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Investigating imaging and clinical decision tools for identifying and ruling out subarachnoid haemorrhage in patients presenting with an acute severe headache to UK Emergency Departments

Submission date 14/10/2020	**Recruitment status** No longer recruiting	[X] Prospectively registered [X] Protocol
Registration date 17/11/2020	**Overall study status** Completed	[_] Statistical analysis plan [_] Results
Last Edited 09/08/2022	**Condition category** Circulatory System	[_] Individual participant data [_] Record updated in last year

Plain English summary of protocol

Background and study aims
The SHED study aims to understand how acute headaches are dealt with by the Emergency Department (ED). It wants to understand how accurate the investigations for identifying and ruling out a bleed on the brain, called a subarachnoid haemorrhage are.

Who can participate?
Any adult with an acute severe headache that reached maximal intensity within one hour presenting to UK Emergency Departments (ED) between October 2021 and February 2022

What does the study involve?
This study doesn't involve any additional treatments or tests, and no extra questions other than those that the participant's doctor will ask you routinely. The study team are not seeking written consent for this study because it involves no change in patient clinical assessment or care. However, if participants do not want to take part it is easy to opt-out as described at http://ternresearch.co.uk.

What are the possible benefits and risks of participating?
There will be no direct benefit to participants from taking part. However, this research may change the way that headaches are managed in the future and therefore impact future treatment for those who re-attend. It could also positively impact other patients who come to the hospital with the same problem.

As part of routine care participant's doctor may decide you need a CT Brain and/or CT angiography as part of your routine care. Those who take part in this study will not undergo any additional x-ray imaging. These procedures use ionising radiation to form images of your body and provide the doctor with other clinical information. Ionising radiation can cause cell damage

that may, after many years or decades, turn cancerous. The chances of this happening to participants are the same whether they take part in this study or not. There is also a risk within the study of data storage. The study team have minimised this risk through use of a specialist medical database service which conforms to all current international standards. This project will be treated like any serious research study, with strict oversight and regular review.

Where is the study run from?
The Northern Care Alliance (UK) with data collected from over 100 UK emergency departments.

When is the study starting and how long is it expected to run for?
August 2019 to February 2023

Who is funding the study?
The Royal College of Emergency Medicine (UK)

Who is the main contact?
Dr Robert Hirst
tern@rcem.ac.uk

Contact information

Type(s)
Scientific

Contact name
Dr Tom Roberts

ORCID ID
https://orcid.org/0000-0003-4991-974X

Contact details
12 Hamilton Road
Bristol
Bristol
United Kingdom
BS3 1PB
+44 (0)7894234121
tomkieranroberts@gmail.com

Type(s)
Public

Contact name
Dr Robert Hirst

ORCID ID
https://orcid.org/0000-0003-0404-2403

Contact details
Emergency Department
Musgrove Park Hospital

Parkfield Drive
Taunton
United Kingdom
TA1 5DA
+44 (0)7506 385159
tern@rcem.ac.uk

Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
Nil known

Study information

Scientific Title
Subarachnoid Haemorrhage in the Emergency Department (SHED)

Acronym
SHED

Study objectives
To understand the sensitivity of CT brain and the Ottawa subarachnoid clinical decision rule for patients presenting with acute severe headache (with maximal intensity within 1 h) to UK Emergency Departments.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 11/02/2020, South West Frenchay Research Ethics Committee (Level 3, Block B Whitefriars Lewins Mead, Bristol BS1 2NT; nrescommittee.southwest-frenchay@nhs.net; +44 (0) 207 104 8290), ref: 19/SW/0243

Study design
Prospective observational cohort study

Primary study design
Observational

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Subarachnoid haemorrhage and acute severe headache

Interventions
As an observational study, there will be no change to clinical practice. Headache features will be prospectively collected. Relevant investigations of CT brain, lumbar puncture, and CT-angiogram will be collected. 28-day follow-up data for subarachnoid haemorrhage and mortality will be collected.

Subarachnoid haemorrhage will be identified from the data collected as any of the following:
1. Subarachnoid Blood present on unenhanced CT reported by a trained radiologist. Site CT characteristics will be collected to include minimum criteria applied for inclusion in the final analysis, as follows:
1.1. A 3rd generation multi-slice scanner (4 to 320 slices/rotation)
1.2. 5-7.5 mm cuts for brain
1.3. 2.5 – 5mm cuts for the posterior fossa
2. Subarachnoid Blood present on CT-Angiogram or MR-Angiogram reported by a trained radiologist
3. CSF findings consistent with SAH according to the 2008 National Biochemist reporting guideline. The vast majority of UK laboratories processing CSF samples adhere to the 2008 clinical biochemistry guidelines. However, for those sites identified as using xanthochromia or red blood cells in lieu of 2008 criteria, the study team will adopt criteria stipulated in the original paper by Perry et al.
4. Visible xanthochromia. Red blood cells (>5×106/L) in the final tube of cerebrospinal fluid collected and an aneurysm identified on cerebral angiography (digital subtraction, computed tomography, or magnetic resonance angiography)

All cases of subarachnoid haemorrhage within the cohort will be captured, by performing follow up at 28 days from presentation. Clinical notes and primary care contact will be scrutinised, to determine reference standard diagnosis, clinical outcomes and mortality. HES data will be pursued using the 4 digit diagnostic codes for subarachnoid haemorrhage following database lock.

Intervention Type
Other

Primary outcome(s)
Current primary outcome measure as of 18/05/2021:
1. External validation of a 6-hour CT brain rule out strategy for alert (defined as awake and fully orientated or GCS 15/15) patients presenting with acute non-traumatic headache, where there is clinical concern for SAH using prospectively collected data.

Previous primary outcome measure:
1. External validation of the proposed 6 h CT brain rule out strategy for alert patients (defined as awake and fully orientated or GCS 15/15) presenting with acute non-traumatic headache, suggestive of subarachnoid haemorrhage using prospectively collected data

Key secondary outcome(s))
1. Change in sensitivity of CT brain imaging in patients presenting with acute severe headache over hourly intervals from 6 to 24 h after onset of headache using prospectively collected CT brain data

2. Validation of the Ottawa subarachnoid haemorrhage clinical decision rule in patients presenting with acute non-traumatic headache using prospectively collected clinical notes, primary care contact data, and HES data

Added 18/05/2021:
The prevalence of subarachnoid haemorrhage in patients under 40 years of age identified from the data collected as any of the following:
1. Subarachnoid blood present on unenhanced CT reported by a trained radiologist. Site CT characteristics will be collected to include minimum criteria applied for inclusion in the final analysis, as follows:
1.1. A 3rd generation multi-slice scanner (4 to 320 slices/rotation)
1.2. 5 – 7.5 mm cuts for brain
1.3. 2.5 – 5 mm cuts for the posterior fossa
2. Subarachnoid blood present on CT-angiogram or MR-angiogram reported by a trained radiologist
3. CSF findings consistent with SAH according to the 2008 National Biochemist reporting guideline. The vast majority of UK laboratories processing CSF samples adhere to the 2008 clinical biochemistry guidelines. However, for those sites identified as using xanthochromia or red blood cells in lieu of 2008 criteria, the study team will adopt criteria stipulated in the original paper by Perry et al.
4. Visible xanthochromia. Red blood cells (>5 × 10e6/l) in the final tube of cerebrospinal fluid collected and an aneurysm identified on cerebral angiography (digital subtraction, computed tomography, or magnetic resonance angiography)
For patients who are evaluated for acute severe headache reaching maximal intensity within 1 hour in UK emergency departments.

Completion date
01/02/2023

Eligibility

Key inclusion criteria
1. Aged ≥18 years
2. Presenting with a non-traumatic acute headache that reaches maximal intensity within one hour to UK Emergency Departments (ED) or equivalent acute secondary care environment

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Key exclusion criteria
1. Direct head trauma in the previous 7 days
2. Returning for reassessment of the same headache within the recruitment period
3. Established diagnosis of subarachnoid haemorrhage, brain neoplasm, ventricular shunt or hydrocephalus prior to attendance at the emergency department.
4. Focal neurological deficit
5. Headache with onset >14 days prior to attendance
6. Recurrent headaches defined as ≥3 headaches of similar character and intensity as presenting headache
7. Transfer from another hospital with confirmed subarachnoid haemorrhage
8. Prisoner presenting to ED/secondary care
9. Patient currently under detained Mental health act, presenting to ED/secondary care

Date of first enrolment
01/10/2021

Date of final enrolment
01/02/2023

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
North Bristol NHS Trust
Bristol
Bristol
United Kingdom
BS10 5NB

Sponsor information

Organisation
Northern Care Alliance

Funder(s)

Funder type
University/education

Funder Name
Royal College of Emergency Medicine

Alternative Name(s)
RCEM

Funding Body Type
Private sector organisation

Funding Body Subtype
Universities (academic only)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan
Data will be stored using a non-publically available repository, REDCap. Data will be collected by local clinicians who would usually have access to the data as part of routine clinical care and stored within local medical records. Data entered into the online database will be encrypted, password protected and only identifiable to the local care team and the Chief Investigators for the purposes of data validation only. Local data collectors will only have access to their own site data when they access the database.
Patient-level data will only be reviewed by the local direct healthcare/research nursing team and stored in a manner compliant with standard medical record procedure at the local hospitals. Anonymised clinical data will be extracted and uploaded to a secure and GCP compliant online database (REDCAP). Any personal identifiers used to generate an anonymised medical record on the database will be encrypted and only be accessed by the study Chief Investigator or members of the direct healthcare team, for review only in the event of data queries.
The fully anonymised dataset will be locked and analysed by Dr William Hulme, statistician at the University of Manchester. Study data will stored on the REDCAP database for 5 years. Individual sites will retain screening logs with identifiable data on-site for a period of 5 years after the study has closed to recruitment, to ensure any data queries or source data validation exercises can be completed. This information will be stored locally by clinical care and/or research teams, in compliance with local organizational procedures.

IPD sharing plan summary
Stored in repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Participant information sheet	version v1.1	05/12/2019	02/12/2020	No	Yes
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes
Protocol (preprint)	Protocol preprint		06/10/2021	No	No

Study website	Study website	11/11/2025	11/11/2025	No	Yes