Optimal Lung Cancer Diagnostic Pathway in Scotland and the National Optimal Lung Cancer Pathway in England aim to streamline lung cancer diagnosis, recommending an optimised radiology pathway in which CXR and CT scan reporting occurs within the first week (Week 0) of referral. To address these recommendations, we implemented an AI CXR evaluation tool called qXR by qure.ai[3], for prioritisation of urgent suspicion cancer (USoC) cases across 3 sectors which combined acquire over 70,000 outpatient CXRs annually.

Figure 1 – National Optimal Lung Cancer Pathway

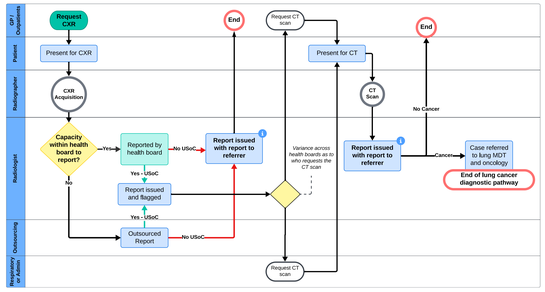


28-day Best Practice timed pathway from the National Optimal Lung Cancer Pathway in England

Methods

As part of a mixed methods study, we deployed the qXR AI solution in a randomised stepped wedge trial design, introducing an AI-enabled pathway that integrates automated triaging of acquired CXR to enable faster reporting and workflow efficiency in line with NOLCP targets. We highlight some of the key insights we have learnt in this implementation.

Figure 2 – Current State USoC diagnostic pathway



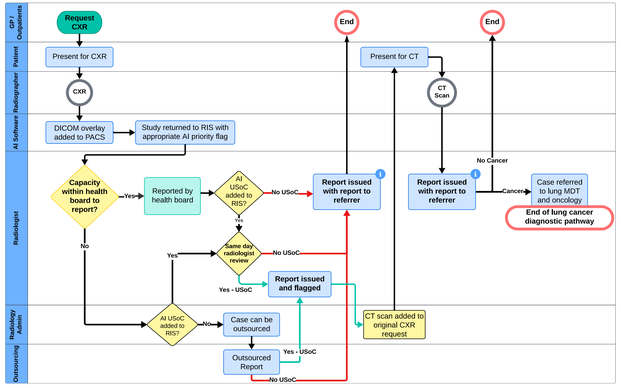
In the traditional pathway, there are significant delays at the point of CXR reporting as it is not possible to prioritise abnormal cases automatically.

CXRs would usually be reported in order of acquisition.

Once a report is generated, the results are returned to the referring GP or the respiratory team depending on local protocols, who then submit a request for an urgent CT, causing further delays in the pathway.

The 72-hour target to CT is not met.

Figure 3 – Future state AI-enabled USoC diagnostic pathway



In AI-enabled pathway, suspicious CXRs are given a priority flag prompting same-day reporting.

If the suspicion of cancer persists, a CT request is generated and linked to the original CXR to avoid delays in re-requesting.

The patient is given a CT appointment within 72 hours, in alignment with optimal diagnostic pathway recommendations.

Our Experience

We found that successful CXR AI implementation relies on several critical factors.

Robust IT Infrastructure

Seamless integration of AI outputs into existing platforms is essential for usability. Embedding AI-generated priority scores into existing worklists and appending AI interpretation to the original CXR DICOM allowed easy case identification and understanding of AI outputs without additional logins or widgets.

Stakeholder Engagement and Training

Early involvement of stakeholders, including department champions and superusers, alongside comprehensive staff training is key to ensure proficient use of AI tools. Departmental flowcharts further supported decision-making.

Ongoing refinement of AI algorithms

Initial model calibration with local datasets reduced false positives. Continuous evaluation based on real-world data led to improved diagnostic accuracy and efficiency, and increased user satisfaction. An important insight for future deployments is to recognise groups with a high likelihood of a false positive result (e.g., respiratory clinics) and systematically exclude them to trim known abnormal cases from the USoC list.

Conclusion

CXR AI can help meet optimal diagnostic pathway recommendation targets, but success hinges on setting up optimal conditions by ensuring seamless systems integration, staff training, workflow optimisation, and continuous model monitoring. This offers a roadmap for institutions aiming to incorporate AI into their diagnostic processes, fostering operational efficiency and advancement in patient care.

References

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2. Recht MP, Dewey M, Dreyer K, et al. Integrating artificial intelligence into the clinical practice of radiology: challenges and recommendations. Eur Radiol 2020;30(6):3576–3584.
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