Greater Manchester
Cancer Alliance

Greater Manchester Chest X-Ray AI Pilot Project

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Introduction

The Greater Manchester (GM) Chest X-Ray (CXR) Artificial Intelligence (AI) Pilot Project represents the largest scale pilot implementation and service evaluation of diagnostic imaging AI in the UK to date. The pilot ran between July 2022 and August 2023, which included 6 months of project initiation and 6 months of in-service clinical evaluation. This project has been developed as part of a Collaborative Working initiative between The Christie NHS Foundation Trust, Qure.ai Technologies Limited and AstraZeneca UK.

Over 300,000 CXRs were processed by AI during this period and clinical evaluation took place in 6 of the 7 main Acute Hospital Trusts in Manchester. The experience gained from this project will further knowledge and understanding of the benefits, risks, and barriers to adoption of AI in routine clinical practice. The AI product provides clinical decision support in reading CXR. The AI is run within minutes of the CXR being acquired in radiology and can be used to help prioritise cases for reporting as well as flagging potential abnormalities to radiologists and radiographers reporting the examination.

Benefits

The main benefits achieved through the pilot project are:

- First-of-type experience in implementing AI at scale, establishing system wide governance, addressing technical and barriers to adoption, conducting clinical safety assessments, post implementation reviews and benefits analytics, and paving the way for future AI projects.
- Determination of multivariate prevalence ratio of AI findings on CXRs that raise a suspicion of lung cancer to enable earlier diagnosis and activation of the diagnostic pathway by highlighting CXRs for early review by the local radiology team.
- Identification of optimised enhanced detection rate (EDR) of lung cancers where AI decision support may overcome human factors involved in missed diagnosis of lung cancers on CXRs (e.g. scanning error, recognition error and decision-making error)
- Incorporating safety netting through adoption of standard report safety netting advice in the case of normal CXRs
- Determination of factors affecting the workflow and efficiency of AI clinical decision support and prioritisation on the workforce and radiology reporting time.
- Supporting earlier access to fast-track and straight-to-test CT pathway for patients with findings warranting further investigation on rapid review.

Key Objectives

7 key objectives were set out to achieve during the pilot:

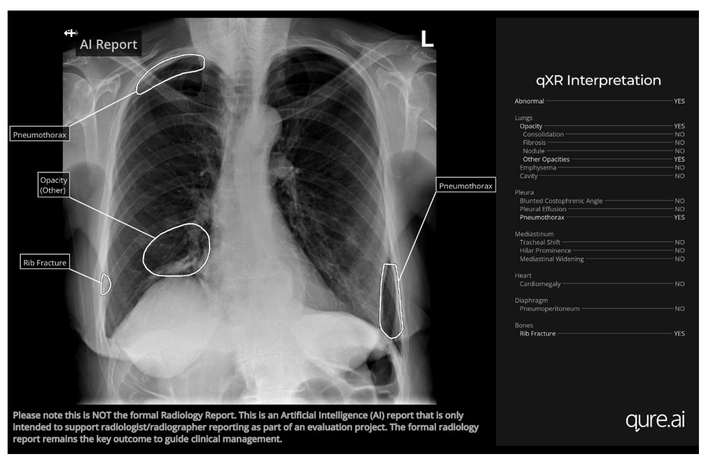
1. Demonstrate the feasibility of deploying an AI software across a regional imaging network of multiple acute care Trusts in Greater Manchester (GM).
2. Improve chest X-ray (CXR) reporting efficiency.
3. Reduce the time from CXR capture to final report across the entire GM CXR service.
4. Improve the time from CXR capture to final report in patients with a CXR suspicious for lung cancer.
5. Improve the time from CXR Capture to CT imaging in patients with a CXR suspicious for lung cancer.
6. Implement a system-wide safety net for patients with a normal CXR but high clinical suspicion of lung cancer.
7. Reduce the potential for missed diagnoses of lung cancer on CXR with double-read reporting (AI + radiologist/radiographer).

Rollout & Results

The project has shown AI can reduce report turnaround times for prioritised compared to non-prioritised CXR with a 46% improvement in achieving the national optimum lung cancer pathway (NOLCP) target compared to the average at the first pilot site. A dynamic prioritisation model has been built to help Trusts determine how best to deploy resources to achieve the benefit.

The AI technology was turned on in 3 phases during the pilot, which were;

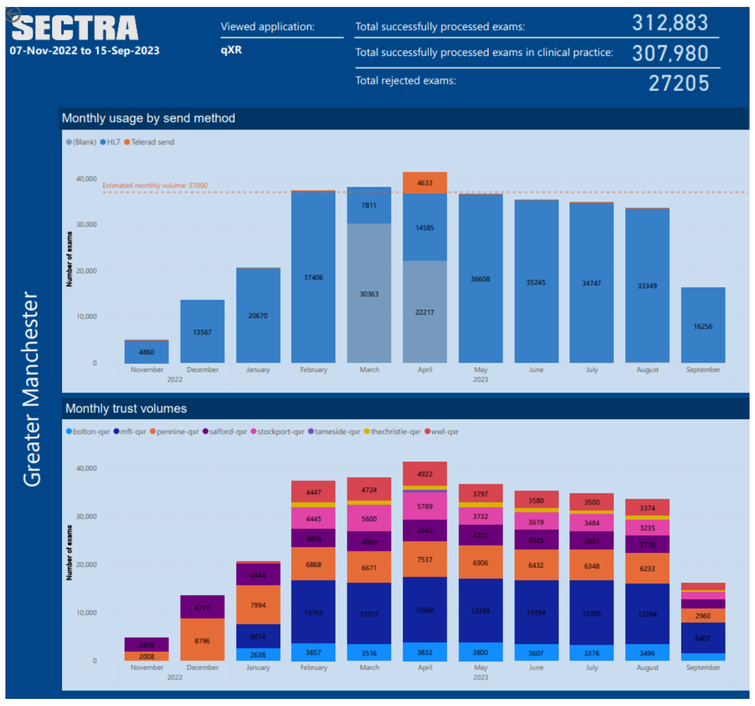
1. Shadow Mode – Background AI processing of CXRs (only visible to PACS system administrators). Enables assessment of AI performance prior to clinical deployment.
2. Clinical Decision Support – An additional AI ‘secondary capture’ image is generated showing AI findings. Trusts can decide which patient referral groups to enable secondary capture processing for e.g., GP referral, A&E, inpatients, outpatients etc.
3. Clinical Workflow Prioritisation – Priority cases are flagged by AI to be reported first with the intention of reducing turnaround times for cancer cases and other significant findings.



The above image shows an example of the ‘secondary capture’ image which helped to aid clinical decision support for users.

The benefit of allowing the technology to be turned on in phases was that Trusts were able to go live with each stage in sequence, according to their local state of readiness, risk assessments and local approval governance processes. This allowed us to assess each Trust on an individual basis and rollout in phases, as well as splitting the outcome data down by Trust level.

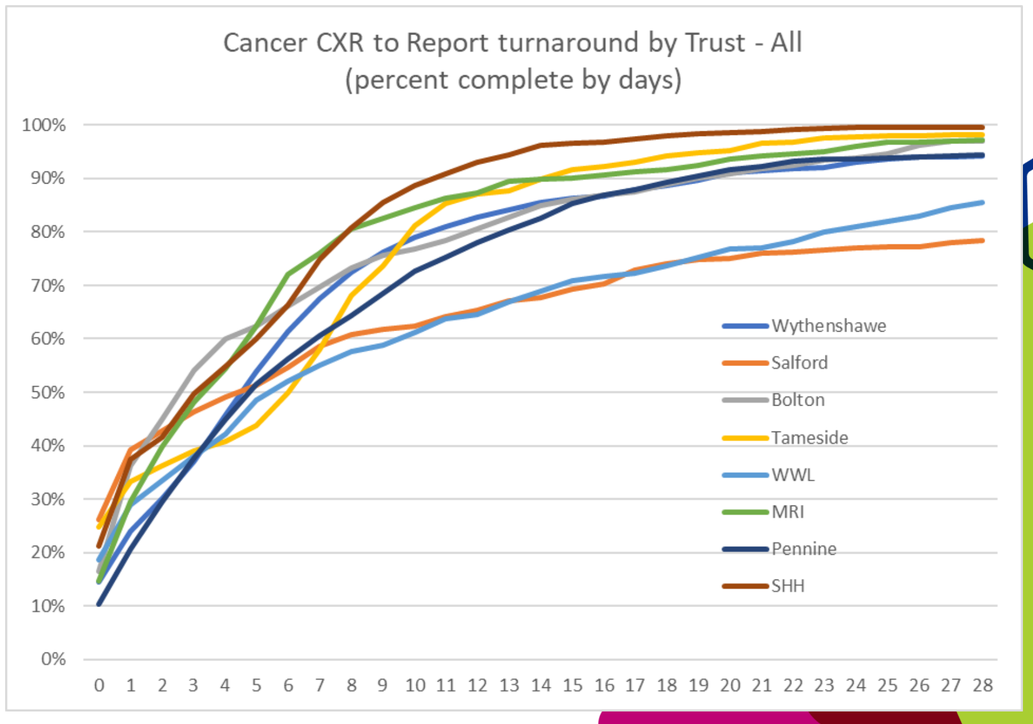
The image below, the Sectra amplifier platform report, shows all CXRs processed during the pilot.



The AI was split into priority 1,2,3,4, which indicated the likelihood that the patient CXR was suspicious of cancer, those which were being reported quicker.

The image to the right shows the report turnaround time for the CXR in cancer patients by Trust.

This work has resulted in a greater understanding of the benefits of risks of using AI in clinical practice, lessons learned in implementing AI at scale, and recommendations to further evaluate AI and address gaps in the evidence identified in the NICE early value assessments (EVA).



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