Phase 2 Pilot Implementation of Thrombolysis for Acute Stroke
Guideline Content

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1.0 Introduction

Stroke is the third most common cause of death in industrialised countries after myocardial infarcts and tumour diseases (1). Stroke is the most common cause of permanent disability, with approximately 85% of strokes being ischaemic, with the remaining 15% being haemorrhagic. Since the incidence of stroke is strongly age-related, the number of people with stroke is expected to increase substantially over the next decade alongside the predicted increases in the elderly population (2).

The burden of stroke is heavy for both the patient and for society. Until recently, there was no pharmacological treatment available for acute stroke. Thrombolytict therapy with Alteplase within three hours of symptom onset significantly reduces death and disability at 90 days (3).

The stroke MCN supports the service to provide IV Alteplase within NHS Ayrshire and Arran. To facilitate implementation across NHS Ayrshire and Arran a phased implementation will take place. The second stage of the phased implementation will involve a service being commenced in Crosshouse Hospital from March 2010. This follows on from stage 1 of the phased implementation at Ayr Hospital which commenced in May 2009. The service will be provided Monday – Friday 0830 -1630 hours excluding public holidays. This second stage of the implementation plan will inform the planned development of a stroke thrombolysis service across NHS Ayrshire and Arran.

2.0 Rationale for Alteplase

Thromboembolic occlusion of an artery is a major cause of stroke. An occlusion of an artery leads to an immediate drop of blood flow into the corresponding arterial territory. Brain tissue with a blood flow between 10 and 20 ml/100g/min may survive for a few hours, but is likely to die if the blood flow is not rapidly re-established (2). Spontaneous reperfusion may occur through endogenous release of plasminogen activator, which stimulates plasmin formation from plasminogen. For larger occlusions this release seems insufficient to induce reperfusion in time to avoid a cerebral lesion (2).
Administration of Alteplase as an intravenous infusion mimics and amplifies this endogenous response. Reperfusion should be achieved as early as possible to avoid development of a cerebral lesion/s and to avoid complications caused by ischaemic injury to the blood vessel walls and the blood-brain barrier (2). Alteplase is the only rt-PA agent currently licensed for treatment in acute ischaemic stroke in the UK. The incidence of symptomatic neurological deterioration due to intracerebral haemorrhage is increased to around 2% with IV Alteplase (3).

Patients who are admitted with stroke within three hours of definite onset of symptoms, who satisfy the tight treatment criteria and have no compelling contra-indications, should be clinically considered for treatment with IV Alteplase by a stroke physician (12).

### 3.0 Purpose and Scope of the Guideline

The purpose of this clinical guideline is to clarify, standardise and ensure evidence based practice is applied to the administration of IV Alteplase in stroke. All staff are responsible for ensuring that they have the knowledge and competencies required and for adhering to the principles of this guideline. There will be ongoing evaluation of the process and this will inform future service delivery.

This guideline will provide guidance on the safe administration of IV Alteplase to adult patients within Ayr and Crosshouse Hospital Monday – Friday between 0830 hours and 1630 hours excluding public holidays.

### 4.0 Definition of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>A&amp;E</td>
<td>Accident and Emergency</td>
</tr>
<tr>
<td>Alteplase</td>
<td>Tissue plasminogen activator</td>
</tr>
<tr>
<td>BP</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>CT</td>
<td>Computerised Tomography</td>
</tr>
<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>FAST</td>
<td>Face Arm and Speech Test</td>
</tr>
<tr>
<td>FBC</td>
<td>Full Blood Count</td>
</tr>
<tr>
<td>GI</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>HASU</td>
<td>HyperAcute Stroke Unit</td>
</tr>
<tr>
<td>ICH</td>
<td>Intracerebral haemorrhage</td>
</tr>
</tbody>
</table>
5.0 Guideline Content

5.1 Ambulance Role

Ambulance staff play a key role in identifying patients suitable for IV Alteplase. Ambulance staff will assess the patient using the FAST criteria and then rapidly transport the patient to A&E at Ayr or Crosshouse Hospital.

5.2 Accident and Emergency Role

When a potentially suitable patient is identified for IV Alteplase then A&E should page the thrombolysis nurse. A&E staff will work in partnership with the thrombolysis nurse and Doctor receiving for thrombolysis in order to provide seamless care. A&E will assess the patient for stroke using ROSIER.

5.3 Thrombolysis Nurse Role

Within the HASU a nurse trained in thrombolysis will be highlighted on a daily basis (thrombolysis nurse). The nursing staff involved will be trained and certified in NIHSS, Modified Rankin score and have attended training in thrombolysis for acute stroke. The thrombolysis nurse will play a key role in co-ordinating care for the patient working in partnership with other departments. The thrombolysis nurse can be contacted via paging system. At Ayr: page 1935. At Crosshouse: page 3769

When informed by A&E of a potential patient for IV Alteplase the thrombolysis nurse will be responsible for notifying medical staff. At Ayr the thrombolysis nurse will notify the radiographer at CT scan. At Crosshouse A&E will contact the duty radiologist. The thrombolysis nurse will ensure a bed is available within HASU. If the patient is
suitable for IV Alteplase then the thrombolysis nurse will be responsible for initiating the Alteplase nursing care plan.

All nursing staff involved in caring for patients treated with IV Alteplase will be trained to recognise early signs of complications and appropriate remedial action.

5.4 Medical Role
Dr Godfrey / Dr Shah / Dr Ghosh / Dr Musbah will be the clinicians responsible for the clinical decision to treat and for initiation of treatment of patients with IV Alteplase during phase 2 of the implementation plan. As experienced stroke clinicians they will diagnose acute stroke and assess the patient’s suitability for IV Alteplase.

Examinations will include a full neurological examination, 12 lead ECG, NIHSS score, relevant bloods and reference to the inclusion/exclusion criteria and contraindications as defined within this document.

Criteria for treatment
- Male or female
- Age 18 -80 years
- Clinical diagnosis of ischemic stroke causing a measurable neurological deficit >4 and <25 on NIHSS.
- Time of symptom onset established to be less than 180 minutes (3 hours) before treatment would begin.
- Stroke symptoms present for at least 30 minutes and have not significantly improved before treatment. Symptoms must be distinguishable from an episode of generalized ischemia (i.e. syncope, seizure or migraine disorder).
- CT excludes haemorrhage well-established infarction or any contraindications such as tumour, abscess or early oedema with mass effect.
- Patients are willing to receive thrombolysis and give informed consent. Relatives are unable to give consent for treatment however it is good practice to discuss risks and benefits where appropriate. Where patients are unable to consent then medical staff should use section 47 of the Adults with Incapacity.
Contraindications to treatment with IV Alteplase

General:
- Hypersensitivity to the active substance or to any of the excipients.

Cases where there is a high risk of haemorrhage such as:
- Significant bleeding disorder at present or within the past 6 months
- Known haemorrhagic diathesis (including renal and hepatic insufficiency).
- Patients receiving oral anticoagulants, e.g. Warfarin sodium
- Manifest or recent severe or dangerous bleeding
- Known history of or suspected intracranial haemorrhage
- Suspected subarachnoid haemorrhage or condition after subarachnoid haemorrhage from aneurysm
- Any history of central nervous system damage (i.e. neoplasm, aneurysm, intracranial or spinal surgery)
- Recent (less than 10 days) traumatic external heart massage, obstetrical delivery, recent puncture of a non-compressible blood-vessel (e.g. subclavian or jugular vein puncture)
- Severe uncontrolled arterial hypertension
- Bacterial endocarditis, pericarditis
- Acute pancreatitis
- Documented ulcerative gastrointestinal disease during the last 3 months, oesophageal varices, arterial-aneurysm, arterial/venous malformations
- Neoplasm with increased bleeding risk
- Severe liver disease, including hepatic failure, cirrhosis, portal hypertension (oesophageal varices) and active hepatitis
- Major surgery or significant trauma in past 3 months
- Minor surgery within past 10 days including liver and kidney biopsy, thoracocentesis lumbar puncture or arterial puncture at a non-compressible site within past 14 days.
- GI or urinary or respiratory haemorrhage within the last 21 days.
- Haemorrhagic retinopathy
- Patient on peritoneal dialysis or haemodialysis.
Contraindications specific to acute ischaemic stroke:

- Symptoms of ischaemic attack beginning more than 3 hours prior to infusion start or when time of symptom onset is unknown.
- Minor neurological deficit or symptoms rapidly improving before start of infusion.
- Severe stroke as assessed clinically (e.g. NIHSS>25) and/or by appropriate imaging techniques.
- Seizure at onset of stroke.
- Evidence on the CT-scan of intracranial haemorrhage (ICH), well-established infarction or any contraindications such as tumour, abscess or early oedema with mass effect.
- Symptoms suggestive of subarachnoid haemorrhage, even if CT-scan is normal.
- Administration of heparin within the previous 48 hours and a thromboplastin time exceeding the upper limit of normal for laboratory.
- Patients with any history of prior stroke and concomitant diabetes.
- Prior stroke or head trauma within the last 3 months.
- Platelet count of below 100,000/mm3.
- Systolic blood pressure > 185 or diastolic BP > 110 mm Hg, or aggressive management (intravenous pharmacotherapy) necessary to reduce BP to these limits.
- Blood glucose <3 or >22mmol/L (approximately < 50 or > 400 mg/dl).

Use in children, adolescents and elderly patients

Alteplase is not indicated for the treatment of acute stroke in paediatric patients under 18 years or adults over 80 years of age.

Use in pregnant or lactating females

The Summary of Product Characteristics for Alteplase advises that there is very limited experience with the use of Alteplase during pregnancy and lactation. Studies in animals have shown reproductive toxicity. In cases of an acute life-threatening disease the benefit has to be evaluated against the potential risk. It is not known if Alteplase is excreted into breast milk.
5.5 Administration of Alteplase

Complications should be explained to the patient / family and where possible verbal consent obtained from the patient. If unable to obtain consent from the patient then section 47 of the Adults with Incapacity Act should be used. Where the medical practitioner complies with the certification requirements set out in section 47 of the Adults with Incapacity Act and completes a treatment plan, they will have the authority to give what treatment is reasonable.

Initiation of treatment must be performed by a physician specialising in neurological care. This includes the physician making up infusion and administering the bolus for the patient. During phase 2 this will be carried out by Dr Ghosh / Dr Musbah / Dr Godfrey and Dr Shah.

Total dose

0.9 mg/kg (maximum of 90 mg).

Initial bolus dose

10% of total dose given as IV bolus. Vials should be constituted to a concentration of 1mg/ml with the accompanying vial of water for injections as below:

<table>
<thead>
<tr>
<th>Concentration</th>
<th>10mg</th>
<th>20mg</th>
<th>50mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mg/ml</td>
<td>10ml</td>
<td>20ml</td>
<td>50ml</td>
</tr>
</tbody>
</table>

If foaming occurs, allow the vials to sit undisturbed until the foam subsides; the drug will remain active. **DO NOT SHAKE THE VIAL, AS AGITATION COULD DENATURE THE PROTEIN STRANDS.**

Please Note - if the package transfer device (50mgs vials) is used to reconstitute the Alteplase (will produce a 1mg/ml solution), ensure it is inserted into the diluent vial first as the powder vial is under partial vacuum.
**IV infusion**

Remaining 90% of dose should be given as an IV infusion over 60 minutes. Alteplase may be diluted further with sodium chloride 0.9% to a minimum concentration of 0.2mg/ml.

Alteplase must not be diluted with water for injections or carbohydrate infusion solutions e.g. glucose. It must not be mixed with other drugs, neither in the same vial nor via the same cannula. Use immediately after reconstitution of Alteplase and discard any remaining solution (4). Please refer to Appendix 11.

**5.6 Level of care for patients receiving Alteplase**

All patients will be admitted to the HASU within station 16 and ward 4D. Patients deemed suitable for IV Alteplase will receive the 10% bolus of Alteplase within the HASU. In exceptional circumstances where rapid initiation of treatment is necessary the 10% bolus may be administered in CT scan.

The patient will receive their care under the responsibility of an experienced stroke physician (Dr Ghosh / Dr Musbah / Dr Godfrey / Dr Shah), and will receive intensive monitoring as per protocol (see guidelines). Staff involved will have the appropriate skills and will be trained to recognise any complications at the earliest opportunity initiating appropriate treatment where required.
5.7 Equipment Required

- Peripheral Cannula
- Vial of Alteplase + water for injections for reconstitution +/- Sodium Chloride 0.9% (if further dilution desired)
- Syringes and Needles
- Standard I.V Giving Set
- Drip Stand
- Baxter Pump and Cardiac Monitor
- Sodium Chloride 0.9% 10mls flushes
- Infusion Chart
- Infusion fluid as per prescription
- 70% isopropyl alcohol swabs
- Non-sterile gloves
- Sharps disposal container
- Clinical waste bag
- Alcohol Gel

5.8 Potential complications

There are significant risks with administration of IV Alteplase which can be fatal. Risks include ICH, active bleeding, acute hypertension, and anaphylaxis. Staff should be alert to the early signs of complications and initiate treatment at the earliest opportunity. Any adverse effects should be reported via the Yellow Card Scheme. Any clinical incidents should be reported via DATIX system.
### 5.9 Guidelines

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain the procedure to the patient/family and obtain verbal consent. If necessary use the Adults with Incapacity Act.</td>
<td>To obtain consent.</td>
</tr>
<tr>
<td>2. Complete examination, bloods, investigations, record NIHSS score, ROSIER, and complete inclusion/exclusion criteria.</td>
<td>To ensure patients suitability for inclusion and reduce risk of complications.</td>
</tr>
<tr>
<td>3. If no contraindications rapidly transfer patient to CT scan.</td>
<td>To prevent time delay in initiation of IV Alteplase.</td>
</tr>
<tr>
<td>4. If no contraindications on CT scan make decision on whether to treat with IV Alteplase.</td>
<td>Clinical decision on whether to treat with Alteplase.</td>
</tr>
<tr>
<td>5. Rapidly transfer patient to HASU.</td>
<td>To provide area for patient to receive monitoring and management by skilled staff.</td>
</tr>
<tr>
<td>6. Connect patient to cardiac monitor.</td>
<td>To monitor for any abnormalities at earliest opportunity 6, 7.</td>
</tr>
<tr>
<td>7. Inspect the Alteplase to ensure it is clear, colourless and within date. Ensure Alteplase is prescribed on both electronic prescribing / prescription chart and high risk infusion chart. Check patients name, unit number, CHI if available and date of birth on prescription with details on identification bracelet.</td>
<td>To ensure correct drug and dose is administered to correct patient and prevent complications.</td>
</tr>
<tr>
<td>8. Undertake antiseptic hand hygiene e.g. apply alcohol hand-rub to socially clean hands (5).</td>
<td>To comply with standard infection control precautions.</td>
</tr>
<tr>
<td>9. Administer 10% bolus of IV Alteplase.</td>
<td>To commence treatment at earliest opportunity.</td>
</tr>
<tr>
<td>10. Prime the IV giving set with prescribed fluid.</td>
<td>To prevent air bubble formation in line.</td>
</tr>
<tr>
<td>11. Check the Alteplase with prescription chart and check patient’s name, unit number, CHI if available and date of birth on prescription with details on identification bracelet.</td>
<td>To ensure correct drug and dose is administered to correct patient and prevent complications.</td>
</tr>
<tr>
<td>12. Undertake antiseptic hand hygiene e.g. apply alcohol hand-rub to socially clean hands (5).</td>
<td>To comply with standard infection control precautions.</td>
</tr>
<tr>
<td>13. Commence infusion at prescribed rate and record start time, rate, and nurse on high risk infusion chart.</td>
<td>To ensure fluid is administered as prescribed.</td>
</tr>
<tr>
<td>14</td>
<td>Record Temperature, Pulse Respirations, oxygen saturations, blood pressure, neurological observations every 15 minutes for 2 hours, then every 30 minutes for 6 hours, then 1 hourly for 16 hours.</td>
</tr>
<tr>
<td>15</td>
<td>Ensure oxygen saturations above 95%.</td>
</tr>
<tr>
<td>16</td>
<td>Do not catheterise for the first 30 minutes post thrombolysis.</td>
</tr>
<tr>
<td>17</td>
<td>Do not administer antiplatelets, anticoagulants or NSAID for 24 hours.</td>
</tr>
<tr>
<td>18</td>
<td>Avoid central venous access and arterial puncture for first 24 hours.</td>
</tr>
<tr>
<td>19</td>
<td>Observe patient for complications and inform patient to alert staff if any change in condition noted.</td>
</tr>
<tr>
<td>20</td>
<td>Do not pass NG tube for the first 24 hours post thrombolysis.</td>
</tr>
<tr>
<td>21</td>
<td>Maintain bed rest for the first 24 hours.</td>
</tr>
<tr>
<td>22</td>
<td>Ensure patient receives repeat CT scan of brain at 24 hours.</td>
</tr>
<tr>
<td>23</td>
<td>Ensure patient is comfortable.</td>
</tr>
<tr>
<td>24</td>
<td>On completion dispose of waste in sharps container / clinical waste bag and apply alcohol hand-rub to hands.</td>
</tr>
</tbody>
</table>

### 6 Patients potentially suitable for Alteplase outwith hours

Patients who meet the criteria for IV Alteplase should be discussed with INS and if appropriate they should be rapidly transferred to INS. In exceptional circumstances where the service is not available Monday – Friday 0830 -1630 hours then suitable patients should be referred to INS for Alteplase if criteria met.
7 Related NHS Ayrshire & Arran Documents

NHS Ayrshire and Arran Control Of Infection Manual Section 18 Guidelines on the Care and Maintenance of Intravascular Devices.


NHS Ayrshire and Arran GHD- Code of practice for the administration of medicines.

8 References


9 Bibliography


APPENDIX 1

Algorithm for A&E for patient admitted with suspected stroke diagnosis

Patient considered potentially suitable for Alteplase

Page Thrombolysis Nurse Ayr: 1935 Crosshouse: 3769

- On arrival rapidly transfer patient onto trolley
- Ensure witness if present remains with patient

- Check FBC, platelets, coagulation screen, glucose, LFT’s, u’s & e’s, blood typing and cross match
- Send bloods as emergency to laboratory and inform laboratory of urgent requirement for results. Mark blood form for thrombolysis.
- Carry out 12 lead ECG
- Ensure peripheral cannula in situ and patent. Where possible insert 2 cannulas.
- Inform duty radiologist of potential thrombolysis patient (Crosshouse only).

- Record vital signs including neurological observations
- Check patient’s peripheral blood glucose.
- Work in partnership with stroke team

Patient suitable for thrombolysis
- Assist on transfer to CT scan
- End of A&E role

Unsuitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol
APPENDIX 2
Algorithm for Thrombolysis Nurse for suspected patient with stroke diagnosis

A&E notify Thrombolysis Nurse of potential patient for Alteplase

- Page Dr receiving for thrombolysis (Ayr) or phone Dr mobile (Crosshouse)
- Inform radiographer of potential patient for thrombolysis (Ayr only)

- Attend A&E
- Commence pre-thrombolysis checklist

- Work in partnership with A&E staff

- Assist A&E staff record vital signs including neurological observations
- Assist A&E staff check patients peripheral blood glucose
- Record patients weight in kgs

Patient suitable for thrombolysis
- Rapidly transfer patient to CT scan

No contraindications on CT scan
- Commence Alteplase stroke care plan
- Rapidly transfer patient to HASU
- Specialist Dr will administer 10% bolus of Alteplase & nurse will commence 90% infusion thereafter ideally within HASU
- Monitor patient as per protocol/care plan

Patient not suitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol

Complications
- Follow algorithm and protocol for management of complications

No complications
- Commence secondary prevention as pre acute stroke protocol

Contraindications on CT scan
- Discontinue algorithm
- Commence acute stroke protocol

No contraindications on CT scan
- Commence Alteplase stroke care plan
- Rapidly transfer patient to HASU
- Specialist Dr will administer 10% bolus of Alteplase & nurse will commence 90% infusion thereafter ideally within HASU
- Monitor patient as per protocol/care plan

No complications
- Commence secondary prevention as pre acute stroke protocol

Complications
- Follow algorithm and protocol for management of complications
APPENDIX 3
Algorithm for Stroke Thrombolysis

Patient admitted to Accident and Emergency with Suspected stroke diagnosis

Less than 3 hours since the onset of symptoms

Complete neurological examination, ROSIER, NIHSS, blood tests, past medical history, 12 lead ECG and criteria for inclusion on thrombolysis check list

Suitable for inclusion
- Arrange urgent CT scan brain

CT Result - No contraindications for thrombolysis
- Rapidly transfer patient to HASU
- Administer bolus of Alteplase
- Commence Alteplase infusion
- Monitor patient as per protocol

No complications
- Repeat CT brain 24 after treatment
- Follow acute stroke protocol for secondary prevention

More than 3 hours since the onset of symptoms

Unsuitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol

CT Result - Contraindications to thrombolysis

Unsuitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol

Complications Developed
- Follow algorithm and protocol for management of complications
APPENDIX 4

Algorithm for patients with symptoms of Intra-cerebral haemorrhage (ICH) receiving Alteplase

Patient receiving Alteplase with symptoms of ICH

- Stop infusion if symptoms of ICH e.g. new neurological deficit, nausea and vomiting, headache
- Record vital signs and neurological observations every 15 minutes until patient stabilises

- Arrange urgent CT scan

CT Result – haemorrhage present
- Discuss with neurosurgeons
- Obtain blood results
- If appropriate discuss with haematologist
- If appropriate administer cryoprecipitate containing Factor V111 and platelets
- Control blood pressure (see acute hypertension algorithm.)

CT Result – No haemorrhage
- Discontinue algorithm
- Follow medical management plan
- Follow acute stroke protocol

No neurosurgical intervention
- Correct any clotting disorders
- Manage as per primary ICH
- Consider repeat CT scan

Neurosurgical Intervention Indicated
- Correct any clotting disorders
- Rapidly transfer patient to Neurosurgical Unit
APPENDIX 5

Algorithm for patients with acute hypertension receiving Alteplase

**Patient receiving Alteplase with new onset acute hypertension:**
BP >220/120mm Hg (Single reading) or >185/110 mmHg (two readings 5 minutes apart)

- Stop infusion of Alteplase.
- Record vital signs and neurological observations every 15 minutes until patient stabilises
- Monitor patient as per Alteplase protocol
- If any signs of ICH present follow ICH algorithm

- Administer Labetalol 50mgs IV repeated 10-20 minutes OR
- Administer Glyceryl trinitrate infusion titrated

**TARGET BP<185/110**

When target BP achieved:
- Continue to monitor patients as per Alteplase protocol/care plans
- Follow acute stroke protocol for secondary prevention
APPENDIX 6

Algorithm for patients with active bleeding receiving Alteplase

Patient receiving Alteplase with symptoms active bleeding i.e. marked hypotension

- Urgently inform medical staff
- Stop infusion
- Use mechanical control where possible compression venous/arterial puncture sites.
- Record vital signs and neurological observations every 15 minutes until patient stabilises
- Commence volume replacement and maintain systolic BP >110

Blood taken for fibrinogen, PT, PTT, platelets, FBC, Group and Save – send to lab as emergency
- Obtain blood results

Abnormal blood results
- If appropriate discuss with haematologist
- Correct any clotting abnormalities
- Transfuse if required

No abnormal blood results
- Continue volume replacement and maintain systolic BP >110
- Monitor patient as per Alteplase and stroke protocol
- Treat patient as per medical management plan
- Discontinue algorithm

Discuss with surgeons

Surgical Intervention Indicated
- Correct any clotting disorders
- Rapidly transfer patient to theatre
- End of algorithm

No surgical intervention
- Correct any clotting disorders
- Manage as per medical management plan and monitor as per alteplase and stroke protocol
APPENDIX 7

Algorithm for patients with anaphylaxis receiving Alteplase

**Patient receiving Alteplase with symptoms of anaphylaxis i.e. hypotension**

Commence ABC management

- Urgently inform medical staff and urgent review by medical staff
- Stop infusion
- Commence volume replacement and maintain systolic BP > 110

When patient’s condition stabilises

- Administer adrenaline – follow NHS Ayrshire & Arran anaphylaxis guidelines
- Maintain oxygen saturations above 95%
- Consider steroids and antihistamines
- Record vital signs including neurological observations every 15 minutes until condition stabilises

**When patient’s condition stabilises**

- Continue to monitor patient as per Alteplase protocol
- Commence secondary prevention as per acute stroke protocol
- Document in medical and nursing notes reaction to Alteplase
- Enter reaction onto Electronic Prescribing (Ayr); Medication prescription chart (Crosshouse).
APPENDIX 8

Algorithm for referral to Institute of Neurological Sciences (INS) outwith Monday – Friday 0830-1630

Patient admitted to Accident and Emergency with Suspected stroke diagnosis

Less than 3 hours since onset of symptoms

Complete examination, ROSIER, blood tests, 12 lead ECG and criteria for inclusion on thrombolysis check list

Suitable for inclusion
- Discuss with INS neurologist / on call neurology registrar

Suitable for transfer to INS
- Don’t do CT scan – likely to cause delay unless clinically indicated.
- Rapidly transfer patient to INS sending any documentation, tests results
- Ensure relatives or witness arrives at INS with patient

Unsuitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol

More than 3 hours since onset of symptoms

Unsuitable for thrombolysis
- Discontinue algorithm
- Follow acute stroke protocol

Not for transfer to INS
- Discontinue algorithm
- Follow acute stroke protocol
APPENDIX 9

Modified Rankin Score (Circle appropriate answer)

<table>
<thead>
<tr>
<th>SCORE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No symptoms at all</td>
</tr>
<tr>
<td>1</td>
<td>No significant disability despite symptoms; able to carry out all usual duties and activities</td>
</tr>
<tr>
<td>2</td>
<td>Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance</td>
</tr>
<tr>
<td>3</td>
<td>Moderate disability; requiring some help, but able to walk without assistance</td>
</tr>
<tr>
<td>4</td>
<td>Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance</td>
</tr>
<tr>
<td>5</td>
<td>Severe disability; bedridden, incontinent and requiring constant nursing care and attention</td>
</tr>
<tr>
<td>6</td>
<td>Dead</td>
</tr>
</tbody>
</table>

TOTAL (0–6): ____
## APPENDIX 10

### NIHSS (Circle appropriate answer)

### 1. Level of Consciousness (LOC)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Alert- keenly responsive</td>
</tr>
<tr>
<td>1</td>
<td>Drowsy- rousable by minor stimulation to obey, answer, or respond</td>
</tr>
<tr>
<td>2</td>
<td>Stuporous- requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped)</td>
</tr>
<tr>
<td>3</td>
<td>Comatose- responds only with reflex motor or autonomic effects or totally unresponsive, flaccid</td>
</tr>
</tbody>
</table>

### 1b. LOC questions

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Answers both correctly</td>
</tr>
<tr>
<td>1</td>
<td>Answers one correctly</td>
</tr>
<tr>
<td>2</td>
<td>Both incorrect</td>
</tr>
</tbody>
</table>

### 1c. LOC commands

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Obeys both correctly</td>
</tr>
<tr>
<td>1</td>
<td>Obeys one correctly</td>
</tr>
<tr>
<td>2</td>
<td>Both incorrect</td>
</tr>
</tbody>
</table>

### 2. Best Gaze

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Partial gaze palsy- gaze is abnormal in one or both eyes, no forced deviation/total gaze paresis</td>
</tr>
<tr>
<td>2</td>
<td>Forced deviation- or total gaze paresis not overcome by oculocephalic manoeuvre</td>
</tr>
</tbody>
</table>

### 3. Visual Fields

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No visual loss(or in a coma)</td>
</tr>
<tr>
<td>1</td>
<td>Partial haemianopia</td>
</tr>
<tr>
<td>2</td>
<td>Complete haemianopia</td>
</tr>
<tr>
<td>3</td>
<td>Bilateral hemianopia-including cortical blindness</td>
</tr>
</tbody>
</table>

### 4. Facial Palsy

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Minor- flattened nasolabial fold, asymmetry on smiling</td>
</tr>
<tr>
<td>2</td>
<td>Partial- total or near total paralysis of lower face</td>
</tr>
<tr>
<td>3</td>
<td>Complete- absent facial movement in upper and lower face and lower face on one or both sides</td>
</tr>
</tbody>
</table>

### 5. Best Motor RIGHT ARM

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift- holds limb at 90 degrees for full 10 seconds</td>
</tr>
<tr>
<td>1</td>
<td>Drift- drifts down but does not hit bed</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity</td>
</tr>
<tr>
<td>4</td>
<td>No movement</td>
</tr>
</tbody>
</table>

### 6. Best Motor LEFT ARM

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift- holds limb at 90 degrees for full 10 seconds</td>
</tr>
<tr>
<td>1</td>
<td>Drift- drifts down but does not hit bed</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity</td>
</tr>
<tr>
<td>4</td>
<td>No movement</td>
</tr>
</tbody>
</table>

### 7. Best Motor RIGHT LEG

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift- holds leg at 45 degrees for full 5 seconds</td>
</tr>
<tr>
<td>1</td>
<td>Drift- drifts down but does not hit bed</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity</td>
</tr>
<tr>
<td>4</td>
<td>No movement</td>
</tr>
</tbody>
</table>

### 8. Best Motor LEFT LEG

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift- holds leg at 45 degrees for full 5 seconds</td>
</tr>
<tr>
<td>1</td>
<td>Drift- drifts down but does not hit bed</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity</td>
</tr>
<tr>
<td>4</td>
<td>No movement</td>
</tr>
</tbody>
</table>

### 9. Limb Ataxia

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Absent(or in coma)</td>
</tr>
<tr>
<td>1</td>
<td>Present in 1 limb</td>
</tr>
<tr>
<td>2</td>
<td>Present in 2 or more limbs</td>
</tr>
</tbody>
</table>

### 10. Sensory

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Partial loss- patient feels pinprick is less sharp or is dull on affected side</td>
</tr>
<tr>
<td>2</td>
<td>Dense loss(or in coma)- patient is unaware of being touched on face, arm, leg</td>
</tr>
</tbody>
</table>

### 11. Best Language

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No dysphasia</td>
</tr>
<tr>
<td>1</td>
<td>Mild- moderate dysphasia obvious loss of fluency or comprehension, without significant limitation on ideas expressed or form of expression. Makes conversation about provided material difficult or impossible, e.g. examiner can identify picture or naming card from patient’s response.</td>
</tr>
<tr>
<td>2</td>
<td>Severe dysphasia- all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener who carries burden of communication. Examiner cannot identify materials provided from patient response</td>
</tr>
<tr>
<td>3</td>
<td>Mute- no usable speech or auditory comprehension, or in coma.</td>
</tr>
</tbody>
</table>

### 12. Dysarthria

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal articulation</td>
</tr>
<tr>
<td>1</td>
<td>Mild- moderate dysarthria- patient slurs some words can be understood with some difficulty. Unintelligible or worse- speech is so slurred as to be unintelligible (absence of or out of proportion to dysphasia) or is mute / anarthic, or in coma</td>
</tr>
</tbody>
</table>

### 13. Neglect

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No neglect(or in a coma)</td>
</tr>
<tr>
<td>1</td>
<td>Partial neglect- visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities</td>
</tr>
<tr>
<td>2</td>
<td>Complete neglect- profound hemi-inattention or hemi-inattention to more than one modality. Does not recognise own hand or orients to only one side of space</td>
</tr>
</tbody>
</table>

Total: ________
APPENDIX 11

Body weight/ dose chart for Alteplase
The following chart can be used as an aid in calculating the volumes required for bolus and infusion doses. The reconstituted Alteplase may be diluted further with sodium chloride 0.9% to a minimum concentration of 0.2mg/ml. In most cases it can be made up into 100mls and set at rate of 100mls per hour (see below). Vials used are 50mgs.

Only 1 x 50mg vial required when total dose is below 50mgs.

<table>
<thead>
<tr>
<th>Weight Kilogram (Kg)</th>
<th>Total IV Alteplase Dose (mg) at 0.9 mg/kg</th>
<th>Alteplase Bolus (mg) <em>10% of total</em></th>
<th>Alteplase Bolus (ml)</th>
<th>Discard Saline from 100mls bag</th>
<th>Infusion Dose (mg)</th>
<th>Infusion Rate (ml/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.0</td>
<td>90.0</td>
<td>9.0</td>
<td>9.0</td>
<td>81</td>
<td>81.0</td>
<td>100</td>
</tr>
<tr>
<td>95.5</td>
<td>85.9</td>
<td>8.6</td>
<td>8.6</td>
<td>77.3</td>
<td>77.3</td>
<td>100</td>
</tr>
<tr>
<td>90.9</td>
<td>81.8</td>
<td>8.2</td>
<td>8.2</td>
<td>73.6</td>
<td>73.6</td>
<td>100</td>
</tr>
<tr>
<td>86.4</td>
<td>77.7</td>
<td>7.8</td>
<td>7.8</td>
<td>70</td>
<td>70.0</td>
<td>100</td>
</tr>
<tr>
<td>81.8</td>
<td>73.6</td>
<td>7.4</td>
<td>7.4</td>
<td>66.3</td>
<td>66.3</td>
<td>100</td>
</tr>
<tr>
<td>77.3</td>
<td>69.5</td>
<td>7.0</td>
<td>7.0</td>
<td>62.6</td>
<td>62.6</td>
<td>100</td>
</tr>
<tr>
<td>72.7</td>
<td>65.5</td>
<td>6.5</td>
<td>6.5</td>
<td>58.9</td>
<td>58.9</td>
<td>100</td>
</tr>
<tr>
<td>68.2</td>
<td>61.4</td>
<td>6.1</td>
<td>6.1</td>
<td>55.2</td>
<td>55.2</td>
<td>100</td>
</tr>
<tr>
<td>63.6</td>
<td>57.3</td>
<td>5.7</td>
<td>5.7</td>
<td>51.5</td>
<td>51.5</td>
<td>100</td>
</tr>
<tr>
<td>59.1</td>
<td>53.2</td>
<td>5.3</td>
<td>5.3</td>
<td>47.9</td>
<td>47.9</td>
<td>100</td>
</tr>
<tr>
<td>54.5</td>
<td>49.1</td>
<td>4.9</td>
<td>4.9</td>
<td>44.2</td>
<td>44.2</td>
<td>100</td>
</tr>
<tr>
<td>50.0</td>
<td>45.0</td>
<td>4.5</td>
<td>4.5</td>
<td>40.5</td>
<td>40.5</td>
<td>100</td>
</tr>
<tr>
<td>45.5</td>
<td>40.9</td>
<td>4.1</td>
<td>4.1</td>
<td>36.8</td>
<td>36.8</td>
<td>100</td>
</tr>
</tbody>
</table>

Reconstitution guidance:
The Alteplase vial should be reconstituted to a concentration of 1mg/ml with the vial of water for injections provided in the drug pack.

Ensure when the packaged transfer device is used to reconstitute the Alteplase, that it is inserted into the diluent vial first as the powder vial is under partial vacuum.

If foaming occurs, allow the vials to sit undisturbed until the foam subsides; the drug will remain active. **DO NOT SHAKE THE VIAL, AS AGITATION COULD DENATURE THE PROTEIN STRANDS.**

Following the 10% bolus dose the remaining 90% should be administered as an IV infusion over 60 minutes.