

# Acute Stroke Thrombolysis Guideline (*Template*)

## TIME IS BRAIN

### Call “Code Stroke”

DOOR TO NEEDLE TARGET IS less than 60 MINUTES!

#### **Guideline: Use of IV Recombinant Tissue Plasminogen Activator (rtPA, tPA, Alteplase, Actilyse®) in Acute Ischaemic Stroke**

This treatment is indicated in selected acute stroke patients. See New Zealand Clinical Guidelines for Stroke Management 2010 [www.nzgg.org.nz](http://www.nzgg.org.nz)

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#### **Purpose**

This stroke thrombolysis guideline is intended to guide clinicians when planning stroke thrombolysis with intravenous tissue plasminogen activator (Alteplase). *[NB: this template has been developed by the NZ National Thrombolysis Working Group, requires local adaptation, and can be used as a guideline or converted into a pathway by adding tick boxes and patient sticker areas].*

Thrombolysis should be considered in patients with acute stroke symptoms arriving within 3.5 hours (treat IV within 4.5 hrs) of symptom onset. Alteplase CANNOT be substituted with any other fibrinolytic agents, including other forms of recombinant tPA.

#### **Definitions**

“Code Stroke” is a key component of effective thrombolysis and denotes a rapid treatment pathway to minimise onset to needle time. It is a communication protocol to activate the appropriate Stroke Thrombolysis Team to meet the patient at the hospital door. *This will utilise different resources in different hospitals.*

It also includes:

1. Avoidance of transit to non-thrombolysis hospitals
2. Pre-hospital notification that a potential stroke thrombolysis patient is en-route with an estimated time of arrival
3. Bloods and IV lines x 2 performed in transit if no delays would result, or otherwise at hospital triage
4. Pre-notification of CT staff of pending arrival
5. Possible communication of history via mobile phone with ambulance staff or witness
6. Stroke team meets patient at door and patient is ideally taken straight to CT
7. Rapid stroke team assessment for eligibility criteria and final treatment decision

#### **Resources required for stroke thrombolysis**

All potential stroke thrombolysis candidates should receive an ED triage category 2. Treatment must be supervised by a doctor with experience in providing stroke thrombolysis. Formal arrangements for remote supervision are acceptable. Examples of “remote supervision” are

1. Telephone+PACS imaging support from an experienced stroke physician
2. Telestroke (=full video link review of the case by an experienced stroke physician)

Stroke thrombolysis should be managed in a location familiar/stocked with the following:

1. 2 copies of this printed guideline or a locally approved acute stroke pathway document
2. Nursing protocol including drug administration & post-thrombolysis care protocols
3. Relevant drugs: Alteplase/Labetolol, syringes, needles, and flush
4. Compiling a ‘thrombolysis kit’ including these items is recommended

*NB: This guideline template only covers guidance on the provision of IV Alteplase. IA Alteplase or clot retrieval information is not within the scope of this guideline template.*

## **Suggested Roles and Responsibilities**

*(This will vary slightly depending on location)*

### **Nurse**

1. Place 2 x IV lines 18g inserted carefully (may bleed after Alteplase from missed attempts)
2. Obtain bloods for U+E, Glucose, G+H, Coag; Phone lab to emphasise urgency of results
3. Check BSL (glucose) from blood sample
4. Begin close monitoring P, BP, O2, ECG (report BP >180/>110mmHg)
5. Travel with patient to CT
6. Obtain weight (or best estimate) for Alteplase dose
7. Obtain Alteplase nursing protocols
8. Obtain Alteplase drug and place at bedside (unopened)
9. Administer drug when asked to do so by treating doctor
10. Handle the stroke patient gently, avoid catheters whenever possible, no catheters during alteplase infusion.
11. Provide post-thrombolysis monitoring and hand-over to inpatient RN

### **RMO**

1. Organise CT brain (completed < 20 mins from arrival) "emergency: stroke thrombolysis"
2. Ensure Alteplase protocol is at bedside
3. Assist with 2x 18g IV lines, bloods, blood forms (FBC, glucose, COAG, G+H, and U+E)
4. Seek appropriately monitored bed for after post-thrombolysis monitoring (examples SU, HDU, CCU).
5. Chase blood results immediately before Alteplase given
6. Assist with ECG (if time allows)
7. Ensure family stays with patient

### **Designated "Code Stroke" Team Leader**

1. Meet patient at door if pre-notified
2. Supervise thrombolysis team to ensure all tasks are completed rapidly
3. Ensure treatment criteria are met (see pathway below)
4. Accompany patient to CT
5. Discuss case with Neurologist/Stroke Physician
6. Assist stroke consultant with family discussion
7. Calculate and chart Alteplase
8. Organise Admission and capture audit information

### **Stroke Physician**

1. Attend ASAP once contacted by Code Stroke Team Leader, then take over supervision
2. Or if supervising remotely discuss case with Code Stroke Team Leader prior to treatment
3. Interpret CT
4. Be available for treatment discussion with patient/family
5. Be responsible for final treatment decision

## Thrombolysis Pathway (Step-by-Step)

### If patient presents without 'pre-notification' and "Code Stroke" has not yet been activated:

Triage/ward nurse (completed within 2 minutes)

- a. Was time of onset <3.5 hours? if "yes" then move to b.
- b. Is it a Stroke? (*For RN screen FAST Test +/- additional signs– see Appendix 1 for local adaptation options*) If "yes" then move to c.
- c. Ensure patient 'Category 2' (if in ED) and notify doctor to immediately organise CT brain
- d. Activate "Code Stroke"

### If pre-notification received or above triage completed and "Code Stroke" activated:

#### Pre-Hospital Arrival: "Code Stroke" Team Leader

- Wait for the patient at ambulance bay at estimated time of arrival
- Asks triage to prepare an ED team
- Alerts Neurologist/Stroke Physician responsible for Thrombolysis
- Alerts the CT team ("completed in 20 minutes"\*)
- Prepares to supervise team of 2-3 other staff completing post-arrival tasks expediently

#### Post-Hospital Arrival/Inpatient Assessment: "Code Stroke" Team Leader ensures/actions

- CT requested and CT team notified
- Labs done/sent (including coags)
- 2 IVs in place
- BP addressed
- ECG done and read
- Protocol at bedside
- Confirm time of onset, nature of event, and clinical diagnosis of stroke
- Complete NIHSS
- Review all in-and exclusions
- Drug kit at bedside
- Telestroke equipment on site if using
- Family instructed to stay near
- Review CT for exclusions Final treatment decision is made by an experienced Stroke Physician (on site or remotely)

#### Patient Treatment

- Discuss treatment with patient and family
- Obtain body weight
- Calculate Alteplase dose
- Chart medication
- Ask RN to prep and administer the drug
- Complete admission paperwork and initiate transfer to inpatient unit if patient still in ED
- Patient may transfer during the infusion if stable
- Discuss post-thrombolysis care with relevant RN(s)
- Complete timeline audit sheet

## In- and Exclusion Criteria

### Inclusion criteria:

- Ischaemic stroke** causing a focal neurological deficit (defined as impairment of language, motor function, cognition, co-ordination, neglect, vision, and/or gaze).
- Significant deficit** defined as NIHSS  $\geq 4$  OR severe aphasia, dense homonymous haemianopia, significant ataxia or dominant hand weakness even if NIHSS  $< 4$ .
- Not dramatically improving** (Minor or moderate improvement in a major stroke does not preclude)
- Onset time** reliably established to be  $< 4.5$  hours at time of treatment initiation (if wakes with stroke, onset time is when last awake, if unable to identify onset then use “time last normal”).
- Previously without** advanced neurologic or medical disability that would preclude significant benefit from treatment

### Exclusion Criteria:

- Evidence of intracranial haemorrhage on head CT
- Clinical presentation consistent with SAH even if CT Head normal
- Stroke, intracranial surgery, or major head trauma in previous 3 months
- Any history of intracranial haemorrhage, AVM, or aneurysm with risk of recurrent bleeding
- GI/GU haemorrhage in previous 21 days
- Major surgery or serious trauma (excludes head trauma) in previous 14 days
- Arterial puncture at non compressible site or LP in previous 7 days
- Transmural MI or post-MI pericarditis in previous 21 days
- Other serious medical condition that would impose a significant hazard if Alteplase administered
- Evidence of acute trauma or bleeding
- Suspected septic embolism
- Seizure at onset of symptoms
- Hypertension SBP  $>185$  mm Hg or DBP  $>110$  mm Hg or requiring aggressive treatment
- Glucose  $<2.7$  or  $> 22$  mmol/l
- Known hereditary/current haemorrhagic diathesis, INR  $>1.5$ , APTT  $>40$ , or platelet count  $<100,000/\mu\text{L}$
- Exposure to weight based LMWH within last 48 hours
- Exposure to oral anticoagulants within last 48 hours unless INR  $<1.5$  (Warfarin) or APTT and Thrombin Clotting Time are both normal (Dabigatran)
- Pregnancy/Lactation or Parturition within last 30 days

### Additional exclusions for the 3 to 4.5 hour time window from ECASS 3 protocol

- Coma or “obtundation, fixed eye deviation AND complete hemiplegia” or NIHSS  $\geq 25$
- A history of “both diabetes and prior stroke”
- Any oral anticoagulant, irrespective of INR
- CT scan showing evidence of hypodensity over one-third MCA territory
- Blood pressure  $>185/110$  (no acute treatment permissible to reach target)
- Age  $> 80$  years old

NB: The above criteria are based on published study protocols and some may not be absolute. The final treatment decision is at the discretion of the treating stroke physician/ neurologist. Deviations from the above criteria should be documented in the patient record. If the treating physician is uncertain about the utility of treatment in any given patient it is acceptable to defer treatment.

## Guidance for stroke thrombolysis discussion with patient/family/whanau

Informing the patient is important, and written documentation is recommended. This effective, yet potentially harmful treatment **must be explained** with time for the issues to be processed, and questions asked. Agreement/Assent should be obtained from either the patient if s/he is able to comprehend fully the discussion or their appropriate surrogate. In their absence, the doctor should choose appropriately to treat/not treat on the patient's behalf. Non-treatment is a reasonable option.

### Items that should be discussed and documented include

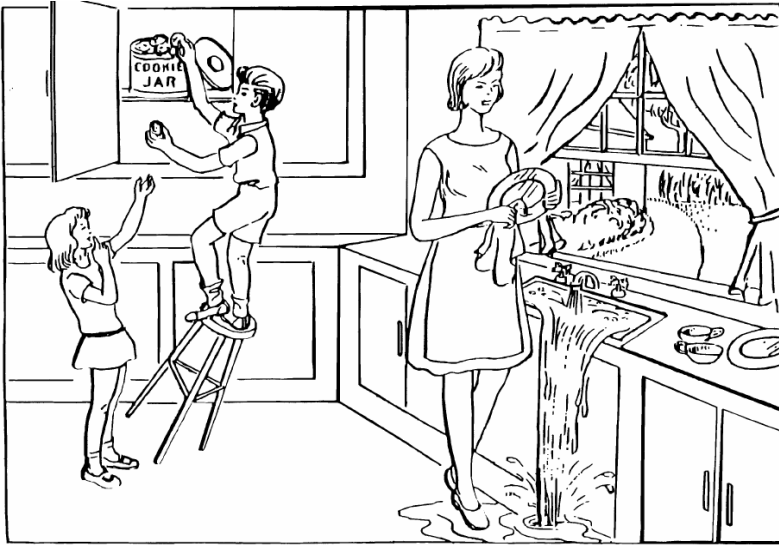
- Thrombolysis is recommended as a treatment option.
- The nature of stroke and the mechanism of thrombolysis/ALTEPLASE.
- Time-is-brain, earlier treatment offers greater benefits.
  
- Alteplase < 3 hours** of symptom onset
  - An additional 1 in 10 people (10%) may regain independence, 1 in 3 (30%) may benefit to some degree
  - Most people do not benefit
  - 1 in 16 people (6%) may bleed into the brain and half of these (3%) may die
  - Overall risk of death is not increased with treatment
  
- Alteplase within 3 to 4.5 hours** of symptom onset
  - Benefit is overall less than if treated within 3 hours of symptom onset and bleeding risk may be higher
  
- Other Items to Discuss/document**
  - Other side-effects such as allergy, hypotension, fever, bleeding may occur
  - S/he understands the effectiveness of this treatment, and understands the risks?
  - S/he acknowledges that sufficient time and information was provided

Document names of individuals involved in above discussion

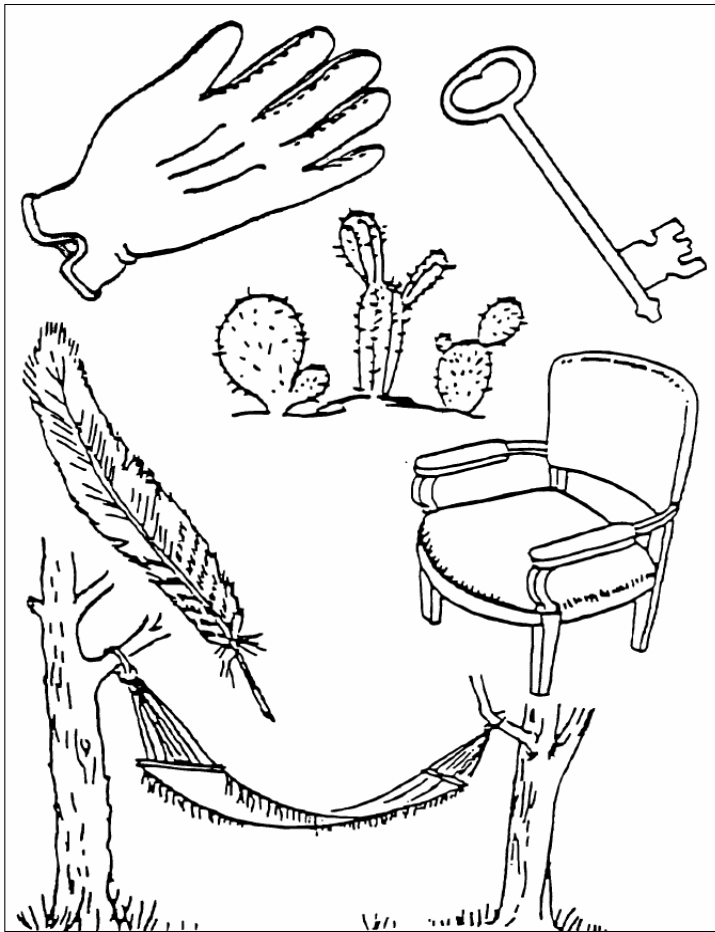
**The NIHSS: a clinical severity score; to be used by trained staff**

<p>Instructions: 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 make a special effort).</p>	
<p><b>1A: Level of Consciousness:</b> 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.</p>	<p>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 areflexic.</p>
<p><b>1B LOC Commands:</b> 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.</p>	<p>0 Performs both tasks correctly 1 Performs one task correctly 2 Performs neither task correctly.</p>
<p><b>1C LOC Questions:</b> 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.</p>	<p>0 Answers both questions correctly 1 Answers one question correctly 2 Answers neither question correctly</p>
<p><b>2 Best Gaze</b> 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 palsy (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.</p>	<p>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 is not overcome by the oculocephalic manoeuver.</p>
<p><b>3 Visual fields</b> 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 a 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.</p>	<p>0 No visual loss. 1 Partial hemianopia. 2 Complete hemianopia. 3 Bilateral hemianopia (blind including cortical blindness)</p>
<p><b>4 Facial Palsy</b> 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.</p>	<p>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.)</p>
<p><b>5A and 5B: Motor Arm</b> 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.</p>	<p>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 limb fusion</p>

<p><b>6A and 6B: Motor Leg</b> 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.</p>	<p>0 No drift; limb holds 30 degree position for full 5 seconds 1 Drift; limb drifts down before 5 seconds; does not hit bed or other support. 2 Some effort against gravity; limb cannot get to or maintain 30 degrees, drifts down to bed but has some effort against gravity. 3 No effort against gravity; limb falls. 4 No movement.</p> <p>UN= Amputation or limb fusion</p>
<p><b>7 Limb Ataxia:</b> This 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 paralysed. 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 the case of blindness, test by having the patient touch nose from extended arm position.</p>	<p>0 None 1 Present in one limb 2 Present in two limbs</p> <p>UN= Amputation or limb fusion</p>
<p><b>8 Sensory</b> 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 be only 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.</p>	<p>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 or total sensory loss; patient is not aware of being touched in the face, arm, and leg.</p>
<p><b>9 Best language</b> 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.</p>	<p>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</p>
<p><b>10 Dysarthria</b> 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 the explanation for this choice. Do not tell the patient why he/she is being tested.</p>	<p>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</p>
<p><b>11 Extinction and Inattention (formerly Neglect):</b> 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 anosognosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.</p>	<p>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</p>



**MAMA  
TIP – TOP  
FIFTY – FIFTY  
THANKS  
HUCKLE-  
BERRY  
BASEBALL  
PLAYER**



**You know how.**

**Down to earth.**

**I got home from  
work**

**Near the table in  
the dining room**

**They heard him  
speak on the radio  
last night**



## ALTEPLASE ADMINISTRATION

The recommended dose is *0.9 mg/kg body weight (maximum of 90mg)* given in 2 parts:

- 10% of the total dose administered as an initial IV bolus
- followed by the remaining 90% of reconstituted Alteplase administered as an IV infusion over 60 minutes

### Preparing and giving the Dose:

1. Identify approximate weight of patient. Use dosing table to obtain dose.
2. Reconstitute Alteplase to a concentration of 1mg/ml – 50mg vial with 50ml or 10mg with 10ml (water for injection) diluents using the transfer cannula provided.

#### Reconstitution



**Alteplase should NOT be mixed with other drugs, neither in the same infusion vial nor the same venous line (NOT even with Heparin)**

3. For patients weighing  $\leq 80\text{kg}$ , use a combination of 50mg and 10mg vials, to minimise wastage
4. Once Alteplase is reconstituted, withdraw bolus dose from vial and administer as an IV push over 1 minute, followed by saline flush
5. Minimise delays between bolus and infusion; best assisted by a doctor drawing up and administering the bolus and the nurses setting up the infusion (or similar division of labour between nurses)
6. The remainder of the dose is infused over 1 hour. This can be infused in the following ways:
  - a. Add Alteplase to Syringe/and infuse via Syringe Driver over 60 minutes. If volume exceeds 50 mls, 2 pumps may need to be used OR
  - b. Add Alteplase to unprimed Burette and infuse via pump over 60 minutes. Flush system with 30 mls saline once infusion finished OR
  - c. Inject Alteplase into a 50ml bag normal saline and infuse via a standard Guardrails (or IVAC) pump over 60 minutes OR
  - d. Take a 150ml normal saline bag and remove 100mls. Then inject the remaining Alteplase into the saline bag and infuse via pump over 60 minutes
7. Prime any tubing with Alteplase solution, Flush system with 0.9% sodium chloride after completion of infusion.
8. Alteplase/TPA should be infused through one IV line and any IV fluids and IV co-medication should be administered through another.
9. Delay giving any IV co-medication for several hours if possible (especially ACE-inhibitors)
10. Heparin, Clopidogrel, or Aspirin should not usually be prescribed during the first 24 hours for anterior circulation strokes; however anticoagulation is sometimes used in basilar thrombosis as the bleeding risk is lower in vertebrobasilar thrombosis.

**Recombinant tissue plasminogen activator (Alteplase/Actilyse®) IV dosing by patient weight**

Patient Weight (kg)	Total dose@ 0.9mg/kg (mg)	Volume of 1mg/1ml ALTEPLASE		Patient Weight (kg)	Total Dose @0.9mg/kg (mg)	Volume of 1mg/1ml TPA	
		10% Bolus (ml)	90% Infusion (ml)			10% Bolus (ml)	90% Infusion (ml)
<b>40</b>	36	3.6	32.4	<b>70</b>	63	6.3	56.7
<b>41</b>	36.9	3.7	33.2	<b>71</b>	63.9	6.4	57.5
<b>42</b>	37.8	3.8	34.0	<b>72</b>	64.8	6.5	58.3
<b>43</b>	38.7	3.9	34.8	<b>73</b>	65.7	6.6	59.1
<b>44</b>	39.6	4.0	35.6	<b>74</b>	66.6	6.7	59.9
<b>45</b>	40.5	4.1	36.4	<b>75</b>	67.5	6.8	60.7
<b>46</b>	41.4	4.1	37.3	<b>76</b>	68.4	6.8	61.6
<b>47</b>	42.3	4.2	38.1	<b>77</b>	69.3	6.9	62.4
<b>48</b>	43.2	4.3	38.9	<b>78</b>	70.2	7.0	63.2
<b>49</b>	44.1	4.4	39.7	<b>79</b>	71.1	7.1	64.0
<b>50</b>	45.0	4.5	40.5	<b>80</b>	72.0	7.2	64.8
<b>51</b>	45.9	4.6	41.3	<b>81</b>	72.9	7.3	65.6
<b>52</b>	46.8	4.7	42.1	<b>82</b>	73.8	7.4	66.4
<b>53</b>	47.7	4.8	42.9	<b>83</b>	74.7	7.5	67.2
<b>54</b>	48.6	4.9	43.7	<b>84</b>	75.6	7.6	68.0
<b>55</b>	49.5	5.0	44.5	<b>85</b>	76.5	7.7	68.8
<b>56</b>	50.4	5.0	45.4	<b>86</b>	77.4	7.7	69.7
<b>57</b>	51.3	5.1	46.2	<b>87</b>	78.3	7.8	70.5
<b>58</b>	52.2	5.2	47.0	<b>88</b>	79.2	7.9	71.3
<b>59</b>	53.1	5.3	47.8	<b>89</b>	80.1	8.0	72.1
<b>60</b>	54.0	5.4	48.6	<b>90</b>	81.0	8.1	72.9
<b>61</b>	54.9	5.5	49.4	<b>91</b>	81.9	8.2	73.7
<b>62</b>	55.8	5.6	50.2	<b>92</b>	82.8	8.3	74.5
<b>63</b>	56.7	5.7	51.0	<b>93</b>	83.7	8.4	75.2
<b>64</b>	57.6	5.8	51.8	<b>94</b>	84.6	8.5	76.1
<b>65</b>	58.5	5.9	52.6	<b>95</b>	85.5	8.6	76.9
<b>66</b>	59.4	5.9	53.5	<b>96</b>	86.4	8.6	77.8
<b>67</b>	60.3	6.0	54.3	<b>97</b>	87.3	8.7	78.6
<b>68</b>	61.2	6.1	55.1	<b>98</b>	88.2	8.8	79.4
<b>69</b>	62.1	6.2	56.0	<b>99</b>	89.1	8.9	80.2
				<b>100kg &amp; over</b>	90.0	9.0	81.0

## Post-Thrombolysis Monitoring

Patient is monitored in a setting with adequate staffing e.g. ASU, HDU, CCU (locality dependent)

- All patients require recording of vital signs (pulse, blood pressure, temperature, respiratory rate) and neuro observations (GCS, pupillary reaction and size, limb power). From start of infusion begin monitoring
  - Every 15 minutes for 2 hours then
  - ½ hourly until 6 hours, then
  - 1 hourly until 12 hours, then
  - 2 hourly until 24hrs

### Reportable observations and possible complications – call registrar urgently

- Allergic reaction (anaphylaxis, orolingual angioedema, urticaria, bronchospasm, hypotension)
- Fever  $\geq 38^{\circ}$
- Hypertension  $\geq 180/105$
- Hypotension systolic BP  $\leq 110$ ; consider whether higher levels are functionally hypotensive in some elderly patients to optimize penumbral perfusion (lie flat, treat medical causes, consider volume status/bleeding)
- Haemorrhage: observe / test all body waste for suggestion of occult bleeding check potential bleeding sites e.g. wounds, IV access, puncture sites NB: Onset of abdominal pain may indicate retroperitoneal bleeding
- Neurological deterioration
- Particular attention to clues suggesting haemorrhage:
  - Altered neurology, nausea/vomiting, new headache
  - Increasing hypertension (urgent treatment if SBP  $> 180$ , or DBP  $> 105$ )
  - Increasing pulse or decreasing BP to suggest volume depletion
  - Peripheral bleeding, puncture sites, large bruising, or arterial puncture site into thigh

### Patient care post thrombolysis

- Gentle handling, gentle BP monitoring, Do not use a razor blade for shaving for 24 hours.
- Avoid NG tube placement for 24 hours if possible.
- Avoid IDUC placement during Alteplase infusion and for at least 30 minutes (best  $>4$ hours) afterwards.
- Safety precautions to prevent falls, particularly if agitated or has neglect.
- Minimise invasive procedures
- Leave IV luer in situ for blood taking, if possible. If venepuncture is required, apply direct pressure to puncture site for 20 minutes, minimise physical handling of the patient to prevent bruising/bleeding.
- Bed rest for the first 24 hours unless cleared by consultant neurologist/stroke physician
- If relative hypotension for age, or if fluctuating neurology  $\rightarrow$  lie flat and consider hydration boluses.
- NBM initially, generally requires generous hydration support parenterally.
- Capillary glucose 4 hourly if baseline glucose high or if diabetic (otherwise avoid needle sticks)
- Call **urgently** for help if there is any clinical deterioration

### Antiplatelet agents after Thrombolysis

- A CT scan should be obtained at around 24hrs to exclude bleeding intracranially
- Once CT negative for significant blood start oral antiplatelet therapy
- Very minor bleeding does not usually preclude antiplatelet therapy, but in this setting therapy should be discussed with consultant neurologist/stroke physician before initiation

## Management of Complications

### High Blood-Pressure

High BP post thrombolysis increases the risk of haemorrhagic complications and needs careful management

- SBP > 185 or DBP > 110 mmHg on repeated measurements is a contra-indication to thrombolytic therapy unless easily reduced with IV medications. BP pre-treatment is not used in the 3-4.5hr cases (ECASS 3 protocol).
- If BP rises during or after thrombolytic therapy it will also need to be lowered.

**Systolic BP is 180-230mmHg or DBP 105-120mmHg (≥2 recordings; 5-10min apart):**

- Prop patient upright
- Give IV labetalol 10mg over 1-2 minutes, use ECG monitoring
- Contraindications include asthma, severe PVD, CHF, heart block, Verapamil, Diltiazem (see alternative agents below)
- The dose may be repeated or doubled every 10-20 minutes up to a total dose of 150mg
- Monitor BP every 15 minutes during Labetalol treatment and observe for development of hypotension

**Systolic BP >230 mmHg and/or Diastolic >120 but <140:** Confirm recording and if confirmed, do not treat with tPA and stop tPA treatment if already commenced. If treated already, begin with above Labetalol protocol. Monitor Q 10 minutes and if no response discuss with ICU (target <180/105).

**Diastolic BP >140:** Confirm recording; if remains >140. If tPA has been started stop it and initiate immediate BP management and discussion with ICU (target <180/105). NINDS protocol used Nitroprusside (in ICU environment, 0.5-10 microgram/kg/minute), being careful to avoid large drops in BP

**Other available medications to control BP (if Labetalol contra-indicated) include the following**

- Hydralazine
  - 5-10mg IV stat then as required Q20-30minutes, Consider infusion 50-150 microgram/minute.
  - This and GTN are vasodilators that may interfere with cerebral auto-regulation and then precipitate large drops in BP making them less useful in stroke
- Verapamil if Labetalol contraindicated.
  - Give 5 mg IV over 5 minutes, repeated at 5 minutes if required,
  - Consider infusion 5-10mg/hr, maximum 100mg/day.
  - Use ECG monitoring.
  - Contraindications include cardiac failure, heart block or concomitant beta-blockers.
- Clonidine if alert;
  - 150 micrograms IV over 5 minutes, repeat after 20 minutes (as it may generate an initial mild increase in BP that reverses) if required, and further doses Q3-6 hrs if required
  - May be safest agent but animal studies suggest delayed stroke recovery and sedative
- GTN
  - 5 - 115 microgram per minute., may increase every 3-5 minutes.

### Haemorrhage

- Usually presents as worsening or new neurological deficit in the first 12 hours post Alteplase administration.
- Stop Alteplase infusion if still in progress. There is **NO** reversal agent for Alteplase.
- Urgent FBC and clotting screen with prothrombin time (PT), aPTT, and fibrinogen level
- Urgent CT brain scan. If haemorrhage present discuss with on call neurology team, and on call haematologist and ask about the use of FFP/Cryoprecipitate +/-neurosurgical team (surgery not usually appropriate).
- ICU, steroids and osmotic therapy are usually not appropriate.
- Note: Minor asymptomatic haemorrhage is common and does not worsen outcome.
- Large symptomatic haemorrhage has a poor prognosis and may be fatal.

### Allergic Reaction

- 1) Typically manifests as orolingual angioedema, unilateral or bilateral during or shortly after TPA
- 2) Usually responds promptly to standard treatment.
  - a) Stop infusion if still running and swelling is more than mild or is progressing rapidly
  - b) If airway compromise give 0.5ml IM Adrenaline 1:1000
  - c) Otherwise consider Hydrocortisone 100mg IV, Loratadine 10mg PO or Promethazine 50mg IM
- 3) Monitor airway carefully.

## Appendix 1: ED Assessment Resources

Sample 'Stroke FAST Track form' that could be used by ED Triage Nurses:

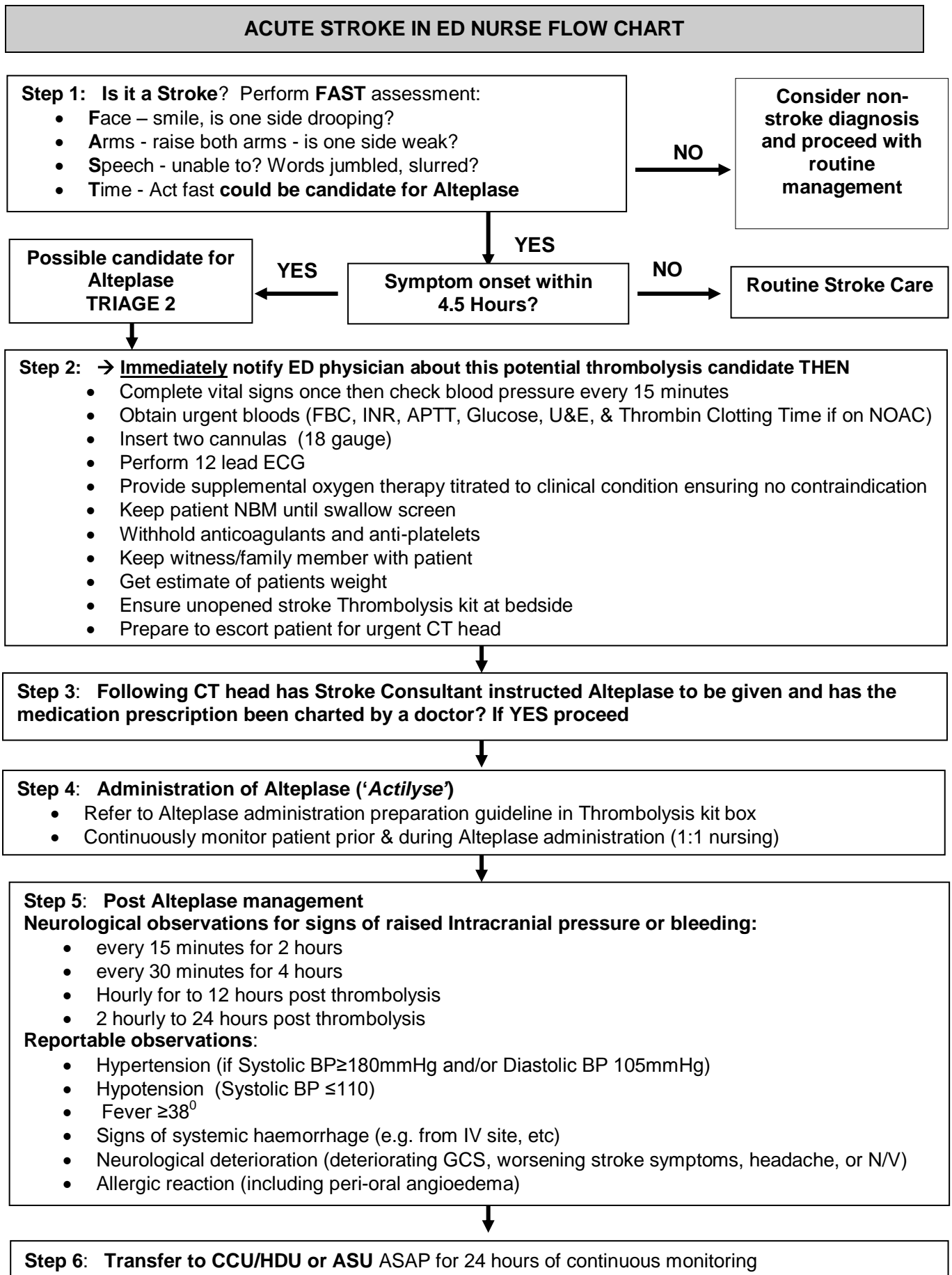
<b>Stroke Fast Track</b>		
<i>Patient Sticker</i>	Date: ____ / ____ / ____	<b>Triage 2</b>

1	Time of onset of stroke  Time: ____:____ hr  (Note: Time of onset is unknown or the patient wakes with stroke, then the onset is when the last awake and normal)  <b>If &lt;4hrs to FAST</b>	<b>FAST Test: is it a stroke?</b> <b>1. FACE: Unequal smile</b> <b>2. ARM: Weakness of arm or leg</b> <b>3. SPEECH difficulties</b>  <b>If answers YES to any of the above activate stroke thrombolysis pathway</b>
2	IV access x2 and laboratory investigations; phone to ensure urgency as often the time-limiting factor	<b>FBC    U&amp;E    Creatinine    Glucose (initial finger prick)</b> <b>COAG (include TCT)    Pregnancy Test (if applicable)</b> <b>Group and Hold</b>
3	Baseline Recordings  Time: ____:____ hours	<b>GCS</b> ____ <b>Temp</b> ____ <b>B/P</b> ____  <b>HR</b> ____ <b>SaO2</b> ____ <b>BSL</b> ____  <b>ECG</b> ____

Rosier Score for use by ED Doctors:

Confirm Diagnosis with <b>ROSIER score</b>		
Loss of Consciousness?	Yes ⇨ -1	No ⇨ 0
Seizure activity?	Yes ⇨ -1	No ⇨ 0
Is there NEW ACUTE onset or on awakening of the following?		
Speech disturbance?	Yes ⇨ +1	No ⇨ 0
Unilateral face weakness?	Yes ⇨ +1	No ⇨ 0
Unilateral arm weakness?	Yes ⇨ +1	No ⇨ 0
Unilateral leg weakness	Yes ⇨ +1	No ⇨ 0
Visual field deficit?	Yes ⇨ +1	No ⇨ 0
If Total ≥1 → Activate 'Code Stroke' If Total <1 → Abort Thrombolysis Protocol and provide routine stroke care		

## Sample ED RN Flow Chart



## Appendix 2: Sample audit Tool

### Timelines tracking Alteplase from stroke onset to when bolus given

	Time (0001hrs-2400hrs)	Reasons for any delay
1. symptom onset		
2. patient/whanau response		
3. ambulance call		
4. ambulance sent		
5. ambulance arrive		
6. ambulance depart		
7. ambulance to hospital		
8. triage time		
9. first doctor time		
10. Stroke team notified		
11. CT asked		
12. CT performed		
13. Alteplase bolus given		