



Impact of specialist neurovascular care in subarachnoid haemorrhage[☆]



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ABSTRACT

Background: The management of neurosurgical disorders has become increasingly specialised. The care of patients with subarachnoid haemorrhage (SAH) has generally been part of core neurosurgical practice, provided by general neurosurgeons whatever their specialist interest. The aim of this present study therefore is to ascertain if, and to what extent care provided by a dedicated neurovascular team (compared to care provided by a general neurosurgical team) change patient disposition in SAH.

Methods: This is a retrospective analysis of SAH patients, identified from a departmental database of a single neurosurgical centre. In 2008, the service was reorganised such that a neurovascular team cared for all SAH patients. We compared clinical outcome in people admitted prior to this service reorganisation (Period A, 2004–2007) with patients admitted afterwards (Period B, 2009–2011). Survival and recovery were assessed according to the Glasgow Outcome Scale (GOS). Multi-factorial logistic regression analysis was performed to determine the injury and age adjusted incidence of complications, odds of survival at discharge, discharge home, mortality, good recovery (GOS 5) and favourable outcome, by dichotomising GOS (GOS 4–5 vs. GOS 1–3) at 3 months.

Results: 1114 patients were included in the study. The mean age of patients presenting in Period A ($n = 543$) was younger [50 years (SD 13.5)] than those in Period B ($n = 571$) [53 years (SD 13)]. Patients admitted in Period B were more likely to present as poor grade (World Federation of Neurological surgeons (WFNS) grades 4 and 5) compared to Period A (26.5% vs. 21.3%). No statistical differences between the groups in the incidence of pre-operative re-bleeding (3% vs. 5%) or rates of delayed cerebral ischaemia (16.1% vs. 16.1%) were observed.

After adjustment for age, sex and injury severity, the odds of patient time to discharge, discharge home and good recovery (GOS 5) were 27% ($p < 0.001$), 45% ($p = 0.001$) and 93% ($p < 0.001$) higher respectively in Period B than Period A.

Conclusions: The data presented here demonstrates that management of SAH by a dedicated neurovascular team improves the potential for patient recovery.

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1. Introduction

Aneurysmal subarachnoid haemorrhage (SAH) is a common neurosurgical emergency associated with a high morbidity and

mortality. Encouragingly, the overall outcome following SAH has improved significantly over the last 3 decades because of a number of factors including more timely diagnosis and better access to specialist treatment [1–3]. In addition, more aneurysms are now treated by endovascular coiling rather than surgical clipping, which may also have contributed to better outcomes.

Historically, the process of care from diagnosis, treatment of aneurysm, to in-patient management (critical care to discharge) was the responsibility and routine work of 'general' neurosurgeons. The introduction of neurosurgical subspecialisation along with the shift to aneurysms being treated endovascularly by interventional

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neuroradiologists has meant that SAH patient care is increasingly fragmented. As a result patients are cared for by a number of diverse specialities (sometimes stroke physicians and critical care physicians) each with their own range of expertise, experience and opinions on management [4,5].

It has been reported that clinical practices of non-specialists caring for SAH patients are heterogeneous and often at odds with available evidence, and in this setting a single specialty approach has been associated with poorer outcomes [6,7].

Multidisciplinary management of SAH patients by joint specialty care has been shown to reduce complications and intensive care length of stay [8], but this has not translated into better outcomes.

The aim of the present study therefore is to ascertain if, and to what extent care provided by a dedicated neurovascular team (compared to care provided by a general neurosurgical team) improves patient outcomes in SAH.

2. Methods

2.1. Study design

This is a retrospective single-centre sequential study comparing outcomes in patients presenting to the Greater Manchester Neuroscience Centre (GMNC) with a spontaneous SAH in two time periods between January 2004 and December 2007 (Period A) vs. January 2009 and December 2011 (Period B).

Data was extracted from prospective departmental log of all SAH patients treated at the GMNC since 2003. Patients presenting in the year 2008 were deliberately excluded, as it was the year that marked the change in services and the introduction of subspecialty neurovascular care.

2.2. Structure of the SAH service

Patients in Period A were admitted under the 'on call' consultant neurosurgeon, and preferentially had their aneurysm(s) treated by

an interventional neuroradiologist. Post-procedure, patients were managed in the neurosciences high dependency (nHDU) or intensive care (ICU) (supported by neuro-anaesthetists or non-specialist critical care physicians) areas under the supervision of the admitting consultant neurosurgeon. Patients were discharged to the neurosurgical ward when clinically indicated and followed up by the same neurosurgical team.

Over the course of 2008 vascular neurosurgical sub-specialisation was implemented in the department and all patients were admitted under vascular neurosurgeons.

SAH patients in Period B were admitted under the supervision of an on-call consultant neurosurgeon. Care was transferred to the neurovascular team on the next working day that included vascular neurosurgeons, a neurovascular fellow and a neurovascular specialist nurse. Following a multidisciplinary team imaging review, a decision was made about the type of aneurysmal intervention (if any) to be undertaken. Surgical clipping was performed by the vascular neurosurgeons and endovascular coiling was performed by the interventional neuro-radiologists. Following aneurysm intervention, the neurovascular team directly supervised ICU/nHDU care, in collaboration with non-specialist intensive care physicians and neuro-anaesthetists. A formal education programme, led by the specialist neurovascular nurse, was introduced, to teach all of the staff about the importance of identification and management of complications associated with subarachnoid haemorrhage.

It is important to note that the differences in management before and after 2008 stemmed from a reorganisation of services, and there was no change in treatment methods utilised (Fig. 1).

2.3. Patient characteristics and clinical data

Data for this study was obtained by amalgamating departmental databases that recorded the in-patient journey of all SAH patients admitted and treated at the GMNC. Any missing data was retrospectively obtained from hospital electronic records. Clinical and radiological characteristics were recorded including age, sex, clinical condition and injury severity, as determined by the World

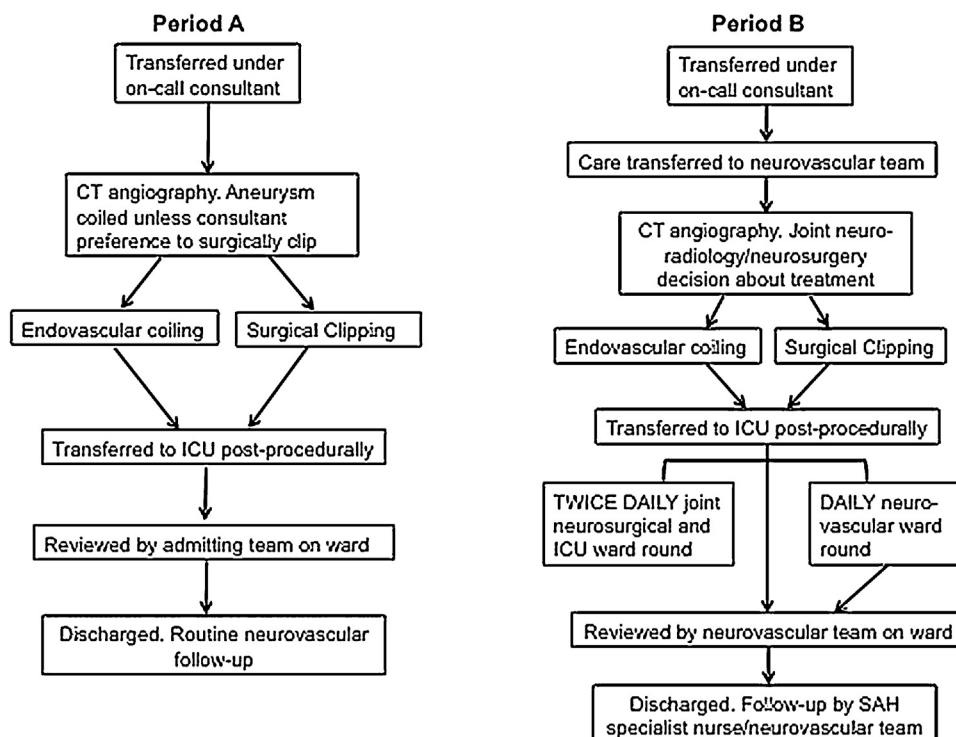


Fig. 1. Diagrammatic representation of the differences in the structure of the SAH service between Period A and Period B.

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