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Prospective patient-reported reasons for delayed diagnosis of spontaneous subarachnoid haemorrhage

Samuel Hall,[1] Vishnu Achyuth Suresh ,[1] Soham Bandyopadhyay,[1,2] Robert Sutton ,[1] Frederick Ewbank,[1,2] Diederik Bulters[1,2]

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[1]Neurosurgery, Southampton University Hospitals NHS Trust, Southampton, UK
[2]Faculty of Medicine, University of Southampton Division of Clinical and Experimental Sciences, Southampton, UK

Correspondence to
Dr Soham Bandyopadhyay; S.Bandyopadhyay@soton.ac.uk

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ABSTRACT

Background Prompt diagnosis of subarachnoid haemorrhage (SAH) is crucial to prevent life-threatening complications. However, timely SAH diagnosis is not uniformly achieved. This work aims to identify and analyse patient-reported reasons contributing to delayed SAH diagnosis.

Methods We prospectively interviewed all patients with delayed SAH diagnosis at Wessex Neurological Centre, UK, between 1 May 2018 and 30 April 2021. Interviews were structured detailing symptom onset, healthcare consultations and reasons for delays. Content analysis was used to develop a coding scheme, and statistical analysis was performed using analysis of variance, $\chi 2$ and Fisher's exact tests.

Results Of 550 cases of spontaneous SAH, 106 (19.3%) diagnoses were delayed.

85/106 (80.2%) patients did not seek immediate medical attention (15.5% of all SAH). The most common reasons were 'waiting to see if symptoms would settle' (18/85, 3.3% of all SAH) and 'headaches not severe enough' (15/85, 2.7% of all SAH).

48/106 (45.3%) reported diagnostic delays after seeking care (8.7% of all SAH), attributable to either misdiagnosis (36/48, 6.5% of all SAH) or errors in diagnostic testing (12/48, 2.2% of all SAH).

Patients who did not seek immediate medical attention were more likely to experience diagnostic delays after seeking care (OR 9.77, 95% CI 4.97 to 19.49, p<0.001). Among patients presenting late, diagnostic delays after seeking care occurred more frequently in Glasgow Coma Scale (GCS) 15 patients compared with GCS <15 (OR 5.3, 95% CI 1.4 to 19.5, p=0.011). 49/85 (57.6%) patients who delayed seeking care, and 21/36 (58.3%) misdiagnosed patients reported clinical thunderclap headache.

Conclusion Prospective patient interviews capture data missed by retrospective chart review. This work has therefore identified important sources of delay in seeking care following the onset of SAH. Patients with delayed presentation were more likely to experience healthcare errors. These insights may help inform clinician awareness and public health initiatives aimed at earlier diagnosis.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Despite its usually dramatic presentation, timely diagnosis of subarachnoid haemorrhage (SAH) can be challenging.
⇒ Few studies have explored the reasons underlying delayed diagnosis, with those available relying on retrospective hospital records or focusing primarily on in-hospital delays.

WHAT THIS STUDY ADDS

⇒ We prospectively interviewed patients with delayed SAH diagnosis to identify key patient-reported reasons contributing to delay before and after seeking healthcare.
⇒ 80% of patients attributed their delayed diagnosis to delayed care-seeking, and 45% to diagnostic delay after seeking care; patients who delayed seeking care were more likely to experience subsequent healthcare-related diagnostic delays.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Highlights patient-reported barriers to timely SAH diagnosis, which may inform local patient education and clinician awareness initiatives.

INTRODUCTION

The global incidence of spontaneous, atraumatic subarachnoid haemorrhage (SAH) is approximately 6.1 per 100 000 individuals annually.[1] The majority result from rupture of an intracranial aneurysm.[2] Outcomes for patients with aneurysmal SAH (aSAH) remain poor. Approximately a quarter of patients die before reaching hospital and a further quarter die within 1 month.[3] Survivors often suffer from long-term neurological disability and/or psychiatric sequelae such as depression.[4]

While a sudden, severe 'thunderclap' headache is the hallmark of SAH,[5] a small proportion of SAH presentations are atypical with more moderate headaches relieved by analgesia or non-specific symptoms like nausea, neck or back pain which make diagnosis more challenging.[6 7] The 2013 UK National Confidential Enquiry into Patient Outcome and Death (NCEPOD) found that 12.8% of SAH cases had delayed diagnoses, which contributed to adverse outcomes including rebleeding and death in approximately 20% of these patients.[8] Other studies have similarly shown that delays in diagnosis are a preventable contributor to poor outcomes.[9 10]

Delays can occur at two key points: patient delay in accessing care and diagnostic delay after seeking care.[11] Relatively little data exist for the reasons behind these delays, with most research focussing on the interval between diagnosis and

treatment. Among studies investigating delayed SAH diagnosis, most focus on the diagnostic delays after seeking care,[10 12] while patient delays remain an important but underexplored contributor.[13] NCEPOD identified several healthcare-related contributors to a delayed diagnosis, including delayed initial assessment, lack of formal protocols for acute-onset headache and failure to perform CT head. However, the report only superficially examined primary care delays and patient-related factors, and it relied retrospectively on hospital electronic records to identify diagnostic delays after seeking care. Many reasons for delays, particularly patient factors but also doctor attitudes, cannot be discerned from such records. These reasons can only be effectively ascertained prospectively. As a result, pre-hospital delays and other important in-hospital delays may have been underreported, and their causes not understood.

Given the absence of studies where causes of delay are collected at source from patients, we undertook this prospective quality improvement project with the aims of:

1. Identifying and categorising patient-reported reasons for delayed presentation and diagnosis of SAH.
2. Exploring recurrent themes in patient experiences to pinpoint modifiable factors in the patient journey.

METHODS

Design

This prospective quality improvement project used structured interviews underpinned by content analysis as the methodological orientation. The consolidated criteria for reporting qualitative research were followed.[14]

Patient and public involvement

Patients were not involved in the design, conduct, reporting or dissemination plans of this work.

Participants

All SAH admissions to Wessex Neurological Centre (WNC) between 1 May 2018 and 30 April 2021 were screened for eligibility. Inclusion criteria were spontaneous SAH confirmed by CT or lumbar puncture (LP) and a delay in diagnosis in the judgement of the receiving neurosurgeon. Following the patient interview, delayed diagnoses were categorised as either patient delay in accessing care, diagnostic delay after seeking care, or both.

Patient delay was defined as a conscious or unconscious decision by the patient not to seek immediate medical advice following symptom onset (ictus). Classification was based on patient-reported behaviours and attitudes after symptom onset rather than a predefined time threshold.

Diagnostic delay after seeking care was defined as failure to diagnose SAH at the first healthcare encounter due to discharge before making a diagnosis, medical misdiagnosis or deviation from the expected diagnostic pathway. In line with accepted clinical standards, this included immediate non-contrast CT head imaging, followed by LP performed ≥12 hours after ictus where the initial CT was negative.[15 16]

In view of the fact that patients with convexity SAH have a different presentation to the remainder of patients with SAH (focal neurological deficits and seizures vs thunderclap headache), patients with convexity SAH were excluded. Other forms of non-aSAH, such as perimesencephalic basal SAH, which share a common presentation with aSAH, were included.[2]

Informed consent to participate in the interview was obtained from all participants with capacity. For patients without capacity, the next of kin (NOK) was consulted to confirm eligibility and participate. All consecutive patients with delayed diagnosis were approached face-to-face.

Reflexivity and positionality

Questionnaires were created by SH (neurosurgical registrar) to ascertain individuals' risk factors for SAH, symptom timing and nature, healthcare consultations and reasons for delays (online supplemental appendix A). The questionnaire was reviewed and revised by FE and DB to optimise construct, content and face validity. SH piloted the interviews with colleagues and received training under DB before interviewing the participants at WNC. The interviewer's clinical role may have influenced question framing, participant accounts and interpretation of responses. To mitigate this, interviews followed a structured topic guide incorporating both closed and open-ended, non-leading questions.

Data collection

Only the participant/NOK and SH were present during the 30-min interviews. Field notes were taken without recordings and shown to participants for comments and corrections. To ensure reliability and accuracy, the data from the interviews were cross-referenced with the patient's clinical notes by SH and SB. All data were pseudo-anonymised and collated for analysis.

Data analysis

'Patient-reported thunderclap headache' was headaches reported by patients to be sudden, explosive and/or severe at onset, with a known time of ictus. 'Clinical thunderclap headache' was defined as thunderclap headache reported to reach maximal intensity within 1 min, in line with accepted definitions.[17] A coding scheme was developed to categorise the responses from the structured interviews, which included categories such as 'risk factors', 'symptom onset', 'initial healthcare consultation' and 'diagnostic delays'. Each category was further subdivided to capture specific details (eg, types of risk factors and reasons for delays). SH and FE independently reviewed the field notes and applied the coding scheme to ensure consistency and reliability. Discrepancies were resolved by consensus. The frequency of each code was counted to identify how often specific themes or factors were mentioned across all interviews. This provided quantitative data on the prevalence of different risk factors, symptoms and reasons for delays, which were summarised using descriptive statistics. During data collection, the COVID-19 pandemic occurred, prompting an analysis based on ictus before or after 20 March 2020 (the date of the first UK national lockdown). Analysis of variance and $\chi 2$ or Fisher's exact test were used to compare continuous and categorical data, respectively. Statistical analysis was performed using GraphPad Prism version 9 (La Jolla, USA), with significance set at $p<0.05$.

RESULTS

Between 1 May 2018 and 30 April 2021, 550 patients with spontaneous SAH were admitted to WNC. 107 patients with a delayed diagnosis of SAH were identified and agreed to participate in the interviews; however, one patient with non-aneurysmal convexity SAH was subsequently excluded. The final cohort comprised 106 patients (19.3%), with a mean age of 57.3±13.0 years, and 65 (61.3%) were female (table 1).

Patient delays

85 (80.2%) patients with a delayed diagnosis had delayed seeking medical attention following ictus (table 1), with a mean delay between ictus and first presentation of 92.8±132.4 hours.

Table 1 Characteristics based on source of delay

Characteristic		Patient delay only (n=58)	Diagnostic delay only (n=21)	Patient and diagnostic delay (n=27)	P value
Age (mean±SD)		58.4±10.7	52.9±17.3	58.4±13.5	0.45
Female gender (N, %)		37 (63.8)	15 (71.4)	13 (48.1)	0.22
History of smoking (N, %)		36 (62.1)	7 (33.3)	13 (48.1)	0.07
Hypertension (N, %)		19 (32.8)	2 (9.5)	10 (37.0)	0.07
Previous SAH (N, %)		5 (8.6)	1 (4.8)	0 (0.0)	0.33
Known UIA (N, %)		2 (3.4)	0 (0.0)	0 (0.0)	1.00
Family history of SAH/UIA (N, %)		4 (6.9)	0 (0.0)	3 (11.1)	0.43
The medical department initially attended following onset of symptoms (N, %)	Emergency department	47 (81.0)	9 (42.9)	15 (55.5)	<0.01
	GP	8 (13.8)	4 (19.0)	11 (40.7)	
	Other	3 (5.2)	8 (38.1)	1 (3.7)	
Non-aneurysmal SAH (N, %)		8 (13.8)	7 (33.3)	7 (25.9)	0.12

GP, general practice; SAH, subarachnoid haemorrhage; UIA, unruptured intracranial aneurysm.

57/85 (67.1%) patients described experiencing a sudden-onset, severe headache, 49 of whom (86.0%) reported clinical thunderclap headache (table 2).

Patients who delayed seeking medical attention most commonly attended the emergency department (ED, n=62), followed by their general practitioner (GP, n=19), the 111 service (a free 24-hour helpline and triage service provided by the National Health Service (NHS) in England, n=3) or called an ambulance (n=1). After their delayed presentation, 27 (31.8%) patients subsequently faced a diagnostic delay after seeking care.

The pathways of patients with delayed SAH diagnosis are illustrated in figure 1. Online supplemental figures 1 and 2 show these by subgroups of patients presenting with patient-reported thunderclap and non-thunderclap headaches, respectively.

The 85 patients provided 113 reasons why they did not seek immediate medical attention. The most common reasons were categorised as 'waiting to see if it would settle' (n=18), 'deemed headaches were not severe enough to need medical input' (n=15) and 'assuming it was a migraine' (n=14). The full list of reasons why patients delayed seeking care can be seen in table 3.

Delays in high-risk patients

Of the patients delaying seeking care, 12 had a personal awareness of SAH; five suffered a previous SAH (including one with a known additional unruptured intracranial aneurysm (UIA), and seven had a family history of SAH/UIA. One patient had a known UIA but no previous SAH. A patient-reported thunderclap headache was described by eight of these 12 patients (66.6%), of whom five (41.6%) met the definition of clinical thunderclap headache. Among the 12 patients, 16 reasons were identified for delayed care-seeking: 'assuming it was a different cause for headache' (n=3), 'fear of hospitals' (n=2), 'fear of wasting NHS time' (n=2), 'stoicism' (n=2), 'waiting to see if it would settle' (n=2), 'obtunded' (n=2), 'assumed it was COVID' (n=1), 'assumed it was alcohol related' (n=1) and 'amnesic of ictus' (n=1).

Reasons for seeking care

97 reasons for why patients who delayed seeking care subsequently sought medical advice were provided (table 4). The most common reason was the 'persistence of symptoms' (n=40), followed by 'new symptoms' (n=31) and 'insistence by a family member' (n=18).

Diagnostic delays after seeking care

Diagnostic delays after seeking care were identified in 48 (45.3%) patients (table 1). The most common circumstances for these to occur were on presentation to the ED (n=24, 50.0%), followed by consultation with GP (n=15, 31.3%) and healthcare workers who were identified not to be doctors (n=9, 18.8%): pharmacist (n=1, 2.1%), nurse (n=1, 2.1%), paramedics (n=5, 10.4%), NHS 111 operator (n=1, 2.1%) or emergency 999 operator (n=1, 2.1%).

Among all patients with spontaneous SAH (n=550), diagnostic delays after seeking care occurred more frequently in those who

Table 2 Reported symptoms among patients who delayed care seeking and misdiagnosed SAH patients

Symptom		Patient delay (n=85)	Misdiagnosed (n=36)
Patient-reported thunderclap headache* (N, %)		57 (67.1)	26 (72.2)
Time to peak headache intensity (N)	≤ 5 s	47	19
	6–60 s	2	2
	2–5 min	1	1
	5–30 min	1	2
	> 1 hour	1	0
	Could not remember	5	2
Non-thunderclap headache (N, %)		11 (12.9)	6 (16.7)
Unknown/not specified (N, %)		17 (20.0)	4 (11.1)

*Headaches described as sudden, explosive and/or severe at onset, with a known time of ictus, and not necessarily peaking within 1 min.
SAH, subarachnoid haemorrhage.

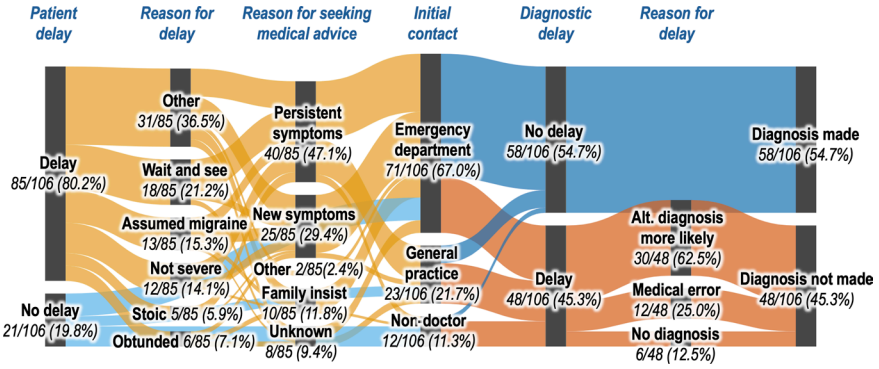

Figure 1 Sankey diagram illustrating the progression of 106 patients with delayed subarachnoid haemorrhage diagnosis. The flow demonstrates the presence or absence of a patient delay in accessing care, reasons for the initial delay, factors prompting eventual presentation, the pathway of presentation (emergency department, general practice or non-doctor consultation) and whether a diagnostic delay after seeking care occurred, including the possible causes. Blue flows indicate no delay, while orange flows indicate a delay. Figures were generated using Python (version 3.8.5) and Plotly (version 6.3.0).

delayed seeking care following ictus compared with those who presented promptly (27/85 (31.8%) vs 21/465 (4.5%); OR 9.77, 95% CI 4.97 to 19.49, p<0.001). Among patients presenting late, diagnostic delays after seeking care were more common in patients with Glasgow Coma Scale (GCS) 15 compared with GCS <15 (24/59 (40.7%) vs 3/26 (11.5%); OR 5.3, 95% CI 1.4 to 19.5, p=0.019).

Of those who faced a diagnostic delay after seeking care, 39 (81.2%) were sent or told to remain home following their first presentation. This included one patient with a previous history of aSAH, who contacted a paramedic immediately after suffering a fall and getting a sudden headache reminiscent of their first SAH. They relayed that the paramedic assessment solely focused on the fall, and their headache was attributed to their fall. Of the patients told to stay at home, it took up to four separate presentations (mean of 1.3) to be investigated and diagnosed with SAH.

In 36/48 patients (75.0%), either no clinical diagnosis (n=6) or the wrong diagnosis (n=30) was made. 12/36 (33.3%) of these patients were seen in ED. Of the six undiagnosed patients, four were not seen by a doctor but by another healthcare worker. Three were discharged and one of the participants self-discharged. Of the 30 patients incorrectly diagnosed, 39 instances of alternative diagnoses were made. The most common were neck strain/trapped nerve (n=6), migraine (n=6), gastroenteritis (n=4) and alcohol overuse (n=4). Two patients volunteered that they did not give a good history by downplaying the severity of their headaches. 21/36 (58.3%) misdiagnosed patients reported clinical thunderclap headache (table 2).

The remaining 12 patients (25.0%) who faced a diagnostic delay after seeking care were suspected to have SAH by doctors in ED, but errors relating to CT or LP occurred. In nine patients, visible blood was missed on the CT head, with errors from both consultant radiologists (n=5) and registrars (n=4). Missed consultant cases were later diagnosed by subsequent LPs (2/5, 40.0%), repeat scans (2/5, 40.0%) or review by the neurosurgery team (1/5, 20.0%). All registrar errors were detected on routine second reporting by a supervising consultant. LP errors occurred in three patients: one was not performed after the CT, one was delayed too long after the CT and the results of one were misinterpreted.

Impact of COVID

The odds of a delayed SAH diagnosis were higher after the onset of the COVID-19 pandemic, though not statistically significant (48/203 (23.6%) vs 58/347 (16.7%); OR 1.54, 95% CI 1.00 to 2.37, p=0.056). The distribution of patient (pre-COVID 47/58 (81.0%) vs post-COVID 38/48 (79.2%); OR 0.89, 95% CI 0.34 to 2.32, p=0.81) and diagnostic delays after seeking care (pre-COVID 26/58 (44.8%) vs post-COVID 22/48 (45.8%); OR 1.04, 95% CI 0.48 to 2.24, p=0.91) and duration of patient delay to seeking medical attention (mean difference 17.7 hours, 95% CI −5.6 to 41.0, p=0.29) were all similar before and after the pandemic.

DISCUSSION

This work prospectively explores patient-reported reasons for delayed SAH diagnosis through direct interviews. We found that 80% of patients attributed their delayed diagnosis to delayed care seeking, substantially higher than previous estimates of 8%–40%.[13 18 19] This figure is likely closer to the true rate of patient delay, given our prospective and patient-centred approach to data collection, which captured details of symptom experience and decision-making often under-reported in routine clinical documentation and retrospective chart reviews. By comparison, 45% of patients reported diagnostic delay after seeking care, lower than the 60%–92% reported in older studies,[13 18 19] possibly reflecting improvements in SAH recognition.[20 21] The overall proportion of delayed diagnoses was 19.3%, comparable to recent literature[10 12 13] and markedly lower than historic reports, including a 1993–1994 study at our centre in which delayed diagnosis occurred in over 50% of cases.[18 22 23] Nevertheless, a delayed diagnosis rate approaching one in five cases remains high and suggests persistent barriers to timely recognition of SAH.

Patient delays

The most common reason reported by patients for delaying care was ‘waiting to see if symptoms would settle’ despite most reporting clinical thunderclap headache. Similar findings have been demonstrated previously. In Inagawa’s 1980–1998 series of 358 SAH cases exploring delayed diagnosis, physician-related delays dropped by 50% whereas patient delays remained unchanged.[13] The author concluded that healthcare systems improved, but patient behaviour did not, with many patients experiencing severe headaches yet not seeking care. Another 1988 study exploring reasons for patient delay in SAH also found that patients frequently underestimated the seriousness

Table 3 Patient-reported reasons for delaying seeking medical advice, and number of responses assigned to each reason

Reason	Patient delay only (n=58)	Patient and diagnostic delay after seeking care (n=27)	Total (n=85)
Waited to see if it would settle	13	5	18
Deemed not severe enough	10	5	15
Assumed due to another headache diagnosis: migraine	11	3	14
Stoicism	3	5	8
Obtunded	7	0	7
Fear of wasting NHS time	3	2	5
Fear of hospitals	2	2	4
Unknown: low GCS	3	0	3
Assumed due to another headache diagnosis: 'severe normal headache'	2	0	2
Unknown: patient amnesic of ictus	3	0	3
Thought it was a virus	1	1	2
Thought it was a neck problem	1	1	2
Unclear presented non-specifically unwell/confused	1	1	2
Assumed due to another headache diagnosis: brain tumour	0	1	1
Assumed due to another headache diagnosis: hypertensive	1	0	1
Assumed due to another headache diagnosis: tension	1	0	1
Resolution of symptoms	1	0	1
Thought it was dehydration/viral as partner also unwell	1	0	1
Thought it was ear wax buildup	1	0	1
Thought it was a seizure phenomenon	1	0	1
Thought it was due to high BP	1	0	1
Thought it was too much alcohol causing a collapse	1	0	1
Thought it was due to COVID infection	1	0	1
Thought it was an overdose of recreational analgesics	1	0	1
Thought it was due to food poisoning due to vomiting	1	0	1
Thought it was food poisoning	1	0	1
Thought it was due to heat stroke	0	1	1
Thought it was a COVID vaccine side effect	0	1	1
Thought it was due to a recent head injury	0	1	1
Thought it was a side effect of antibiotics	0	1	1
Thought it was a hangover	0	1	1
Not registered with a GP	0	1	1
Patient prefers complementary medicine	0	1	1
Waited to get a GP appointment on Monday	0	1	1
Caring for an unwell spouse	1	0	1
Wanted to get through Christmas	1	0	1
Google said it was a tension headache	1	0	1
No faith in hospitals	1	0	1
Felt too unwell to see GP	1	0	1
Unable to get time off work	1	0	1
Fear of receiving a terminal diagnosis	1	0	1

BP, blood pressure; GCS, Glasgow Coma Scale; GP, general practice; NHS, National Health Service.

of their headache.[18] Together, these findings suggest a persistent long-standing perception among parts of the public that headache represents a low-acuity complaint, reflected in our series where patients often attributed symptoms to migraine or considered them 'not severe enough'.

Worryingly, eight of 12 patients who delayed seeking care after experiencing a sudden-onset, severe headache either had a personal or family history of SAH/UIA. The most common reason for delay in this group was assuming it was a different cause for headache. This finding suggests that even among individuals with heightened baseline risk, prior disease awareness does not reliably translate into timely healthcare-seeking. Symptom misattribution was prominent despite classical SAH features. This highlights potential limitations in current counselling approaches for high-risk patients, although we also note that some of the reasons may suggest unwillingness to accept their diagnosis.

Public health campaigns, such as the 'act F.A.S.T.' stroke initiative, may help address patient-related delays by challenging the perception of headache as a low-acuity complaint. To be effective, messaging should be explicit, simple and action-oriented, emphasising that sudden-onset, severe headache warrants urgent medical assessment. However, tailoring the exact messaging is essential to not invoke unwarranted concern and needs extensive stakeholder engagement. More easily implemented is the messaging to healthcare professionals that many patients with SAH present late and that delayed presentation should not imply absence of SAH.

Table 4 Patient-reported reasons for seeking medical attention after their initial delay

Reason	Number of responses assigned this code
Persistence of symptoms	40
Family member insistence	18
New symptoms: low GCS	17
New symptoms: focal neurology	5
New symptoms: seizure	5
New symptoms: other	4
Recurrence of symptoms	4
Intentional delay awaiting appointment	1
Wanted to know if safe to drive	1
Needed analgesia	1
Unable to answer	1

GCS, Glasgow Coma Scale.

Diagnostic delays after seeking care

Patients who presented late were more likely to experience a subsequent diagnostic delay after seeking care. This association is likely driven by confirmation bias, where clinicians presented with a patient who has delayed seeking help may subconsciously dismiss the possibility of a serious condition like SAH. The delayed presentation itself can create a mental framework that the condition is less urgent, leading clinicians to anchor on benign diagnoses (eg, migraine or tension headache) even when red flags, such as a thunderclap headache, are present as was the case in 58% of misdiagnosed patients. While only a minority of thunderclap headaches are attributable to SAH, anchoring may also lead clinicians to underestimate the need for imaging when indicated.[24 25] Bias is further amplified by the fact that late presenters are more likely to be neurologically intact (more frequently GCS 15) and may downplay their symptoms. Delayed presentation can also contribute to CT-related errors given CT loses sensitivity to blood over time and even when still visible, smaller volumes of blood are easier to miss.[26] Similarly, an LP may have been deemed unnecessary in a patient with minimal symptoms.

SAH presenting with thunderclap headaches should not be missed clinically. Guidelines universally recommend immediate CT for classic SAH,[3 27 28] and valuable tools such as the Ottawa SAH rule should be implemented irrespective of neurological status.[29 30] While atypical presentations carry a higher risk of delayed diagnosis, risk can be mitigated by maintaining a low threshold for CT when clinical suspicion remains, even without classic symptoms.[9 28] Additionally, audits, morbidity and mortality meetings, and professional reflection may help to improve future detection.

Limitations

As a single-centre analysis, generalisability is limited. Our interview-based methodology is subject to recall bias, particularly where NOK contributed responses. Despite prior training, use of a single interviewer with a clinical background may have contributed to interviewer and response interpretation bias. The absence of a standardised time-based definition of 'delay' introduces subjectivity in classification and limits comparison with studies using fixed temporal thresholds. Outcome data for all 550 SAH patients were not available, limiting assessment of the clinical impact of delayed diagnoses. Some analyses may be underpowered, and larger sample sizes may have identified significant associations such as with the COVID-19 pandemic. Our estimates also exclude patients who died before presentation or never sought care.

CONCLUSION

This work highlights important patient-reported reasons contributing to delayed diagnosis of SAH. These findings may help inform patient-focused initiatives aimed at promoting timely care-seeking after sudden severe headache and earlier recognition of SAH.

Contributors Conceptualisation: SH and DB. Data curation: SH and FE. Formal analysis: SH, VS and SB. Methodology: SH and DB. Project administration: SH and DB. Software: SH, VS, SB and RS. Supervision: DB. Writing – original draft: SH, SB and VS. Writing – review and editing: all authors. Final approval of manuscript: all authors. DB is the guarantor and accepts full responsibility for the integrity of the work as a whole.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involved human participants, but exemption of this quality improvement project from ethical approval was confirmed using the UK Health Research Authority decision tool, followed by local approval and registration through the Trust quality improvement governance team. All patient data were anonymised prior to analysis. Exempted from this study, participants gave informed consent to participate in the study before taking part.

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ORCID iDs
Vishnu Achyuth Suresh https://orcid.org/0000-0002-8662-3588
Robert Sutton https://orcid.org/0009-0007-6398-8238

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