**Adult Stroke Thrombolysis Guidelines**

<table>
<thead>
<tr>
<th>Full Title of Guideline:</th>
<th>Adult Stroke Thrombolysis Guidelines</th>
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</table>
| **Author (include email and role):** | Mark Vettasseri  
Stroke ST6, City Hospital  
Mark.vettasseri@nuh.nhs.uk  
Senthil Raghunathan  
Consultant Stroke Physician  
Nottingham University Hospitals  
Ganesh Subramanian  
Consultant Stroke Physician  
Stroke Governance Lead  
Nottingham University Hospitals |
| **Division & Speciality:** | Stroke Department, Medicine Division |
| **Scope (Target audience, state if Trust wide):** | Trust Wide  
Medical staff involved in the care of patients with acute ischaemic strokes who are considered for treatment with IV Thrombolysis |
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| **Explicit definition of patient group to which it applies (e.g. inclusion and exclusion criteria, diagnosis):** | Adult patients with an acute ischaemic stroke who are candidates to receive IV Thrombolysis  
This guideline covers initial assessment and management and the treatment of complications of thrombolytic therapy. |
| **Changes from previous version (not applicable if this is a new guideline, enter below if extensive):** | MT guidelines updated  
Monitoring updated  
BP guidance updated |
| **Summary of evidence base this guideline has been created from:** | 1. RCP National Clinical Guideline for Stroke  
2. NICE Stroke Guidelines (ng 128)  
3. NICE Appraisal for Alteplase (TA264)  
4. BCSH guidelines - “Measurement of non-Coumarin anticoagulants and their effects on tests of Haemostasis” |

*This guideline has been registered with the trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date or outside of the Trust.*
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# 1. Stroke Thrombolysis Pathway

## Eligibility Criteria for consideration of IV Thrombolysis
- Aged over 18 (there is no upper age limit)
- Clinical symptoms of a stroke lasting for over 30 mins with clear time of symptom onset
- Sufficient time available to administer thrombolysis within 4.5 hours of symptom onset

<table>
<thead>
<tr>
<th>ALL CRITERIA MET</th>
<th>CRITERIA NOT MET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceed with Thrombolysis Pathway</td>
<td>Refer to Stroke Guidelines (on intranet)</td>
</tr>
</tbody>
</table>

### Urgently Contact Berman 1 (Hyperacute Stroke Unit)
Arrange emergency transfer (Blue Light Ambulance) of patient to Berman 1. Berman 1 Staff will inform:

- **Mon-Fri 9am-5pm**: On-call Stroke Consultant and Stroke SpR.
- **All other times**: On-call Stroke Consultant and Hospital at Night (H@N). On-call Medical SpR and SHO MUST attend patient immediately on their arrival to Berman 1.

### Initial Management
- Focused history to clarify onset time and inclusion/ exclusion criteria are met (see page 4).
- Perform NIHSS Score and focused physical examination.
- Record Capillary Blood Glucose – Treat if <4 or >20.
- Record BP – If >185 systolic and/or >110 diastolic (refer to page 6).
- Secure IV access with 20G (pink) cannula or larger.
- Send bloods for FBC, U&E, Clotting, Bone Profile, LFT, TFT, ESR, Glucose, Group and Save.
- Record weight (if this will cause a significant delay then estimate weight).
- Request Emergency CT Head and CTA (if MT appropriate – see page 6) and phone CT Radiographers (ext 59400).

### Post CT Management
- CT Head must be reviewed by either Stroke Consultant or Radiologist to exclude contra- indications to thrombolysis.
- On-call Stroke Consultant will make decision on whether to proceed with thrombolysis.
- Patient consent should be obtained (see page 4).
- Do not wait for blood results unless patient is on anti-coagulation or they have a co-morbidity that could adversely affect blood count or coagulation screen. Thrombolysis can be administered if INR \( \leq 1.7 \) (see page 5 for advice when patients are on anti-coagulants).
- BP must be below 185/110 prior to thrombolysis (see page 6).
- Dose Alteplase according to weight (see page 5). Bolus can be given in Radiology Department.
- Patients with a stroke secondary to an intracranial proximal large vessel occlusion may be considered for mechanical thrombectomy (see page 6).

### Post-Thrombolysis Management
- All patients should be managed on Berman 1 Hyperacute Stroke Unit.
- Record observations as per Stroke Thrombolysis Observation Chart (STOC) for 24 hours post-thrombolysis. GCS should also be recorded at least 4 hourly or more often if condition dictates
- Maintain BP <185 systolic and <110 diastolic.
- Repeat NIHSS at 2 hours and 24 hours.
- Avoid urinary catheters, NG tubes, IM injections and arterial puncture for 24 hours after thrombolysis.
- Anti-platelets should not be given in first 24 hours and should only be commenced when risk of intracranial haemorrhage is felt to be low.
- See page 7 for management of the main post-thrombolysis complications.
- Refer to Stroke Guidelines (on intranet) for further management and investigations after 24 hours.
2. Inclusion Criteria

- Age over 18 years old (no upper age limit)
- Symptoms of acute stroke with a clear onset time
- Thrombolysis can be administered within 4.5 hours of symptom onset
- Haemorrhage excluded on neuro-imaging

3. Contra-indications

Absolute Contra-indications:

- Major surgery in last 14 days
- GI or urinary tract bleeding in last 21 days
- History of intracranial haemorrhage, Intra-cranial malignancy or intracranial AVM
- Symptoms suggestive of subarachnoid bleed (even if CT Head clear)
- BP greater than >185 systolic or >110 diastolic unresponsive to medical treatment (see page 6)
- INR >1.7
- Hyperglycaemia (>20) or Hypoglycaemia (<3)

Relative Contra-indications:

- Large hypodense area on CT scan (<1/3 of MCA territory)
- Stroke or head injury in last 3 months
- Rapidly improving NIHSS (National Institute of Health Stroke Severity Scale)
- Seizure at onset of symptoms
- Use of anti-coagulation in last 24 hours (see page 5)
- High pre-morbid dependency
- Lumbar Puncture or Arterial puncture at non-compressible site in last 7 days

The above list is not exhaustive.

If you are unsure of eligibility for thrombolysis (e.g. varying neurology (NIHSS score), possible stroke mimic) please discuss with on call Stroke consultant.

4. Patient Consent

- Verbal consent should be obtained from the patient prior to administering IV thrombolysis.
- If the patient lacks capacity to give their consent then a treatment decision should be made in their best interests. Where possible this should be discussed with their next-of-kin.
- Patients should be informed there is a 1 in 3 chance of improvement, 1 in 20 chance of bleeding and 1 in 100 chance of death.

5. Alteplase Administration

- Alteplase is the only agent licensed for thrombolysis of ischaemic strokes.
- Administer 0.9 mg/kg body weight up to a maximum of 90mg.
- 10% of this dose should be administered as a IV bolus dose over 2-3 minutes. This should be prepared as a solution at 1mg/ml.
- The remainder should be administered as an infusion over 60 mins. For infusions up to 50mg use 100ml saline. For doses over 50mg use 250ml saline.
- Use the following dosing table.

<table>
<thead>
<tr>
<th>Body Weight (kg)</th>
<th>Bolus (mg)</th>
<th>Infusion (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>3.6</td>
<td>32.4</td>
</tr>
<tr>
<td>45</td>
<td>4.1</td>
<td>36.4</td>
</tr>
<tr>
<td>50</td>
<td>4.5</td>
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<tr>
<td>90</td>
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<td>72.9</td>
</tr>
<tr>
<td>95</td>
<td>8.6</td>
<td>76.9</td>
</tr>
<tr>
<td>Over 100</td>
<td>9.0</td>
<td>81</td>
</tr>
</tbody>
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6. Patients on Anti-coagulants

- If a patient is on Warfarin thrombolysis can be administered as long as the INR is less than or equal to 1.7.
- Use of Unfractionated Heparin is not a contraindication if APTT is below 1.2
- Use of therapeutic dose Low Molecular Weight Heparin (e.g enoxaparin) in last 24 hours is an absolute contra-indication.
• A normal thrombin time and APTT would suggests that the therapeutic effects of Direct Thrombin inhibitors (e.g Dabigatran) is likely to be minimal and these patients can be considered for thrombolysis.
• Clotting screen is a poor marker of the activity of anti-Xa agents (Apixaban, Rivaroxaban and Edoxaban) and so thrombolysis is contra-indicated until at least 24 hours has elapsed since their last dose.

7. Mechanical Thrombectomy – Also please refer to ‘Management of Acute Stroke’ guidelines re indications for MT

• An Interventional Neuro-radiology service is available Monday-Friday between 8am-4pm, at the QMC Campus, which provides the mechanical thrombectomy service.
• Patients with a proximal intracranial large vessel occlusion (in the anterior circulation) causing a disabling stroke (NIHSS ≥6) should be considered for combination IV thrombolysis and mechanical thrombectomy. Although the commissioning criteria suggests that it is only for those who have had symptom onset in the last 6 hours, evidence suggests that it can be considered (in selected group of patients) in those who developed symptoms within the last 24 hours – if there is evidence of salvageable brain in neuroimaging.
• If there is a contra-indication to thrombolysis but not mechanical thrombectomy, then a referral should be considered if the procedure can begin within 5 hours of symptom onset.
• Mechanical thrombectomy can be performed up to 24 hours after the onset of symptoms in a Posterior Circulation Stroke (POCS). Please discuss with Stroke Consultant/ SpR on call if in doubt.

8 Hypertension Management

Blood pressure must be less than 185/110 diastolic prior to administering Alteplase, and must be maintained at this level for 24 hours after thrombolysis.

For rapid BP control

1. If BP remains high administer 10mg IV Labetalol over 1-2 mins. This can be repeated after 10 minutes if required.
2. If BP is unresponsive to Labetalol boluses or if Labetolol is contra-indicated (e.g bradycardia, Asthma, CCF, heart block) then commence a GTN infusion at a rate 0.6-12ml/hr.
3. If BP remains raised despite above measures then discuss with consultant about proceeding / continuing with thrombolysis administration.
**Note:** A rapid rise in blood pressure after thrombolysis may be due to an intracranial haemorrhage and should be considered as a potential cause.

9. Treatment of Complications of Thrombolysis

9.1 Bleeding After Thrombolysis

Intracranial bleeding should be suspected in any patient who experiences:
- Neurological deterioration (Drop in GCS of 2 or more, Increase in NIHSS of 4 or more)
- New headache
- Acute rise in blood pressure
- Nausea and vomiting

Extracranial bleeding is not always obvious but should be suspected if:
- Signs of shock
- Drop in BP
- Evidence of blood loss

If bleeding is suspected then the following steps should be followed:

1. Stop Alteplase infusion
2. Arrange appropriate urgent (next on list) imaging. If intra-cranial haemorrhage is suspected then non-contrast CT Head is required. If bleeding suspected from other non-compressible site then imaging might include CT chest or abdomen or endoscopic procedures.
3. Review admission bloods and send repeat FBC, Coagulation screen and Fibrinogen as urgent samples.
4. Inform on-call Stroke Consultant

If bleeding is confirmed and has occurred within 24 hours of administering Alteplase then rapid reversal may be required:

1. Administer 1g Tranexamic Acid in 100mls 0.9% Saline over 10 mins
2. Urgently check FBC, Coagulation screen, Fibrinogen and Group and Save. These samples should be hand delivered to the lab.
3. If Fibrinogen is <1.5 requests and administer 2 pools of cryoprecipitate.
4. Recheck fibrinogen after Cryoprecipitate and discuss with Haematology On-Call if still <1.5.
5. Consider Tranexamic Acid Infusion (1g in 250ml 0.9% Saline over 8 hours).
6. Discuss with Stroke Consultant about whether a referral to Neurosurgery or other appropriate specialty is required.
7. Consider 1g/kg 20% Mannitol at 10ml/min if CT shows evidence of midline shift secondary to oedema.

9.2 Anaphylaxis

Anaphylaxis is uncommon but can occur after receiving IV Alteplase. This should be suspected if any of the following features are present:

- Urticarial rash
- Bronchospasm
- Angioedema
- Shock

If an Anaphylaxis is suspected:

1. Stop Alteplase infusion immediately
2. Patient requires urgent medical review as per Advanced Life Support Guidelines
3. Administer 1:1000 Adrenaline 0.5-1ml SC depending on severity of reaction
4. IV Hydrocortisone 200mg
5. IV Chlorphenamine 10mg
6. IV fluid challenge with 500-1000ml saline of hypotensive/ shocked
7. Inform Critical Care Team

9.3 Cerebral Oedema

Raised Intracranial Pressure may be indicated by:

1. Unequal pupils
2. Drop in GCS
3. Nausea and vomiting
4. High BP and low pulse rate

An urgent CT Head should be arranged if cerebral oedema is suspected and if confirmed:

1. Discuss with Stroke Consultant
2. Avoid excessive fluid administration
3. Consider administration of 1g/kg 20% Mannitol over 1 hour. If this is administered, then catheterisation, fluid balance and electrolyte monitoring is required.
9.4 Malignant MCA Syndrome

Neurosurgical referral for consideration of a Decompressive Hemicraniectomy is required if a patient has suffered a large MCA territory stroke and meets the following criteria:

- No significant pre-stroke disability (modified Rankin Score <2)
- Neurological deficit consistent with an MCA stroke
- NIHSS > 15
- Signs on CT of an infarct involving over 50% of the MCA territory or an infarct volume of greater than 145 cm$^3$ on diffusion-weighted MRI images.
- Within 48 hours of stroke onset

Do not wait for a drop in GCS before making neurosurgical referral.

Exclusion criteria for decompressive Hemicraniectomy include:

- Both pupils fixed and dilated
- Haemorrhagic transformation of the infarct
- Life expectancy < 3 years
- Significant co-morbidities

Patients should not be excluded from surgery based on age alone.
10 References


NICE (2019). Stroke and transient ischaemic attack in over 16s: diagnosis and initial management (Clinical Guideline ng 128)

NICE (2012). Alteplase for treating acute ischaemic stroke. (Technology appraisal guidance TA264)

