PATIENTS
PEOPLE
POPULATION

AMBITION   RESPECT   COMPASSION

NHS
Sandwell and West Birmingham
NHS Trust

REPORT TITLE:	Artificial Intelligence Report
SPONSORING EXECUTIVE:	Martin Sadler, Executive Director for Information Technology Digital
REPORT AUTHOR:	Martin Sadler, Executive Director for Information Technology Digital
MEETING:	Public Trust Board	**DATE:**	10th May 2023

1. Suggested discussion points *[two or three issues you consider the Trust Board should focus on in discussion]*

The purpose of this paper is to bring the board up to date with our work in the field of Artificial Intelligence in a clinical setting.

The Trust Board should note the work done so far by the Trust in the field of using Artificial Intelligence in Radiology pathways.

While the Radiology and IT departments are keen to build on this experience, the board should discuss the best way to support future developments building on the progress made in the field of Artificial Intelligence in healthcare at Sandwell & West Birmingham.

2. Alignment to our Vision *[indicate with an 'X' which Strategic Objective[s] this paper supports]*

OUR PATIENTS		**OUR PEOPLE**		**OUR POPULATION**	
To be good or outstanding in everything that we do	x	To cultivate and sustain happy, productive and engaged staff	x	To work seamlessly with our partners to improve lives	x

3. Previous consideration *[at which meeting[s] has this paper/matter been previously discussed?]*

None

4. Recommendation(s)

The Public Trust Board is asked to:

a.	**NOTE** the activities and achievements so far in Artificial Intelligence research
b.	**SUPPORT** further work in Artificial Intelligence in Radiology and other areas

5. Impact *[indicate with an 'X' which governance initiatives this matter relates to and, where shown, elaborate in the paper]*

Board Assurance Framework Risk 01	x	*Deliver safe, high-quality care.*				
Board Assurance Framework Risk 02	x	*Make best strategic use of its resources*				
Board Assurance Framework Risk 03		*Deliver the MMUH benefits case*				
Board Assurance Framework Risk 04		*Recruit, retain, train, and develop an engaged and effective workforce*				
Board Assurance Framework Risk 05	x	*Deliver on its ambitions as an integrated care organisation*				
Corporate Risk Register [Safeguard Risk Nos]						
Equality Impact Assessment	Is this required?	Y		N	If 'Y' date completed	
Quality Impact Assessment	Is this required?	Y		N	If 'Y' date completed	

SANDWELL AND WEST BIRMINGHAM NHS TRUST

Report to the Public Trust Board on 10th May 2023

Artificial Intelligence Report

1.   Introduction or background

1.1   Artificial intelligence (AI) refers to the simulation of human-like intelligence in machines that are programmed to perform tasks, such as visual perception, speech recognition, decision-making, and language translation. AI systems are designed to learn and adapt through experience, allowing them to improve their performance over time without being explicitly programmed.

1.2   The Trust began work with IBM in 2020 on a clinical review of scanned radiology images where the AI Algorithm reviewed previous chest scans and their reports. This activity taught the AI Algorithm to correlate notes with images and then to review their associated historic images.

Normal radiology practice in breast screening is that each image is reviewed by two radiologists independently and if there is a discrepancy in findings a third radiologist perform peer review to share learning. Elsewhere each image has one radiologist reporting Our research in AI looked at Chest screenings and the clinical findings. The AI studied 12,000 images making it one of the largest and most comprehensive studies in UK Healthcare so far.

1.3   When the AI reviewed the 12,000 images any flagged discrepancies were reviewed by radiologists and the study found that 0.6% of potentially significant findings were missed. These included secondary complications, missed fractures, missed cancer nodules and pulmonary embolisms.

1.4   0.6% is an exceptionally low discrepancy rate which not only showed us that that our radiologists have an excellent record on accuracy but also that Artificial Intelligence can be used to review radiology images. to further enhance quality and safety

1.5   This flavour of AI is known as "narrow intelligence". These are AI systems that can learn from previously taught experiences and use that knowledge to inform their decisions. An example of the text and image reviewed appears in Annex 1.

1.6   An AI only pathway for patient care is not likely to happen in the near future and importantly is not something we in the Trust are looking to implement. We want to implement AI solutions to work alongside our medical and professional staff

1.7   The research has now come to an end and the findings have been presented in the international Radiology conference in Chicago, USA, organised by the Radiology Society of North America. RSNA. The more formal report will be published in a scientific journal shortly.

1.8   In April this year the project won a national Smarter Working Award in the category of Automation, Artificial Intelligence and Machine Learning, competing against several government agencies.

2.   Implications, further work and opportunities

2.1   Our study has been one of the largest and most successful AI studies in the UK so far. It has received national and international recognition and the staff involved in the work are attracting attention from organisations and individuals who want support and who want to work with us going forward.

2.2   There is no place for AI completely replacing radiologists as they perform complex decisions. An AI only pathway for patient care is not likely to happen soon and importantly is not something we in the Trust are looking to implement. We want to implement AI solutions to work alongside our medical and professional staff.

2.3   We believe that the clinical benefit of using AI in the short- and medium-term centres around supporting clinical pathways, reviewing information and supporting radiologists. The advantages of creating a pathway involving the combination of a radiologist supported by AI is what we are seeking to demonstrate.

2.4   In addition, we are currently working with AI projects to investigate any patterns in patients' failure to attend imaging appointments. We have discovered that inpatients are delayed through issues with internal communication and that outpatients are delayed relating to work patterns. We discovered no causation from travel issues or correlation with ethnicity.

2.5   We are developing AI to turn a scan into instructions to create a 3-dimensional print of shoulder bone structures. We are planning to show patients their shoulder structure before procedures in order that they can understand their surgical procedures better, and that the surgeons can understand the bone structure before operating.

2.6   We are working with the National Institute for Health and Care Excellence (NICE) to support an evidence standards framework. To ensure safe delivery of AI in healthcare.

3.   Next stages

3.1   The West Midlands Combined Authority are in the early stages of considering creating a regional AI centre combining Industry, Health, Higher Education and Research which we are very supportive of and hope to be a part of.

3.2   We have partnerships with universities, with Aston University we are looking at the effects of virus infection in the lungs and with Birmingham City University we are looking at making best use of imaging data to detect early signs of dementia. We are using CT scans that were taken for the purpose of the patients' normal care pathways and then retrospectively reviewing them for signs of the onset of dementia.

3.3   A similar project is similarly looking for early signs of the potential to develop metabolic syndrome, leading to heart disease or diabetes or stroke from historic CT scans for other purposes. Both may lead to earlier intervention for patients.

3.4   We are intending to develop the use of AI algorithms to review breast screening to prospectively and retrospectively check for signs of tumours and other issues.

3.5   Work so far have been completed by dedicated individuals in between their clinical and operational main duties. Work has not been funded internally or externally and we continue to look for areas where funding for this research can be used to progress our work by freeing up people to dedicate more time to this.

4.   Recommendations

4.1   The Public Trust Board is asked to:

   a. **NOTE** the achievements so far in Artificial Intelligence research
   b. **SUPPORT** further work in Artificial Intelligence in Radiology and other areas

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2nd May 2023

Annex 1: Example Text and Image from a chest scan

Clinical History :
Clinical Details: Right supraclavicular neck swelling and
right arm swelling with venous congestion
Clinical Question: ? central cause for venous obstruction
Past Medical History: Nil

CT Thorax with contrast : Post-intravenous contrast arterial
phase examination. No previous cross-sectional imaging
available for comparison.

Marked emphysematous changes with apical and paramediastinal
bullous formation. No focal collapse, consolidation or large
effusion. Mild left basal subpleural patchy groundglass
change.

No incidental central pulmonary embolus. Normal heart size.

The right internal jugular vein appears distended and does
not enhance on this examination.
Again, this is an arterial phase examination is difficult to
visualise either subclavian or axillary veins (bilaterally),
some reactive lymphadenopathy noted within the right axilla.
No destructive bone lesion within the thorax.
Within the partially imaged upper abdomen, calcified
gallstones within an unremarkable gallbladder. Fatty
infiltration within the liver.

Conclusion: Findings are suspicious for right internal
jugular and right SVC thrombus. Emphysematous changes within
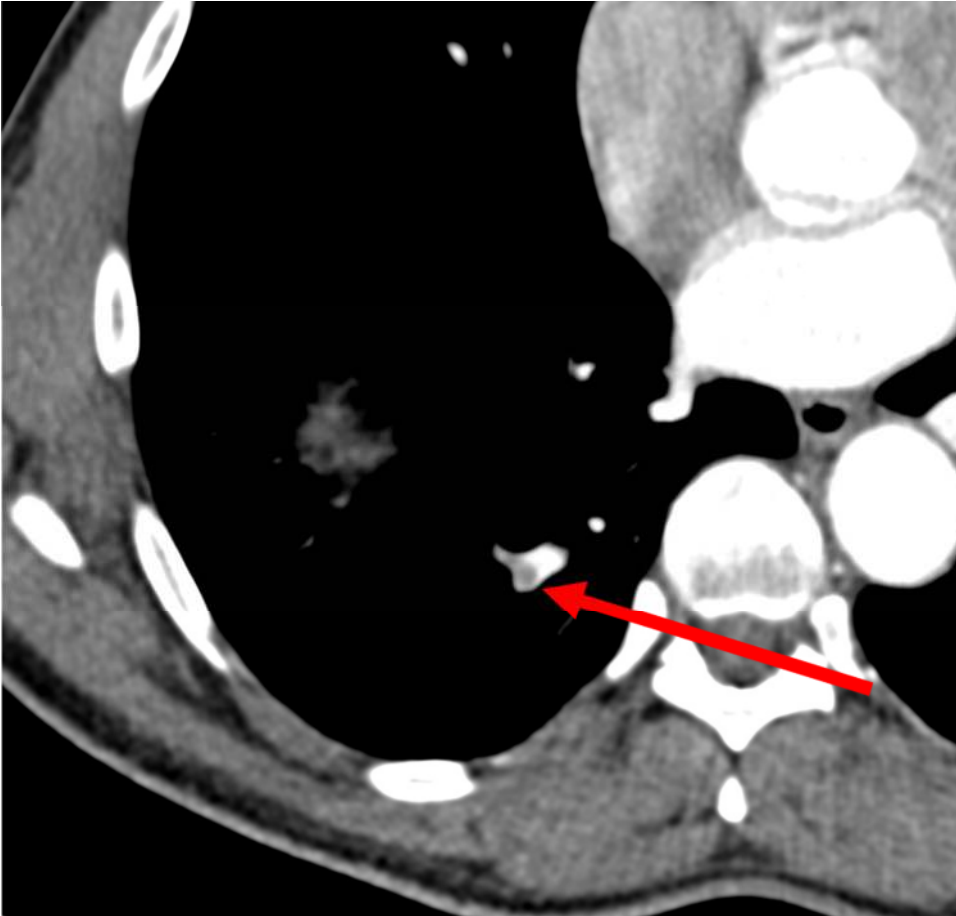the lungs, no central cause identified.

Figure 1: Axial view of a missed finding for pulmonary embolism and its historic report