One-year outcomes of patients with subarachnoid haemorrhage admitted to a neurosurgical ICU

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Background

- Subarachnoid haemorrhage (SAH) is defined as bleeding into the subarachnoid space as a result of ruptured cerebral aneurysms or vascular malformations (Macdonald & Schweizer, 2017).
- It is associated with significant morbidity and mortality due to the effects of blood extravasation, perfusion disruption, hydrocephalus and delayed cerebral ischemia (Geraghty & Testai, 2017).
- Patients with high grade SAH often present with seizures and coma, and require ICU admission (Claassen & Park, 2022).

Study Aim

- The aim of this study was to define the epidemiology, long-term outcomes and predictors of outcome in patients following SAH who are admitted to a mixed/neurosurgical adult critical care unit in London.

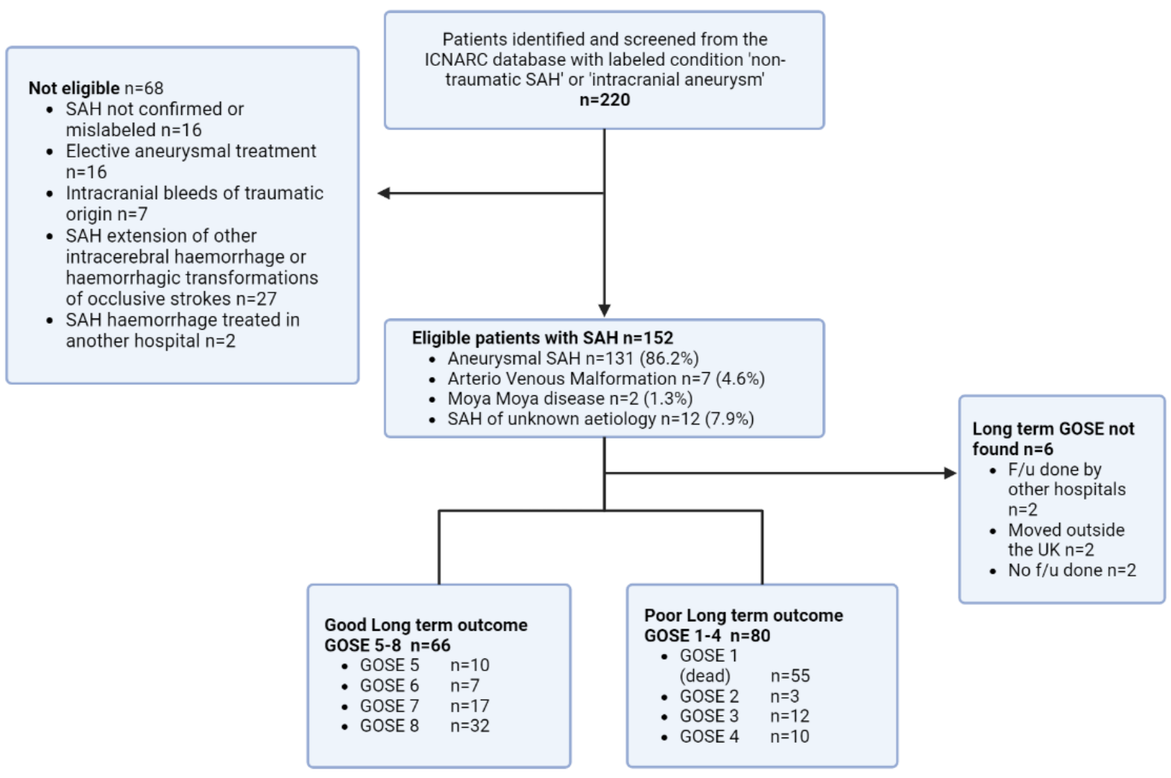
Methods

- This was a single centre, retrospective study of SAH patients admitted to the Royal London Hospital (RLH) ACCU in a 4-year period (2018-2021).
- It was registered as an audit with the local quality improvement office. Patients were identified through the local ICNARC database and relevant data obtained through ICNARC and electronic patient records. Outcomes were from follow-up clinic letter.
- Neurological outcomes were assigned using the Glasgow Outcome Scale (GOSE).
- Patients were then divided into two groups: GOSE outcome of 1-4 (poor outcome group) and GOSE 5-8 (good outcome group) for analysis.
- Patient demographics and treatments between the two groups were compared to identify associations with long-term outcomes.
- Statistical analysis was carried out using Student's T-test for normally distributed data, Mann-Whitney U for non-parametric data and Chi-squared test for categorical variables.

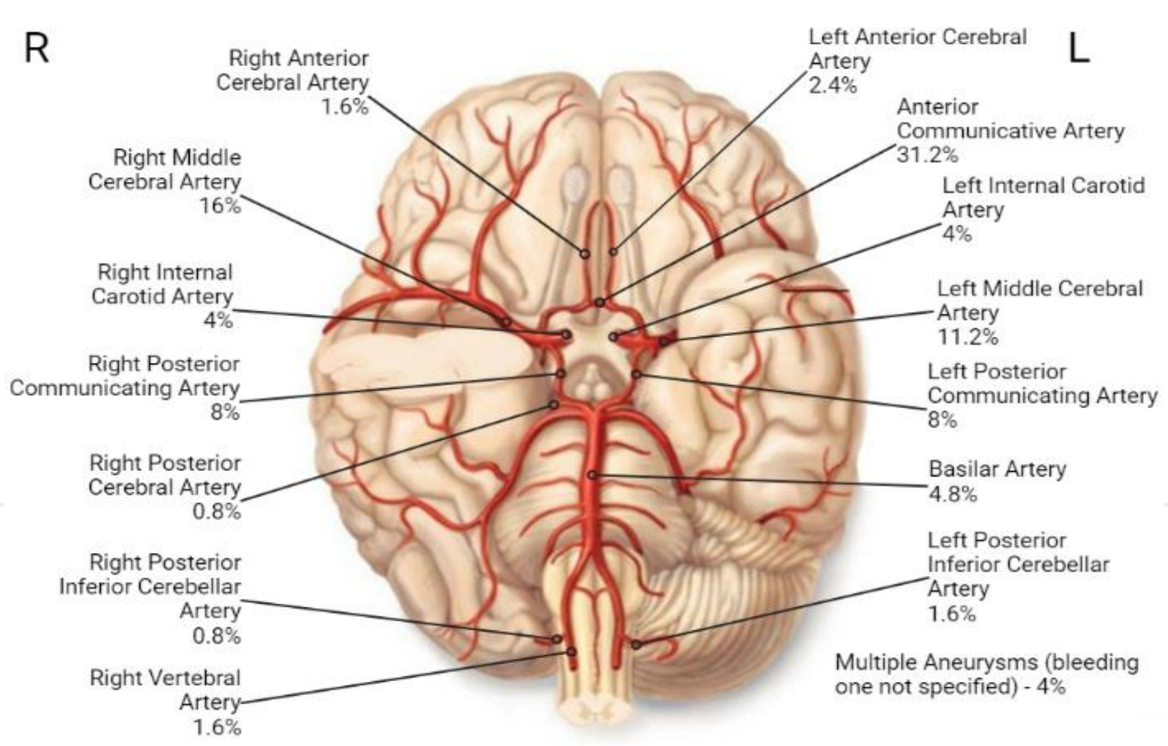
Results

- From the 152 patients identified, 80 had a poor outcome (52.6%) and this included 55 patients (36%) who died (fig.1). Sixty-six (43.4%) had a good outcome.
- When excluding the patients who died during admission(51), 69.5% of patients had good long-term outcomes and 26.3% had poor long-term outcomes. Six patients (3.9%) were lost to follow-up.
- The median time to follow-up after discharge was one year.

Figure 1: Participants' Flow Diagram



- 131 (86.2%) patients had SAH of aneurysmal origin. Figure 2 shows the aneurysm locations.



- Low GCS on admission, higher World Federation of Neurosurgeons Score (WFNS), the need for external ventricular drains (EVD), mechanical ventilation and increasing organ support were associated with worse long-term outcomes ($p<0.05$) (table 1).
- The length of hospital and ICU stay were significantly longer in the poor long-term outcome group after removing patients who died in the ICU.
- Patients treated with endovascular coiling were more likely to be in the good outcome group ($p<0.001$). Patients who had a good outcome were also younger ($p=0.006$).

Table 1: Differences between Good and Poor Long-term outcomes

Patient's characteristics	Good Long-term Outcomes n=66		Poor Long-term Outcomes n=80		P-value
Age, mean ± SD (y)	51.1 ± 11.3		56.6 ± 12.4		**0.006**
Sex, n (%)					
Male	23	(34.8)	29	(36.3)	0.860
Female	43	(65.2)	51	(63.8)	
GCS on admission					
Median (IQR)	14	(6)	7	(10)	**<0.001**
WFNS score, n (%)					
WFNS 1	25	(37.9)	17	(21.3)	
WFNS 2	12	(18.2)	6	(7.5)	
WFNS 3	2	(3.0)	5	(6.3)	
WFNS 4	14	(21.2)	13	(16.3)	
WFNS 5	13	(19.7)	39	(48.8)	
WFNS, median (IQR)	2	(3)	4	(3)	**<0.001**
Treatments, n (%)					
Extra ventricular drain inserted	33	(50.0)	53	(66.3)	**0.047**
Lumbar drain	11	(16.7)	8	(10.0)	0.233
Ventriculoperitoneal shunt	16	(24.2)	15	(18.8)	0.652
Mechanical ventilation	36	(54.5)	63	(78.8)	**0.002**
Tracheostomy	9	(13.6)	14	(17.5)	0.524
Aneurysm specific treatment * analysis including treated Aneurysms (n=105)					
Endovascular coiling	39	(65.0)	26	(57.8)	**<0.001**
Surgical clipping	21	(35.0)	19	(42.2)	0.277
Max number of supporting organs					
Median (IQR)	3	(2)	4	(1)	**0.009**
Length of stay *analysis excluding patients who died during admission(51) n=95					
Critical Care length of stay (days)					
Median (IQR)	10.10	(11.8)	16.5	(14.4)	**0.003**
Hospital length of Stay (days)					
Median (IQR)	32.5	(35)	75	(53)	**<0.001**

Note: SD=standard deviation; y=years; IQR=interquartile; WFNS= World Federation of Neurosurgical Societies; GCS=Glasgow Coma Scale.

Discussion

- This study confirms that SAH is associated with significant mortality and poor neurological outcomes if there is a need for ICU admission (Virta et al., 2021). The one-year mortality of patients in this study was 36% which is comparable with other multicentre studies which reported 1 year mortality of 24 - 43% (Rehman et al., 2022; Virta et al., 2021).
- Looking at functional outcomes, when only including survivors, 26.3% of patients had poor 1-year outcome, rates higher than the ones reported in a recent pooled analysis of international population-based studies where poor functional outcomes were reported in just 15% of survivors (Rehman et al., 2022). More research is necessary to identify the reason for this difference.
- Patients with poor outcomes were older and had significantly worse GCS on admission. Whilst higher WFNS scores were seen in the poor outcome group, patients with high WFNS scores also had good outcomes.
- Furthermore, patients who underwent endovascular coiling were more likely to have a good outcome compared to those who were clipped. However, multiple factors went into decision making to offer one treatment versus the other. Closer look at these decision-making challenges, as well as patient demographics and disease severity are needed to determine how they influence outcome.

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