STANDARDS TO BE MET

1. PRE-HOSPITAL

Ambulance Services

1.1 Patients with suspected stroke symptoms will have a FAST test performed by Ambulance personnel.

1.2 Patients with a positive FAST result will be transported as a status 2 priority to ED.

2. TRIAGE

2.1 ED Triage Nurse – ATS 2 for the following patients

Symptoms of stroke	Symptoms of stroke (FAST Test +ve)	Symptoms of posterior circulation stroke (may be FAST –ve)
• FAST Test +ve • Presenting within 4½ hours of symptom onset (meets thrombolysis guidelines)	• and taking warfarin	• Clear history of sudden onset cerebellar symptoms • Sudden onset visual field defect And/or • Sudden onset vertigo • ***Note**: Posterior circulation stroke symptoms occur in combination not in isolation*

3 INITIAL ASSESSMENT

3.1 ED Nurse

a) Assess A, B, C and D; measure vital signs,
b) ROSIER assessment to be completed as soon as possible – this may be performed by registered nurse (RN) if this has not been performed by the ED doctor.
c) Insert 2 x medium-large bore cannulae
d) Send URGENT bloods for - CBC, clotting screen, U&E, glucose, G&H, cholesterol, LFTs and ESR
e) Check Blood Glucose level as hypoglycaemia or severe hyperglycaemia can mimic acute stroke.
f) Perform a 12-lead ECG.
g) Estimate the patient's weight.
h) Ongoing physiological observations including Blood pressure measurement every 15 minutes
i) Ensure that relatives are notified and asked to stay with patient if they are on site as they may be needed for Thrombolysis consent process

3.2 ED Doctor

a) Use the ROSIER Score (Recognition of Stroke in Emergency Room) to decide whether acute stroke is the most likely diagnosis.
b) **Thrombolysis screen**:
   i. Is the patient FAST +ve and ROSIER +ve?
   ii. Was the patient last seen awake and without symptoms less than 4½ hours ago?
   iii. Does the patient have a significant neurological deficit consistent with anterior or posterior circulation stroke?
   iv. Is a subarachnoid haemorrhage unlikely based on the history?

   *If **YES** to all four (4) above screening questions, ask Radiology for an immediate CT head.*
c) The Radiology Department has committed to delivering a CT head within 15 minutes for any FAST +ve, ROSIER +ve thrombolysis candidate – ensure these clinical criteria are clearly written on the request form i.e. FAST positive, ROSIER positive –patient for Thrombolysis
d) A full 'clerk-in' is not required by the ED doctor before CT.
e) Ensure cannulae are in situ and bloods have been sent URGENTLY
f) A 'routine' chest X-ray is NOT required – request if chest signs/symptoms only.
g) Alert the on-call Medical Registrar re: a potential thrombolysis candidate.
h) *If within normal working hours only*, alert the Stroke Team on Acute Stroke Co-ordination line 0277065064.

3.3 Radiology Department

a) If YES to all four (4) screening questions above, a non-contrast CT head should be performed immediately. If the patient is not a thrombolysis candidate according to the screening questions above, then an urgent CT head is only indicated if:
   i. The patient is anticoagulated (NB – INR is irrelevant in patients taking Dabigatran or treatment dose low molecular weight heparins)
   ii. There is reduced or deteriorating conscious level
   iii. Suspected neurosurgical diagnosis eg Sub Arachnoid Haemorrhage or Subdural Haematoma
b) All other stroke patients require a CT head within 24 hours (including weekends / public holidays).
c) In a potential thrombolysis candidate an immediate report is required confirming whether there is any bleed, as well as other radiological findings.

4 DECISION TO THROMBOLYSE

4.1 This will be the responsibility of the ED SMO or Medical Registrar/SMO and/or the Stroke Team SMO, depending on who is available at the time.
4.2 The NIHSS (Stroke Scale, January 2003) should be completed before the decision is made to thrombolyse (see separate document).
4.3 Ensure that the patient:
   a) Meets the inclusion criteria for thrombolysis (see below)
   b) Has no contraindications to thrombolysis (see below)
   c) Gives informed consent to thrombolysis (or, if unable, a full explanation of risks vs benefits is given to next-of-kin or EPOA for health and welfare if present).
4.4 Once a decision is made to thrombolyse, a HDU bed must be booked for the patient and ASU informed.
4.5 Thrombolysis is to take place in Resus without delay.

4.6 Inclusion Criteria for Thrombolysis

a) History consistent with acute stroke (FAST +ve, ROSIER +ve)
b) A significant neurological deficit (ie NHISS greater than 4)
c) Time of onset established to be less than 4½ hours
d) Non-contrast CT head has excluded haemorrhage
e) Aged over 18
f) No contraindications to thrombolysis.

NB – posterior circulation strokes ARE thrombolysed as well as anterior circulation strokes if they meet the criteria. In rare cases of the devastating basilar artery thrombosis (causing altered conscious level, hemi- or quadriparesis and pupillary, occulomotor and pseudobulbar signs), thrombolysis may be given after the 4½ hour window (up to 12 hours) especially in younger patients – a specialist opinion is recommended.

4.7 **Contraindications to Thrombolysis**

Not acute ischaemic stroke	Bleeding risk	Risks outweigh benefits
• Hypoglycaemia (less than 2.5 mmol / L) or hyperglycaemia (more than 22 mmol / L) • Haemorrhage seen on CT • Clinical presentation suggests SAH • Seizure at onset of symptoms	• INR of more than 1.7 • Currently anticoagulated with Dabigatran or treatment dose heparin • Platelet count less than 100 • Active bleeding (eg GI, genitourinary) • Known bleeding disorder eg haemophilia • Stroke or MAJOR head injury within the last three (3) months • Major surgery within the last 14 days • Previous intracerebral bleed • Pregnancy • Blood pressure greater than 185 / 110 mmHg* (see BP guidelines below)	• Symptom onset uncertain or more than 4½ hours ago • Rapidly improving symptoms • NIHSS is less than four (4) or more than 25 • Any other serious medical illness that is likely to interfere with treatment • Known severe allergy to rTPA trace elements including gentamicin

4.8 Relative Contraindications

a) Alternative diagnoses possible: in young patients (ie aged less than 40) alternative diagnoses are more likely – including migraine and functional disorders. An immediate specialist opinion is therefore recommended if possible.
b) Patients with PROMINENT small vessel disease seen on CT and those with DIABETES are at increased risk of intracerebral haemorrhage with rTPA treatment (risk of bleeding closer to 20% than 6%) – however, these are relative contraindications.

4.9 Informed Consent – refer to policy 1.1.1

a) Informed consent is not mandatory in a medical emergency if the patient is UNABLE to comprehend or communicate and treatment is given in his/her best interests.
b) The risks vs benefits of thrombolysis are:
   i. The sooner the treatment is given, the greater the benefit
   ii. One third of patients have an improved outcome (are less disabled)

iii. Around one (1) in 16 patients (6.4%) will have a symptomatic haemorrhage
iv. Death is possible with thrombolysis but also occurs in acute stroke *without* thrombolysis and is equally likely to occur with or without the treatment
v. Additional risk vs benefits information for specific patients should also be given.

4.10 See **Appendix A** for visual information of risks vs benefits.

4.11 Intravenous rTPA (Alteplase) Administration
a) The total dose in acute ischaemic stroke is 0.9 mg / kg - MAXIMUM dose is 90mg.
b) rTPA (Alteplase) comes in a dry powder form ('Actilyse') in 50 mg vials.

4.12 Drawing up process
Under aseptic conditions, the dry substance is dissolved with the accompanying diluent to obtain a final concentration of 1mg Alteplase per ml. Roll, do not shake the vial to mix. Allow to stand until liquid becomes colourless / pale yellow.

4.13 Preparation
Withdraw 10% of the total dose into a syringe for bolus injection and add the remaining volume / dose to a 50 ml bag of 0.9% Sodium Chloride which will be administered using a volumetric infusion pump over 60minutes.

4.14 Administration
The bolus dose is given by IV injection over one (1) minute followed by immediate commencement of the 60 minute infusion.

5. PROCESS FOR MONITORING AND CARE DURING AND AFTER THROMBOLYSIS

5.15 Monitoring (to identify potential complications post thrombolysis)
a) Patients should be monitored for signs of bleeding:
i. Measure BP and heart rate every 15 minutes for two (2) hours
ii. Every 30 minutes for six (6) hours
iii. Every hour for 16 hours
b) Any change in neurological status (e.g. worsening weakness / speech OR change in GCS) must be notified to the Medical Registrar on-call immediately as the patient may need an urgent CT head. Perform neuro-obs hourly for the first 24 hours.

5.16 Post Thrombolysis Care
a) Do NOT give aspirin for 24 hours post rTPA infusion
b) Patients who have been thrombolysed for acute ischaemic stroke will be admitted to HDU for at least eight (8) hours.
c) If not already, the Stroke Team should be contacted during normal working hours re: thrombolysed patients
d) A repeat CT head MUST be performed the next day (within 24 hours) on all thrombolysed patients and aspirin 300 mg must be administered as soon as possible after the repeat CT shows no haemorrhage.

5.17 Brain protection
a) Patients must be nursed in the semi-recumbent position (45 degrees head up)
b) High blood pressure (greater than 185 / 110 mmHg) should be reported to the Medical Registrar immediately

c) Low blood pressure (less than 100 systolic) should be treated with a fluid challenge unless it the patient is KNOWN to have low blood pressure normally
d) Fever (more than 38degC) must be aggressively treated with Paracetamol and cooling measures
e) Do not give 'routine' oxygen - maintain SpO2 at 95% or more in all patients
f) Treat any hypoglycaemia (less than 2.5 mmol / L) or hyperglycaemia (more than 22 mmol / L)
g) Do not insert urinary catheters, arterial / central lines, NG tubes etc for the first 24 hours unless absolutely necessary (bleeding risk). Do not shave patients

6. MANAGEMENT OF COMPLICATIONS

6.1 Bleeding

a) If there are signs of major bleeding (tachycardia/low BP; external bleeding; deterioration in neurological status), then:
   i. Stop the Alteplase infusion
   ii. Apply pressure to any bleeding vessel
   iii. Check CBC and clotting screen
   iv. Request immediate CT head if intracerebral bleed is suspected
   v. In severe cases, consider transfusion of cryoprecipitate or PCC (prothrombin complex concentrate) in consultation with a senior doctor.
b) In cases of minor bleeding (e.g. cannula site) – apply pressure to the area and continue to monitor the patient without stopping the Alteplase infusion.

6.2 Hypertension

a) If the blood pressure is greater than 185 / 110 mmHg for more than two readings 10 minutes apart then measures to acutely lower the blood pressure are required. NB – blood pressure must NOT be lowered to 'normal', it should be lowered by around 10% to below this threshold. Blood pressure can be lowered in the following ways:
   i. Labetolol 10 mg over 1 - 2 minutes. This can be repeated every 10 - 20 minutes (total dose 150 mg). Watch for bradycardia and / or hypotension. Non-selective beta-blockers are contraindicated in asthma and should not be used in patients who are already bradycardic.
   ii. GTN infusion – titrated to BP (use CCU infusion protocol).
b) 'Aggressive' measures to lower BP (defined as three [3] doses of Labetalol or high dose GTN infusion) are contraindications to thrombolysis in acute stroke, as these patients have a higher intracerebral bleeding risk.

6.3 Neurological deterioration

It is vital that nurses report any change in neurological status of thrombolysed patients – not just changes in GCS. Deterioration in limb strength / speech or a new severe headache can be signs of an intracerebral haemorrhage. If a patient suffers an acute neurological deterioration (obvious deterioration of their stroke symptoms or reduced GCS) then:

a) Alert the on-call Medical Registrar immediately
b) Consider the 5 S's:
   i. Sugar (hypoglycaemia)
   ii. Seizure
   iii. Sepsis
   iv. Stroke (intracerebral bleed)
   v. Secondary hydrocephalus / raised ICP

c) Get an immediate repeat CT head unless hypoglycaemia, seizure or a *severe* infection (eg aspiration pneumonia) has developed which could explain the deterioration. If unsure, get a CT head.
d) The following situations in acute stroke are indications for immediate neurosurgical referral:
   i. Intracerebral haemorrhage causing hydrocephalus
   ii. Malignant MCA Syndrome in patients aged less than 60 – decompressive hemi craniectomy should be performed within 24 - 48 hours of symptom onset and without it, mortality is 80%.
   iii. Malignant cerebellar infarction should also be discussed with neuro-surgical team advice for advice on management.
e) There is NO ROLE for the use of dexamethasone, mannitol or frusemide in stroke. Mannitol is occasionally used to buy time for patients with Malignant MCA Syndrome who are being transferred to neurosurgical theatres. It should not be given in any other context.

REFERENCE

- NIHSS Stroke Scale, January 2003

ASSOCIATED DOCUMENTS

- Bay of Plenty District Health Board policy 1.1.1 Informed Consent
- Bay of Plenty District Health Board Form FM.R9.1 Rosier Scale Checklist
- Bay of Plenty District Health Board Hospital Stroke Guideline (draft)

APPENDIX A

From Gadhia et al. Stroke 2010; 41: 300-306 – illustrating the benefits vs risks of Alteplase treatment administered within a 3 hour window in the two NINDS-TPA (stroke) trials.