Contents

Important Contacts for the Stroke Team ................................................................. 2

Hyperacute Management ....................................................................................... 2
  Brain imaging ........................................................................................................ 2
  Acute ischaemic stroke ....................................................................................... 2
  Intracerebral haemorrhage (ICH) ...................................................................... 2

Physiological Support ............................................................................................ 3
  Hypertension ....................................................................................................... 3
  Hypotension ......................................................................................................... 3
  Fever .................................................................................................................... 3
  Glucose ................................................................................................................ 4
  Oxygen .................................................................................................................. 4
  Cardiac arrhythmia ............................................................................................. 4
  Fluids and electrolytes ....................................................................................... 4

Prevention and Management of Complications ..................................................... 4
  Swallowing .......................................................................................................... 4
  Nutrition .............................................................................................................. 4
  Venous thromboembolism .................................................................................. 4
  Urinary catheters ................................................................................................. 5
  Pressure areas ..................................................................................................... 5
  Cerebral oedema .................................................................................................. 5
  Hydrocephalus .................................................................................................... 5
  Seizures ................................................................................................................ 5
  Agitation ............................................................................................................... 5

Early Secondary Prevention .................................................................................. 6
  Antiplatelet therapy ............................................................................................ 6
  Therapeutic anticoagulation ............................................................................. 6
  Blood pressure .................................................................................................... 6
  Lipids ................................................................................................................... 6
  Carotid stenosis ................................................................................................. 7
  Lifestyle modifications ....................................................................................... 7

Early Rehabilitation ............................................................................................... 7

References .............................................................................................................. 7
Important Contacts for the Stroke Team

<table>
<thead>
<tr>
<th>Contact</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke nurse on duty (SNOD)</td>
<td>Mobile: 07795 591295; Bleep 3730</td>
</tr>
<tr>
<td>Cardiac and Stroke Receiving Unit (CSRU)</td>
<td>Extension 5443 (Wycombe)</td>
</tr>
<tr>
<td>Hyperacute Stroke Unit (HASU, Ward 8)</td>
<td>Extension 6113 or 6114 (Wycombe)</td>
</tr>
<tr>
<td>Stroke registrar (9am - 5pm, Monday - Friday)</td>
<td>Bleep 3001/3002</td>
</tr>
<tr>
<td>Medical registrar on-call at Wycombe (for out of hours)</td>
<td>Bleep 9112</td>
</tr>
<tr>
<td>Medical SHO on-call at Wycombe</td>
<td>Bleep 9113</td>
</tr>
<tr>
<td>Stroke physician on-call (SPOC)</td>
<td>Available via switchboard</td>
</tr>
</tbody>
</table>

The stroke nurse on duty (SNOD) at Wycombe Hospital (WH) should be made aware of all patients with suspected stroke.

Patients presenting to Stoke Mandeville Hospital (SMH) with suspected stroke should be discussed with the stroke team at Wycombe Hospital as soon as possible to decide on the most appropriate management. This should be with the SNOD in the first instance.

Patients within the time window for thrombolysis should be transferred to Wycombe CSRU as a “time critical transfer”. See Guideline 274 Stroke Patients presenting to Stoke Mandeville Accident and Emergency Department.

Patients should be clerked using the Acute Stroke Admission Pathway (Guideline 149A).

Patients with transient ischaemic attack (TIA) should be managed according to Guideline 759AA TIA Risk Assessment and Referral Form. These cases should be discussed with the SNOD as appropriate.

**Hyperacute Management**

**Brain imaging**

Should be performed **immediately (ideally next slot or within one hour)** in the following cases:

- Indication for thrombolysis (will need an immediate scan) or early anticoagulation.
- On anticoagulant therapy
- Known bleeding tendency
- Depressed level of consciousness (GCS <13)
- Unexplained fluctuating neurological symptoms
- Papillodema, neck stiffness or fever
- Severe headache at onset of symptoms

All people with acute stroke should have brain imaging within 4 hours of arrival in hospital.

**Acute ischaemic stroke**

Consideration should be made for acute thrombolytic therapy and thrombectomy.

**THROMBOLYSIS**

See Guideline 149A Acute Stroke Admission Pathway for inclusion/exclusion criteria, dosage, and monitoring guidelines.

**THROMBECTOMY**

Patients should be considered for thrombectomy if they have a disabling stroke (NIH score 6 or more) and were independent prior to the stroke (modified Rankin Score of <3). Such patients should have a computed tomography angiogram (CT angiogram) if available. If this shows large vessel occlusion in the distal internal carotid artery, middle cerebral artery, or basilar artery then the patient should be referred to a Neuroscience Centre (see Guideline 149A Acute Stroke Admission Pathway).

**Intracerebral haemorrhage (ICH)**

- Anticoagulation with warfarin should be reversed immediately using both prothrombin complex concentrate and intravenous vitamin K (discuss with haematologist).
- Systolic blood pressure should be lowered to 140 mmHg in patients with intracerebral haemorrhage (ICH) who do not have clinical or radiological evidence of raised intracranial pressure.
pressure (see Guideline 150 Blood Pressure Management in Acute Intracerebral Haemorrhage). Other patients should have their systolic blood pressure lowered to 180 mmHg if over this level.

- Patients with intracerebral haemorrhage should be monitored in the HASU and should be referred for immediate brain imaging if there is any change in level of consciousness, unless it has already been determined that they are not for neurosurgical input.

- A neurosurgical opinion should be obtained if there is any doubt as to whether the patient may be a candidate for neurosurgical intervention. Indications for neurosurgery include patients with:
  - Posterior fossa intracerebral haemorrhage (especially cerebellar bleeds).
  - Primary intracerebral haemorrhage who have hydrocephalus.
  - An intracerebral haemorrhage who are deteriorating clinically.
  - Intracerebral haemorrhage secondary to a cerebral aneurysm or other vascular abnormality.

### Physiological Support

There is very strong evidence that Stroke Unit care reduces mortality and morbidity in patients with acute stroke. Patients suspected of having acute stroke should be transferred to the HASU within 4 hours of their admission to the CSRU.

### Hypertension

In general, any pre-existing antihypertensive medication should continue to be given, assuming the patient can swallow and take their medication. If the patient is unable to swallow, consult the ward pharmacist for advice.

Antihypertensive treatment in acute stroke is recommended if there is one or more of the following:

- Hypertensive encephalopathy.
- Hypertensive nephropathy.
- Hypertensive cardiac failure.
- Aortic dissection.
- Pre-eclampsia/eclampsia.
- Intracerebral haemorrhage with systolic blood pressure over 140 - 180 mmHg (see above).

Acutely elevated blood pressure (BP) is common following ischaemic stroke and should not be treated aggressively. In patients with a systolic BP >220 mmHg, or a diastolic BP >110 mmHg, blood pressure should be reduced gradually.

Candidates for intravenous thrombolysis should be considered for blood pressure reduction if blood pressure is above 185/110 mmHg. This can be achieved in most cases using intravenous labetalol. If using labetalol intravenously, give 10 - 20 mg over 1 - 2 minutes. An alternative is intravenous glyceryl trinitrate (GTN) infusion 0.5 - 10 mg per hour or a GTN patch at 5 mg over 24 hours. For oral therapy consider ramipril 2.5 mg or amlodipine 5 mg.

### Hypotension

If the blood pressure is below 140 mmHg systolic in ischaemic stroke then omit normal antihypertensives and correct hypovolaemia with intravenous sodium chloride 0.9%. Consider a cause of hypotension, e.g. cardiac ischaemia, arrhythmia or sepsis.

In patients with known severe carotid disease or severe intracranial atherosclerosis the systolic blood pressure should be kept above 150 – 160 mmHg if possible.

### Fever

Treat hyperthermia (temperature >37.5°C) with paracetamol (1 g four times daily PO/IV) and cooling (fans, sponging).

Identify and treat any infection following the guidelines given on the Antimicrobial sector of MicroGuide (see https://viewer.microguide.global/BUCKS). Infections such as pneumonia and
urinary tract infection (UTI) are a common complication post stroke and should be identified and managed. Patients being evaluated for post-stroke pneumonia should have a chest x-ray and blood cultures taken.

**Glucose**
If the blood glucose remains >15 mmol/L consider starting an insulin sliding scale, as high blood glucose can worsen the ischaemic damage. (RCP Stroke Guidelines, 2016)

**Oxygen**
Give oxygen (24%) to patients with oxygen saturations persistently below 95%.

**Cardiac arrhythmia**
Patients should have continuous cardiac monitoring for the first 48 hours on the HASU.

**Fluids and electrolytes**
Correct hypovolaemia and then give maintenance fluids. Most acute stroke patients will need intravenous (IV) fluid therapy. Consider using IV sodium chloride 0.9% for fluid replacement. Avoid glucose if possible, in the first 48 hours (unless hyperosmolar, hypoglycaemic or on an insulin sliding scale).

**Neurological Deterioration**
See potential causes in box below.

### Causes of neurological deterioration after stroke
- Carotid stenosis with recurrent embolisation
- Carotid stenosis with low flow (possibly with hypotension)
- Recurrent cardioembolism
- Seizure (especially after haemorrhage)
- Sepsis/hypoglycaemia/hypoxia/hypotension (e.g. arrhythmia)
- Cerebral oedema (peaks at day 3 - 5 after infarction)
- Haemorrhagic conversion of infarction
- Evolving lacunar infarction (capsular warning syndrome or ‘stroke-in-evolution’)
- Hydrocephalus (ICH with intraventricular blood, posterior fossa bleed/infarct)
- Expanding haematoma or rupture into ventricle

**Prevention and Management of Complications**
Much of the mortality and morbidity following stroke is from secondary complications.

**Swallowing**
All patients with acute stroke should be screened for a swallowing disorder before being given oral food/fluids/medication. This should be done by a person with specific training in swallowing disorders using the pathway in [Guideline 149A Acute Stroke Admission Pathway](#).

**Nutrition**
All patients should be screened for malnutrition using the Malnutrition Universal Screening Tool (MUST). Consideration should be made for a nasogastric tube within the first 24 hours if the patient is not eating orally.

**Venous thromboembolism**
First line thromboembolism prophylaxis in patients with acute stroke is with intermittent pneumatic compression (IPC) sleeves - see [Guideline 149A Acute Stroke Admission Pathway](#).

Deep vein thrombosis (DVT) prophylaxis using heparin should NOT be used routinely in the first 1 - 2 weeks after stroke.
**Urinary catheters**

Catheters should be avoided where possible. Incontinence is not an appropriate indication for urinary catheterisation. Appropriate indications for urinary catheterisation are:

- Urinary retention.
- Need for accurate fluid balance.
- Sacral pressure area.
- Dignity in end of life care.

**Pressure areas**

Pressure areas should be prevented by risk assessment (e.g. Waterlow), pressure-relieving mattresses where appropriate, regular inspection and attention to nutrition.

**Cerebral oedema**

This tends to peak at 3 - 5 days after cerebral infarction.

Patients with space-occupying cerebellar infarction and reduced conscious level should be discussed with neurosurgery for consideration of urgent decompressive surgery.

In selected patients with space-occupying supra-tentorial infarction (malignant middle cerebral artery syndrome), consider referral for urgent hemispherectomy (surgical decompression). This should be done after discussion with the SPOC. Suitable patients will have little co-morbidity, have large middle cerebral artery (MCA) territory strokes and have drowsiness. Referrals are made in the first instance to the John Radcliffe Stroke Unit on-call team. If suitable, patients are transferred to the Stroke Unit at the John Radcliffe where they will be reviewed by the neurosurgeons. Referrals should be made within 24 hours of stroke onset and surgery should occur within 48 hours of stroke onset.

**Hydrocephalus**

Consider if there is neurological deterioration, especially if there has been intraventricular haemorrhage or if there has been posterior fossa stroke (e.g. cerebellar bleed or infarction). Urgent ventriculostomy may be required.

**Seizures**

Common, especially after lobar cerebral haemorrhage. Consider in any deterioration and treat conventionally, e.g. with diazepam 10 mg IV or lorazepam 4 mg IV as necessary. If there is no IV access then diazepam 10 – 20 mg rectally can be considered (monitor respiration).

If there is a failure of benzodiazepines for status epilepticus then consider levetiracetam or phenytoin. Levetiracetam is generally preferred first line in stroke patients as there is less cardiovascular risk. If phenytoin is used, continuous cardiac monitoring is required. Phenytoin should be given as an infusion of 20 mg/kg at a rate not exceeding 50 mg/minute. A maintenance dose of 100 mg three times per day orally or intravenously is then given. Prepare the initial infusion using the Buckinghamshire Healthcare NHS Trust Adult and Paediatric Injectables Guide. See also **Guideline 73FM Phenytoin Information for Prescribing, Monitoring and Administration in Adults**.

For patients requiring inpatient control of seizures, whose seizures have terminated, levetiracetam is the drug of choice. For those with a high risk of early recurrence (e.g. multiple seizures over a short time period) this can be given at a dose of 500 mg BD either PO or IV if necessary, after a loading dose of 1000 mg IV initially. For patients with a low risk of early recurrence who are inpatients then start at 250 mg BD orally and increase to an initial maintenance dose of 500 mg BD over a few days. Further increases should be made on the basis of seizure recurrence. The initial maintenance dose may be adjusted for specific patients (250 mg twice daily is reasonable in the frail elderly and 750 mg twice daily in younger patients with a high body mass index (BMI)). For outpatients, the standard regimen of 250 mg once daily, increasing every 2 weeks to an initial maintenance dose of 500 mg BD, should be used.

**Agitation**

Consider urinary retention or other sources of pain and manage appropriately. If necessary, use short acting benzodiazepines in the first instance (e.g. midazolam 2.5 mg by subcutaneous injection).
Early Secondary Prevention

All patients should have appropriate investigation to determine the cause of the stroke (see Guideline 145 Evaluation and Investigation of Acute Stroke).

Antithrombotic Therapy

- Antithrombotic therapy should be given to all patients with acute ischaemic stroke and in whom brain imaging has excluded an intracerebral haemorrhage and should be given according to the stroke antithrombotic guideline. See Guideline 708FM Antithrombotics and Rivaroxaban 2.5 mg Tablets for Secondary Prevention of Occlusive Vascular Events.

- Gastrointestinal bleeding prophylaxis for patients on dual antithrombotic therapy should be given as per Appendix 1 in Guideline 708FM above.

Therapeutic Anticoagulation

- In patients with ischaemic stroke who have atrial fibrillation or other cardioembolic source, anticoagulation should be delayed for 10 - 14 days if the stroke is large. The patient should receive aspirin 300 mg daily during this period. If the stroke is small, anticoagulation can be started sooner. The decision to start anticoagulation earlier than 14 days should be taken only by the stroke physician responsible for the patient.

- All patients with atrial fibrillation who are being started on anticoagulation should have a referral form sent to the New Oral Anticoagulant (NOAC) Clinic.

- If a new oral anticoagulant (dabigatran, rivaroxaban, apixaban, edoxaban) is initiated then antithrombotic agents should be stopped at the start of anticoagulation in most cases, unless the patient requires long term treatment with both anticoagulation and antithrombotic treatment. This decision will be made by the treating stroke physician.

- Treatment with therapeutic doses of fractionated or unfractionated heparin should be reserved for highly selected cases and should be undertaken only after discussion with a consultant. There is a significant risk of haemorrhagic conversion of cerebral infarction with the use of therapeutic doses of heparin or low molecular weight heparin.

Blood Pressure

Long term blood pressure reduction after stroke prevents further vascular events. Treatment should be initiated or increased to achieve a blood pressure below 130/80 except in severe bilateral carotid stenosis (over 70% stenosis) when the target is 150 - 160 systolic.

The blood pressure often falls spontaneously over the first few days after stroke, so blood pressure lowering therapy for long term secondary prevention should be initiated at hospital discharge or at 1 - 2 weeks, whichever is later.

If target BP not achieved, refer to specialist.

Agent of choice (from NICE guidelines on Hypertension in Adults, updated November 2016):

- Over 55 years, or black people of African or Caribbean family origin of any age:
  Long acting dihydropiridine calcium channel blocker (e.g. amlodipine) or, if not tolerated or there is evidence of (or a high risk of) heart failure, give a thiazide-like diuretic, e.g. indapamide.
  If not achieved add ACE-I (e.g. ramipril) or ARB (e.g. candesartan)

- Under 55 years
  ACE–I or ARB
  See Guideline 227FM Clinical Management of Hypertension in Adults.

Lipids

Patients with non-cardioembolic ischaemic stroke or transient ischaemic attack (TIA) should be offered treatment with a statin unless contraindicated. Patients with cardioembolic stroke may be offered a statin, particularly if there is evidence of atherosclerosis – see Guideline 104FM Lipid Modification for Non-Familial Hypercholesterolaemia (for Adults) for recommendations on which statin to use.
Statin therapy should be started at 48 hours after stroke onset. Statin therapy should not be initiated after cerebral haemorrhage. Statins may nevertheless be appropriate if the risk of vascular events due to atherosclerosis is high.

**Carotid stenosis**

Any patient with a carotid artery territory TIA or stroke without severe disability should be considered for endarterectomy.

Carotid imaging should be organised, either magnetic resonance angiogram (MRA), duplex scan or computed tomography angiogram (CTA).

Endarterectomy should be considered in symptomatic stenosis of 50 – 99% using the NASCET criteria (symptomatic stenosis 70 – 99% using ECST criteria).

Surgery should be performed within two weeks of symptoms.

**Lifestyle modifications**

- Advise to stop smoking and support with formal smoking cessation programme.
- Advise to take regular exercise.
- Eat a diet rich in natural foods including fruit and vegetables, and avoid excess processed foods.
- Alcohol should be kept within recognised safe drinking limits.

**Early Rehabilitation**

Early sitting out and mobilisation help to reduce the incidence of stasis pneumonia, venous thromboembolism and pressure ulceration. However, mobilisation within 24 hours after stroke should only be for patients who require little or no assistance to mobilise, based on the results of the AVERT trial. Once medically stable such patients should receive frequent, short mobilisations in the first instance (National Clinical Guidelines for Stroke, 2016).

Some patients suffer neurological deterioration when placed in an upright position early after stroke and appropriate monitoring is necessary.

**References**


AHA Guidelines for the Early Management of Patients with Acute Ischaemic Stroke 2019 [https://www.ahajournals.org/doi/10.1161/STR.0000000000000211](https://www.ahajournals.org/doi/10.1161/STR.0000000000000211).

See also:

Guideline 34FM  Dabigatran: Guidance for Management of Overdose, Bleeding and Emergency/Elective Surgery
Guideline 73FM  Phenytoin Information for Prescribing, Monitoring and Administration in Adults
Guideline 104FM  Lipid Modification for Non-Familial Hypercholesterolaemia (for Adults)
Guideline 145  Evaluation and Investigation of Acute Stroke*
Guideline 149A  Acute Stroke Pathway – Part 1*
Guideline 149B  Acute Stroke Pathway – Part 2*
Guideline 150  Blood Pressure Management in Acute Intracerebral Haemorrhage*
Guideline 222  Adult and Paediatrics Injectables Guide*
Guideline 227FM  Clinical Management of Hypertension in Adults
Guideline 274  Stroke Patients Presenting to Stoke Mandeville Accident and Emergency Department*

Guideline 313FM  Dabigatran, Rivaroxaban and Apixaban for Atrial Fibrillation
Guideline 708FM  Antiplatelets and Rivaroxaban 2.5 mg Tablets for Secondary Prevention of Occlusive Vascular Events
Guideline 733FM  Thromboprophylaxis in the Hospital Setting: Reducing the Risk of Hospital Acquired Deep Vein Thrombosis or Pulmonary Embolism
Guideline 759AA  TIA Risk Assessment and Referral Form*

*BHT users only

<table>
<thead>
<tr>
<th>Title of Guideline</th>
<th>Management of Acute Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline Number</td>
<td>146FM</td>
</tr>
<tr>
<td>Version</td>
<td>6</td>
</tr>
<tr>
<td>Effective Date</td>
<td>June 2021</td>
</tr>
<tr>
<td>Review Date</td>
<td>June 2024</td>
</tr>
<tr>
<td>Original Version Published</td>
<td>June 2007</td>
</tr>
<tr>
<td>Approvals:</td>
<td></td>
</tr>
<tr>
<td>Stroke and Neurology Governance</td>
<td>January 2021</td>
</tr>
<tr>
<td>Medicines Check (Pharmacy)</td>
<td>6th May 2021</td>
</tr>
<tr>
<td>Clinical Guidelines Group</td>
<td>18th May 2021</td>
</tr>
<tr>
<td>Author/s</td>
<td>Dr Matthew Burn</td>
</tr>
<tr>
<td>SDU(s)/Department(s) responsible for updating the guideline</td>
<td>Stroke, Neurology, and Neurorehabilitation</td>
</tr>
<tr>
<td>Uploaded to Intranet</td>
<td>1st June 2021</td>
</tr>
</tbody>
</table>

Buckinghamshire Healthcare NHS Trust