Clinical Standard Operating Procedure (SOP)

SUBARACHNOID HAEMORRHAGE

SETTING	Service-wide
FOR STAFF	All staff
PATIENTS	All patients with confirmed subarachnoid haemorrhage

Introduction

Aneurysmal (spontaneous) subarachnoid haemorrhage (SAH) occurs with an incidence of approximately 7.9 cases per 100,000 population per year. Approximately 85% of patients bleed from intracranial arterial aneurysms, 10% from non-aneurysmal peri-mesencephalic haemorrhage and 5% from other vascular abnormalities including arteriovenous malformations.

The mean age of patients is 50 years, with a higher incidence in women than men. Of those that have an intracranial source, 85% occur in the Circle of Willis with multiple aneurysms seen in around a third of patients. The principal symptom is of hyperacute severe headache. Other associated symptoms include dizziness, orbital pain, diplopia and visual loss. Some patients have motor or sensory disturbance, seizures and other focal neurology. Unfortunately, two thirds of patients have a reduced level of consciousness on admission to hospital.

The World Federation of Neurosurgical Societies (**WFNS**) grading system for SAH is widely used to classify the clinical severity with the higher the grade the higher the morbidity and mortality:

- **Grade 1**: GCS 15, no motor deficit
- **Grade 2**: GCS 13-14 without deficit
- **Grade 3**: GCS 13-14 with focal neurological deficit
- **Grade 4**: GCS 7-12 with or without deficit
- **Grade 5**: GCS <7 with or without deficit

Early diagnosis, transfer and treatment is critical to improving the outcomes and survival.

All cases should be referred to the local neurosurgical centre (UHP in Peninsula, NBT in Severn) via existing referral pathways using 'Referapatient'.

Referral

In the South West, all patients with WFNS grade 1-4 are routinely transferred to UHP/NBT for specialist neurosurgical and neurocritical care management. WFNS grade 5 patients should be discussed with the on-call neurosurgeon and a consultant-led decision should determine the appropriate management (i.e. transfer to neurosurgical centre or neuro-prognostication in the local ICU).

The on-call neurosurgeon must identify if the patient requires time-critical imaging on arrival in the receiving hospital (UHP and NBT have protocols for arranging this and meeting the patient) and these must be communicated to the transferring team. If the patient requires a time-critical intervention this should also be communicated to the transferring team.

Transfer

Patients with SAH are at risk of sudden and potentially rapid deterioration. They should be monitored in an appropriate high-care environment (e.g. Emergency Department, monitored ward area, ICU) prior to transfer to the neurosurgical centre. Transfer is always urgent and sometimes time critical (e.g. deteriorating clinical course due to hydrocephalus).

Early deterioration is commonly as a result of re-bleeding, acute hydrocephalus or seizures which often lead to a lower conscious level necessitating intubation and ventilation for transfer. Non-neurological complications that can occur include neurogenic pulmonary oedema and cardiac dysfunction which may require additional stabilisation and intervention prior to transfer. When these non-neurological complications occur they are associated with poorer grade SAH and, **if they have arisen after initial referral discussion, the case should be rediscussed with the responsible neurosurgical team prior to transfer**.

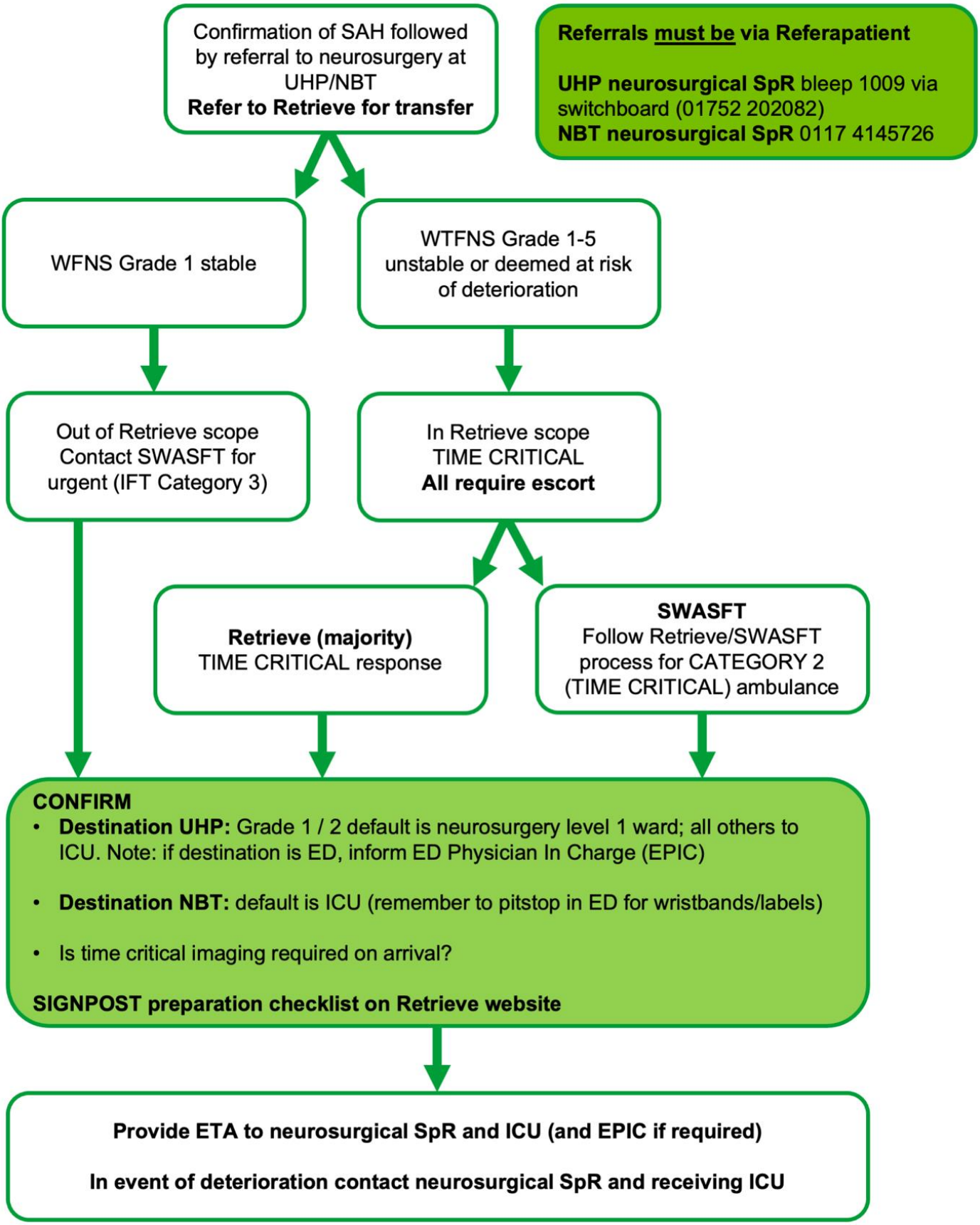
Risk assessment and clinical escorts

SAH patients can be subcategorised for transfer into two groups:

- WFNS Grade 1 who are appraised by the neurosurgical team to be lower risk. Examples of these patients are those who have delayed presentation, are diagnosed with lumbar puncture following negative CT and who have no organ support requirements or signs of hydrocephalus. **Note:** even stable and lower risk patients can rebleed. The majority of acute presentations **do not** fall within this category.
    - These patients **do not** routinely require a medical escort and their low risk of deterioration should be confirmed with the neurosurgical team and receiving ICU.
    - These patients are not in the scope of Retrieve.
    - They should be transferred by South Western Ambulance Service NHS Foundation Trust (SWASFT) as an IFT Category 3 (escalation of care, non-time critical) transfer.
    - Deterioration in this group is due to rebleed and patients should be managed with expedited transfer and standard ABCDE approach by ambulance crew.
- WFNS Grade 1-5 who are unstable or deemed at risk of deterioration (Grade 1 with early hydrocephalus, high blood load, etc).
    - These patients **are critical care patients** and **must be escorted by appropriately trained and experienced clinical escorts** (in line with South West Critical Care Network and national guidance).
    - All of these patients **are in the scope of Retrieve** and **all should be referred**.
    - They should be transferred by Retrieve or SWASFT as an escalation (time critical) or IFT Category 2 transfer.
    - Some of these patients will require repeat time critical imaging on arrival in UHP/NBT to determine initial destination (e.g. direct to theatre vs ICU).

In line with usual practice, if the referring clinician is uncertain, an early referral to Retrieve 24/7 is encouraged to enable a conversation with the Duty Consultant and support appropriate decision-making.

The referral and transfer process is summarised in the flowchart on the next page.


Confirmation of SAH followed by referral to neurosurgery at UHP/NBT
Refer to Retrieve for transfer
Referrals must be via Referapatient
UHP neurosurgical SpR bleep 1009 via switchboard (01752 202082)
NBT neurosurgical SpR 0117 4145726
WFNS Grade 1 stable
WTFNS Grade 1-5 unstable or deemed at risk of deterioration
Out of Retrieve scope Contact SWASFT for urgent (IFT Category 3)
In Retrieve scope TIME CRITICAL
All require escort
Retrieve (majority)
TIME CRITICAL response
SWASFT
Follow Retrieve/SWASFT process for CATEGORY 2 (TIME CRITICAL) ambulance
CONFIRM
• Destination UHP: Grade 1 / 2 default is neurosurgery level 1 ward; all others to ICU. Note: if destination is ED, inform ED Physician In Charge (EPIC)
• Destination NBT: default is ICU (remember to pitstop in ED for wristbands/labels)
• Is time critical imaging required on arrival?
SIGNPOST preparation checklist on Retrieve website
Provide ETA to neurosurgical SpR and ICU (and EPIC if required)
In event of deterioration contact neurosurgical SpR and receiving ICU

Specific clinical care

SAH patients (**excluding** the WFNS Grade 1 patients appraised as lower risk, as described above) should receive time critical transfer care from the Retrieve team with the following interventions:

Airway	• Manage as required • Accurately document presentation and pre-intubation GCS
Breathing	• Aim SpO_2 ≥96% • PaO_2 ≥10kPa if ventilated • $PaCO_2$ 4.5-5.0kPa if ventilated

Circulation	• Aim sBP 120-160mmHg
	  • Hypotension: fluids + vasopressor
	  • Hypertension (**treat** if >160): labetalol infusion
	• Maintain euvolaemia
	• Arterial line for all patients (must not delay transfer)

Disability	• Monitor GCS regularly (15 mins) • Normoglycaemia (6-10mmol/L) • Neuroprotective measures • Load with levetiracetam *only* if evidence of seizures
GI	• NG tube if intubated (must not delay transfer)
Other	• Normothermia • Na^+ 135-145mmol/L

Medication	• Nimodipine for all patients:
	  • 60mg 4 hourly (30mg 2 hourly if significant fall in BP)
	  • IV **will not** be used in Retrieve
	• Analgesia and antiemetics for all

Communication

The Retrieve team should follow the respective processes for patients at UHP and NBT.

UHP: process described in 'UHP transfers' SOP.

- Contact neurosurgical SpR (bleep 1009 via switchboard 01752 202082) prior to departure from referring hospital to confirm acceptance, destination within UHP and to give estimated time of arrival.
- Contact ED / ICU / Duty Floor Anaesthetist depending on destination to convey ETA.

NBT:

- Contact neurosurgical SpR (0117 4145726) prior to departure from referring hospital to confirm acceptance, destination within NBT and to give estimated time of arrival.
- Contact ICU Consultant (0117 4141499) to confirm which Pod and to convey ETA. They will arrange for you to be met by an ICU team if time critical imaging is required.

Review of process

This SOP has been developed by Retrieve in collaboration with the neurosurgical teams in UHP and NBT via the South West Neurosurgical Transformation Group. Activity, feedback and suggested modifications to the processes will be collected by both the Group and Retrieve to inform evolution of the document.

Document Governance

REFERENCES	1. Association of Anaesthetists and Neuro and Anaesthesia Critical Care Society, 2019. Safe transfer of the brain injured patient: trauma and stroke,2019. https://associationofanaesthetists-publications.onlinelibrary.wiley.com/doi/epdf/10.1111/anae.14866 (accessed 17/8/22) 2. NICE Guideline - Subarachnoid haemorrhage caused by a ruptured aneurysm: diagnosis and management Draft for consultation, February 2021 3. Welbourne J, *et al*. Peninsula guide to transferring the adult with a time critical brain injury, 2019. 4. North Bristol NHS Trust ICU / Neurosurgery SAH guidelines, 2021
RELATED DOCUMENTS AND PAGES	
AUTHORISING BODY	Neurosurgery Transformation Group (January 2023)
SAFETY	SAH patients are at significant risk of deterioration during transfer and all measures should be taken to ensure they receive appropriate management and escort whilst en-route to the neurosurgical centres.
QUERIES AND CONTACT	Retrieve Leadership Team