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The impact of an AI tool on diagnostic accuracy, review time, and diagnostic confidence in detecting acute abnormalities in non-contrast CT head scans: a study among emergency medicine clinicians, general radiologists, and radiographers

Submission date
07/09/2023

Recruitment status
No longer recruiting

Registration date
16/10/2023

Overall study status
Completed

Last Edited
12/11/2025

Condition category
Injury, Occupational Diseases, Poisoning

[_] Prospectively registered
[X] Protocol
[X] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
The study aims to evaluate the impact of an AI tool called qER 2.0 EU on the diagnostic accuracy, speed, and confidence of healthcare professionals who review non-contrast CT head scans. The study will involve 30 readers, including general radiologists, emergency medicine clinicians, and CT radiographers, who will interpret 150 non-contrast CT head scans, first without and then with the assistance of the AI tool. The scans will include 60 control cases and 90 abnormal cases with intracranial haemorrhage, brain infarct, midline shift, or skull fracture. The study will assess the stand-alone performance of the AI tool and its impact on the readers' performance.

Who can participate?
Emergency medicine consultants and registrars, general radiologist consultants and registrars, and CT radiographers who review CT head scans as part of their clinical practice.

What does the study involve?
30 readers will be recruited across four NHS trusts including ten general radiologists, fifteen EM clinicians, and five CT radiographers of varying seniority. Readers will interpret each scan first without, then with, the assistance of the qER 2.0 EU AI tool, with an intervening 4-week washout period. Using a panel of neuroradiologists as ground truth, the stand-alone performance of qER will be assessed, and its impact on the readers’ performance will be analysed as change in accuracy, mean review time per scan, and self-reported diagnostic confidence.

What are the possible benefits and risks of participating?
None

Where is the study run from?
Oxford University Hospitals NHS Trust (UK)

When is the study starting and how long is it expected to run for?
October 2022 to October 2024

Who is funding the study?
This work was supported by the NHSX AI in Health and Care Award (UK)

Who is the main contact?
Prof. Alex Novak, alex.novak@ouh.nhs.uk

Contact information

Type(s)
Principal investigator

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Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

Integrated Research Application System (IRAS)
310995

ClinicalTrials.gov (NCT)
NCT06018545

Protocol serial number
IRAS 310995

Study information

Scientific Title

AI Assisted Reader Evaluation in Acute Computed Tomography (CT) head interpretation (AI-REACT)

Acronym
AI-REACT

Study objectives
The purpose of the study is to assess the impact of an Artificial Intelligence (AI) tool called qER 2.0 EU on the performance of readers, including general radiologists, emergency medicine clinicians, and radiographers, in interpreting non-contrast CT head scans. The study aims to evaluate the changes in accuracy, review time, and diagnostic confidence when using the AI tool. It also seeks to provide evidence on the diagnostic performance of the AI tool and its potential to improve efficiency and patient care in the context of the National Health Service (NHS). The study will use a dataset of 150 CT head scans, including both control cases and abnormal cases with specific abnormalities. The results of this study will inform larger follow-up studies in real-life Emergency Department (ED) settings.

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 13/12/2022, Research Ethics Committee of the Central University (CUREC) and the Interdivisional Research Ethics Committee of Medical Sciences (IDREC) (Churchill Drive, Headington, Oxford, OX3 7GB, United Kingdom; +44 1865 (6)16577; ethics@medsci.ox.ac.uk), ref: R80145/RE002

Study design
Observational cohort study that is retrospective multicenter and multireader

Primary study design
Observational

Study type(s)
Other, Efficacy

Health condition(s) or problem(s) studied
Extradural haemorrhage, Subdural haemorrhage, Subarachnoid haemorrhage, Intraparenchymal haemorrhage, Intraventricular haemorrhage, Brain infarct or stroke, Intracraneal Mass effect, Skull fractures

Interventions
A retrospective dataset of 150 non-contrast CT head scans will be compiled, to include 60 control cases and 90 abnormal cases with intracranial haemorrhage, brain infarct, midline shift or skull fracture. The intracranial haemorrhage cases will be sub-classified into extradural, subdural, subarachnoid, intraparenchymal, and intraventricular.
30 readers will be recruited across four NHS trusts including ten general radiologists, fifteen EM clinicians, and five CT radiographers of varying seniority. Readers will interpret each scan first without, then with, the assistance of the qER 2.0 EU AI tool, with an intervening 4-week washout period. Using a panel of neuroradiologists as ground truth, the stand-alone performance of qER will be assessed, and its impact on the readers' performance will be analysed as change in accuracy, mean review time per scan, and self-reported diagnostic confidence. Subgroup

analyses will be performed by reader professional group, reader seniority, pathological finding, and neuroradiologist-rated difficulty.

Intervention Type
Other

Primary outcome(s)
Reader and qER performance will be evaluated as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and Area Under Receiver Operating Characteristic Curve (AUC). Reader performance will be evaluated with and without AI assistance. Reader speed will be evaluated as the mean review time per scan, with and without AI assistance.

Key secondary outcome(s))
Reader confidence will be evaluated as self-reported diagnostic confidence on a 10 point visual analogue scale, with 0 being not completely confident, and 10 being totally confident, evaluated with and without AI assistance.

Completion date
02/10/2024

Eligibility

Key inclusion criteria
Emergency medicine consultants and registrars, general radiologist consultants and registrars, and CT radiographers who review CT head scans as part of their clinical practice

Participant type(s)
Health professional

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 years

Upper age limit
99 years

Sex
All

Total final enrolment
30

Key exclusion criteria
1. Neuroradiologists
2. (Non-radiologist groups) Clinicians with previous formal postgraduate CT reporting training

3. (Emergency Medicine group) Clinicians with previous career in radiology/neurosurgery to registrar level

Date of first enrolment
27/06/2023

Date of final enrolment
04/08/2023

Locations

Countries of recruitment
United Kingdom

England

Scotland

Study participating centre
Oxford University Hospitals NHS Foundation Trust
John Radcliffe Hospital
Headley Way
Headington
Oxford
England
OX3 9DU

Study participating centre
Guy's and St Thomas' NHS Foundation Trust
St Thomas' Hospital
Westminster Bridge Road
London
England
SE1 7EH

Study participating centre
Northumbria Healthcare NHS Foundation Trust (headquarters)
Rake Lane
North Shields
England
NE29 8NH

Study participating centre

NHS Greater Glasgow and Clyde
J B Russell House
Gartnavel Royal Hospital
1055 Great Western Road Glasgow
Glasgow
Scotland
G12 0XH

Sponsor information

Organisation
Oxford University Hospitals NHS Trust

ROR
https://ror.org/03h2bh287

Funder(s)

Funder type
Government

Funder Name
NHS transformation directorate (NHSX)

Results and Publications

Individual participant data (IPD) sharing plan
All data generated or analysed during this study will be included in the subsequent results publication

IPD sharing plan summary
Published as a supplement to the results publication

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		12/02/2024	12/11/2025	Yes	No
Other unpublished results	version 0.1		12/11/2025	No	No
Other unpublished results	Supplementary materials version 2.4		12/11/2025	No	No
Participant information sheet	version 1.0	29/11/2022	12/09/2023	No	Yes

Protocol file	version 0.1	12/09/2023	No	No
Statistical Analysis Plan		12/11/2025	No	No