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| **Stroke Thrombolysis RDH Protocol** |

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| **Target Audience** | Medical Staff; Nursing and Midwifery Staff |
| **Jurisdiction** | Emergency Department RDH |
| **Jurisdiction Exclusions** | All other areas |
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| Purpose |

The Stroke Thrombolysis Protocol is designed to expedite workup of stroke patients who may benefit from acute reperfusion therapy with intravenous Alteplase.

| Abridged Stroke Thrombolysis RDH Procedure(The full, unabridged, procedure begins on page 6) |
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| Patients who present to the RDH with a suspected stroke must have a blood glucose taken. The blood glucose level must be > 3.5 mmol/L to proceed with this pathway.The patient must have a ROSIER assessment (see “Recognition of Stroke in the Emergency Department Assessment” on page 4). If ROSIER score is 1 or more call switchboard and activate a Code Stroke.A Code Stroke will notify: Stroke Medical Consultant (Neurologist, Physician or ICU Consultant), Stroke Medical Officer (Neurology Registrar or Medical Registrar), ICU Clinical Nurse, CT radiographer (Darwin Private Hospital), CT Radiologist (RDH) and Bed Manager.Assess haemodynamics and GCS and stabilise the patient as required.Insert a cannula in each cubital fossa (at least one being 18G), send bloods (see form in Code Stroke pack), and analyse a venous blood gas using the ED blood gas analyser.The stroke team will assess the patient’s eligibility for alteplase treatment based on NIHHS score and inclusion and exclusion criteria. The stroke team will organise for a CTB/CTA/CTP at the CT scanner at Darwin Private Hospital or, if not available, RDH.ED nursing staff to aid the Code Stroke team with transport of the patient to the CT scanner and then to ICU. Only if there is no ICU bed available should the patient go to ED resus.Inclusion criteriaOnset of ischaemic stroke within the preceding 4½ hours.Potentially disabling neurological deficit.Patient’s CT scan does not show haemorrhage or non-vascular cause of stroke.Exclusion criteriaAbsolute (thrombolysis should not be administered)Uncertainty about time of stroke onset if last seen well > 4½ hours ago, e.g., patient awaking from sleep.Hereditary or acquired coagulopathy (INR > 1.7, platelet count ≤ 100×109/L, heparinisation with raised APTT, or therapeutic dose of low molecular weight heparin (LMWH) or other oral anticoagulant within the last 12 hours.Clinical and radiological suspicion of subarachnoid haemorrhage.Suspected septic embolus.Hypertension: systolic blood pressure ≥ 185 mmHg or diastolic blood pressure > 110 mmHg on repeated measures despite treatment.Seizure at symptom onset without vessel occlusion.CT evidence of extensive middle cerebral artery (MCA) territory infarction: sulcal effacement or blurring of grey-white junction in greater than ⅓ of MCA territory.Relative (use thrombolysis with caution)Age < 18 years (thrombolysis can be considered in physiologically adult adolescents, but should not be administered to children).Pregnancy.CT Perfusion displays an infarct core (CBF/CBV) greater than 70 mL with minimal penumbral mismatch.Hypoglycaemia (BGL ≤ 3.5 mmol/L) or BGL ≥ 22 mmol/L → correct and then re-evaluate.Stroke or serious head trauma within the past three months.Patient has known history of intracranial haemorrhage, subarachnoid haemorrhage, known intracranial arteriovenous malformation or previously known intracranial neoplasm.Suspected recent (within 30 days) myocardial infarction.Recent (<30 days) parenchymal organ biopsy or surgery, trauma with internal injuries, parturition, gastrointestinal or urinary tract haemorrhage that, in the opinion of the responsible clinician, would increase the risk of unmanageable bleeding, i.e., bleeding that cannot be controlled by local pressure.Cardiopulmonary resuscitation or arterial puncture at non-compressible site within the last 7 days.Severe comorbidities limiting life expectancy or posing treatment risk.Pre-existing dementia or dependency.Minor or rapidly improving non-disabling neurological deficit, especially if CT angiogram is normal.Dose of oral anticoagulant (apixaban, dabigatran or rivaroxaban) last administered > 12 hours – discuss with Haematology.TreatmentAlteplaseDose: 0.9 mg per kg given intravenously: initial bolus of 10% of total dose over 1 minute, followed by an infusion of the remaining 90% over 1 hour. Maximum total dose of 90 mg.Acute Management of HaemorrhageIt should be noted that alteplase has a very short half-life and has no reversal agent.Bleeding from compressible sites should have firm and direct pressure applied over the area. The alteplase infusion does not need to be stopped unless bleeding becomes problematic.Extracranial bleeding from non-compressible sites should prompt immediate cessation of alteplase infusion and, if life-threatening, will require activation of the Adult Massive Transfusion (MTP) Procedure.Intracranial bleeding (ICH) should be suspected if any of the following occur:• Neurological deterioration• New onset of headache or drowsiness• Decrease in GCS• Acute hypertension• Convulsions• Nausea and vomiting.If intracranial bleeding is suspected, cease alteplase infusion and organise an urgent CT brain.If ICH is confirmed, commence cryoprecipitate (and platelets if patient is thrombocytopenic). Discuss with on-call Haematologist.If haemorrhage is life threatening, consider tranexamic acid 1 g intravenously over 10 minutes.Acute Management of Angioedema, Anaphylaxis and HypertensionRefer to *Stroke Thrombolysis RDH Procedure*.Recognition of Stroke in the Emergency Department (ROSIER) AssessmentAll patients must initially undergo a finger prick blood glucose level (BGL) with readings < 3.5 mmol/L being assessed by an ED Medical Officer.Patients are dee‌med eligible for acute treatment if **all three** of following criteria are met:1. ROSIER Scale of ≥ +1, **and**
2. Symptom onset of ≤ 4 hours (if stroke onset time is unknown, presume > 4 hours), **and**
3. Independent and with no history of severe cognitive dysfunction or terminal illness (if uncertain assume normality).

In the event that the onset time is unknown the onset time is taken from the time that they were last known to be well. If the history of premorbid function cannot be obtained it is reasonable to assume normality and assess eligibility based on criteria 1 and 2 alone. Wake up strokes should not be excluded at this stage of triage (as time of onset can often be subsequently established).ROSIER Scale

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Has there been loss of consciousness or syncope? | Y (-1) |  | N (0) |  |
| Has there been seizure activity? | Y (-1) |  | N (0) |  |
| Is there a NEW ACUTE onset (or on awakening from sleep) of: |
|  I. Asymmetric facial weakness | Y (+1) |  | N (0) |  |
|  II. Asymmetric arm weakness | Y (+1) |  | N (0) |  |
|  III. Asymmetric leg weakness | Y (+1) |  | N (0) |  |
|  IV. Speech disturbance | Y (+1) |  | N (0) |  |
|  V. Visual field defect | Y (+1) |  | N (0) |  |
|  |  |  |  |  |
| Total Score |  | (-2 to +5) |

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| Protocol |

## Stroke Triage

Stroke Triage is designed to rapidly confirm a diagnosis of stroke and identify patients who may benefit from acute reperfusion therapy. ED triage of possible stroke patients is a two-stage process. The ED Triage nurse will attempt to identify all possible stroke patients and arrange rapid evaluation by an ED doctor.

### Triage Criteria

When a patient presenting with symptom/s clinically suspicious of stroke:

It is recognised that this criteria will include a number of stroke mimics. These are difficult to exclude at the triage window, and so are included in NEURO ALERT for urgent assessment.

* Unilateral limb weakness
* Hemiplegia
* Altered level of consciousness
* Visual changes such as aura or blurring
* Unilateral facial weakness
* Reported changes to speech
* Reported difficulty with swallow

and possible duration less than four hours:

1. Allocate ATS 2 (or ATS 1 if clinically appropriate).
2. If **unstable**, request a majors or resus bed as clinically appropriate.
3. If **stable** transfer immediately to Clinical Initiatives Area for immediate RAT review.
4. Announce NEURO ALERT on ED public address system (advising switch is not required)

### NEURO ALERT RAT Review

A consultant or registrar will complete the ‘NEURO ALERT’ RAT Assessment Checklist beginning with blood glucose.

Patients are deemed eligible for acute stroke treatment if **all three** of following criteria are met:

1. ROSIER Scale of ≥ +1, ***and***
2. Symptom onset of ≤ 4 hours (if stroke onset time is unknown, presume >4 hours), ***and***
3. Independent and with no history of severe cognitive dysfunction or terminal illness (if uncertain assume normality).

In the event that the onset time is unknown the onset time is taken from the time that they were last known to be well. If the history of premorbid function cannot be obtained it is reasonable to assume normality and assess eligibility based on criteria 1 and 2 alone. Wake up strokes should not be excluded at this stage of triage (as time of onset can often be subsequently established).



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| **‘NEURO ALERT’ RAT Assessment Checklist** |
| **BGL** | >3.6mmol/L?  | □ **YES** □ **NO ►** *Treat* |
| **Pre-morbid functioning** |
| Independent and with no history of severe cognitive dysfunction or terminal illness? *(if uncertain assume normality)* | □ **YES** □ **NO** |
| **Time of Symptom Onset** |
| Symptom onset of ≤ 4 hours?*(if stroke onset time is unknown, presume >4 hours)* | □ **YES** □ **NO** |
| **ROSIER Scale** |  |
| Has there been loss of consciousness or syncope? | Y (-1) N (0) |
| Has there been seizure activity? | Y (-1) N (0) |
| Is there a NEW ACUTE onset (or on awakening from sleep) of: |
| Asymmetric facial weakness? | Y (+1) N (0) |
| Asymmetric arm weakness? | Y (+1) N (0) |
| Asymmetric leg weakness? | Y (+1) N (0) |
| Speech disturbance? | Y (+1) N (0) |
| Visual field defect? | Y (+1) N (0) |
| **ROSIER TOTAL** |  |
| **Is ROSIER ≥1?** | □ **YES** □ **NO** |
| Time of Activation of NEURO CALL\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  **If YES to all*** Activate ‘NEURO CALL’ via switch
* Transfer to majors/resus bed if avail
* Commence NEURO CALL checklist
 |

The above may result in the following outcomes:

* Patient has a ROSIER score ≥ +1 and time of onset from symptoms is < 4 hours:

*Action: Activate NEURO CALL*

* Patient is considered to have a stroke, i.e., ROSIER Scale of ≥ +1, but does not fulfil other Stroke Triage criteria, i.e., symptom onset time > 4 hours or severe dementia present:

*Action: Refer to Neurology Registrar on call (during working hours) or medical registrar after hours*

 *A quick assessment of the patient is made to try and clarify the time*

 *If, after further clarification, the time of onset is < 4 hours, activate NEURO CALL (note: any Medical Officer can activate NEURO CALL)*

 *If > 4 hours, then patient will be reviewed in timely manner after patients already referred to registrar are assessed and admitted*

* Patient is not considered to have a stroke, i.e., ROSIER Scale of ≤ 0, and Stroke Triage criteria are not met:

*Action: Assess as per usual ED practice and management*.

### ACTIVATING

If a patient meets NEURO CALL criteria:

1. Activate ‘NEURO CALL’ via switch on 🞷🞷🞷 and over ED PA.
2. Transfer to resus bed (or majors if unavailable)
3. Commence NEURO CALL checklist. Document on the ED Neuro Alert/Call form:

#### ‘NEURO CALL’ ED Nursing Pre-scan Checklist

* Assess vital signs and resuscitate as appropriate
* Oxygen supplementation if required (Target oxygen saturation > 95%)
* Get Neuro Call box that is kept in ED Resus (for contents see page 27)
* Insert one iv cannula in each cubital fossa (with at least one 18G)
* Arrange URGENT bloods (pre-printed request in CVA CALL box): FBE, U&E, LFT, INR & APTT, VBG
* Determine and document weight
* Prepare for transport to DPH CT (2 PCAs and ALS1 RN escort required)
* Perform 12 lead ECG if will not delay transfer to CT

In addition, all stroke patients should receive the ED Nursing Stroke Care Bundle. Document on the ED Neuro Alert/Call form:

* Elevate head of bed 30°
* NBM until swallow assessment by approved person
* Implement ED Falls Protection Package
* Regular temperature check: escalate if >37.5 °C

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## Stroke Thrombolysis Protocol

### Introduction

The Stroke Thrombolysis Protocol is designed to expedite workup of stroke patients who may benefit from acute reperfusion therapy with intravenous Alteplase. The protocol requires early engagement of Emergency Department, Neurology, Radiology and ICU workforce. Designation of tasks allows for rapid transition of the patient to ICU (via radiology) where treatment can be delivered.

### The NEURO CALL Team

The NEURO CALL team is available within working hours till October 2016 and then 24/7 thereafter. The roster of personnel is available to relevant hospital staff. The workforce that should receive simultaneous notification of a Neuro Call via pager is listed below.

1. *Stroke Medical Consultant* – Consultant support is mandatory for all CVA Call patients. A Neurologist or Physician or ICU Consultant with expertise in the management of complex stroke patients is considered appropriate. On site presence is preferable but not mandatory.
2. *Stroke Medical Officer* – 24/7 on site presence is preferable. The Neurology Registrar or Medical Registrar is considered appropriate.
3. Immediate notification for the following hospital personnel:
4. DPH CT Radiographer and Radiologist
5. ICU Specialist

### Task Designation

ED Medical Officer and Nurse:

1. As per the ‘CVA CALL’ ED Nursing Pre-scan Checklist above.

**Stroke Medical Officer** (Neurology Registrar, Medical Registrar, ICU Registrar):

1. Confirm history with patient and/or family or witnesses with particular reference to:
2. Stroke onset time
3. Medical history
4. Advance care directive / refusal of life sustaining treatment / outcomes to avoid
5. Medication
6. Premorbid cognitive and physical function
7. Previous surgery or bleeding history.
8. Perform National Institute of Health Stroke Scale (NIHSS).
9. Arrange CT scan with Darwin Private radiographer and make sure that scanner is ready for patient. If Darwin Private Hospital CT not available arrange CT scan at RDH.
10. Identify any potential bleeding source.
11. Assess vital signs every 15 minutes.
12. Obtain and document all results (i.e. ECG, blood tests, vital signs).
13. Complete checklist of inclusion/exclusion criteria for intravenous alteplase (see page 9).
14. Assist and supervise patient during transfer to radiology.
15. Notify Stroke Consultant.
16. Obtain consent for intravenous alteplase (if applicable).
17. Action treatment specific protocols as recommended by Stroke Medical Consultant.
18. Arrange an ICU bed through ICU clinical nurse
19. Contact hospital bed manager regarding bed destination post radiology.

Stroke Medical Consultant:

1. The Consultant’s primary role is to determine if the patient is eligible for acute therapy and to advise on acute management. This requires review of the patient’s history, clinical findings, laboratory investigations and neuro-imaging. On site assessment is optimal although not mandatory if the above can be adequately addressed via remote means.
2. Liaise and provide information to patient (if possible) or substitute decision maker/s (if any), persons responsible/family members or friends (Registrar may take on this role if the Consultant is not on site).

### Radiology

Brain imaging prior to treatment is mandated as follows:

1. An urgent non-contrast CT brain scan (pre-printed request in CVA CALL box) is mandatory for all CVA Call patients and must include the red ED name check sticker.
2. CT angiography (CTA) (aortic arch to vertex) and CT perfusion is also recommended provided there is no contraindication for additional imaging, i.e., known contrast allergy, significant renal impairment with estimated glomerular filtration rate (eGFR) < 30.

**Upon completion, images will be reviewed by the stroke team and the consultant radiologist. A treatment decision is made by the Stroke Medical Consultant.**

### Timeliness

Overall the aim is for the following to occur:

* Initial medical assessment to be completed in the first 10 minutes
* CT scan within 20 minutes during working hours, 40 minutes out of hours
* A door to needle time of <45 minutes during working hours and <60 minutes after hours.

## Intravenous Alteplase Protocol

### Eligibility Criteria

#### Inclusion Criteria

* Onset of ischaemic stroke within the preceding 4½ hours.
* Potentially disabling neurological deficit. This is determined by the patient’s NIHHS score and CT imaging.
* Patient’s CT scan does not show haemorrhage or non-vascular cause of stroke.

#### Exclusion Criteria

**Absolute** (thrombolysis should not be administered)

* Uncertainty about time of stroke onset if last seen well > 4½ hours, e.g., patients awaking from sleep
* Hereditary or acquired coagulopathy: INR > 1.7, platelet count ≤ 100×109/L, heparinisation with raised APTT, or therapeutic dose of low molecular weight heparin (LMWH) or other oral anticoagulant within the last 12 hours
* Clinical and radiological suspicion of subarachnoid haemorrhage
* Suspected septic embolus
* Hypertension: systolic blood pressure ≥ 185 mmHg or diastolic blood pressure > 110 mmHg on repeated measures despite treatment
	+ See “Management of Hypertension in Stroke Thrombolysis” on page 18).
* Seizure at symptom onset without vessel occlusion
* CT evidence of extensive middle cerebral artery (MCA) territory infarction: sulcal effacement or blurring of grey-white junction in greater than ⅓ of MCA territory.

**Relative** (use thrombolysis with caution)

* Age < 18 years (thrombolysis can be considered in physiologically adult adolescents, but should not be administered to children)
* Pregnancy
* CT Perfusion displays an infarct core (CBF/‌CBV) greater than 70 mL with minimal penumbral mismatch
* Hypoglycaemia (BGL ≤ 3.5 mmol/L) or BGL ≥ 22.2 mmol/L → correct glucose level and then re-evaluate
* Stroke or serious head trauma within the past three months
* Patient has known history of intracranial haemorrhage, subarachnoid haemorrhage, known intracranial arteriovenous malformation or previously known intracranial neoplasm
* Suspected recent (within 30 days) myocardial infarction
* Recent (< 30 days) parenchymal organ biopsy or surgery, trauma with internal injuries, parturition, gastrointestinal or urinary tract haemorrhage that in the opinion of the responsible clinician would increase the risk of unmanageable bleeding, i.e., bleeding that cannot be controlled by local pressure
* Cardiopulmonary resuscitation or arterial puncture at non-compressible site within the last seven days
* Severe comorbidities limiting life expectancy or posing treatment risk
* Pre-existing dementia or dependency
* Minor or rapidly improving non-disabling neurological deficit especially if CT angiogram is normal
* Taking oral anticoagulant (apixaban, dabigatran or rivaroxaban) but last dose last administered > 12 hours previously.

### Management of Pre-Treatment Hypertension

Refer to “Management of Pre-Treatment Hypertension” on page 16.

### Alteplase Administration – General Considerations

#### Treatment Order

A decision to proceed with intravenous alteplase therapy may only occur following recommendation by a Stroke Medical Consultant.

#### Counselling and Consent

Eligible patients (or relevant third-party where appropriate) should receive counselling and provide written consent to proceed. Consent must be sought from the patient (if they have decision-making capacity) and if not, the patient’s appointed substitute decision maker if they have an advance care directive in place. If the patient is not competent and there is no substitute decision maker, thrombolysis should not be given.

During the consent process the patient or substitute decision maker is provided with the “Clot Busting Medication for Acute Ischaemic Stroke” information sheet. Consent is documented using a “Consent for Procedures/Treatment” form.

#### Nursing and Location

A 1:2 nurse: patient ratio is recommended for the first 24 hours. Patients should be transferred to the Intensive Care Unit where the alteplase infusion can be administered and monitored by nursing staff with expertise in bleeding and neurological assessment. If an ICU bed is not immediately available the patient should go to the Resus room in ED and alteplase administered there.

#### Safety Precautions

Give alteplase through a dedicated cannula. Alteplase is not to be given through the same line as other medication, fluids or blood products.

Avoid any invasive therapies for at least 12 hours (including non-urgent blood sampling, intramuscular injections, nasogastric tube, and urinary catheter).

Do not administer antiplatelet (i.e., aspirin, clopidogrel, dipyridamole or ticagrelor) or anticoagulant (i.e., heparin, enoxaparin, warfarin, rivaroxaban, apixaban, dabigatran) agents, including those for deep vein thrombosis (DVT) prophylaxis, for 24 hours.

A Sequential Compression Device (SCD) is recommended for DVT prophylaxis in the first 24 hours.

Safety precautions to prevent falls.

Do not use razor blade for shaving – use an electric razor only.

### Alteplase Background Information

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| Drug: | Recombinant tissue plasminogen activator (rtPA) or alteplase |
| Trade Name: | Actilyse (Boehringer Ingelheim) |
| Action: | Alteplase binds to fibrin in a thrombus and converts the entrapped plasminogen to plasmin. This initiates local fibrinolysis (clot breakdown). Alteplase can induce haemorrhage in ischaemic stroke patients, particularly if the protocol is not strictly followed.  |
| Pharmacokinetics: | Alteplase is metabolised primarily by the liver. More than 50% of alteplase in plasma is cleared within 5 mins after the infusion has been completed (i.e., half-life) and approximately 80% is cleared within 10 mins. |
| Presentation: | Alteplase is available as a 50 mg vial and a 10 mg vial (off-white lyophilized powder). When reconstituted with 50 mL or 10 mL sterile water (supplied with drug), a resulting 1 mg/mL final solution is obtained. |
| Storage: | Alteplase stock may be stored at room temperature up to 30°C and protected from light. Following reconstitution any unused solution may be kept in the refrigerator at 2‒8°C for 24 hours. |
| Dosing: | The dose of intravenous alteplase is 0.9 mg/kg (max total dose of 90 mg). See “Alteplase Weight-Dose Schedule” below. * 10% given as an initial bolus over 1 minute
* The remaining 90% to be given as an infusion via syringe pump over 60 minutes immediately after bolus dose
 |
| Alteplase vial use: | If the patient requires a total dose of ≤ 80 mg, the dose may be reconstituted from: 1 × 50 mg vial followed by the necessary 10 mg vials. If the patient requires > 80 mg, the total dose must be reconstituted 2 × 50 mg vials (see weight-dose schedule). |
| Requirements: | Alteplase: 50 mg ± 10 mg vials (as per weight-dose schedule)Each alteplase pack will contain:* 1 vial of powder (50 mg or 10 mg)
* 1 vial sterile water for injection (50 mL or 10 mL)
* 1 transfer cannula is supplied with 50 mg pack

Other items required: 60 mL, 20 mL, 10 mL, 5 mL and 2 mL syringes with luer lock |

### Alteplase Administration Procedure:

1. Reconstitute with supplied sterile water to 1mg/mL i.e. 50mg vials with 50mL water.

2. Withdraw initial bolus amount as per chart (10% of total dose).

3. Administer initial bolus over 1 minute.

4. Determine amount to be give as infusion and discard unnecessary Alteplase. Label appropriately.

5. Prime infusion line, insert syringe into syringe pump, and attach to patient

6. Set pump to infuse the total remaining dose amount over 1 hour. If two syringes are used the syringe driver should still be set to infuse the total dose remaining over 1 hour.

7. After infusion completed flush infusion line with 30mLs sodium chloride to ensure all drug is infused.

8. Disconnect syringe infusion from patient. Leave intravenous (IV) cannula in-situ.

**Example:**

1. Patient weighs 84kgs - total dose of Alteplase required = 75.6mLs.
2. Mix 2x50mg vial with 2x50mLs water.
3. Using a 10mL syringe draw up 7.6mLs of Alteplase to give 10% bolus (leaving 68mLs still to infuse).
4. Using a 60mL syringe number 1 draw up 34mLs of Alteplase.
5. Using a 60mL syringe number 2 draw up 34mLs of Alteplase.
6. Set syringe pump to infuse at 68mLs an hour.
7. Each syringe will take 30 minutes to infuse.

### Alteplase Weight – Dose Schedule

The volumes in this chart are for Alteplase reconstituted to 1mg/mL i.e. 50mg in 50mL

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| --- | --- | --- | --- |
| Patient Weight (kg) | Total Dose: 0.9 mg/kg (mL)  | Initial Bolus (mL)  | 60 min Infusion (mL)  |
| 45 | 40.5 | 4.1 | 36.5 |
| 46 | 41.4 | 4.1 | 37.3 |
| 47 | 42.3 | 4.2 | 38.1 |
| 48 | 43.2 | 4.3 | 38.9 |
| 49 | 44.1 | 4.4 | 39.7 |
| 50 | 45 | 4.5 | 40.5 |
| 51 | 45.9 | 4.6 | 41.3 |
| 52 | 46.8 | 4.7 | 42.1 |
| 53 | 47.7 | 4.8 | 42.9 |
| 54 | 48.6 | 4.9 | 43.7 |
| 55 | 49.5 | 5 | 44.6 |
| 56 | 50.4 | 5 | 45.4 |
| 57 | 51.3 | 5.1 | 46.2 |
| 58 | 52.2 | 5.2 | 47 |
| 59 | 53.1 | 5.3 | 47.8 |
| 60 | 54 | 5.4 | 48.6 |
| 61 | 54.9 | 5.5 | 49.4 |
| 62 | 55.8 | 5.6 | 50.2 |
| 63 | 56.7 | 5.7 | 51 |
| 64 | 57.6 | 5.8 | 51.8 |
| 65 | 58.5 | 5.9 | 52.7 |
| 66 | 59.4 | 5.9 | 53.5 |
| 67 | 60.3 | 6 | 54.3 |
| 68 | 61.2 | 6.1 | 55.1 |
| 69 | 62.1 | 6.2 | 55.9 |
| 70 | 63 | 6.3 | 56.7 |
| 71 | 63.9 | 6.4 | 57.5 |
| 72 | 64.8 | 6.5 | 58.3 |
| 73 | 65.7 | 6.6 | 59.1 |
| 74 | 66.6 | 6.7 | 59.9 |

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|  |  |  |  |
| --- | --- | --- | --- |
| Patient Weight (kg) | Total Dose: 0.9 mg/kg (mL)  | Initial Bolus (mL)  | 60 min Infusion (mL)  |
| Infusions over 60mL can be split between two 60 mL syringes |
| 75 | 67.5 | 6.8 | 60.8 |
| 76 | 68.4 | 6.8 | 61.6 |
| 77 | 69.3 | 6.9 | 62.4 |
| 78 | 70.2 | 7 | 63.2 |
| 79 | 71.1 | 7.1 | 64 |
| 80 | 72 | 7.2 | 64.8 |
| 81 | 72.9 | 7.3 | 65.6 |
| 82 | 73.8 | 7.4 | 66.4 |
| 83 | 74.7 | 7.5 | 67.2 |
| 84 | 75.6 | 7.6 | 68 |
| 85 | 76.5 | 7.7 | 68.9 |
| 86 | 77.4 | 7.7 | 69.7 |
| 87 | 78.3 | 7.8 | 70.5 |
| 88 | 79.2 | 7.9 | 71.3 |
| 89 | 80.1 | 8 | 72.1 |
| 90 | 81 | 8.1 | 72.9 |
| 91 | 81.9 | 8.2 | 73.7 |
| 92 | 82.8 | 8.3 | 74.5 |
| 93 | 83.7 | 8.4 | 75.3 |
| 94 | 84.6 | 8.5 | 76.1 |
| 95 | 85.5 | 8.6 | 77 |
| 96 | 86.4 | 8.6 | 77.8 |
| 97 | 87.3 | 8.7 | 78.6 |
| 98 | 88.2 | 8.8 | 79.4 |
| 99 | 89.1 | 8.9 | 80.2 |
| 100 | 90 | 9 | 81 |
| 100+  | 90 | 9 | 81 |

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**Nursing Observation:**

The following nurse observation and task schedule is recommended (A summary version is available in the ED Neuro Alert/Call Form).

|  |  |
| --- | --- |
| **Time** | **Activity** |
| 0 hrs | Apply telemetry monitoring equipment Administer Alteplase bolus and commence infusion as per protocol |
| 0-1 hrs | Write timetable for observations on chart15 minutely observation: Glasgow Coma Scale (GCS) and limb strength, blood pressure (BP), Pulse, oxygen saturation (SpO2), Temperature Assess size and shape of tongue. Observe for signs of allergy: unilateral or bilateral tongue enlargement, rash or redness, coughing, lip, face swelling. (See guideline for management of angioedema / anaphylaxis, page 20)Nil by mouth – commence 0.9 % sodium chloride intravenous fluids with rate dependent on patient size and co-morbiditiesHourly Fluid Balance ChartStrict Bed Rest; Safety Precautions: falls prevention (ongoing)Avoid invasive therapies (including thrombo embolic deterrent (TED) stockings)Internal and external bleeding assessment |
| 1-2 hrs | 15 minutely observation: GCS and limb strength, BP, Pulse, SpO2, TemperatureAssess size and shape of tongue. Observe for signs of allergy (unilateral or bilateral tongue enlargement, rash or redness, coughing, lip, face swelling). Hourly Fluid Balance ChartStrict Bed Rest; Safety Precautions: falls prevention, pressure area care*If required*  BGL 2 hourly (ongoing)Internal/external bleeding assessment |
| 2-6 hrs | 30 minutely observation: GCS and limb strength, BP, Pulse, SpO2, TemperatureHourly Fluid Balance ChartStrict Bed Rest; Safety Precautions: falls prevention, pressure area careInternal/external bleeding assessment |
| 6-12 hrs | Hourly observation: GCS and limb strength, BP, Pulse, SpO2, TemperatureHourly Fluid Balance ChartStrict Bed Rest; Safety Precautions: falls prevention, pressure area careInternal/external bleeding assessmentCommence Sequential Compression Device, plus or minus thigh length TED stockings |
| 12-24 hrs | Two hourly observation: GCS and limb strength, BP, Pulse, SpO2, TemperatureHourly Fluid Balance ChartPatient can sit out of bed if able / Physiotherapy review if available Swallow screen assessmentNasoenteric tube feeding can be inserted if required.Internal/external bleeding assessment |

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## Management of Patient Post Thrombolysis

### Management of Hypertension in Stroke Thrombolysis

#### Before Thrombolysis

Hypertension (systolic BP ≥ 185 mmHg and/‌or diastolic BP > 110 mmHg) is an absolute contra-indication to thrombolysis in ischaemic stroke. However, if the BP can be reduced in a safe manner, this contra-indication can be removed. Clinicians need to be aware that aggressively reducing blood pressure has the potential to reduce cerebral blood flow and worsen outcomes. Therefore, if the BP does not come down to acceptable levels after the management outlined below, thrombolysis should not be performed.

#### During or After Thrombolysis

Uncontrolled hypertension during alteplase infusion and subsequent 24 hours may result in, or be the result of, intracranial haemorrhage. Early recognition and management are therefore critical.

In the event of a blood pressure reading > 185/110 mmHg the following measures should be taken:

* Confirm the blood pressure reading manually using a sphygmomanometer.
* Check the patient is not in pain or urinary retention (may need bladder scan) and manage this, or any other sources of discomfort, appropriately.
* If hypertension is associated with deterioration of neurological status consider the possibility of symptomatic intracerebral haemorrhage. Contact the Stroke Medical Officer with a view to organising an urgent non-contrast CT Brain.
* Re-check the blood pressure 5 minutes after the first reading – if the second reading is also > 185/110 mmHg proceed with antihypertensive therapy (see following section).

#### Treatment of Hypertension Before, During, or After Thrombolysis for Ischaemic Stroke

If hypertension > 185/110 mmHg occurs during alteplase infusion and remains above these levels for > 15 minutes initial measures as specified above, the alteplase infusion should be ceased. It can be recommenced if the BP returns to < 185/110 mmHg, but only if the entire dose can be administered within 5½ hours of symptom onset.

Give intravenous labetalol 10‒20 mg via slow injection over 1‒2 minutes. This may be repeated every 10‒20 minutes to a maximum total dose of 300 mgs.

A labetalol infusion may be commenced at the discretion of the ED or ICU consultant. An arterial line is advisable. If a labetalol infusion is required prior to thrombolysis, this should be considered a contra-indication.

* Note: Hydralazine is also sometimes used for the management of hypertension in the context of stroke thrombolysis. However, hydralazine is far less titratable and has the potential to precipitously drop the BP, which adversely affects cerebral perfusion and clinical outcomes. Labetalol is the preferred agent.

### Management of Haemorrhage with Alteplase Therapy

Haemorrhage is the most frequent adverse reaction associated with alteplase. The types of haemorrhage can be divided into three broad categories:

* Intracranial – clinical features include headache, nausea with refractory vomiting, and declining neurological status.
* Internal – gastrointestinal (GI) tract (5%), genito-urinary tract (4%), retroperitoneal sites (< 1%), parenchymal organs. Clinical features include tachycardia, hypotension, pallor, restlessness, lower back pain, lower limb pain and weakness.
* External or surface bleeding ­– observed mainly at disturbed sites such as venous and arterial punctures sites of recent surgical intervention. Extensive skin bruising, epistaxis and gingival bleeding ≤ 1%. Assessment includes examination of IV sites, gums (2-hourly mouth care), urine and faeces.

#### Management of Suspected Intracranial Haemorrhage

Intracranial haemorrhage should be suspected if any of the following occur:

* Neurological deterioration
* New onset of headache or drowsiness
* Decreasing GCS
* Acute hypertension
* Convulsions
* Nausea and vomiting

The following should be considered in the event of suspected intracranial haemorrhage (depending on index of suspicion):

* Suspend alteplase infusion. It should be noted that alteplase has a very short half-life and has no reversal agent.
* Arrange urgent non-contrast CT brain.
* Take venous blood for full blood count, APTT, INR, fibrinogen, electrolytes, urea, creatinine, blood group and save.

If intracranial haemorrhage is confirmed on CT brain:

* Discuss with on call haematologist and notify the hospital transfusion service immediately of blood product requirements.
	+ Administer cryoprecipitate (1 adult dose as directed by haematologist / transfusion service, number of packs depends on size of the pack). Note cryoprecipitate takes 15‒30 minutes to thaw.
	+ Platelet transfusion (1 or 2 adult therapeutic doses – note 1 adult therapeutic dose is now contained in a single bag and not as multiple ‘units’) in patients with thrombocytopenia or on antiplatelet therapy.
* If haemorrhage is life threatening consider antifibrinolytic therapy with tranexamic acid (1 g intravenously over 10 minutes). Tranexamic acid should not be given in the same IV line as blood products. Note that antifibrinolytic therapy may cause thrombosis.

#### Management of Suspected Extracranial Haemorrhage

Superficial bleeding, i.e., venepuncture sites, nose bleeds, other superficial wounds:

* Apply direct pressure, dressings
* Intravenous fluids as required
* If bleeding occurs during alteplase infusion, continue unless bleeding becomes problematic.

Serious bleeding from non-compressible site, i.e., GI haemorrhage, retroperitoneal haemorrhage:

* Suspend alteplase infusion. It should be noted that alteplase has a very short half-life and has no reversal agent.
* Take venous blood for full blood count, APTT, INR, fibrinogen, electrolytes, urea, creatinine, blood group and save. Notify the hospital transfusion service immediately. Early local measures to control the bleeding where possible are essential, e.g., upper GI bleeding
* If bleeding becomes critical, activate and manage as per hospital *Adult Massive Transfusion (MTP) Procedure*. This will guide the optimal timing of fresh frozen plasma (FFP), platelets and cryoprecipitate in relation to red cells, in conjunction with on call haematologist.
* Consider antifibrinolytic therapy with intravenous, tranexamic acid (1 g intravenously over 10 minutes) ­– consult with on call haematologist. Tranexamic acid should not be given in the same IV line as blood products. Note antifibrinolytic therapy may cause thrombosis. Further use of tranexamic acid should be based on the *Adult Massive Transfusion (MTP) Procedure*.
* Arrange urgent imaging of suspected bleeding site.
* Discuss with appropriate duty surgeon/gastroenterologist/interventional radiologist.

### Management of Alteplase Related Angioedema

Angioedema (rapid swelling of soft tissues) is a rare (1‒2%) but potentially life-threatening complication of thrombolysis, usually occurring towards the end of the infusion. It is more common in patients on pre-existing angiotensin converting enzyme inhibitor therapy and may involve the lips, tongue, oropharynx or larynx. Isolated angioedema should be distinguished from anaphylaxis (see following section).

Angioedema threatening the airway warrants urgent medical review and the following actions:

1. Consider ceasing alteplase immediately (depending on severity of stroke and reaction).
2. Administer oxygen, monitor saturation.
3. Monitor airway, check stridor, prepare for possibility of intubation or cricothyrotomy.
4. Administer adrenaline 0.5 mg intramuscular injection (IMI) but note that angioedema in a setting of rtPA/ACE-I responds poorly to adrenaline, antihistamines and corticosteroids. Do not continue to give adrenaline if no response to initial dose.
5. Consult duty immunologist regarding use of icatibant (Firazyr) 30 mg subcutaneously. This is a bradykinin antagonist. Angioedema should cease progression or reduce in 30‒60 minutes.

### Management of Alteplase Related Anaphylaxis

Anaphylaxis (usually 2 or more of erythema, urticaria, angioedema, hypotension, tachycardia, bronchospasm) is rarer than isolated angioedema and occurs through an immunological mechanism.

1. Consider ceasing alteplase immediately (depending on severity of stroke and reaction).

2. Administer oxygen, monitor airway, administer adrenaline 0.5 mg IMI, fluid resuscitation if hypotensive, nebulised salbutamol for bronchospasm, repeat adrenaline 0.5 mg IMI if no response.

3. Consider adrenaline infusion if inadequate response.

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| Implementation, Review & Evaluation Responsibilities |

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| --- | --- | --- |
|  | **Method** | **Responsibility** |
| **Implementation**  |  |  |
| **Review** |  |  |
| **Evaluation** |  |  |

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| --- |
| Key Associated Documents |

|  |  |
| --- | --- |
| **Key Legislation, By-Laws, Standards, Delegations, Aligned & Supporting Documents** | Information Sheet: Clot Busting Medication for Acute Ischaemic Stroke[Adult Massive Transfusion (MTP) Procedure](http://internal.health.nt.gov.au/PGC/DM/Documents/TEHS/NT%20Transfusion/Adult%20Massive%20Transfusion%20%28MTP%29%20Procedure.docx)[Anaphylaxis Management Flowchart RDH ED Guideline](http://internal.health.nt.gov.au/PGC/DM/Documents/TEHS/Royal%20Darwin%20Hospital/Emergency%20Department/Anaphylaxis%20Management%20Flowchart%20RDH%20ED%20Guideline.docx)[Stroke and Transient Ischemic Attack (TIA) RDH ED Protocol](http://internal.health.nt.gov.au/PGC/DM/Documents/TEHS/Royal%20Darwin%20Hospital/Emergency%20Department/Stroke%20and%20Transient%20Ischemic%20Attack%20%28TIA%29%20RDH%20ED%20Protocol.docx) Australian Commission on Safety and Quality in Health Care [ACSQHC]. (2015). [National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines](http://www.safetyandquality.gov.au/wp-content/uploads/2015/09/National-Standard-for-User-Applied-Labelling-August-2015-print-version.pdf). Sydney: ACSQHC. |
| **References** |  |

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| --- |
| Definitions and Search Terms |

| Preferred Term | Description |
| --- | --- |
| ACE-I | Angiotensin-converting enzyme inhibitor. |
| APTT | Activated partial thromboplastin time. |
| BGL | Blood glucose level |
| BP | Blood pressure. |
| CBF | Cerebral blood flow. |
| CBV | Cerebral blood volume. |
| CT | Computed tomography scan. |
| CTA | CT angiography. |
| CTB | CT of brain. |
| CTP | CT perfusion. |
| ECG | Electrocardiogram. |
| eGFR | Estimated glomerular filtration rate. |
| FFP | Fresh frozen plasma. |
| GCS | Glasgow Coma Scale. |
| GI | Gastrointestinal. |
| ICH | Intra-cranial haemorrhage. |
| IMI | Intramuscular injection. |
| INR | International Normalised Ratio. |
| LMWH | Low molecular weight heparin. |
| MCA | Middle cerebral artery. |
| MTP | Massive transfusion protocol, or massive transfusion procedure. |
| NIHSS | National Institute of Health Stroke Scale. |
| ROSIER | Recognition of Stroke in the Emergency Department.Note that while the ‘R’ in the original acronym stands for ‘Room,’ in Australia the term “Emergency Department” is used in preference to “Emergency Room,” hence the mismatch between the acronym and its expansion. |
| rtPA | Recombinant tissue plasminogen activator. |
| SCD | Sequential compression device. |
| SpO2 | Peripheral oxygen saturation. |
| TED | Thromboembolic deterrent device. |
| **Preferred Term** | **Description** |
|  |  |

**Alternative Search Terms**

|  |
| --- |
| Evidence Table |

*(For assistance please contact the Clinical Librarian on 8922 6994*

*or click on* [*Evidence Table Completion Guide for Policy, Procedure and Guideline Development*](http://internal.health.nt.gov.au/PGC/DM/Documents/Corporate%20Support/Information%20Services/Library%20Services/Policy%20Guideline%20Program/PGC/Evidence%20Table%20Completion%20Guide%20for%20Policy%2C%20Procedure%20and%20Guideline%20Development.docx)*)*

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| --- | --- | --- | --- |
| **Reference**  | **Method** | **Evidence level****(I-V)** | **Summary of recommendation from this reference**  |
|  |  |  |  |
|  |  |  |  |

##

## Appendix 1: NIH Stroke Scale

**Date and time of NIHSS:** \_\_\_ / \_\_\_ / \_\_\_\_\_(mm/dd/yyyy)  \_\_\_ : \_\_\_ (hh:mm, 24 hr clock)

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

| Instructions  | Scale Definition  | Score  |
| --- | --- | --- |
| 1a. Level of Consciousness: The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation. | 0 = Alert; keenly responsive.1 = Not alert; but arousable by minor stimulation to obey, answer, or respond.2 = Not alert; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped).3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and flexic.  | ――― |
| 1b. LOC Questions: The patient is asked the month and his/her age. The answer must be correct – there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues.  | 0 = Answers both questions correctly.1 = Answers one question correctly.2 = Answers neither question correctly.  | ――― |
| 1c. LOC Commands: The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.  | 0 = Performs both tasks correctly.1 = Performs one task correctly.2 = Performs neither task correctly.  | ――― |
| 2. Best Gaze: Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.  | 0 = Normal.1 = Partial gaze palsy; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present.2 = Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver.  | ――― |
| 3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.  | 0 = No visual loss.1 = Partial hemianopia.2 = Complete hemianopia.3 = Bilateral hemianopia (blind including cortical blindness).  | ――― |
| 4. Facial Palsy: Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.  | 0 = Normal symmetrical movements.1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling).2 = Partial paralysis (total or near-total paralysis of lower face).3 = Complete paralysis of one or both sides (absence of facial movement in the upper and lower face).  | ――― |
| 5. Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.  | 0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds.1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.2 = Some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.3 = No effort against gravity; limb falls.4 = No movement.UN = Amputation or joint fusion, explain: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_5a. Left Arm5b. Right Arm  | ―――――― |
| 6. Motor Leg: The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.  | 0 = No drift; leg holds 30-degree position for full 5 seconds.1 = Drift; leg falls by the end of the 5-second period but does not hit bed.2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.3 = No effort against gravity; leg falls to bed immediately.4 = No movement.UN = Amputation or joint fusion, explain: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_6a. Left Leg6b. Right Leg  | ―――――― |
| 7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.  | 0 = Absent.1 = Present in one limb.2 = Present in two limbs.UN = Amputation or joint fusion, explain: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  | ――― |
| 8. Sensory: Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, “severe or total sensory loss,” should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item.  | 0 = Normal; no sensory loss.1 = Mild-to-moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched.2 = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.  | ――― |
| 9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.  | 0 = No aphasia; normal.1 = Mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient’s response.2 = Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.3 = Mute, global aphasia; no usable speech or auditory comprehension.  | ――― |
| 10. Dysarthria: If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.  | 0 = Normal.1 = Mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.2 = Severe dysarthria; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.UN = Intubated or other physical barrier, explain: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  | ――― |
| 11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.  | 0 = No abnormality.1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.2 = Profound hemi-inattention or extinction to more than one modality; does not recognize own hand or orients to only one side of space.  | ――― |
|  | Total NIHSS: | ――― |

## Appendix 2: ED Stroke Box Content

* 1. Stroke protocol
	2. Pre-printed urgent pathology and radiology request
	3. Alteplase 50mg/ml x 2 bottles
	4. 50 ml syringe x 2
	5. 10 ml syringe x 2
	6. Syringe pump line x 1
	7. Normal Saline 10ml x 2
	8. Consent forms

## Appendix 3: Stroke Consent Form

Formal RDH consent form must be used to document consent

An “Ischaemic Stroke” is when a blood clot blocks an artery in the brain which leads to a lack of oxygen and then tissue damage.

*Alteplase* is a powerful clot busting medication that can dissolve the clot and allow blood flow to return. This medication however can only be given to patients who meet certain criteria.

The faster the medication is given, the better the chances of recovery are. The medication is most effective within 3 hours but has benefit up to 4.5 hours after the onset of the stroke. There is no benefit after this time.

**Benefits**

In patients receiving the medication, compared to not receiving the medication:

* ***13% of patients will go back to being completely independent*** ***with no disability at all***
* ***19% of patients will have an improvement in their disability***

***There is no mortality benefit from the medication.***

 **Risks**

The main risk of this medication is bleeding into the brain:

* 6% will have bleeding into the brain
* 3%, will have no symptoms despite this (half the patients who bleed into the brain)
* 2% will have a worsening of their symptoms
* 1-2% of patients will die.

The main factors that makes a patient high risk for bleeding are the size of the stroke and a delay to getting the treatment.

There is a very rare chance that the patient may have an allergic reaction to the medication which might be life threatening at time. If this occurs, then the medication is stopped and attempts are made to reverse the allergic reaction.

