Stroke Model of Care Oversight Committee

Clinical Guideline No.: CG002

Stroke Management Procedures and Protocols

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Government of South Australia
SA Health

1. Acknowledgements

We offer sincere thanks to the many contributors whose commitment and knowledge have informed the development of this document.

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2. Disclaimer

This document has been developed by the Stroke Model of Care Oversight Committee to support service change according to best practice within allocated funding and industrial agreements. This paper is expected to challenge how any current funds for stroke services are spent, ensuring allocated funds are reviewed and used to deliver stroke care according to best practice. This paper is not a tool to seek funds over and above what is allocated now or into the future for these services.

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Contents

3. Abbreviations

ASPECTS	Alberta Stroke Program Early Computerised Tomography Score
APTT	Activated Partial Thromboplastin Time
ART	Assessment for Rehabilitation Tool
BGL	Blood Glucose Level
BP	Blood Pressure
CT	Computed Tomography
CTA	Computed Tomography Angiography
CTP	Computed Tomography Perfusion
DN	Dietitian
DOAC	Direct acting Oral AntiCoagulant
DVT	Deep Vein Thrombosis
ECG	Electrocardiograph
ED	Emergency Department
EVT	EndoVascular Thrombectomy
eGFR	estimated Glomerular Filtration Rate
FFP	Fresh Frozen Plasma
FMC	Flinders Medical Centre
GCS	Glasgow Coma Scale
GI	Gastrointestinal
GTN	Glyceryl Trinitrate
HDU	High Dependency Unit
IA	Intra-Arterial
ICA	Internal Carotid Artery
ICH	Intracerebral Haemorrhage
ICU	Intensive Care Unit
IMI	Intramuscular injection
INR	International Normalised Ratio
IV	Intravenous
LMH	Lyell McEwin Hospital
LMWH	Low Molecular Weight Heparin
LVO	Large Vessel Occlusion
MAP	Mean Arterial Pressure
MCA	Middle Cerebral Artery
MET	Medical Emergency Team
mNIHSS	modified National Institute of Health Stroke Scale
MO	Medical Officer
MRC	Medical Retrieval Consultant
MRI	Magnetic Resonance Imaging
MTP	Massive Transfusion Protocol
NIHSS	National Institute of Health Stroke Scale
NSF	National Stroke Foundation
OT	Occupational Therapy
PE	Pulmonary Embolus
PT	Physiotherapy
RAH	Royal Adelaide Hospital
rCBF	relative Cerebral Blood Flow
rtPA	Recombinant tissue plasminogen activator
ROSIER	Recognition of Stroke in the Emergency Room
SAAS	SA Ambulance Service
SCD	Sequential Compression Device

SP	Speech Pathology
SpO2	Oxygen Saturation
SW	Social Work
TQEH	The Queen Elizabeth Hospital

4. Introduction

This document will facilitate the delivery of best practice acute stroke care for all South Australians. The content is targeted at hospitals with stroke units and focuses on care that is required from the time of admission to discharge from an acute stroke unit bed. The document aims to provide standardized management that eliminates variability and promotes a platform for inter-hospital collaboration. This document has been developed by stroke experts and incorporates recommendations from the *Clinical Guidelines for Stroke Management 2017*, Stroke Foundation (SF) and its 2018 Endovascular Thrombectomy (EVT) focused update. It is recommended that each stroke unit and country stroke services use this document to generate a hospital specific management protocol that is ratified by their respective protocol committee. Site-specific application of the document is guided by the Clinical Services Capability Framework [143]. Safe implementation of these protocols requires that clinicians making emergency stroke decisions have rapid and reliable access to neuroimaging. This is a shared responsibility of the networks, SA Medical Imaging and contracted private imaging service providers.

The document assumes that all people presenting with stroke will be cared for by an interdisciplinary stroke team comprised of medical, allied health and nursing professionals who have a special interest and expertise in the management of stroke, and staffed at SF recommended staff to patient ratios. The successful implementation of this document relies on stroke teams working in a coordinated model, and taking a patient-centred approach to care delivery. Senior team members provide ongoing support and training to less experienced staff who may rotate through the stroke team. Ideally, senior members of the acute stroke team have the opportunity to get experience in sub-acute/community stroke rehabilitation facilities to enhance understanding of the whole stroke pathway. Unless stated otherwise the stroke team in this document refers to the stroke medical consultant and medical officers, the stroke nurse coordinator, and senior stroke allied health staff from each discipline (physiotherapy (PT), occupational therapy (OT), dietetics (DN), speech pathology (SP), social work (SW)). Pharmacists, psychologists and allied health assistants are valuable stroke team members when available. Allied health team leader positions assist in service coordination and should be considered as part of the stroke team. Junior and trainee staff from all disciplines should rotate through the team in order to foster ongoing learning in a supportive environment.

An overview of the pathway for stroke management is provided. The pathway is designed to effectively recognise stroke in the community and transport patients to the nearest stroke unit hospital whereby appropriate acute therapy can be delivered. On arrival, a triage protocol assesses eligibility for hyper acute therapies with subsequent activation of a dedicated team that facilitates rapid transit to a stroke unit / country stroke service where treatment can be effectively delivered. The pathway also accommodates a standardized approach for inter-hospital transfer, management of transient ischaemic attack and an acute stroke care protocol applicable to all patients beyond the hyper acute phase.

This document includes the following protocols:

1. Stroke Triage Protocol
2. Country Stroke Triage Protocol
3. Inter-Hospital Transfer Protocol
4. Code Stroke Protocol
5. Intravenous Thrombolysis Protocol
6. Intracerebral Haemorrhage Protocol
7. Endovascular thrombectomy Protocol
8. Decompressive Craniectomy Protocol
9. Acute Stroke Care Protocol
10. TIA Triage Protocol

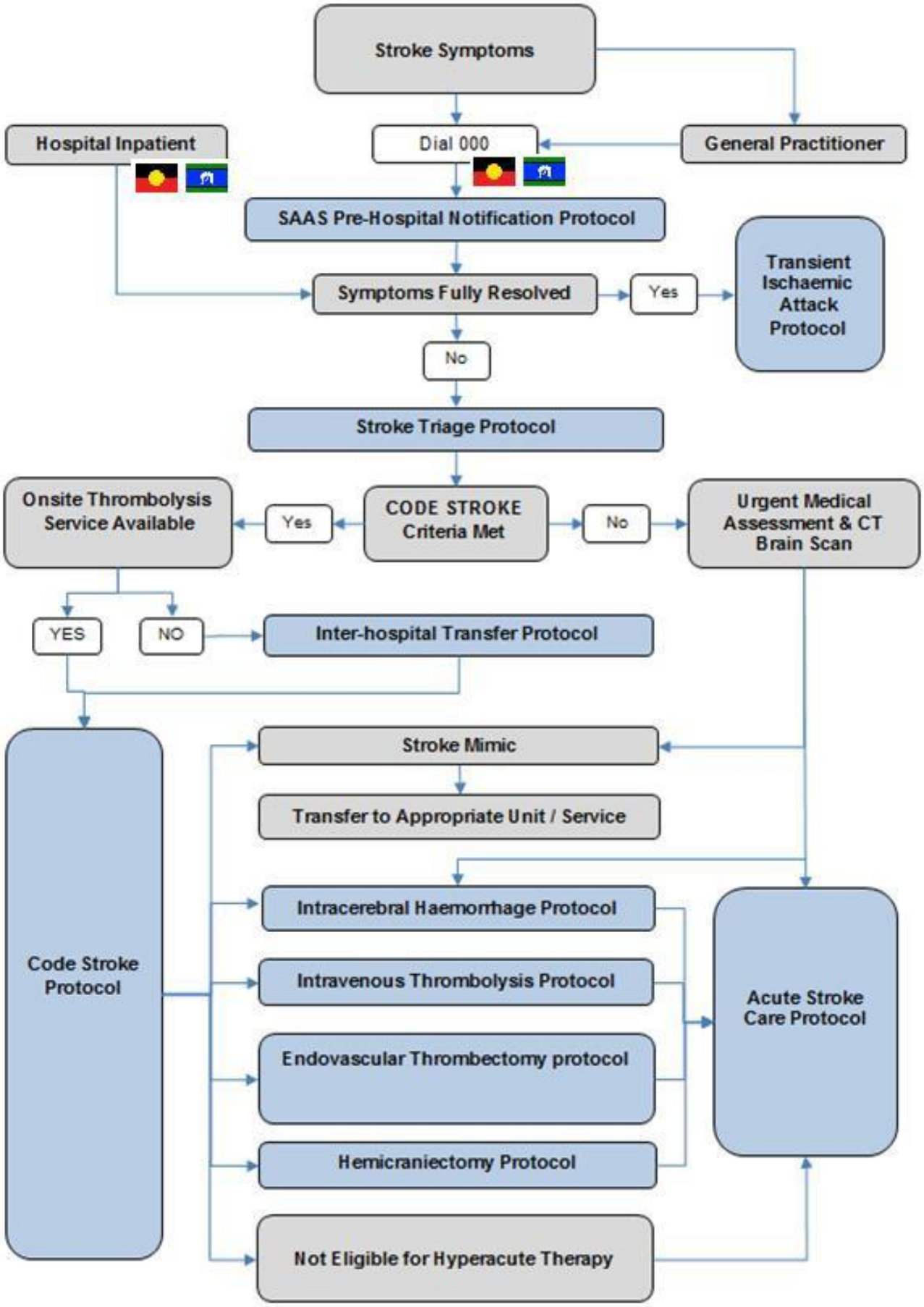
5. Safety, Quality and Risk Management

 National Standard 1 Clinical Governance	 National Standard 2 Partnering with Consumers	 National Standard 3 Preventing & Controlling Healthcare-Associated Infection	 National Standard 4 Medication Safety	 National Standard 5 Comprehensive Care	 National Standard 6 Communicating for Safety	 National Standard 7 Blood Management	 National Standard 8 Recognising & Responding to Acute Deterioration
☒	☐	☐	☒	☒	☒	☐	☒

6. Acute stroke guidelines for Children

'TO BE DEVELOPED'

7. Acute stroke management pathway



8. Stroke triage protocol

The Stroke triage protocol is designed to rapidly confirm a diagnosis of stroke and identify patients who may benefit from acute reperfusion therapy. Implementation is recommended in the hospital emergency department (ED) and available on a 24/7 basis. The protocol should be performed by an ED health care worker (typically ED triage nurse) on all patients who present with suspected stroke.

It is recommended that patients initially undergo a finger prick blood glucose level (BGL) with readings < 3.5 mmol/l urgently corrected to normal prior to proceeding with ED Stroke Triage Protocol. The latter comprises completing the Recognition Of Stroke In the Emergency Room (ROSIER) Scale[1] (see below), establishing the stroke onset time and premorbid function. Ambulance staff will usually have completed the ROSIER score, and also possibly the ACT-FAST scale (Ctrl+click to select link).

At ED presentation, patients are deemed potentially eligible for thrombolysis if **all three** of following criteria are met:

1. ROSIER Scale of ≥ +1, **and**
2. Symptom recognition time of ≤ 4.5 hours **and**
3. Independent and with no history of severe cognitive dysfunction or terminal illness (if uncertain assume normality).

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 and strokes of unknown onset time should not be excluded at this stage of triage (as time of onset can often be subsequently established). Although thrombolysis must be commenced within 4.5 hours of stroke onset, a triage stroke onset of <4.5 hours is given to allow for timing imprecision (often able to be refined post-presentation).

Depending on local feasibility and resourcing, patients with a high probability of a large vessel occlusion (ACT-FAST positive patients) should be met at the door by the stroke team and taken directly on the ambulance stretcher to the CT scanner.

In addition, following recent extended hours EVT trials, code stroke triage criteria are met for any patient presenting up to 24 hours post-onset (or since last known well time) if points 1 and 3 are met, and if the patient has a significant focal neurological deficit (especially unilateral face/arm +/- leg weakness with significant speech disturbance and/or hemispatial neglect) These patients will usually have a ROSIER score of three or above and will be ACT-FAST positive (see below – (ref Zhao Stroke)..

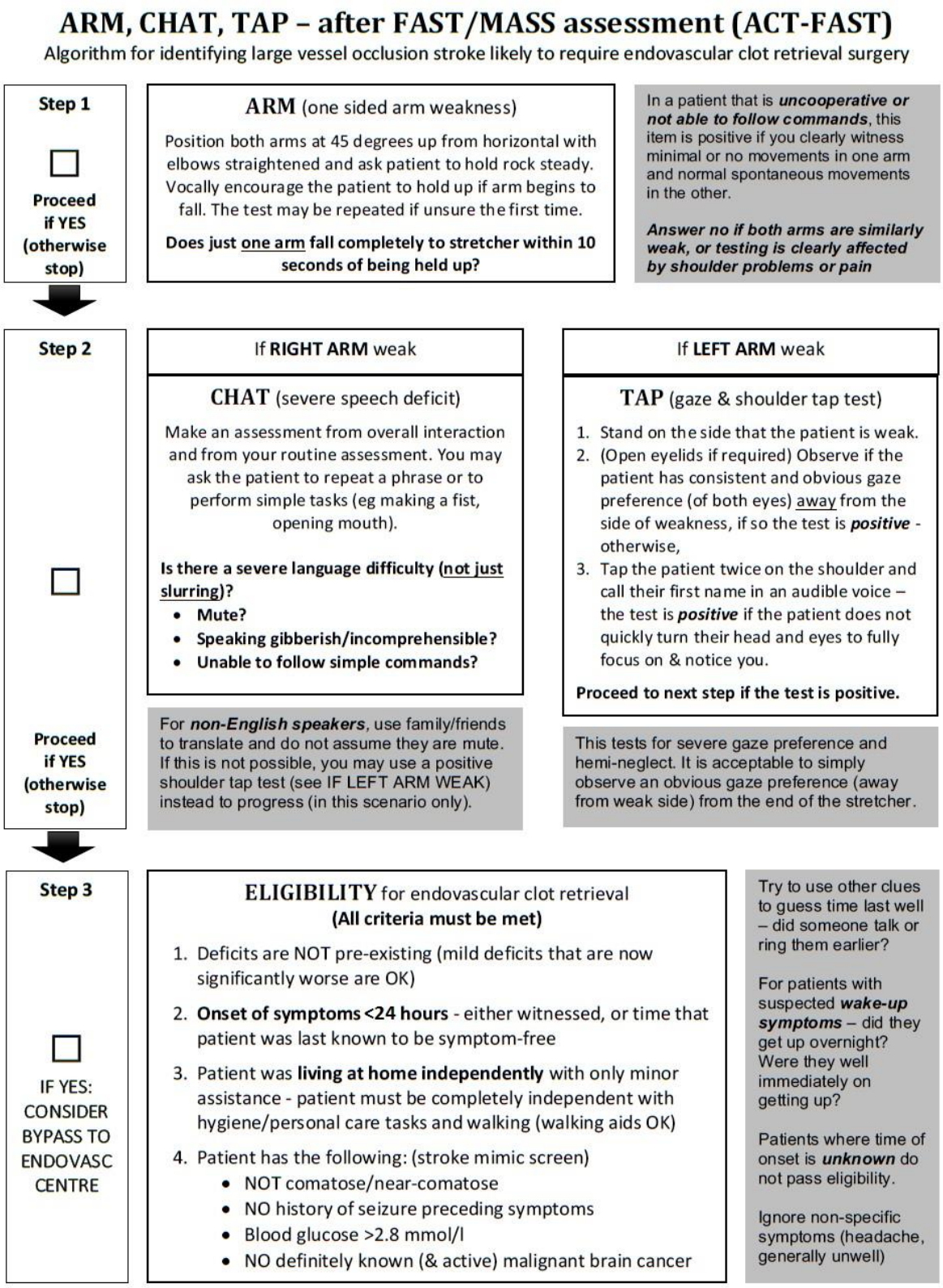
ROSIER Scale: Recognition of Stroke in the Emergency Room[1]

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)	

ACT-FAST Scale



(Zhao et. al, 2018) [153]

The above may result in the following outcomes:

1. Patient presents to a non-stroke unit hospital and all stroke thrombolysis triage criteria are met:

   Action: Patient to be urgently reviewed by the most senior ED Medical Officer and considered for transfer to the nearest stroke unit hospital or country stroke service (see inter-hospital transfer protocol, (Ctrl+click to select link) – please note that if a patient is a high probability of a large vessel occlusion direct transfer to the RAH may be recommended).

2. Patient presents to a non-stroke unit hospital and thrombectomy triage criteria are met (i.e. patient with symptoms >4.5 hours but a severe clinical syndrome/ACT-FAST positivity)

   Action: Patient to be urgently reviewed by the most senior ED Medical Officer and considered for transfer to the Royal Adelaide Hospital (see inter-hospital transfer protocol, Ctrl+click to select link).

3. Patient presents to a stroke unit hospital / country stroke service and all stroke triage criteria are met:

   Action: Activate local hospital code stroke protocol (Ctrl+click to select link).

4. Patient presents to a thrombolysing but non-EVT hospital and thrombectomy triage criteria are met (i.e. patient with symptoms >4.5 hours but a severe clinical syndrome)

   Action: Patient to be urgently reviewed by the most senior ED Medical Officer and considered for transfer to the Royal Adelaide Hospital (see inter-hospital transfer protocol, Ctrl+click to select link).

5. Patient is considered to have a stroke (i.e. ROSIER scale of ≥ +1) but does not fulfil other Stroke Triage criteria (i.e. mild stroke with symptom onset time > 4.5 hours or severe dementia):

   Action: Admit to ED as per local hospital practice. For hospitals with stroke units notify the on call stroke team as soon as possible. For non-stroke unit hospitals transfer to nearest stroke unit hospital is recommended pending bed availability (see inter-hospital transfer protocol, Ctrl+click to select link).

6. Patient is not considered to have a stroke (i.e. ROSIER scale of ≤ 0) and stroke triage criteria are not met:

   Action: ED Assessment as per local hospital practice.

Inpatient Acute Stroke

Strokes occurring when a patient is already admitted are often complex. There are often additional contraindications. However, these patients often have delayed recognition of stroke due to pre-existing illnesses and treatments (such as anaesthesia, pain relief or co-existing delirium). The state protocol does not mandate how different hospitals should approach these patients. However, each hospital should develop its own process to rapidly assess, diagnose and if necessary transfer such cases. Early consultant involvement is a key factor.

Country Acute Stroke Initial Assessment and Management Protocol

Stroke Assessment Criteria

1 - ROSIER Scale of ≥ +1, and
2 - Independent and with no history of severe cognitive dysfunction or imminently terminal illness
3 - Symptom onset of ≤ 4.5 hours ('found on floor' and 'wake up strokes' **NOT** excluded)
OR
3 - Items 1 and 2 **+ hemiplegia +/- dysphasia<24 hours**
All 3 Criteria MUST be met to proceed to YES

YES
Meets Code Stroke Criteria

CODE STROKE CALL
Inform Radiology of ETA
24/7

NO

ALL OTHER SUSPECTED STROKE PRESENTATIONS
(INELIGIBLE for **Thrombolysis, may be eligible for other acute stroke interventions)**

Acute Stroke Assessment (should not delay time to CT):

- Assess vital signs and resuscitate if necessary
- O2 supplementation (SPO2> 95%)
- Confirm history and ROSIER scale and BGL
- Insert large bore IVC x 2.
- **ORDER URGENT CT brain, CTA (CT Angiography) and CTP (CT Perfusion)**
- Urgent bloods to SA Pathology (form in stroke pack)
- Perform National Institutes of Health Stroke Scale (NIHSS)
- Perform 12 lead ECG (should not delay CT scan) and weight (estimate or ask patient or family)
- Following non-contrast CT and immediately post-CTA acquisition when patient is still on CT table 24/7 call **RAH** stroke phone: **0409 348 788 - will confirm CTP suitability** (Switchboard: 8707 4000 as back-up)
- ****Aboriginal & Torres Strait Islander Identification & Protocol**

**** Aboriginal & Torres Strait Islander Identification & Protocol**

CT BRAIN and CT angiogram (aortic arch to circle of willis). Perform urgently if stroke< 24 hours' duration

1. Asses vital signs and resuscitate if necessary
2. Insert IVC x2 and collect bloods
3. Perform ECG, BGL and weight
4. Complete Stroke Nurse Assessment (in pack)
5. Alert Team Leader / After Hours Coordinator
6. Consider transfer to Metro Hospital / Ward admission. If MCA/basilar/carotid occlusion consider urgent transfer to RAH for endovascular thrombectomy (EVT). Call **RAH** stroke phone **0409 348 788**

Reperfusion Therapy

Eligibility Criteria (must meet all):

I. Onset of stroke symptoms within 4.5hrs and 24 hrs Endovascular Thrombectomy (EVT)
II. Potentially disabling neurological deficit
III. CT brain - shows **NO** haemorrhage or TPA contraindications
IV. No other Contraindications
V. Exclusion Criteria checked

EXCLUSION CRITERIA:

Absolute Contraindications - DO NOT ADMINISTER rtPA
- Uncertain time of onset (last seen well >4.5hrs)
- Hereditary or acquired coagulopathy (INR>1.7)
- Oral anticoagulant within 12hrs
- Clinical and Radiological suspicion of subarachnoid haemorrhage with vasospasm
- Suspected septic embolus
- Hypo (<3.5mmol) or Hyper (>22.2mmol) glycaemia
- Hypertension (systolic >185mmHg /diastolic >110mmHg)
- Seizure at symptom onset without vessel occlusion
- PLT < 100 x 10/L

Relative Contra-indications-use of rtPA with careful consideration
- Age <18yrs
- Pregnancy
- CT evidence of >1/3 middle cerebral artery infarction or ASPECTS of less than 6-7.- Known history of intracranial / subarachnoid haemorrhage where risk outweighs potential benefits
- Suspected /known recent (< 30 days) MI
- Organ surgery or trauma with internal injuries (<30days)
- Gastrointestinal or genitourinary bleeding (<30 days)
- CPR or arterial puncture in last 7 days
- Severe comorbidities
- Pre -existing dementia (modified Rankin >3)
- Dose of oral anticoagulant >12hrs

TPA+/- EVT Eligible

OnCall Stroke Consultant authorises rtPA
VI. Notify Team Leader/ After-hours Coordinator
VII. Administer alteplase or tenecteplase if large vessel occlusion (LVO) according to protocol
VIII. Transfer to RAH ASAP if LVO for possible endovascular thrombectomy (EVT)

Post rtPA ADMINISTRATION
- Admit to ward/monitored beds/HDU
- Continue Acute Stroke Observation Record for 24hrs
- Swallow Screen
- Referrals to Community/Allied Health Services
- Assess for rehabilitation needs

Only EVT Eligible

OnCall Stroke Consultant authorises urgent transfer with Interventional Neuroradiologist input if required
IX. Notify Team Leader/ After-hours Coordinator
X. Await transfer
XI. IV fluids, lie flat (if tolerated)

**** Ctrl+Click here for specific transfer considerations for Aboriginal peoples**

With an increased window of EVT eligibility, all patients in South Australia presenting with symptom duration of less than 24 hours need to be considered for this treatment. Some of these patients may be eligible for thrombolysis, either at a country stroke thrombolysing service or at the closest metropolitan Stroke Unit.

A statewide approach to acute stroke management enables all South Australian stroke patients, to be assessed, treated and/or transferred.

The same principles above apply to all Country Hospitals. Treatment and transfer decisions are often more complex for patients living in rural and remote parts of S.A. To support timely clinical decisions, clinicians located at all country hospitals are able to call or videoconference with a metropolitan vascular neurologist to determine the best care pathway for country stroke patients. This acute stroke support service, staffed by Metropolitan vascular neurologists is available 24/7. Country clinicians seeing patients with acute stroke are encouraged to use this service to ensure the country patient is transferred to the appropriate hospital in a timely fashion (or not transferred, as appropriate).

This enhanced stroke support service allows appropriate patients to be selected for transfer to Adelaide while allowing others to access specialised stroke care closer to home.

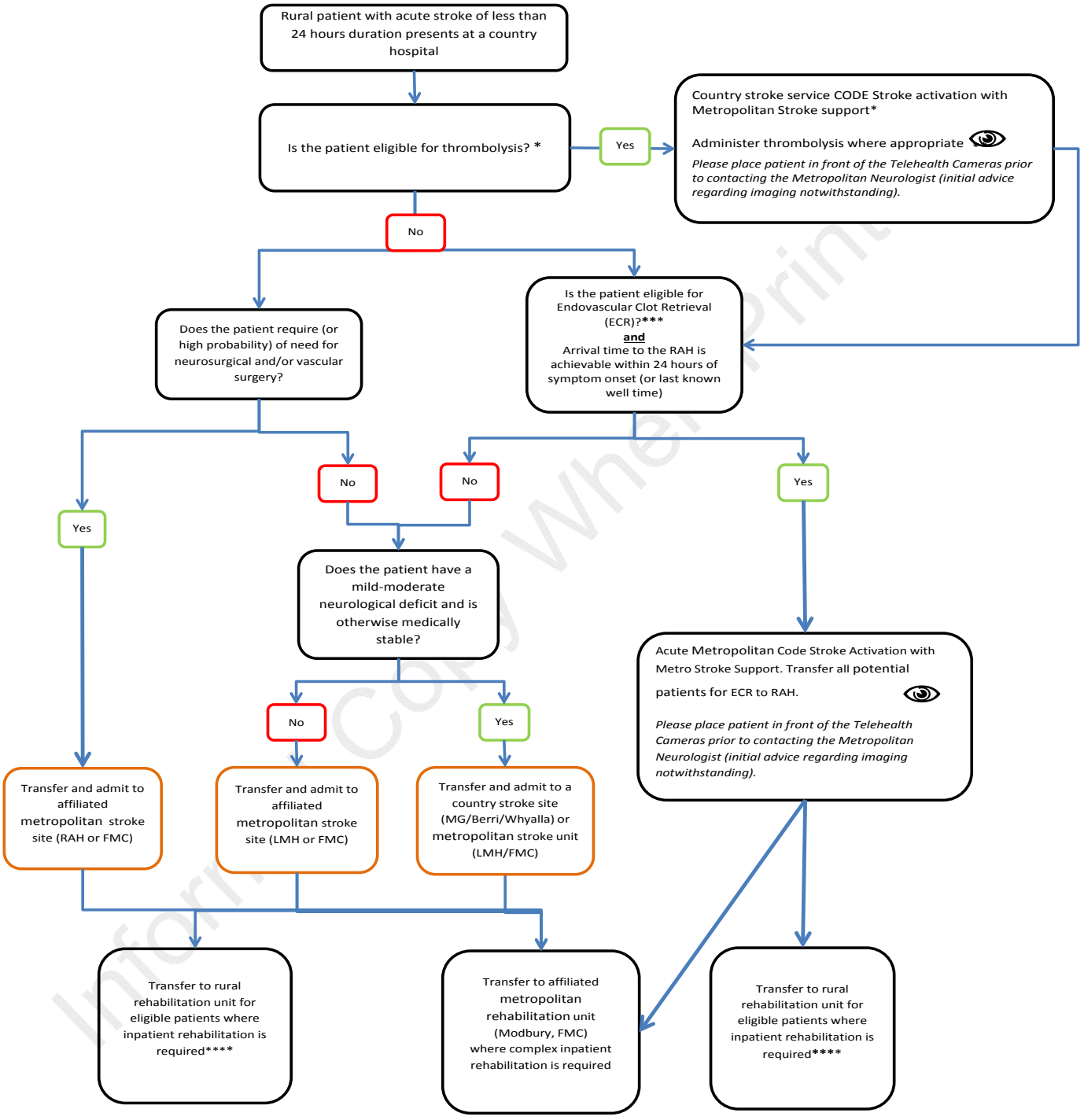
After the discussion with the Metro telestroke consultant, once the patient transfer destination has been confirmed, Medstar should be contacted to assist with transfer and transfer logistics. If the patient is for ultra-urgent transfer when the transfer destination is immediately apparent (e.g. to the RAH for thrombectomy) this contact should be via three-way discussion between the telestroke consultant, Medstar retrieval consultant and the country clinician. Otherwise the country clinician should arrange transfer through routine transfer channels once the transfer destination and bed are confirmed.

The flowcharts guiding these decisions are inserted over-page for reference.

Please refer to Appendix 18 or Ctrl+Click Flags below to go to Emergency Services

South Australian Rural Stroke Pathway - Thrombolysis

South Australian Rural Stroke Pathway - Thrombolysis Sites



* Refer to Country Acute Stroke Initial Assessment and Management Protocol

** Tenecteplase Protocol if patient eligible for ECR

*** Unilateral moderate weakness and/or clear cut dysphasia and/or hemispatial neglect

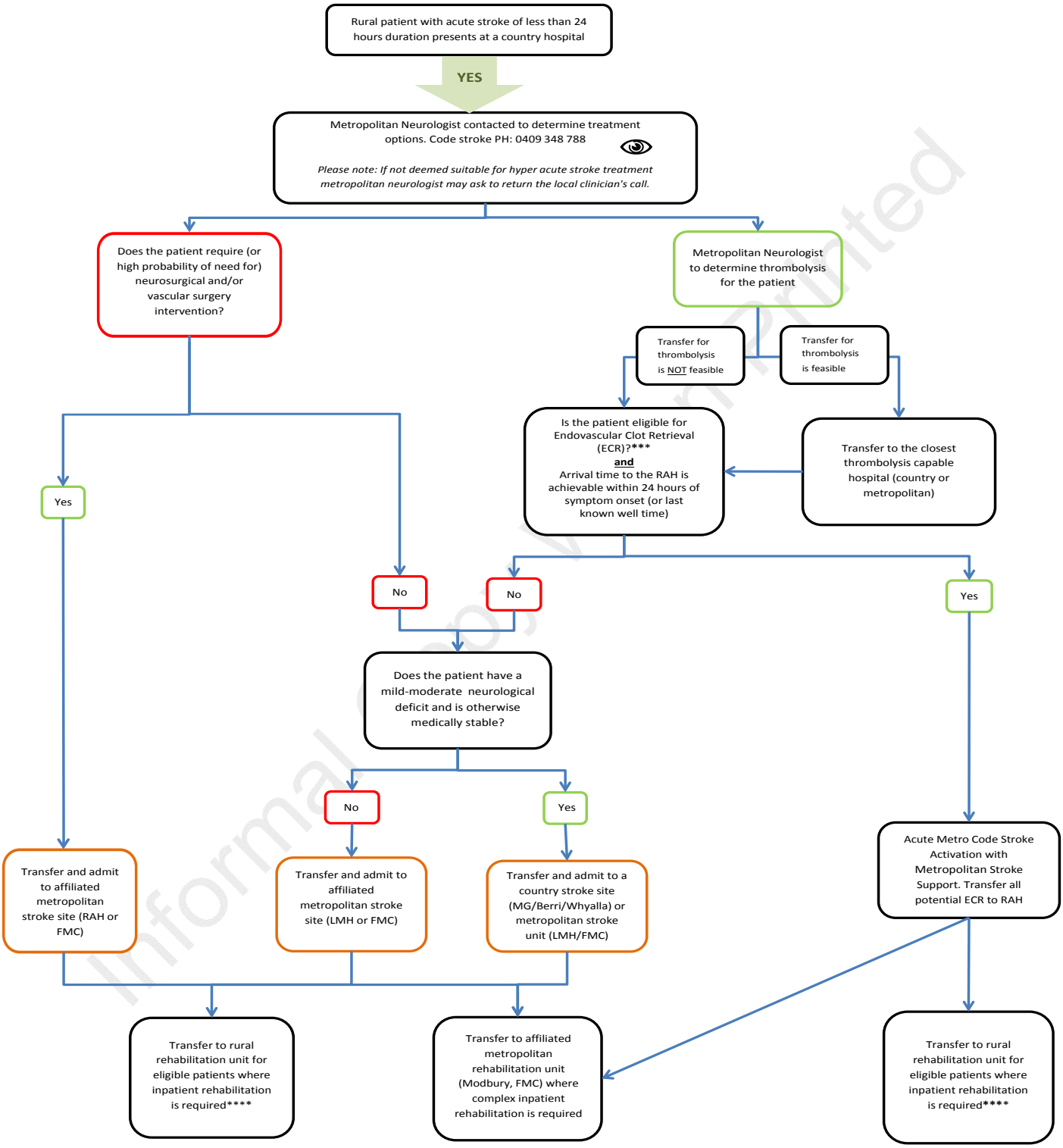
**** Rural rehabilitation unit closest to residential address. Where inpatient rehabilitation is not required, consider ambulatory rehabilitation and/or discussion with rehabilitation service.

Metropolitan Neurologist can link with site using the video conferencing unit

Please refer to Appendix 18 or Ctrl+Click Flags below to go to Emergency Services

South Australian Rural Stroke Pathway - Non Thrombolysis

South Australian Rural Stroke Pathway - Non-Thrombolysis



*** Unilateral moderate weakness and/or clear cut dysphasia and/or hemispatial neglect

**** Rural rehabilitation unit closest to residential address. Where inpatient rehabilitation is not required, consider ambulatory rehabilitation and/or discussion with rehabilitation service.

Metropolitan Neurologist can link with site using the video conferencing unit

9. Inter-hospital transfer protocol

This pathway has been developed to streamline patient transfer between hospitals and to clarify responsibility of patient care. The pathway in 9.1 and 9.2 is applicable to any metro hospital requiring transfer of a patient to specialist stroke care. A separate section (9.4) below outlines the procedure for country transfers. The metropolitan Stroke Units have a dedicated stroke phone to facilitate communication. These phones have the capacity to merge calls between staff to allow shared communication (RAH 0409 348 788, LMH 0467 719 358, FMC 82046895). It is recommended that transfer of a stroke patient from hospital A (transferring hospital) to hospital B (stroke unit hospital) take the following path:

9.1 Transfer of a potential thrombolysis case

1. Medical Officer from hospital A contacts Stroke phone in hospital B - the case is discussed and decision to accept transfer considered.
2. If accepted:
   a. Medical Officer from hospital A arranges priority 2 Code Stroke SA Ambulance Service (SAAS) transfer to hospital B. It should be noted that despite acceptance of transfer by hospital B, that patient responsibility remains with hospital A during the transit process.
   b. Stroke phone-bearer (or delegate) in hospital B notifies the responsible Emergency Department Clinical Lead of transfer and activates the local hospital Code Stroke Protocol and provides estimated time of arrival. This process should also pre-notify radiology and the bed coordinator of incoming activity. The stroke team in hospital B should greet the patient on arrival whereby patient responsibility is transferred.

9.2 Transfer of a potential endovascular thrombectomy case

1. Medical Officer from hospital A contacts the RAH stroke phone (0409 348 788), who then merges the call first the Interventional Neuroradiologist at the RAH and then the Hyperacute stroke consultant. The case and imaging is discussed and decision to accept transfer considered. The RAH stroke phone bearer's role should immediately merge the call, not obtain information in the first instance. Should either the INR or the Hyperacute stroke consultant be unavailable, decision by either is sufficient.
2. If the patient is considered appropriate for endovascular thrombectomy:
   a. Medical officer A arranges priority 2 (lights and sirens) SAAS transfer to the RAH. It should be noted that despite acceptance of transfer by hospital B, that patient responsibility remains with hospital A during the transit process. An escort (i.e. stroke junior doctor or stroke nurse) may be required if an alteplase infusion is being administered in transit (this is not required in the setting of tenecteplase unless haemodynamic instability requiring frequent labetalol).
   b. Medical officer A then calls the RAH stroke phone (0409 348 788) once the patient has left the sending hospital to provide an estimated arrival time.
   c. The RAH stroke phone-bearer then calls a code stroke (Code Stroke, endovascular thrombectomy transfer from XXX, ETA XX minutes). The interventional radiologist contacts the anaesthetist, theatre nurse and radiographers. Intensive care should be notified by the stroke Registrar if an ICU bed is likely to be required. The RAH stroke team should greet the patient on arrival whereby patient responsibility is transferred.

If the patient is critically unwell (e.g. intubated) then the medical retrieval consultant (MRC) at MedSTAR should be involved early via 13STAR. The MRC can then also involve (via a multi-party conference call if required) the stroke consultant, intensive care consultant and/or interventional

neuroradiologist at the receiving unit.

9.3 Transfer of an Aboriginal and Torres Strait Islander patient

When organising a transfer of a patient who has been identified as of Aboriginal and Torres Strait Islander origin, the protocol to meet Aboriginal and Torres Strait Islander cultural and social needs in an emergency should be followed in addition to the above protocols, (See appendix 18). The Aboriginal and Torres Strait Islander family hospital referral flyer should be provided to family.

9.4 Country Transfers

1. If Country medical officer encounters a patient potentially requiring metro transfer:
    a. Call the Rural Telestroke liason consultant contactable via the RAH Code stroke phone (0409 348 788) (please note also Country Code Stroke pathways above)
        i. When transfer is emergent (i.e. for endovascular thrombectomy, transfer to a stroke centre for thrombolysis, or for emergent neurosurgery) the Telestroke consultant will call 13STAR to speak with the MRC (Medical Retrieval Consultant) to discuss the case and transfer options available, involving the country referring clinician on a conference call as required. The MRC will be responsible for arranging the transfer of aeromedical and critically unwell stroke patients using the shared resources that may be available for all critical pre-hospital and retrieval cases across the state.
        ii. When transfer is less emergent, once a metro bed is confirmed by the receiving hospital bed manager, the referring country clinician should arrange for transfer to the metropolitan hospital via routine channels. The level of urgency should be indicated by the metro consultant (i.e. within 12, 24 or 48 hours).

10. Code stroke protocol

10.1 Introduction

The code stroke protocol is designed to expedite workup of stroke patients who may benefit from acute reperfusion therapy (intravenous thrombolysis and/or endovascular thrombectomy). The protocol functions via early engagement of stroke unit workforce and designation of tasks for ED and stroke unit personnel allowing for rapid transition to the stroke unit (via radiology) where treatment can be delivered. It is recommended that this protocol be adopted in all stroke unit hospitals and country stroke services and accessible on a 24/7 basis and be coordinated by workforce derived from the stroke unit or other health care workers who have completed an accredited code stroke training program. Robust communication infrastructure and remote access to neuro-imaging is recommended.

10.2 Code stroke activation

It is recommended that activation of a code stroke protocol be restricted to the following:

1. *SAAS Stroke pre-hospital notification* – This scenario leads to direct pre-notification of a patient en-route to hospital via ambulance. Code stroke activation and notification of patient estimated time of arrival to ED is actioned by the stroke team (or other recipient of the SAAS pre-notification call). The stroke team should ensure that the patient and SAAS workforce are met on immediate arrival to ED. Depending on local hospital resources; a direct to CT approach is preferred when clinical suspicion of a large vessel occlusion is high.

2. *Stroke triage protocol* – This applies to patients presenting to ED who fulfil stroke triage protocol criteria (Ctrl+click to select link). Code stroke protocol is activated by the ED triage nurse (or designated ED stroke triage personnel).

3. *Inpatient stroke and other* – for all other cases, including inpatient stroke, code stroke activation may be actioned by the duty nurse, the reviewing Medical Officer or the Medical Emergency response team (MET) as appropriate.

10.3 The code stroke team

The protocol recommends that a code stroke team is available for designated thrombolysis services (24/7 at the RAH, 0800-2000 at FMC and LMH, and accessible 24/7 at Mount Gambier, Riverland (Berri) and Whyalla Hospitals) and that a roster of personnel is available to relevant hospital staff (i.e. ED, switchboard and stroke unit). The minimum workforce that should receive simultaneous notification of a code stroke request is listed below (rural workforce limitations notwithstanding).

1. *Stroke medical consultant* – Consultant support is mandatory for all code stroke patients. A neurologist or physician with expertise in the management of complex stroke patients is considered appropriate. On site presence is preferable although not mandatory. In the event of being off site (i.e. after-hours remote on-call or telestroke support) robust infrastructure allowing for video-link communication and remote access to neuroimaging is mandatory.

2. *Stroke nurse* – 24/7 on site presence is preferable. A stroke unit nurse coordinator or nurse who has completed an accredited code stroke training program is recommended.

3. *Stroke medical officer* – 24/7 on site presence is preferable. A registrar, stroke fellow or senior resident medical officer (i.e. 2nd or 3rd year physician trainee) is considered appropriate.

Immediate notification may also be considered for the following hospital personnel:

1. CT radiographer and radiologist
2. Stroke unit clinical nurse consultant and Stroke unit Nurse Unit Manager
3. Hospital orderly
4. Hospital bed coordinator
5. Pathology laboratory staff

10.4 Task designation

Evidence suggests that door to needle times are best reduced by an immediate door to Computed Tomography (CT) transfer process, and that the tasks below may all be performed by the code stroke team (with senior ED nurse support) prior to CT if local practice allows. The key tasks are to determine time of onset, the presence of a potentially disabling neurological deficit and the presence of contraindications. Neuroimaging is the critical time-dependent step and other activities should not delay neuroimaging.

The following designation of tasks is recommended upon code stroke activation:

ED medical officer and nurse:

1. Assess vital signs and resuscitate unless advance care directive to the contrary.
2. Oxygen supplementation for patients with oxygen saturation <95% (target oxygen saturation > 94%) - supplementation for non-hypoxic patients is NOT recommended.
3. Perform venesection and arrange URGENT bloods:
    a. Full blood examination
    b. Electrolytes
    c. Glucose
    d. Liver function tests
    e. International normalised ratio (INR), activated partial thromboplastin time (APTT) +/- Thrombin Time +/- Direct acting Oral Anticoagulant (DOAC)-specific test (e.g. Haemoclot assay for Dabigatran)
    f. Troponin
4. Insert two large bore intravenous cannulas, one in each arm.
5. Perform 12 lead electrocardiogram (ECG) (should not delay CT scan).
6. Determine and document weight.
7. Stroke staff will notify radiology and arrange appropriate radiology.

Stroke nurse and medical officer:

1. Confirm history with patient and/or SAAS, family, witnesses or general practitioner with particular reference to:
    a. Stroke onset time
    b. Medical history
    c. Advance care directive/refusal of life sustaining treatment/outcomes to avoid
    d. Medication
    e. Premorbid cognitive and physical function
    f. Previous surgery or bleeding history
    g. Allergies
2. Perform National Institute of Health Stroke Scale (NIHSS).
3. Identify any potential bleeding source.
4. Notify Radiology when patient ready for neuro-imaging.
5. Assess vital signs every 15 minutes.

6. Ensure ED Officer/Nurse responsibilities are completed.
7. Obtain and document all results (i.e. ECG, blood tests, vital signs).
8. Complete checklist of inclusion/exclusion criteria for intravenous thrombolysis (Ctrl+click to select link).
9. Notify stroke consultant (should generally occur when the NCCT has been reviewed but may occur prior in select circumstances).
10. Assist and supervise patient during transfer to radiology.
11. Contact hospital bed manager regarding bed destination post radiology.
12. Obtain consent for intravenous thrombolysis (if applicable). Utilise interpreter services when obtaining consent for patients where English is not the first language as much as is reasonably practical.
13. Action treatment specific protocols as recommended by stroke consultant.
14. Communicate outcome and plan for patient with ED Senior Medical Officer.

Stroke 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 neuroimaging. On site assessment is optimal although not mandatory if the above can be adequately addressed via remote means. The latter requires experienced on-site medical staff and infrastructure to accommodate remote access to neuroimaging and laboratory results, as well as the capability for remote visual assessment via video call.
2. Liaise and provide information to patient (if possible) or substitute decision maker/s (if any), persons responsible/family members or friends (Medical Registrar or Stroke Nurse Coordinator may take on this role if the Consultant is not on site).

10.5 Code stroke radiology

The imaging protocol applicable to code stroke patients is based on Consensus guidelines for acute stroke multimodal imaging.

1. An urgent non-contrast CT brain scan is mandatory for all code stroke patients.
2. CT perfusion imaging (CTP) followed by angiography (CTA) (aortic arch to vertex)) is also recommended (where available) provided the following criteria are met:
    a. There is no contraindication for additional imaging (i.e. known contrast allergy, unstable or rapidly deteriorating renal function (call consultant nephrologist for advice in selected patients)).
    b. CT perfusion imaging does not unduly delay deployment of intravenous alteplase (maximum of 10 minute delay acceptable).

Given the variation in CT equipment and software the optimal CT perfusion parameters defining infarct core and penumbra should be determined by each hospital provided they are evidence based. The best evidence is for relative cerebral blood flow (rCBF) <30% (core) + Tmax >6 seconds or delay time >3 seconds (penumbra). CT perfusion is helpful diagnostically and prognostically, but must be interpreted in tandem with the NCCT and with understanding of inherent limitations (especially time-dependent 'core' prediction).

In the presence of non-traumatic intracerebral haemorrhage, CT perfusion is not mandatory, although it may be the most sensitive technique to detect contrast extravasation. Additionally, 4D whole brain CTA derived from CTP may be helpful for the demonstration of venous sinus thrombosis or a dural arteriovenous fistula. Intracranial CT angiography is recommended in all patients (unless contraindicated).

10.6 Code stroke outcome

Upon completion of imaging a treatment decision is made by the stroke consultant. The following outcomes may occur:

1. Patient confirmed to have a stroke and is eligible for acute therapy - the relevant hyper acute stroke protocol is actioned and the patient is admitted to the stroke unit.
2. Patient is confirmed to have a stroke but ineligible for acute therapy – the generic acute stroke protocol is actioned and the patient is admitted to the stroke unit. Patients with potentially disabling events who have returned close to normal (and have not received rtPA) should be kept under close observation given the risk of deterioration. This is especially the case if imaging has demonstrated the presence of an arterial occlusion but reperfusion therapy has not been initiated. An increase of NIHSS >2 should prompt an inpatient code stroke or urgent medical review.
3. Patient deemed not to have experienced a stroke – Discussion with ED Senior Doctor to communicate plan if not for stroke admission, discussion with ED Senior Doctor should include plan for further assessment or referral to another inpatient team for admission and clarity about who will complete these actions.

10.7 Timeliness

Overall the aim is for the following to occur:

- Initial medical assessment to be completed in the first 15 minutes.
- CT scan within 30 minutes.
- A door to needle time of <45 minutes in hours and <60 minutes after hours.

11. Intravenous thrombolysis protocol

11.1 Eligibility criteria

NOTE THAT TENECTEPLASE MAY BE MORE SUITABLE THAN ALTEPLASE FOR LVO PATIENTS BEING TRANSFERRED TO THE RAH FOR EVT.

Inclusion criteria[1,2]

1. Onset of ischaemic stroke within the preceding 4.5 hours.
2. Potentially disabling neurological deficit.
3. Patient's CT scan does not show haemorrhage or non-vascular cause of stroke.

Exclusion criteria:

Absolute (thrombolysis should not be administered)[2-4]

1. Uncertainty about time of stroke onset if last seen well > 4.5 hours (e.g. patients awaking from sleep).
2. Hereditary or acquired coagulopathy (INR>1.7, platelet count ≤ 100,000 microL, heparinisation with raised APTT, therapeutic unreversed parenteral anticoagulation received within previous 12 hours or therapeutic unreversed apixaban or rivaroxaban received within previous 24 hours).
3. Dabigatran without idarucizumab reversal prior to thrombolysis.
4. Clinical and radiological suspicion of subarachnoid haemorrhage with vasospasm.
5. Suspected septic embolus.
6. Hypoglycaemia (BGL≤2.8mmol/L) or hyperglycaemia (BGL≥22), where there is no perfusion defect or arterial occlusion on CT, or where more normal levels cannot be achieved within the 4 ½ hour window.
7. Seizure at symptom onset without vessel occlusion or CT perfusion abnormality.
8. Stroke secondary to aortic dissection (cervical artery dissection alone is not an exclusion).

Relative (use thrombolysis with caution)[2-4]

1. Age < 18 years (thrombolysis can be considered in physiologically adult adolescents, but should not be administered to children).[5]
2. Hypertension: systolic blood pressure ≥185 mmHg or diastolic blood pressure > 110 mmHg on repeated measures (thrombolysis may commence prior to BP being controlled as in practice safe levels are always achievable and more harm may incur from delaying treatment)*.
3. Pregnancy.
4. CT evidence of extensive middle cerebral artery (MCA) territory infarction (>1/3 MCA or ASPECTS of less than 6-7) or matched CT perfusion lesion, especially 3-4.5 hours post-onset.
5. Therapeutic unreversed DOAC within 24-48 hours.
6. Stroke or serious head trauma within the past three months where the risks of bleeding are considered to outweigh the benefits of therapy.
7. Patient has known history of intracranial haemorrhage, subarachnoid haemorrhage, known intracranial arteriovenous malformation or previously known intracranial neoplasm such that, in the opinion of the clinician, the increased risk of intracranial bleeding would outweigh the potential benefits of treatment.
8. Suspected recent (within 30 days) transmural myocardial infarction.

9. 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 (e.g. by local pressure). Note that discussion with the responsible surgeon can help clarify risk-benefit ratio.
10. Cardiopulmonary resuscitation or arterial puncture at non-compressible site within the last 7 days.
11. Severe comorbidities limiting life expectancy or posing treatment risk.
12. Pre-existing dementia or dependency (modified Rankin score ≥3).
13. Minor or rapidly improving non-disabling neurological deficit (especially if CTA/CTP is normal).[9,10]

For patients where dabigatran use is known/suspected, idarucizumab should be administered (two separate bolus intravenous injections of 2.5 g (= 50 mL) given as quickly as possible (no more than 15 minutes apart). For patients having taken apixaban/rivaroxaban, consider risk benefit ratio and EVT suitability (EVT should also be considered in other cases where thrombolysis is cautioned/ contraindicated because of bleeding risk).

Management of pre-treatment hypertension:

In patients who are eligible for thrombolysis therapy but have systolic blood pressure (BP)>185 mmHg or diastolic BP>110 mmHg, 10-20mg of intravenous Labetalol (or other agents if Labetalol is contraindicated or not available) may be administered via slow injection over 1-2 minutes (can be doubled after 5-10 minutes). Note cardiac monitoring is essential. Record blood pressure every 5 minutes. If BP remains >185/110 mmHg despite aggressive treatment, management with alteplase (or tenecteplase) is contraindicated.

Tenecteplase eligibility criteria

Inclusion criteria[1, 2]

Thrombolysis in acute ischaemic stroke in patients being transferred to a tertiary stroke centre specifically for endovascular thrombectomy (EVT), with the approval of a SA Health Stroke Consultant, in patients otherwise eligible for alteplase, with demonstration of a large vessel occlusion (if CT brain angiography performed) or high likelihood of a large vessel occlusion on the basis of clinical severity and the non-contrast CT.

Exclusion criteria

These are identical to alteplase

General notes:

Compared with alteplase, tenecteplase has a prolonged half-life, enhanced fibrin specificity and improved resistance to plasminogen-activator inhibitor-1. In stroke, tenecteplase is currently being evaluated in several large trials. Preliminary evidence suggests that it is at least non-inferior to alteplase, with some evidence showing that it is superior in some settings. In particular, tenecteplase versus alteplase was assessed in the EXTEND-IA TNK trial, which demonstrated (in thrombolysis eligible patients with a large vessel occlusion prior to EVT) that pre-EVT recanalisation rates with tenecteplase were superior. In addition, tenecteplase is simpler to administer and does not require a medical escort for transfer (as when an alteplase infusion is running), the dose used in this trial was 0.25mg/kg.

Tenecteplase may have a lower Intracerebral Haemorrhage (ICH) risk than alteplase however an identical post-administration nursing and blood pressure schedule is recommended. There is no evidence that the risks of angioedema differ between the two intravenous thrombolytics.

Although the superiority of tenecteplase in the pre-EVT population was suggested, it remains reasonable to administer alteplase in this population if preferred, especially if administered at the tertiary endovascular centre, when the practical limitations of alteplase are less concerning and where

continued alteplase infusion simultaneous to EVT may have conceptual advantages (such as the peri-procedural prevention or dissolution of emboli into new territories).

Tenecteplase is under investigation in several different non-large vessel occlusion (non-LVO) stroke populations currently and there is insufficient evidence to recommend its use in these settings. On the basis of available evidence it is highly likely to be non-inferior; however the question of superiority and the overall risk-benefit ratio remains unclear. Therefore in hospitals that provide thrombolysis with tenecteplase for suspected large vessel occlusion strokes, who do not stock alteplase, who encounter a patient with a disabling ischaemic stroke unlikely to be a large vessel occlusion, tenecteplase cannot be recommended, however this may be reasonable in individual circumstances, following consent regarding off-protocol use.

Further, in certain non-thrombolysis designated hospital settings (such as a stroke occurring in an intubated patient at Modbury or the Queen Elizabeth Hospital) it may be reasonable to administer tenecteplase in eligible patients with a proven or likely large vessel occlusion under the guidance of a Vascular Neurologist pending transfer.

11.2 Thrombolysis administration - general considerations

Treatment order

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

Counselling and consent

Eligible patients (or relevant third-party where appropriate) should receive counselling and provide written consent to proceed (see intravenous thrombolysis Patient Information Sheet and the Aboriginal and Torres Strait Islander Patient Information Sheet, ctrl+click to select link). 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. Utilise interpreter services when providing counselling and seeking written consent for patients where English is not the first language.

Timing considerations

For patients who are obviously well-within treatment guidelines (e.g. major stroke presenting very early), commencement of thrombolysis should be considered following non-contrast CT and prior to advanced neuroimaging (if performed).

Nursing and location

A 1:1 nurse: patient ratio is recommended for the first 12-24 hours. Patients should be transferred to a dedicated area within the hospital where the alteplase infusion can be administered and monitored by nursing staff with expertise in neurological assessment and acute stroke care. A designated hyper acute area within a stroke unit is ideal. Emergency departments, intensive care and high dependency units may be suitable as directed by local protocols provided medical and nursing staff have received appropriate training. Completion of an accredited code stroke training program is recommended.

Safety precautions

1. Use a dedicated cannula as Intravenous thrombolysis is not to be given through the same line as other medication, fluids or blood products.
2. Avoid any invasive therapies for at least 12 hours (including non-urgent blood sampling, intramuscular injections, nasoenteric tube with the exception of NET tubes for antiplatelet administration post-extracranial stenting during EVT, and urinary catheter).
3. No antiplatelets (i.e. Aspirin, Clopidogrel, Dipyridamole or Asasantin SR) or anticoagulants (i.e. Heparin, Clexane, Warfarin, Direct-acting Oral Anticoagulants (DOAC's)) including deep vein thrombosis (DVT) heparin prophylaxis for 24 hours (excepting selected patients following thrombectomy).

4. A Sequential Compression Device (SCD) is recommended for DVT prophylaxis in the first 24 hours.
5. Safety precautions to prevent falls.
6. Do not use razor blade for shaving (electric razor only).

11.3 Alteplase background information

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 five minutes after the infusion has been completed (i.e. half-life) and approximately 80% is cleared within 10 minutes.

Presentation: The drug comes as 50mg vial and a 10mg vial (off-white lyophilized powder) of alteplase, and is reconstituted with 50mLs or 10mLs sterile water (supplied with drug), as per manufacturer's instructions. When mixed, the resulting solution is colourless to pale yellow. The final concentration is 1mg/mL alteplase.

Storage: Alteplase stock may be stored at room temperature up to 30^0 C or under refrigeration at 2–8^0 C and protected from light. Any unused drug following reconstitution may be kept in the refrigerator at 2–8^0 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 (Ctrl+click to select link).

- 10% given as an initial bolus over one 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 ≤ 80mg, the total dose may be reconstituted from: 1 x 50mg vial followed by the necessary 10mg vials. If the patient requires > 80mg, the total dose must be reconstituted 2 x 50mg vials (see weight-dose schedule).

Requirements: Alteplase: 50mg +/- 10mg vials (as per weight-dose schedule)
Each alteplase pack will contain:

- 1 vial of powder (50mg or 10mg).
- 1 vial sterile water for injection (50mLs or 10mLs).
- 1 transfer cannula is supplied with 50mg pack.

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

11.4 Alteplase weight – dose schedule

Weight (kg)	Total dose: 0.9 mg/kg (mL)	10% Bolus (mL)	60 minute Infusion (mL)	No. of 50mg vials	No. of 10mg vials
45	40.5	4.1	36.4	1	0
46	41.4	4.1	37.3	1	0
47	42.3	4.2	38.1	1	0
48	43.2	4.3	38.9	1	0
49	44.1	4.4	39.7	1	0
50	45.0	4.5	40.5	1	0
51	45.9	4.6	41.3	1	0
52	46.8	4.7	42.1	1	0
53	47.7	4.8	42.9	1	0
54	48.6	4.9	43.7	1	0
55	49.5	5.0	44.6	1	0
56	50.4	5.0	45.4	1	1
57	51.3	5.1	46.2	1	1
58	52.2	5.2	47.0	1	1
59	53.1	5.3	47.8	1	1
60	54.0	5.4	48.6	1	1
61	54.9	5.5	49.4	1	1
62	55.8	5.6	50.2	1	1
63	56.7	5.7	51.0	1	1
64	57.6	5.8	51.8	1	1
65	58.5	5.9	52.7	1	1
66	59.4	5.9	53.5	1	1
67	60.3	6.0	54.3	1	2
68	61.2	6.1	55.1	1	2
69	62.1	6.2	55.9	1	2
70	63.0	6.3	56.7	1	2
71	63.9	6.4	57.5	1	2
72	64.8	6.5	58.3	1	2
73	65.7	6.6	59.1	1	2
74	66.6	6.7	59.9	1	2
75	67.5	6.8	60.8	1	2
76	68.4	6.8	61.6	1	2
77	69.3	6.9	62.4	1	2
78	70.2	7.0	63.2	1	3
79	71.1	7.1	64.0	1	3
80	72.0	7.2	64.8	1	3
81	72.9	7.3	65.6	1	3
82	73.8	7.4	66.4	1	3
83	74.7	7.5	67.2	1	3
84	75.6	7.6	68.0	1	3
85	76.5	7.7	68.9	1	3
86	77.4	7.7	69.7	1	3
87	78.3	7.8	70.5	1	3
88	79.2	7.9	71.3	1	3
89	80.1	8.0	72.1	2	0
90	81.0	8.1	72.9	2	0
91	81.9	8.2	73.7	2	0
92	82.8	8.3	74.5	2	0
93	83.7	8.4	75.3	2	0
94	84.6	8.5	76.1	2	0
95	85.5	8.6	77.0	2	0
96	86.4	8.6	77.8	2	0
97	87.3	8.7	78.6	2	0
98	88.2	8.8	79.4	2	0
99	89.1	8.9	80.2	2	0
100	90.0	9.0	81.0	2	0
100+	90.0	9.0	81.0	2	0

11.5 Alteplase administration procedure:

1. With a 5mL or 10mL syringe and blunt plastic cannula, draw up the bolus dose and administer, over 1 minute.
2. Draw up the rest of the required dose in a 60mL syringe (note 2 x 60mL syringes will be required for amount > 60mLs). Other sized syringes can be used: 10mLs, 20mLs, & 60mLs.
3. Attach completed 'Medication added' label to syringe.
4. Attach the infusion tubing to the syringe and attach lever lock cannula to other end.
5. Insert syringe into syringe pump, prime line as per pump instructions and attach to patient.
6. Set pump to infuse the total dose remaining amount over 60 minutes.
7. If two syringes are used the syringe driver should still be set to infuse the total dose remaining over 60 minutes (see example).
8. After infusion completed flush infusion line with 30mLs sodium chloride to ensure all drug is infused.
9. 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 1x50mg vial with 50mLs water.
3. Mix 3x10mg vial each with 10mLs water for injection.
4. Using a 10mL syringe draw up 7.6mLs of alteplase to give 10% bolus leaving 68mLs still to infuse.
5. Using a 60mL syringe number 1 draw up 34mLs of alteplase.
6. Using a 60mL syringe number 2 draw up 34mLs of alteplase.
7. Set syringe pump to infuse at 68mLs an hour, i.e. each 34mL syringe will take 30 minutes to infuse.

11.6 Tenecteplase background information

Drug: Recombinant tissue plasminogen activator (rtPA) or tenecteplase, (TNK).

Trade name: Metalyse (Boehringer Ingelheim).

Action: Tenecteplase binds to fibrin in a thrombus and converts the entrapped plasminogen to plasmin. This initiates local fibrinolysis (clot breakdown). Tenecteplase demonstrates enhanced fibrin specificity compared with Alteplase, with possibly reduced post-thrombolysis hypofibrinogenaemia.

Pharmacokinetics: Tenecteplase is metabolised primarily by the liver. Its half-life is around 30 minutes.

Presentation: Tenecteplase medication is presented in a box that consists of:

1. Powder for reconstitution (40mg) vial
2. Prefilled syringe WFI
3. Vial adapter
4. Needle

The drug comes as 40mg vial (off-white lyophilized powder). It is reconstituted with 8mLs sterile water (supplied with drug), as per manufacturer's instructions. When mixed, the resulting solution is colourless to pale yellow. The final concentration is 5mg/mL tenecteplase.

Storage: Tenecteplase is stored at room temperature up to 30^0 C.

Dosing: The dose of intravenous tenecteplase is 0.25 mg/kg (max total dose of 25 mg), given as a single bolus over one minute. See tenecteplase weight-dose schedule (Ctrl+click to select link).

Please note that dosing on tenecteplase syringe is for myocardial infarction (where 0.5mg/kg is used) and must not be used for guiding dosing in ischaemic stroke.

Although the approved vial strength by state pharmacy for stroke is 40mg some country hospitals may only have the 50mg available due to stock levels. Use of 50mg vial is only permissible when no 40mg vial is available (the concentration is also 5mg/mL) i.e. 50mg vial is reconstituted with 10mL sterile water (supplied with drug).

Requirements: Tenecteplase vial and fluid as per manufacturer's kit. No other items required:

11.7 Tenecteplase weight – dose schedule

Weight (kg)	Total dose as bolus (0.25mg/kg)	Bolus volume	No. of 40mg Vials
45	11.5	2.3	1
46	11.5	2.3	1
47	12	2.4	1
48	12	2.4	1
49	12.5	2.5	1
50	12.5	2.5	1
51	13	2.6	1
52	13	2.6	1
53	13.5	2.7	1
54	13.5	2.7	1
55	14	2.8	1
56	14	2.8	1
57	14.5	2.9	1
58	14.5	2.9	1
59	15	3	1
60	15	3	1
61	15.5	3.1	1
62	15.5	3.1	1
63	16	3.2	1
64	16	3.2	1
65	16.5	3.3	1
66	16.5	3.3	1
67	17	3.4	1
68	17	3.4	1
69	17.5	3.5	1
70	17.5	3.5	1
71	18	3.6	1
72	18	3.6	1
73	18.5	3.7	1
74	18.5	3.7	1
75	19	3.8	1
76	19	3.8	1
77	19.5	3.9	1
78	19.5	3.9	1
79	20	4	1
80	20	4	1
81	20.5	4.1	1
82	20.5	4.1	1
83	21	4.2	1
84	21	4.2	1
85	21.5	4.3	1
86	21.5	4.3	1
87	22	4.4	1
88	22	4.4	1
89	22.5	4.5	1
90	22.5	4.5	1
91	23	4.6	1
92	23	4.6	1
93	23.5	4.7	1
94	23.5	4.7	1
95	24	4.8	1
96	24	4.8	1
97	24.5	4.9	1
98	24.5	4.9	1
99	25	5	1
100	25	5	1
100+	25	5	1
Weight dose example 60kg x 0.25mg = 15mg ÷ 5mg (5mg/mL) = 3mLs			

Nursing observation:

The following nurse observation and task schedule is recommended regardless of the formulation of intravenous thrombolysis administered:

Time	Activity
0 hrs	Apply telemetry monitoring equipment. Administer tenecteplase or alteplase bolus and alteplase infusion as per protocol.
0-1 hrs	Write timetable for observations on chart. 15 minutely observation: NIHSS (NIHSS, Ctrl+click to select link), Respiratory Rate (RR), blood pressure (BP), pulse, oxygen saturation (SpO_2), temperature. *NIHSS is the preferred neurological assessment, however if there are circumstances where the nurse is not trained in completing a NIHSS then a default to the GCS which is not the gold standard neurological assessment but is acceptable. All nurses must hand over to the next person by completing a full NIHSS (or GCS where used) together. 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, Ctrl+click to select links). Nil by mouth until swallow screen performed Swallow Screen– commence 0.9 % sodium chloride intravenous fluids. Hourly Fluid Balance Chart. Strict bed rest: Safety precautions: falls prevention (ongoing). Avoid invasive therapies (including thromboembolic deterrent (TED) stockings). Internal and external bleeding assessment.
1-2 hrs	15 minutely observation: NIHSS, RR, BP, pulse, SpO_2, temperature. Assess size and shape of tongue. Observe for signs of allergy or angioedema unilateral or bilateral tongue enlargement, rash or redness, coughing, lip, face swelling. Hourly Fluid Balance Chart. Strict bed rest: Safety precautions: falls prevention, pressure area care *If required* BGL 2 hourly (ongoing). Internal/external bleeding assessment. Commence sequential compression device, plus or minus thigh length TED stockings.
2-6 hrs	30 minutely observation: NIHSS, RR, BP, pulse, SpO_2, temperature. Hourly Fluid Balance Chart. Strict bed rest: Safety precautions: falls prevention, pressure area care. Internal/external bleeding assessment. Commence sequential compression device, plus or minus thigh length TED stockings.
6-12 hrs	Hourly observation: NIHSS, RR, BP, pulse, SpO_2, temperature. Hourly Fluid Balance Chart. Strict bed rest: Safety precautions: falls prevention, pressure area care. Internal/external bleeding assessment.
12-24 hrs	Two hourly observation: NIHSS, RR, BP, pulse, SpO_2, temperature. Hourly Fluid Balance Chart. Patient can sit out of bed if able/physiotherapy review. Nasoenteric tube feeding can be inserted if required. Internal/external bleeding assessment. Swallow assessment by Speech Pathologist if failed swallow screen.

11.8 Management of hypertension with Intravenous Thrombolysis

Uncontrolled hypertension during intravenous thrombolysis and subsequent 24 hours may result in intracranial haemorrhage. Early recognition and management is therefore critical.

In the advent of a blood pressure reading > 180/110 mmHg the following measures should be taken:

1. Confirm reading manually using a sphygmomanometer.
2. Check the patient is not in pain or urinary retention (may need bladder scan) and manage accordingly.
3. If hypertension is associated with deterioration of neurological status consider possibility of symptomatic intracerebral haemorrhage. Contact stroke medical officer in view to urgent non-contrast CT brain. Continue with BP management protocol as specified below.
4. Recheck blood pressure five minutes after first reading - if second reading is >180/110 mmHg proceed with antihypertensive therapy:
    a. Intravenous labetalol 10-20mgs via slow injection over 1-2 minutes. This may be repeated every 5-10 minutes to a maximum total dose of 300mgs in any six hour period AND/.**OR**
    b. Hydralazine as a slow bolus 5mg intravenously, repeated as required every 20 minutes (maximum 5 boluses in any six hour period). AND/OR Intravenous glyceryl trinitrate (GTN) - 30mg in 100mL. Commence 3mL/hr and titrate by 1mL/hr at 5-10 minute intervals to desired BP. Note GTN must be administered via separate intravenous line using non-PVC giving set via a syringe driver. Hydralazine can be given by stroke nurse allocated to patient, with medical review after 2nd dose.

In the event of persistent hypertension (i.e. > 180/110 mmHg), despite the above measures, consider transfer to high dependency unit (HDU) or intensive care unit (ICU) for treatment, within their protocols, with agents such as:

a. Nitroprusside 0.5 micrograms/kg/min IV infusion (as initial dose and titrate to desired blood pressure) **OR**

b. Intravenous labetalol infusion at a rate of 2-8 mg/minute to a maximum total dose of 300mgs in any six hour period

NB If intravenous medications are unsuitable, and ICU is not available, consider administering oral (10-20mg) with caution (note peak antihypertensive effect in 1-2 hours and risk of end-organ hypoperfusion).

If hypertension (i.e. systolic BP > 185 mmHg or diastolic BP > 110 mmHg) occurs during alteplase infusion and remains above these levels for >15 minutes despite treatment as specified above, alteplase infusion should be ceased. It can be recommenced if BP returns to acceptable levels, on the provision that the entire dose can be administered within 5.5 hours of symptom onset.

11.9 Management of haemorrhage with Intravenous Thrombolysis

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

1. Intracranial – clinical features include headache, nausea with refractory vomiting, and declining neurological status.
2. 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.

3. 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 the following occurs:

1. Neurological deterioration
2. New onset headache, or drowsiness
3. Acute hypertension
4. Convulsions
5. Nausea and vomiting.

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

1. Consider suspending alteplase infusion. It should be noted that alteplase has a very short half-life, no reversal agent and that ICH during the infusion itself is extremely rare.
2. Arrange urgent non-contrast CT brain.
3. 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:

1. Aggressive anti-hypertensive management to maintain BP<140/80
2. Discuss with on call haematologist and notify the hospital transfusion service immediately of blood product requirements.
   - Administer cryoprecipitate (one 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.
3. Antifibrinolytic therapy with tranexamic acid (1-2gm over 10-20 minutes). Tranexamic acid should not be given in the same IV line as blood products.
4. Discuss with duty neurosurgeon – haematoma evacuation may be beneficial in selected cases (noting half-life of tPA is 2 minutes, but that fibrinogen depletion lasts several hours).

Management of suspected extracranial haemorrhage:

1. Superficial bleeding – i.e. venepuncture sites, nose bleeds, other superficial wounds
   a. Apply direct pressure, dressings
   b. Intravenous fluids as required
   c. If bleeding occurs during alteplase infusion, continue unless bleeding becomes problematic.
   d. Consider involving staff with advanced airway skills as clinically appropriate.
2. Serious bleeding from non-compressible site – i.e. GI haemorrhage, retroperitoneal haemorrhage.
   a. Suspend alteplase infusion. It should be noted that alteplase has a very short half-life and has no reversal agent.
   b. 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

early Ear nose throat (ENT) involvement as severe epistaxis can be difficult to control and nasal pack may be required)

c. Consider involving staff with advanced airway skills as clinically appropriate.

d. If bleeding becomes critical, activate and manage as per hospital Critical Bleeding/Massive Transfusion Protocol (MTP). 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.

e. Consider antifibrinolytic therapy with intravenous, tranexamic acid [12](1-2gm over 10-20 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.

f. Arrange urgent imaging of suspected bleeding site.

g. Discuss with appropriate duty surgeon/gastroenterologist/interventional radiologist.

11.10 Management of alteplase or tenecteplase 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 below). 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. Consider involving staff with airway skills/call MET call as clinically appropriate. Consider adding Nebulised adrenaline (5mg neb).
3. Administer oxygen, monitor saturation.
4. Monitor airway, check stridor, prepare for possibility of intubation or cricothyrotomy.
5. Administer adrenaline 0.5mg intramuscular injection (IMI) but note that ANGIOEDEMA IN SETTING OF rtPA/ACE-I RESPONDS POORLY TO ADRENALINE, ANTIHISTAMINES AND CORTICOSTEROIDS. Do not continue to give adrenaline if no response to initial dose.
6. Consult duty immunologist regarding use of icatibant (Firazyr) 30mg SC. This is a bradykinin antagonist. Angioedema should cease progression/reduce in 30-60 minutes.

11.11 Management of alteplase related anaphylaxis:

Anaphylaxis (usually two or more of erythema, urticaria, angioedema, hypotension, tachycardia, bronchospasm) is very rare following thrombolysis.

1. Consider ceasing alteplase immediately (depending on severity of stroke and reaction).
2. Administer oxygen, monitor airway, check for oedema around uvula, administer adrenaline 0.5mg IMI, fluid resuscitation if hypotensive, nebulised salbutamol for bronchospasm, repeat adrenaline 0.5mg IMI if no response.
3. Consider adrenaline infusion if inadequate response.
4. Call medical emergency team (MET).

*Refer to local protocol or OWI for management of anaphylaxis.

12. Endovascular thrombectomy protocol

General Considerations

Endovascular treatment of ischaemic stroke is a highly beneficial and cost-effective treatment in the setting of large vessel occlusion (LVO – occlusion of the internal carotid artery, proximal middle cerebral artery or basilar artery). However, it is a costly treatment and benefits diminish over time. It should only proceed following recommendation by a Stroke Consultant and Interventional Neuroradiologist.

If endovascular therapy is contemplated, careful assessment of the patient's premorbid history, neurological findings, neuroimaging and subsequent discussion with the interventional neuroradiologist are mandatory. The procedure should proceed following informed consent by the patient or next of kin (see example information sheet, Ctrl+click to select link and the Aboriginal and Torres Strait Islander Patient Information Sheet), however 2-doctor emergency consent can be considered if the proxy decision-maker is unavailable. Utilise interpreter services when providing counselling and seeking written consent for patients where English is not the first language.

Avoidance of general anaesthesia but with anaesthetics support is associated with improved outcome and lower mortality, and is therefore the preferred option for the procedure. However, if not possible (due to agitation or decreased airway protection), then general anaesthesia (with careful maintenance of BP, especially at induction) may be used, especially for patients with basilar artery occlusion. This latter option will generally require the patient to be monitored in an ICU or HDU environment for at least 24 hours post procedure. Patients managed with intravenous thrombolysis who demonstrate signs of further deterioration prior to endovascular treatment (e.g. increase NIHSS ≥ 2 points from baseline) should have a repeat non-contrast CT brain scan prior to the procedure (preferably on the INR table) to exclude symptomatic intracranial haemorrhage.

As the vast majority of suitable patients do not reperfuse with tPA in the setting of a severe stroke with a proximal vessel occlusion, patients should proceed directly to neurointervention without delay (i.e. imaging should not be repeated to assess 'treatment failure') however this can be considered in transfer cases, especially following tenecteplase which is associated with higher recanalization rates.

The procedure should preferably not commence without anaesthetics in attendance. If full reperfusion has been achieved tPA should cease.

Eligibility Criteria

Inclusion criteria:

(All 3 criteria must be met for eligibility)

1. Clinically disabling stroke.
2. Procedure can be feasibly commenced within 6 hours of last known well time (24 hours if guided by favourable penumbral imaging).
3. LVO demonstrated (internal carotid artery (ICA), dominant vertebral, basilar or proximal MCA (M1) demonstrable on CT angiography.) Other arterial and M2 MCA occlusions have less evidence of benefit and probably higher complication rates but may be considered in select circumstances, in particular a clinically severe deficit (NIHSS>10) and if tPA ineligible.
4. A combination of time since last-known well, premorbid state, age, penumbral imaging and clinical severity suggest non-futility.

NB If perfusion imaging is not possible due to contrast allergy then proceeding directly to endovascular treatment can be considered on a case-by-case basis (e.g. life-threatening stroke).

NB Posterior circulation perfusion imaging is unreliable and decision should be taken on the basis of the clinical severity, non-contrast CT appearances and the vascular occlusion.

Exclusion criteria:

Absolute (EVT should not be performed if any of the following is true) [16, 17]

1. The procedure cannot be completed within < 24 hours since last known well time.
2. Hereditary or acquired coagulopathy (INR>4.0, platelet count ≤30,000μL)
3. Clinical and radiological suspicion of subarachnoid haemorrhage with vasospasm.
4. Absence of salvageable brain tissue (note that greater than 150mL infarction on plain CT/CTP (can be considered in young (<60) patient as potential hemicraniectomy avoidance measure) or when patients present ultra-early on CTP (< 2-3 hours) as CTP can overestimate infarction early.)
5. Pre-existing dementia causing dependency and/or severe physical dependency (modified Rankin score >3).
6. Known severe contrast hypersensitivity (where risk cannot be mitigated by anaesthetist).
7. Known refusal of life-sustaining treatment.

Relative (EVT should be performed with caution)

1. Age < 18 years (can be considered in select cases, especially if physiologically mature).
2. Occlusion of the distal M2 middle cerebral artery, posterior cerebral artery, anterior cerebral artery or vertebral artery.
3. Difficult to control hypertension: systolic blood pressure ≥185 mmHg or diastolic blood pressure > 110 mmHg on repeated measures despite treatment. †
4. CT evidence of extensive middle cerebral artery (MCA) territory infarction
5. Not clearly disabling stroke
6. Severe comorbidity limiting life expectancy or posing treatment risk.

†***Management of pre-treatment hypertension:***

In patients who are eligible for endovascular treatment but have systolic BP>185 mmHg or diastolic BP>110 mmHg, 10-20mg of intravenous Labetalol may be administered via slow injection over 1-2 minutes (can be repeated once after 10 minutes). Note cardiac monitoring is essential. Record blood pressure every 5 minutes. If BP remains >185/110 mmHg despite aggressive treatment, management with endovascular thrombectomy is contraindicated.

The ideal antiplatelet strategy following EVT to prevent reocclusion is uncertain, and has not been the subject of randomised controlled trials. It may be guided by the following factors:

1) The volume of infarcted brain
2) The presence of reperfusion
3) The administration or not of thrombolysis
4) The nature of the arterial lesion (e.g. intracranial atherosclerotic plaque vs embolism)
5) The presence of intracranial or extracranial stenting

Except in straightforward cases, antiplatelet therapy should be explicitly determined by joint decisions of neurologist and neurointerventionalist following procedure completion. The following guide is reasonable but consensus- rather than evidence-based:

1) Embolic stroke with successful EVT following thrombolysis - no antiplatelet therapy for 24 hours
2) Embolic stroke with successful EVT without thrombolysis - give IV aspirin at completion
3) Stroke due to intracranial atherosclerosis not requiring stenting - give IV aspirin at completion regardless of the administration of thrombolysis (if reperfusion achieved and volume of infarction small)
4) Stroke requiring extracranial stenting - give IV aspirin at completion regardless of the administration of thrombolysis, with clopidogrel or ticagrelor (as available/approved) loading if infarct volume is expected to be small
5) Stroke requiring intracranial stenting or balloon angioplasty - administer IV aspirin and additional antiplatelet therapy via NET placed on the INR table (clopidogrel 600mg followed by 75 mg daily or ticagrelor 180mg (as available/approved) followed by 90mg daily)

In cases where risk of re-thrombosis is high (stenting and angioplasty cases, as well as cases with a presumed unstable atherosclerotic plaque that has not required stenting) a repeat CTA should be performed 2 hours after completion, as well as the patient being closely monitored and rescanned for any deterioration. Such patients should not be transferred back to 'home LHN' for the first 24 hours. Additionally, patients having received angioplasty or stenting should be considered for a loading dose of an intravenous GIIB/IIIA antagonist (such as tirofiban (as available/approved) or epitifibatide) to act until the oral agent takes effect.

When reperfusion treatment has been successful, it is reasonable to aim for a BP target of <140/90 systolic to reduce bleeding risk, especially in the setting a thrombolysis and antiplatelet therapy.

- Patients receiving stenting should be given a stent information card on discharge

12.1 Post procedural management for Endovascular treatments

Post procedure patients should be monitored closely either by a nurse special in a stroke unit or in a HDU/ICU environment for at least 12-24 hours.

The following nurse observation and task schedule is recommended:

Time	Activity
0-2 hrs	15 minutely observation: NIHSS, RR, BP, pulse, SpO_2, temperature, arterial puncture site and neurovascular observation in hand or leg. Nil by mouth until swallow screen completed – commence 0.9 % sodium chloride intravenous fluids. Hourly Fluid Balance Chart. Strict bed rest: Safety precautions: falls prevention (ongoing).
2-6 hrs	30 minutely observation: NIHSS, RR, BP, pulse, SpO_2, temperature, neurovascular observation in hand or leg. Hourly Fluid Balance Chart Strict bed rest: Safety precautions: falls prevention, pressure area care.
6-12 hrs	Hourly observation: NIHSS, RR, BP, pulse, SpO_2, temperature. Hourly Fluid Balance Chart. Strict bed rest unless TICI lic/lll reperfusion achieved: Safety precautions: falls prevention, pressure area care.
12-24 hrs	1-2 hourly observation – seek medical opinion to clarify: NIHSS, RR, BP, pulse, SpO_2, temperature. Hourly Fluid Balance Chart. Patient can sit out of bed if able/physiotherapy review. Swallow assessment by Speech Pathologist if failed swallow screen.

Management should aim to maintain euvolemia, normal oxygenation and temperature.

Venous thromboembolism prophylaxis should occur as per guidelines below in all patients.

12.2 Management of complications

Hypertension

The ideal blood pressure goal following EVT is not known. In the setting of demonstrated complete or near-complete reperfusion, a lower blood pressure target (i.e. <140/90 systolic) may be reasonable, especially when factors may indicate a higher than average sICH risk (e.g. a large volume of infarcted tissue, the 'early cerebral vein' sign, concomitant antiplatelet therapy and intravenous thrombolysis). Goal blood pressure following EVT should be determined on a case by case basis, however uncontrolled hypertension following endovascular thrombectomy in the first 24 hours should always be treated.
In the advent of a blood pressure reading > 180/110 mmHg (or greater than the targe) the following measures should be taken:

1. Confirm reading manually using a sphygmomanometer.
2. Check the patient is not in pain or urinary retention (may need bladder scan) and manage accordingly.
3. If hypertension is associated with deterioration of neurological status consider possibility of symptomatic intracerebral haemorrhage. Contact stroke medical officer in view to urgent non-

contrast CT Brain. Continue with BP management protocol as specified below.

4. Recheck blood pressure five minutes after first reading - if second reading is >180/110 mmHg (or target) proceed with antihypertensive therapy:

   4.1 Intravenous labetalol 10-20mgs via slow injection over 1-2 minutes. This may be repeated every 5-10 minutes to a maximum total dose of 300mgs in any six hour period **OR**

   4.2 Hydralazine as a slow bolus 5mg intravenously over 3-5 minutes, repeated as required every 20 minutes (maximum five boluses in any six-hour period). **OR**

   4.3 Intravenous GTN - 30mg in 100mL. Commence 3mL/hr and titrate by 1mL/hr at 5-10 minute intervals to desired BP. Note GTN must be administered via separate intravenous line using non-PVC giving set via a syringe driver.

In the event of persistent hypertension despite the above measures (i.e. > 180/110 mmHg or target), consider transfer to HDU or ICU for treatment with:

a. Nitroprusside 0.5 micrograms/kg/min IV infusion (as initial dose and titrate to desired blood pressure) **OR**

Intravenous labetalol 10 mgs over 1-2 minutes follow with continuous labetalol infusion at a rate of 2-8 mg/minute to a maximum total dose of 300mgs in any six hour period **NB**: If intravenous medications are unavailable (due to ICU bed unavailability) oral (10-20mg) can be considered with caution (noting peak antihypertensive effect in 1-2 hours and potential for end-organ hypoperfusion).

Neurological deterioration

An increase in NIHSS ≥ 2 points from baseline is considered significant and may represent intracerebral haemorrhage, evolving oedema or recurrent occlusion. Urgent medical review and full multimodal CT imaging is usually appropriate, as a rescue procedure may be indicated if vessel reocclusion has occurred.

13. Decompressive craniectomy protocol

13.1 General considerations

Large middle cerebral artery territory infarctions with mass effect lead to an 80% mortality rate and uniformly severe disability in survivors. In selected patients, hemicraniectomy performed within the first 48 hours improves survival and increases the chance of a favourable functional outcome. Hemicraniectomy appears more beneficial when surgery is expedited – in regards to both time from stroke onset and time from first neurological deterioration (i.e. drowsiness). Note that trial data supporting these recommendations are from the pre-thrombectomy era, and that chances of recovery may differ from historical data if perfusion has occurred.

13.2 Eligibility criteria - hemicraniectomy

Inclusion criteria

1. Age ≤ 60 years.
2. Within 48 hours of stroke onset (5 days in select cases).
3. Clinically large MCA territory infarction involving (on CT) ≥ 50% of the MCA territory, or >145cm^3 on MRI diffusion weighted imaging*****.
4. A decrease in level of consciousness from 'alert' to 'non-alert' (i.e. requiring some stimulation to rouse, or worse), attributable to brain swelling.

All patients aged less than 60 with clinical signs consistent with a large MCA stroke should have repeat CT at 12 hours or (preferably) magnetic resonance imaging (MRI) between six and 12 hours after stroke onset to determine the likelihood of deterioration (if completed stroke is not present on initial imaging). If the stroke is of sufficient size, stroke unit doctors should contact neurosurgery, obtain provisional consent from patient or substitute decision maker or person responsible and arrange to monitor in HDU. Note that quality of life does not significantly differ between patients who have suffered non-dominant and dominant stroke; however confluent involvement of the ACA territory may significantly reduce the chance of regaining independent mobility.

Exclusion criteria

1. Patients older than 60, unless circumstances are exceptional (treatment in this setting may be life-saving but at the cost of severe disability (rarely unable to mobilise independently).
2. Pre-existing functional impairment.
3. Two fixed dilated pupils.
4. Large volume contralateral ischaemia or other brain lesion that could affect outcome.
5. Life expectancy <3 years.
6. Known coagulopathy or systemic bleeding disorder.

Surgery should be expedited in patients meeting criteria. Decompressive surgery should involve a bone flap at least 12cm in diameter (including frontal, temporal, and parietal bones). Additional temporal bone should be removed to reach the middle cerebral fossa floor. The dura should be opened and a dural patch inserted and secured to enlarge the intradural space.

***** *Infarct volume can be calculated by the following formula: (axbxc)/2, where a, b and c are the maximal transverse, anterolateral and coronal dimensions (for coronal dimensions multiply number of slices involved by the slice thickness plus gap).*

13.3 Posterior fossa decompression

Posterior fossa decompression is also appropriate in physiologically young patients with large cerebellar strokes with drowsiness and brainstem compression or hydrocephalus due to a space-occupying ischaemic stroke, where there is no extensive brainstem injury. External ventricular drain alone may be useful as an interim treatment for hydrocephalus. If cerebrospinal diversion fails to improve neurological function, decompressive suboccipital craniectomy should be performed. Although a risk of upward herniation exists with ventriculostomy alone, it can be minimized with conservative cerebrospinal fluid drainage or subsequent decompression if the cerebellar infarct causes significant mass effect. Selected patients with large cerebellar strokes should be transferred to a hospital with neurosurgical support for close neurological surveillance.

14. Intracerebral haemorrhage protocol

Intracerebral haemorrhage is a heterogeneous condition, with varying aetiologies that govern appropriate management. The following protocol should be applied to all patients with non-traumatic intracerebral haemorrhage (ICH) and continued until clinically stable (i.e. 24-48 hours).

14.1 Emergency assessment of intracerebral haemorrhage

All patients presenting to EDs with suspected intracerebral haemorrhage should be considered as a medical emergency as early neurological deterioration (associated with poor outcome) is common in the first few hours after onset. Rapid treatment, workup and diagnosis is essential and early referral to specialist care is recommended (unless advance care directive to the contrary). Patients are clinically indistinguishable from ischaemic stroke.

The following evaluation is recommended for all patients with non-traumatic intracerebral haemorrhage:

History:

1. Time of symptom onset or time patient last seen well
2. Progression of symptoms
3. Vascular risk factors
4. Medication including use of antiplatelet agents, anticoagulants, antihypertensives, decongestants, stimulants, sympathomimetics, statin therapy
5. Recent trauma or surgery
6. Premorbid cognitive function
7. Alcohol intake and illicit drug use
8. History of seizures
9. History of malignancy or haematological disorder.

Examination:

1. Vital signs
2. General physical examination
3. Thorough but time urgent neurological examination
4. Baseline Glasgow Coma Scale
5. NIHSS.

Investigations:

1. Full blood examination
2. Electrolytes, urea, creatinine
3. APTT, INR, anticoagulant specific assays as appropriate
4. Urine drug screen - when illicit drug use is suspected
5. Urine pregnancy screen - in women of childbearing age
6. 12 lead ECG
7. Chest x-ray.

Neuroimaging:

1. An urgent non-contrast CT brain should be performed in all patients with suspected intracranial haemorrhage.
2. In the presence of non-traumatic intracerebral haemorrhage, CT perfusion is not mandatory (although it may be the most sensitive test for detecting contrast extravasation, and can provide useful 4D CT angiography images for detecting of an arteriovenous malformation and venous sinus thrombosis). Intracranial CT angiography is recommended in all patients (unless contraindicated) in the following scenarios:
    a. To help determine the risk of haematoma expansion (i.e. presence of the spot sign) if imaging can be performed within six hours of symptom onset.
    b. To determine the presence of underlying vascular pathology (e.g. aneurysm or vascular malformation) in patients where the apparent aetiology is uncertain.

14.2 Criteria for neurosurgical care

The following scenarios should prompt contact with the on-call neurosurgeon in view to immediate transfer to a neurosurgical unit.

1. Large intracerebral haemorrhage with significant neurological deficit in physiologically young patient (if unclear, call neurosurgery)
2. Non-traumatic basal or perimesencephalic subarachnoid haemorrhage.
3. Primary intraventricular haemorrhage.
4. Intracerebral haemorrhage with subarachnoid extension where underlying aneurysm is demonstrated /probable.
5. Intracerebral haemorrhage with suspicion of an underlying lesion.
6. Intracerebral haemorrhage with hydrocephalus.
7. Intracerebral haemorrhage with signs of raised intracranial pressure requiring intracranial pressure monitoring, external ventricular drainage and/or surgical evacuation.
8. Cerebellar haemorrhage with altered neurological state, brainstem compression and/or obstructive hydrocephalus.

Transfer will be considered on a case by case basis following consideration of the information obtained during emergency assessment. Patients not eligible for transfer to a neurosurgical unit should be managed by the Stroke Unit. ICU/HDU care may be required in certain cases. For non-Stroke Unit hospitals, consideration should be given to transfer to the nearest Stroke Unit hospital (see Inter-hospital Transfer Protocol, Ctrl+click to select link).

14.3 Stroke unit versus intensive care unit

In selected cases (i.e. patients with signs of raised intracranial pressure and considered appropriate for full treatment measures) management should be undertaken within an ICU environment where sedation, ventilation and neuromuscular blockade can be safely delivered. For patients admitted to a Stroke Unit, sufficient staff ratios must be provided to adequately monitor for clinical deterioration and administer intravenous anti-hypertensive therapy. Management in a general medical ward is not recommended.

14.4 General principles of intracranial haemorrhage management

The principles of early management of intracranial haemorrhage include general supportive care, reversal of coagulopathy, close neurological monitoring and early detection and management of complications. Application of these principles should be determined on a case by case basis following discussion with the patient, next of kin or family. This should include stroke subtype, aetiology, management and the risk of complications. An agreed management pathway should then be documented following consideration of the patient's advance care directive, age, pre-morbid function, co-morbidity, stroke severity, presence of complications and likelihood of good functional outcome.

In general, patient management will fall into one of the following three pathways:

Full treatment measures

This involves implementation of full supportive measures as specified in the acute stroke care protocol (Ctrl+click to select link), rapid reversal of coagulopathy and management of complications (Ctrl+click to select links). In the event of complications, patients are considered appropriate for mechanical ventilation, ICU/HDU support, neurosurgery and full resuscitation measures (unless advance care directive to the contrary).

Best ward management

This includes patients with an advance care directive for no invasive measures that prolong life, including intubation. Management entails implementation of supportive measures as specified in the acute stroke care protocol (Ctrl+click to select link), reversal of coagulopathy and best ward management of complications. The patient is deemed unsuitable for intubation, ICU/HDU transfer or neurosurgery and resuscitation and care planning should be initiated, discussed with patient (if able) or the patient's appointed substitute decision maker/s or persons responsible and documented.

Palliative care/end of life care

The patient is deemed unsuitable for full treatment measures as described above as the likely outcome of those measures is not acceptable to the patient. A 7 Step Pathway Resuscitation Plan outlining limitation of treatment should be completed in collaboration with the patient (when possible), family or substitute decision makers and include clear instruction on symptom management at the end of life.

Appropriate documentation on the RaDAR chart or the equivalent in EPAS Sunrise Electronic System should also be completed such, as modifications to physiological observations which may trigger unwanted escalation to MET/Code Blue.

[Please remember that MET activation is always appropriate in the setting of acute symptom distress/ pain crisis even in the setting of "Not for CPR/ Not for MET"]

14.5 Additional disease specific supportive measures

Supportive measures as listed in the acute stroke care protocol (Ctrl+click to select link) should be applied to all patients with intracerebral haemorrhage. In addition, the following measures are recommended in the acute phase.

Head positioning:

Patients considered at risk of raised intracranial pressure should remain supine with their head elevated at 20-30 degrees to promote venous return and minimise cerebral oedema. Lowering head position below torso should be avoided.

Hydration:

Intravenous normal saline should be administered at a rate to maintain euvolemia and this should be monitored via fluid balance chart and clinical surveillance. Hypotonic solutions should be avoided as to minimise the risk of cerebral oedema.

Neurological monitoring:

Glasgow Coma Scale (GCS) should be recorded hourly for the first 24 hours then 2-4 hourly for next 48 hours if stable. A decrease in GCS of ≥ 2 points from baseline defines significant neurological decline warranting urgent medical assessment. A GCS ≤ 8 is predictive of impending cardiorespiratory arrest and mandates immediate medical attention. A NIHSS may also be used for neurological monitoring by nursing staff. A significant decline (e.g. an increase of ≥ 2points from baseline) should trigger medical review.

Continuous surveillance for clinical features of raised intracranial pressure (reduced consciousness, headache, nausea, vomiting, visual disturbance) and seizures should be performed and urgent medical attention sought if observed (see management of intracerebral haemorrhage related complications below).

DVT prophylaxis:

A sequential compression device, with or without thigh length compression stockings, should be applied and spontaneous lower limb exercises encouraged.

Prophylactic low dose unfractionated heparin or low molecular weight heparin should be avoided in the first 72 hours. Anticoagulant DVT prophylaxis may be considered thereafter following documented stability of intracranial haemorrhage (although probably best avoided if there is a suspicion of an underlying vascular abnormality or cerebral amyloid angiopathy).

14.6 Reversal of coagulopathy

Patients with coagulopathy or thrombocytopenia should receive reversal or appropriate factor replacement therapy in consultation with a haematologist. Platelet transfusion in patients with a history of antiplatelet therapy appears harmful and should be avoided. It is unclear whether thrombocytopenic patients benefit from platelet transfusion, however this could be considered if dynamic haemorrhage is demonstrated (by CTA or CTP)

Patients on warfarin with an elevated INR require urgent reversal of coagulopathy. The following protocol should be applied:

1. Cease warfarin
2. Administer intravenous Vitamin K (5-10 mg) + Prothrombinex (35IU/kg if INR<3.5, 50iU/kg if >=3.5) + Fresh Frozen Plasma (150-300mL – 1 unit)
3. Recheck INR within one hour of infusion and administer further Prothrombinex and Fresh Frozen Plasma if INR not normalised in consultation with a haematologist.

For patients where dabigatran use is known/suspected, idarucizumab should be administered (two separate bolus intravenous injections of 2.5 g (= 50 mL) given as quickly as possible (no more than 15 minutes apart). Early consultation with Haematology for patients taking Rivaroxaban or Apixaban , however it is reasonable to urgently administer PCC (prothrombin complex concentrate) 25unit/kg rounded to the nearest 500unit, unless 5 half-lives has elapsed.

14.7 Management of intracerebral haemorrhage related complications[14]

Hypertension

Uncontrolled hypertension in the acute phase is associated with poor outcome via its effect on haematoma expansion, peri-haematoma oedema and re-bleeding. Recent evidence suggests improved outcome with tight blood pressure control (aiming for approximately 140/80 mmHg and not substantially below) if instituted within six hours of symptom onset.

Patients with hypertensive readings should be initially assessed for pain or urinary retention (may need bladder scan) and managed accordingly. Blood pressure should be confirmed with a second reading

using a sphygmomanometer after five minutes and managed according to the following:

1. Systolic blood pressure ≥ 150 mmHg or mean arterial pressure (MAP) ≥ 110 mmHg:

   All patients should be considered for aggressive antihypertensive therapy (target systolic blood pressure of 140 mmHg or MAP 105 mmHg) using the following intravenous regimens:

   a. Intravenous labetalol 10-20mgs via slow injection over 1-2 minutes. This may be repeated or dose doubled every 5-10 minutes to a maximum total dose of 300mgs in any six hour period **OR**

   b. Hydralazine as a slow bolus 5mg intravenously over 3-5 minutes, repeated as required every 20 minutes (maximum 5).

   c. Intravenous GTN - 30mg in 100mL. Commence 3mL/hr and titrate by 1mL/hr at 5-10 minute intervals to desired BP. Note GTN must be administered via separate intravenous line using non-PVC giving set via a syringe driver.

In the event of persistent hypertension, despite the above measures, consider transfer to HDU or ICU for treatment, within their protocols, and/or consider:

a. Nitroprusside 0.5 micrograms/kg/min IV infusion (as initial dose and titrate to desired blood pressure) **OR**

d. Intravenous labetalol 10 mgs over 1-2 minutes follow with continuous labetalol infusion at a rate of 2-8 mg / minute to a maximum total dose of 300mgs in any six hour period

***NB**: If intravenous medications are unavailable (due to ICU bed unavailability) oral (10-20mg) can be considered with caution (noting peak antihypertensive effect in 1-2 hours and potential for end-organ hypoperfusion).*

If hypertension is associated with deterioration of neurological status (decrease in GCS of ≥ 2 points or increase in NIHSS ≥ 2 points from baseline or GCS ≤ 8 points) should trigger medical review, consider possibility of raised intracranial pressure. Antihypertensive therapy in this setting should be used with caution as it may reduce cerebral perfusion pressure resulting in further neurological decline. Such patients should be considered for ICU transfer and intracranial pressure monitoring to maintain a cerebral perfusion pressure ≥ 60 mmHg whilst administering antihypertensive therapy.

Raised intracranial pressure

Patients with reduced consciousness, headache, nausea, vomiting, visual disturbance or significant neurological decline (decrease in GCS of ≥ 2 points or increase in NIHSS ≥ 2 points from baseline or GCS ≤ 8 points) should trigger medical review, should be suspected for raised intracranial pressure and managed according to the following:

1. An urgent non-contrast CT brain should be repeated to determine the presence of intraventricular extension, obstructive hydrocephalus, haematoma expansion or peri-haematoma oedema resulting in midline shift or transtentorial herniation.
2. In selected patients (i.e. full treatment measures considered appropriate) confirmation of the above should prompt urgent consultation with the duty neurosurgeon.
3. Such patients should be transferred to an intensive care unit with neurosurgical support allowing for insertion of a parenchymal intracranial pressure monitor and management with pain relief, sedation, neuromuscular blockade and mechanical ventilation to achieve normocarbia (target intracranial pressure 20-25 mmHg, cerebral perfusion pressure 50-70 mmHg).
4. Patients with intraventricular haemorrhage or obstructive hydrocephalus should be considered for insertion of an external ventricular drain.
5. Patients refractory to the above measures should be considered for intravenous hypertonic saline or mannitol (0.25-1.0gm/kg) +/- proceed to hemicraniectomy or craniotomy (especially patients aged under 60).

15. Acute stroke care protocol

15.1 Notification of stroke admissions

The stroke team is notified as soon as a patient with stroke is admitted. While medical and stroke nursing staff are notified from ED via the code stroke protocol paging system, an additional communication system will promptly notify the rest of the team of new admissions. For out-of-hours admissions the stroke coordinator and allied health staff, including Aboriginal Health Practitioner/Aboriginal Health Worker, are notified at the start of next shift. Appropriate communication systems are also in place for admissions on weekends and public holidays.

Through a hospital-specific communication system, the team will be aware of stroke patients admitted anywhere in the hospital, not just stroke unit admissions. All outlying stroke patients should be moved to the stroke unit as a priority, and the stroke team will provide an outreach/consultant service until this can be arranged.[18-20]

15.2 Patient's team identified

Acute stroke team

Each patient/family will have a team of relevant professionals allocated to provide the initial assessment, develop individualised care plans, set goals, and provide interventions. This team of medical, nursing, and allied health professionals work in a coordinated manner, sharing information and decision making with each other and with the patient, or substitute decision makers or persons responsible to facilitate early discharge planning, assessment for rehabilitation and associated referrals.[20, 21] For Aboriginal and Torres Strait Islander patients, this should include an Aboriginal Health Practitioner or Aboriginal Health Worker. A cover system should ensure medical, nursing and allied health with appropriate stroke expertise are available on weekends and public holidays for new admissions and ongoing care of all stroke patients.

Key worker

Each stroke patient will have a key worker appointed from within the stroke team, within 24 hours of admission. The key worker roles can be allocated across the broader stroke team, to individuals from any discipline who have credibility and experience in stroke management and can confidently guide the patient and family/friends through the processes. In hospitals with small numbers of stroke admissions, the stroke nurse coordinator may take on the key worker role.[22, 23]

This coordination model accommodates the following:

a. Reduces duplication in assessments by undertaking the collection of social information and pre-morbid status required by multiple team members (an interdisciplinary assessment).

b. Allows for the patient and family to have 'one contact' for organisational or general inquiries or to direct their specific inquiries.

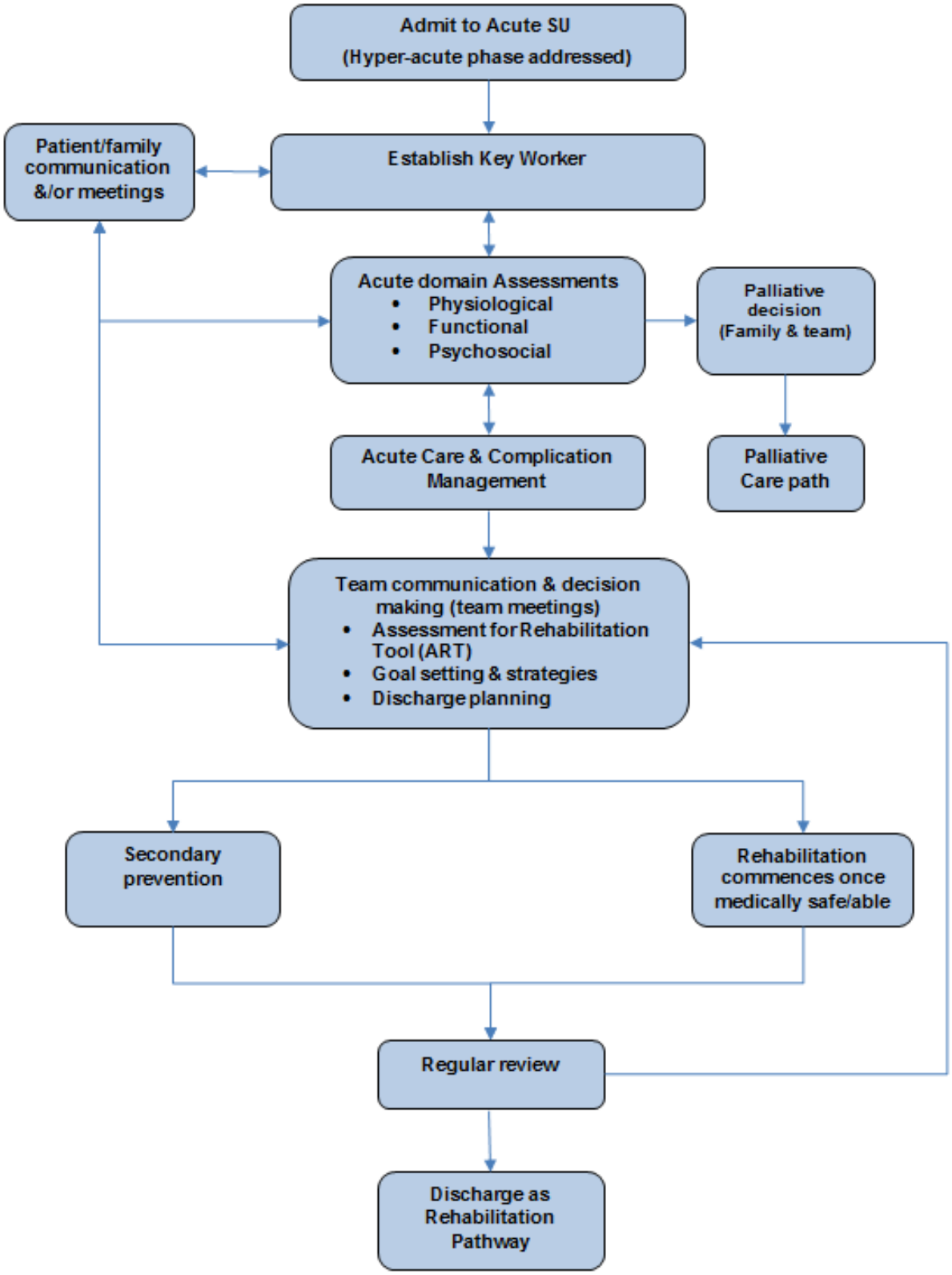
c. Remains a constant for the patient and their family for the admission duration.

d. Facilitates the smooth flow of the acute care pathway, ensuring appropriate referrals are made, assessments completed (e.g. the Assessment for Rehabilitation Tool (ART), Ctrl+click to select link), meetings are scheduled and occur within the necessary timeframes, and discharge arrangements are in place.

e. Ensures that important information is received by the patient and family such as relevant literature, My Stroke Care Plan (SF), post-discharge plans.

f. Facilitates patient-centred care by ensuring meaningful communication and decision making between the patient, substitute decision maker / family / friend and the rest of the stroke team.

16. Acute stroke care pathway



Stroke severity assessment

If not done in ED, an initial screen of stroke severity is conducted early in admission and again at discharge. The recommended tool is the National Institute of Health Stroke Scale (NIHSS, Ctrl+click to select link). Use of a common tool will facilitate transfer of information and comparisons across stroke settings. Staff assessing with the NIHSS should undertake online training and accreditation. An assessment of disability should also be performed at discharge (NIHSS and the modified Rankin score).[23]

16.1 Acute domain assessments

Initial domain assessments are performed by the acute stroke care team members allocated to care for the patient. Through team communication and planning information required across professionals will only be gathered once, avoiding unnecessary duplication for the patient. The findings, actions, recommendations and goals arising from acute assessments should:

a. Be communicated to the whole stroke team via the patients' medical records and important issues shared at formal and informal team meetings.[24]

b. Be discussed with the patient/family by the professionals undertaking the assessment or by the relevant Key Worker.[21]

c. Inform the Assessment for Rehabilitation Tool (ART, Ctrl+click to select link) or other relevant discharge planning discussions and referrals.

Clinicians should use validated and reliable assessment tools or measures that meet the needs of the patient to guide clinical decision making.

Initial investigations and stroke classification

NB: *Management recommendations listed below are applicable to all patients unless they have received intravenous alteplase, or endovascular thrombectomy or they have had an intracranial haemorrhagic stroke (Ctrl+click to select links).*

All patients with suspected stroke should have an urgent brain CT or MRI ('urgent' being immediately where facilities are available but within 24 hours, ideally within 4 hours).

The following investigations should be routinely carried out in all patients with suspected stroke:

a. 12 lead electrocardiogram

b. Full blood count, coagulation studies, electrolytes, renal function, lipids and glucose, erythrocyte sedimentation rate and/or C-reactive protein.

c. Selected patients may require additional investigations including vasculitis and prothrombotic screens.

d. Additional investigations should be performed as soon as possible to determine the aetiology and allow for classification of stroke subtype. This includes cardiac telemetry, intracranial and extracranial vascular imaging (ultrasound, CT angiography or magnetic resonance angiography) and cardiac imaging (trans-thoracic +/- trans-oesophageal echocardiography).

e. Brain Natriuretic Peptide (BNP) blood test may be considered in patients with cardioembolic stroke where the suspicion of unknown source is high.

It is recommended that all patients receive an aetiological classification guiding acute management and secondary prevention. Suggested classification criteria are listed below (potential causes may coexist):

Intracerebral haemorrhage secondary to: [25]

a. Vascular lesion

b. Medication (note that anticoagulation alone is an insufficient cause of haemorrhage)

c. Amyloid angiopathy

d. Systemic disease (i.e. clotting disorder, thrombocytopenia)

e. Arteriolosclerosis (i.e. 'Hypertensive' intracranial haemorrhage)

f. Undetermined aetiology.

Ischaemic stroke secondary to:

a. Large vessel atherosclerosis (intracranial or extracranial)

b. Small vessel disease

c. Cardioembolic

d. Embolic stroke or uncertain source (ESUS)

e. Dissection

f. Other rarer cases (e.g. vasculitis, antiphospholipid syndrome)

g. Undetermined

Physiological assessments and monitoring

Patients should have their neurological status (e.g. NIHSS) and vital signs (including pulse, blood pressure, temperature, oxygen saturation, and glucose levels), cardiac rhythm and respiratory pattern monitored and documented regularly during the acute phase (see table below). Observations should be undertaken by trained personnel and documented in the medical record in a manner that will prompt necessary action.[26-29]

Physiological and neurological monitoring should be undertaken routinely as follows. Deterioration in status should be managed according to the Recognising and Responding to Clinical Deterioration Policy Directive, developed by the Safety & Quality Unit of SA Health.

Observation	0-24 hours	24-48 hours	48-72 hours^	3-5 days	5 days+
Neuro Obs NIHSS	1-4 hourly	4 hourly	6 hourly^	6 hourly^	stop^
NIHSS	On arrival and at 2 hours	NIHSS at 24 hours	NIHSS ON DISCHARGE		
RR,BP,TPR, SpO2	1-4hourly	4 hourly	6 hourly^	6 hourly^	12 hourly^
Cardiac telemetry	Yes*∅*	Yes*	Yes*^	Yes*^	
Blood glucose	4 hourly	4 hourly	6 hourly^#	If>6mmols continue 6 hourly^	If>6mmols continue 6 hourly^

May not be required if known to have atrial fibrillation or if cardioembolic aetiology considered unlikely.

^Observations after 48 hours should be based on individual patient status
 # BGL Screening QID not 4 hourly unless known diabetic∅Minimum 24 hours for Cardiac Telemetry, preferably longer if resource available and discharge not delayed.

Neurological monitoring	The modified National Institute of Health Stroke Severity (NIHSS) scale is a recommended neurological observation tool. Observations should be taken and recorded by trained personnel.[23]
Oxygenation	Patients with oxygen saturations ≤94% should be administered the minimal supplemental oxygen necessary to maintain oxygen saturation of >94% (as hypercarbia may be harmful). [152] The routine use of supplemental oxygen is not recommended. New onset of hypoxia should be managed as per SA Health's Deteriorating Patient Protocol (RADAR). Consider pulmonary embolus, left ventricular failure, aspiration pneumonia, other sepsis. Consider investigation of undiagnosed sleep apnoea.
Pyrexia	Antipyretic therapy, comprising regular paracetamol and/or physical cooling measures, should be used routinely when fever occurs. Antipyretic therapy commences when fever >37.5˚C. Temp >38˚C→ contact MO, consider blood cultures, septic screen (Chest X-ray, MSSU, sputum, other).[30]
Blood pressure	Pre-existing antihypertensive therapy should be continued (orally or via nasoenteric tube) provided there is no symptomatic hypotension or other reason to withhold treatment. In ischaemic stroke (in those not eligible for intravenous thrombolysis or endovascular thrombectomy), if blood pressure is more than 220/120 mmHg antihypertensive therapy can be started or increased, but blood pressure should be cautiously reduced (e.g. by no more than 10-20% every 24 hours) and the patient should be monitored for neurological deterioration.
Heart rate and rhythm	Cardiac monitoring is recommended to screen for atrial fibrillation and other potential serious cardiac arrhythmias for at least 24 hours (unless alternative stroke aetiology immediately apparent). If pulse rate >120 bpm or <50bpm should be managed as per SA Health's Deteriorating Patient Protocol.
Respiration	Abnormal respiration rate >21 or <10 → review position upright if conscious, encourage deep breathing, cough, huffing hourly, oral suction if necessary. Tachypnoea is an early sign of both pneumonia and pulmonary embolism. Deterioration in respiration should be managed as per SA Health's Deteriorating Patient Protocol (RADAR) Consider infection, left ventricular failure, pulmonary embolus, chest x-ray. Nil by mouth if aspiration suspected.
Glycaemic control	On admission, all patients should have their blood glucose level monitored and appropriate glycaemic therapy instituted as per FeSS Sugar Protocol (Ctrl+click to select link). Dextrose containing solutions should be avoided as may cause cerebral oedema.[30]

Functional assessments

Timely functional assessments should be completed and documented, unless receiving end of life care at this time. Wherever available, validated assessment tools should be used and appropriate care plans communicated to the team.

To avoid over-taxing the patient, functional assessments should be staggered according to priority for the individual, using the following table as a guide.

On admission or < 4 hours	Within 24 hours	Within 48 hours	Prior to rehabilitation decision
Swallow screen (nil by mouth until swallow cleared) [31,32]	Swallow assessment by SP if screen failed [33, 34]	Motor function: tone, strength, coordination, dyspraxia [35-37]	ADLs[38]
Hydration [39-41] (Also intravenous therapy)	Mobility assessment: transfers, gait (for mild to moderate stroke)	Mobility assessment: transfers, gait (for severe stroke)	Behaviour
	Risk of falls	Visual, sensory & perceptual assessment	Mood: emotion psychological [44-46]
	Nutrition screen [47, 48]	Nutrition assessment by DN if screen failed [49, 50]	Carer support [21, 51, 52]
	Continence [53-55] Pressure care risk assessment	Communication [43]	Burden of care
	Risk of shoulder subluxation/injury [56, 150]	Cognition [57-59]	
	Psychosocial Assessments		

Screening tools:

The use of screening tools by trained team members is encouraged to identify patients who are at risk, and who require more detailed specialist assessment and intervention. Screening has the advantage of freeing up specialist staff time to concentrate on those patients who will benefit most from specialist skills. Who conducts the screen will vary according to local practice. The use of screening tools must be backed by systematic training programs that are repeated regularly to capture staff turn-over and reinforce understanding and reliability. Screening tools that have proven validity and reliability in stroke populations should be chosen. Below is a list of some screening tool examples, noting that other validated screening tools may be available:

Swallow screen	Swallow screening should occur for all stroke patients prior to oral intake. The "SA Health Swallow Screen for Acute Stroke Patients" has been adopted as the swallow screening tool for use in metropolitan Adelaide acute stroke units with the "Gugging Swallow Screen (GUSS)[60]" continuing to be the tool used in Country Health. If swallowing deficits are identified with screening, patients are to remain nil-by-mouth with an urgent notification to the SP for full swallow assessment.
Nutritional screening	Nutritional screening on admission is used to identify pre-admission nutritional problems. As patients are at risk of deteriorating nutrition status following stroke and throughout acute hospital admission, screening should be repeated at weekly intervals, with referral to DN if issues are detected.[62] The Malnutrition Universal

	Screening Tool (MUST) or eMUST has been adopted for use in metropolitan Adelaide hospitals.
Communication screening	Communication deficits are screened for using tools such as the Western Aphasia Battery (WAB) (short version).
Cognition Screening	Patients not identified as having communication deficits should be screened for cognitive deficits using a validated tool such as the Montreal Cognitive Assessment (MoCA) [57-59]. For patients who do have communication deficits, a functional assessment alongside brief cognitive assessments by Neuropsychologists will be more appropriate.
Mood screening	Stroke survivors with suspected altered mood (e.g. depression, anxiety, emotional liability) should be assessed using a standardised and validated scale. Examples include: > Hospital Anxiety and Depression Scale (HADS), Geriatric Depression Scale or the Patient Health Questionnaire 9 (PHQ9) as appropriate. The Stroke Aphasic Depression Questionnaire Hospital Version SADQ-H10 should be considered for patients with communication issues. [63] Subclinical or clinical scores on screening tools should result in notification of medical staff and referral to psychosocial services.
Pharmaceutical assessment	Pharmaceutical assessment of previous medication should be undertaken. A medication prescription/plan should be made through consultation between medical staff and pharmacist.

Psychosocial assessments

A psychosocial screen (premorbid profile) should be undertaken within 24 hours of admission to capture information relevant to the acute care and forward planning for the patient and their family. It is recommended that the key worker for each patient undertakes this assessment, and shares information with the stroke team, to avoid duplication and to establish a relationship with the patient/family. Important areas to cover include pre-stroke living arrangements, family contacts, functional level, social and work activity, driving, community support services used, informal supports used, any Power of Guardianship and Advance Care Directives, and the patient's and family's initial goals or concerns regarding discharge. A simple tick-box assessment format can add efficiency.

Where there is added social complexity or factors that could impact on eventual discharge options, a referral to Social Work for a more comprehensive psychosocial assessment is required for clarification of any barriers/complexities and allow for timely problem solving. This should occur as early as possible in the stroke care pathway to prevent unnecessary delays for the patient when ready for discharge into the community.

An Aboriginal Health Practitioner or Aboriginal Health Worker should be involved in all psychosocial assessments undertaken with Aboriginal and Torres Strait Islander stroke patients.

16.2 Acute care and complication management

Antithrombotic recommendations listed below are applicable to all stroke patients unless they have received intravenous thrombolysis, or endovascular thrombectomy or they have had an intracranial haemorrhagic stroke (Ctrl+click to select link).

Antithrombotic therapy

Antithrombotic treatment, orally, subcutaneously, intravenously or via nasoenteric tube (for those with dysphagia who will otherwise require NET placed) should be given as soon as possible after the onset of ischaemic stroke symptoms (within 48 hours) if neuroimaging excludes haemorrhage. If aspirin is used the first dose should be 300mg (500mg if intravenous), followed by 100mg daily.

Aspirin IV 500mg Injection (SAS) should be administered to Ischaemic Stroke patients with dysphagia (or in whom validated swallow screening cannot be promptly performed) without a functioning nasogastric tube.

The routine use of early anticoagulation in unselected patients following stroke/TIA is not recommended. Patients who have presented on aspirin already (or have an aspirin contraindication) are PBS eligible for clopidogrel, and a loading dose of 600mg followed by a 75mg maintenance dose should be administered. Aspirin/dipyridamole is also reasonable in this setting (excepting aspirin contraindications) as well as the antiplatelet-naïve (bearing in mind headache as a side-effect and the benefit of titration).

Patients with minor ischaemic stroke or high risk TIA should receive dual antiplatelet treatment with aspirin and clopidogrel (300/600mg load followed by 100/75mg daily for 21-30 days, with concomitant pantoprazole 40mg daily), followed by monotherapy with aspirin, clopidogrel or aspirin/dipyridamole [141].

Anticoagulation therapy

Anticoagulation therapy for secondary prevention for people with ischaemic stroke or TIA from presumed arterial origin should NOT be routinely used. [121, 122, 123]

Anticoagulation therapy for long-term secondary prevention should be used in people with ischaemic stroke or TIA who have atrial fibrillation or other cardioembolic stroke. [121, 122, 123]

Anticoagulation should be delayed in patients with large infarctions (optimal delay is unclear), but should be commenced around day 10-14 days. In patients with TIA, anticoagulation therapy should begin once CT or MRI has excluded intracranial haemorrhage as the cause of current symptoms. In other settings it is reasonable to commence anticoagulation day 0-3 in patients with very small infarcts, day 5-7 in moderate sized infarcts. Direct oral anticoagulants (apixaban, dabigatran or rivaroxaban) are generally preferred to warfarin in the setting of non-valvular atrial fibrillation.

Seizure management

Anticonvulsant therapy is indicated in patients with observed seizures or in patients with a change in mental status associated with electroencephalographic changes in keeping with seizure activity. Valproate and Levetiracetam are preferred agents if status epilepticus occurs (as per the state protocols)

For patients with intracerebral haemorrhage empirical prophylactic anticonvulsant therapy is not recommended. In such patients with seizures, sodium valproate should be avoided given its adverse effect on platelet function.

Nutrition and hydration

All patients should have their hydration status assessed, monitored and managed. Appropriate fluid supplementation should be provided to prevent dehydration. [39-41, 47, 48, 64, 65]

Strategies including making fluid accessible, offering preferred fluid and providing supervision during meals should be adopted to optimise fluid intake. [64] If additional hydration is required, fluid should be administered via intravenous, subcutaneous or enteral routes.

All patients at risk of malnutrition, including those with dysphagia, should be seen by a dietitian (DN) for assessment and management. Nutritional supplementation should be offered to patients whose nutritional status is poor or deteriorating. Non-palliated patients who do not have a functional swallow should not wait longer than 2-3 days before tube feeding is instituted. Nasoenteric tube feeding is the preferred enteral feeding route during the first month post-stroke for patients who have not yet

recovered a functional swallow. Enteral feeding regimes should be tailored to the individual, taking into consideration factors such as tolerance and other rehabilitation goals.

Food intake should be monitored for all patients with acute stroke to indicate if referral to a DN is required, for example using a nutrition observation chart. The DN should continue to monitor intake using Food Intake Charts as clinically indicated. All patients should be weighed within 24 hours of admission and at weekly intervals. [49]

Urinary incontinence

All stroke survivors with suspected continence difficulties should be assessed by trained personnel using a structured functional assessment. A portable bladder ultrasound scan can be used to assist in diagnosis and management of urinary incontinence. Patients with confirmed continence difficulties should have a continence management plan formulated and documented, implemented and monitored. [55-57]

The use of indwelling catheters should be avoided as an initial management strategy except in acute urinary retention.

If incontinence persists the patient should be re-assessed and referred for specialist review.

The following is recommended for patients with urge incontinence:

a. A prompted or scheduled voiding regime program/ bladder retraining should be trialled (in conjunction with findings from the mobility assessment).

b. Anticholinergic drugs can be trialled (note: these medications can cause confusion or cognitive deterioration).

c. If continence is unachievable, containment aids may assist with social continence.

The following is recommended for patients with urinary retention:

a. The routine use of indwelling catheters is not recommended. However if urinary retention is severe, then intermittent catheterisation (IC) should be used to assist bladder emptying during hospitalisation. If retention continues, IC is preferable to indwelling catheterisation.

b. If using IC, then a closed, sterile catheterisation technique should be used in hospital.

c. Any patient discharged with either intermittent or indwelling catheterisation will require education of patient/carer for management, where to access supplies and a contact point in case of problems.

For people with functional incontinence, a whole-team approach is recommended.

Bowel management

Routine bowel management.

Accurate observation, recording, and active bowel management is required to avoid constipation. [55] Use of the Bristol Stool Chart is recommended (Ctrl+click to select link).

The charting of aperients should be routinely considered at admission for all patients.

Adequate hydration and the use of aperients and stool softeners will need to be carefully managed/ modified to suit the requirements of patients with swallowing difficulties.

Constipation that does not resolve or if there is abdominal pain or vomiting requires notification to the medical officer.

Faecal incontinence

All stroke survivors with suspected faecal continence difficulties should be assessed by trained personnel using a structured functional assessment. [55] For those with constipation or bowel incontinence, a full assessment (including a rectal examination) should be carried out and an appropriate management plan of constipation, faecal overflow or bowel incontinence established, and

targeted education provided.

Bowel habit retraining using diet, regulating dietary habits and exploiting the gastrocolic reflex may be used for people who have bowel dysfunction. If continence is unachievable, containment aids may assist with social continence.

Education, careful discharge planning and preparation are required for any patient being discharged with bowel incontinence. Faecal incontinence > 5 times a day may indicate infection → notify MO, collect stool sample. Consider constipation with overflow.

Deep vein thrombosis and pulmonary embolus (PE)

Early mobilisation and adequate hydration should be encouraged in all acute stroke patients to help prevent DVT and PE.

Thigh length Sequential Compression Device (SCD), with or without thigh length compression stockings, is recommended for ICH patients, or those post thrombolysis (first 24 hours), or others at high risk of haemorrhage transformation of the ischaemic stroke, or of DVT.[67] If tolerated they may be used instead of antithrombotic medications as they carry no ICH risk.

Antiplatelet therapy in patients with ischaemic stroke helps prevent DVT/PE. [66] Where ICH risk is low, or when SCDs are not tolerated, low molecular weight heparin or heparin in prophylactic doses can be used. If low molecular weight heparin is contra-indicated or not available, unfractionated heparin should be used. This treatment is also reasonable in ICH patients when bleeding risk is low (i.e. after 3-4 days post onset in arteriolosclerotic ICH)

Anti-thrombotic stockings are NOT recommended for the prevention of DVT/PE post-stroke. [57]

Pressure care

All stroke survivors should have a pressure care risk assessment and regular evaluation completed by trained personnel.

Patients assessed as high risk should be provided with appropriate pressure relieving aides and strategies, including a pressure relieving mattress as an alternative to a standard hospital mattress or appropriate seating systems. [68]

Falls

Falls risk assessment should be undertaken using a validated tool (e.g. SAHLN MR58, MR58a and Mr58b FROP-Com Assessment tool) on admission to hospital. An interdisciplinary management plan should be initiated for all those identified as at risk of falls.

Shoulder subluxation and upper limb management

For people with severe weakness who are at risk of a subluxed or injured shoulder, management should include one or more of the following interventions: firm support devices; electrical stimulation; education for the patient, family/carers and clinical staff on how to correctly handle and position the affected upper limb. [56, 69, 70] Shoulder strapping is not recommended to prevent or reduce subluxation, unless severe weakness is present. [150]

Strategies to highlight the 'at risk' arm should be instituted early after admission such as a highlighted body chart above the bed, or a brightly coloured arm band (has advantage of travelling with the patient).

Upper limb precautions should also be considered for sensory inattention, sensory loss, spasticity, contracture and shoulder pain management.

If shoulder pain is present, shoulder strapping may be used, along with other evidence-based interventions for acute musculoskeletal pain. Other recommendations for shoulder pain would not be appropriate in the acute setting. These include shoulder injections (using steroids or methylprednisolone and bupivacaine for suprascapular nerve block), or botulinum toxin to reduce spasticity.

Oral hygiene

All patients, especially those with swallowing difficulties, should have assistance and/or education, by nursing staff, to maintain good oral and dental hygiene (including dentures). Patients with poor dentition or ill-fitting dentures should be referred to a dental service. [71]

Team communication and decision making

Team communication and decision making will occur at various levels.

Formal team meetings

To facilitate the rapid patient flow required by acute settings, the stroke team should meet twice weekly. [24] The purpose of these meetings is to enable good team communication and collaborative decision making around the key issues for each stroke patient. This would usually include sharing key points from important initial assessments, important changes in status, updating the Assessment for Rehabilitation Tool (ART), reaching consensus on team-wide patient goals, updating progress toward goals, discharge planning and referrals as required.

Discharge planning should commence as soon as possible after admission but also be a focus at team meetings [150]. Potential barriers to a safe discharge are identified early and addressed. Discharge planning meetings should be coordinated by a nominated staff member to maximise effectiveness. A meeting agenda template is recommended.

Decisions from formal team meetings are documented in the medical record. Important information from team meetings is communicated back to the patient/family, usually via their Key Worker.

Daily handover meetings

Brief handovers from nursing staff at the start of the day update the rest of the stroke team e.g. new admissions, changes in patients' status overnight, priority matters requiring attention. Handovers should include referral to relevant allied health staff. These meetings can be used to allocate interdisciplinary tasks.

Informal team communication

Discussions occur informally between team members which may influence the care and plans for the patient /family. Care must be taken to ensure that all relevant team members, and especially the patient /family, are included or consulted if the information will affect them.

Informal discussions that result in decisions for the management of the patient, or changes to previously agreed plans should be documented in the medical records, and the Key Worker informed.

Family meetings

Formal family meetings [21, 24]

Family meetings may be formal, involving multiple family members, the patient and most of their treating team. Formal meetings are not always needed, but may be required at critical times for some patients/families such as for complex discharge planning, where there is family disagreement, where patient/family goals do not align with discharge options, some end-of-life decisions. These meetings are chaired (ideally by a team social worker or Aboriginal Health Practitioner/Aboriginal Health Worker or Aboriginal Liaison Officer), minuted (those present, decisions, goals/actions and concerns raised), and records are kept in the medical record. Copies of meeting records should not be provided to the patient/and/or family. They should instead be encouraged to take their own notes.

The key worker role is important for family meetings. As the link for the patient and family they can provide information about the option of having a family meeting, and provide information relevant to the outcomes of the family meeting (such as NSF literature).

For Aboriginal and Torres Strait Islander patients, it is important to understand that the appropriate

decision maker may be dictated by a clearly established kinship network, and therefore it is important to seek guidance from the Aboriginal Health Practitioner/Aboriginal Health Worker, Aboriginal Liaison Officer, and the family. If the patient has been transferred, teleconferencing and videoconferencing facilities should be used to engage family who are unable to travel with family in order to make decisions.

Informal family meetings

Family meetings may also be informal and brief, face-to-face or by phone. This level of two-way communication should occur frequently between the patient/family and members of the treating team, and especially the Key Worker for that person. Any outcomes from these communications that are relevant to patient care and planning or are significant decisions/information from these meetings should be documented in the medical records. If the patient has been transferred, teleconferencing and videoconferencing facilities should be used to engage family who are unable to travel with family in order to make decisions.

Goal setting

Goal setting should begin informally between acute stroke team members and the patient/family as the assessments occur. [18, 21, 72] Goal setting should be set in collaboration with the patient/family and be directed towards small goals to achieve within short timeframes or treatment sessions, as well as broader long-term goals such as discharge destination [148]. Patients will vary in their ability to identify goals achievable within the acute setting, and may be assisted by using directed choices or a 'goals menu'. Some goals will be shared across team members (such as discharge destination goal), whilst others may be more therapist/nurse specific.

Goals should be clearly communicated and documented for the patient/family and members of the team. This occurs within formal team meetings or at informal discussions between team members and the patient/ family. Patient and family goals feed into the ART and are to be considered at all phases of discharge planning.

Resuscitation planning

The Resuscitation Plan 7 Step Pathway provides a statewide best practice process for decision-making and clinical care planning for resuscitation and end-of-life care across SA Health. The Resuscitation Plan 7 Step Pathway supports safe and high quality resuscitation planning and end-of-life care that is patient centred and, wherever possible, is aligned with the values, needs and wishes of the individual. The seven steps are: trigger (when and why); assessment; consultation; document the clinical care plan; transparency and communication; implementation; and support.

Discharge planning

Discharge planning should follow the framework set out in the stroke rehabilitation pathway (Ctrl+click to select link) and commence as soon as possible after the patient has been admitted to hospital [150]. It is assumed that all stroke patients are assessed for rehabilitation using the ART (Ctrl+click to select link), and are referred to either; inpatient rehabilitation, rehabilitation in the home, or outpatient rehabilitation as well as ongoing monitoring. The only exceptions are individuals who make a full recovery, are on a palliative care pathway, are unresponsive or who decline rehabilitation.

Telerehabilitation can also be included as part of the stroke rehabilitation pathway.

Rehabilitation in the acute setting

Starting intensive out-of-bed mobilisation within 24 hours of stroke onset is not recommended following severe stroke [148]. However, all patients should commence mobilisation (out-of-bed activity) within 48 hours unless contraindicated. The domain assessments completed early in admission inform the ART. For each domain where rehabilitation is indicated, the rehabilitation process should start in the acute setting as soon as the patient is medically safe and/or able to participate and is managed by the

appropriate team therapist. Targeted rehabilitative therapy is structured to enable the patient as much practice as possible, aiming for a total minimum of one hour total active practice per day at least 5 days/week. Practice opportunities will be facilitated by an inter-disciplinary approach, including the use of Allied Health Assistants and may include assistance from family members where appropriate. [35, 36, 42, 73-78]

Rehabilitation therapies are aimed at skill retraining by facilitating neuroplasticity and/or teaching compensatory skills, and take into account the impacts of pre-existing and stroke-related deficits.

To maximise recovery, consideration needs to be given to creating an enriching environment, to foster maximum engagement in the rehabilitation process with the patient and to address salient functions as much as possible with maximum intensity.

Rehabilitation interventions will be individualised for the patient. The aims of rehabilitation and strategies based on recommendations in the guidelines include:

Dysphagia

Speech pathologists should actively manage behavioural approaches to optimise safe swallow function such as positioning, modification of fluids/food, swallowing exercises and environmental modifications. Electro-stimulation is not recommended for use in the clinical setting. [144]

Advice re appropriate feeding and swallowing considerations and maintenance of good oral hygiene should be communicated to staff and family members that assist the patient to eat. This may include, but not be restricted to written advice at the bedside.

Regular monitoring of tolerance to oral diet should occur, and swallow recovery and prognosis be considered in discussions regarding need for timely enteral feeding tube placement in the short and longer term.

Hydration and Nutrition

Dietitians should lead the team in facilitating the recovery of adequate self-managed intake, including provision of oral or enteral nutrition support, provision of altered consistency or other therapeutic diets, and education of the patient and family regarding appropriate food choices to meet nutritional requirements. Environmental barriers to feeding that may impact on hydration and nutrition should also be considered.

Continence

Nursing staff should actively manage bowel/bladder retraining. The patient and family should be educated in self-management techniques/aides and strategies – especially important for those being discharged directly home. [54, 79]

Mobility

- Should occur when medically stable with the following considerations:
  - Endovascular therapy – strict bed rest for minimum first 12 hours
  - Note that patients with persisting large vessel occlusion may be harmed by very early mobilisation - check with treating medical team.
- All patients should be seen by a Physiotherapist in the first 24-48 hours
- See OWI03184 Falls and Harm from Falls Prevention

For patients with mild and moderate stroke, frequent, short sessions of out-of-bed activity should be provided [148]. The team should use strategies to maximise the patient's activity levels and independence. For example, patients can be assisted to walk to the bathroom if appropriate rather that use pan/commode; sitting in an upright chair rather than reclined in 'Cloudchairs'; prompted to move/roll in bed rather than be moved passively. [43, 73, 80-84]

Physiotherapists should provide or oversee the active rehabilitation of balance (e.g. practice reaching in sitting, repetitive task-specific work in standing with feedback); transfers (practice and feedback for rolling, lie to sit, sit to stand, bed to chair etc.); walking (repetitive practice of walking and/or components

of walking, mechanically assisted gait, joint position feedback).

Mobility aides (including ankle-foot orthoses) may be provided early in admission according to individual needs.

Motor functions including upper limb activity

Occupational therapists and physiotherapists should complete assessment and review for passive range of motion, active range of motion, power, coordination and sensation. Tailored upper limb programs should be provided for active rehabilitation of function through repetitive task-specific training, strengthening (progressive resistance exercises, electrical stimulation, biofeedback), mirror therapy, mental practice, constraint-induced movement therapy [148]. [36, 80, 83, 85-88]Robotics and virtual reality-based therapy may be used if available.

Activities of Daily Living (ADLs)

Occupational therapists should provide and oversee the active rehabilitation of ADLs as per the patient's goals. The team should support the patient to maximise independence. Therapists and nurses should encourage the rehabilitation of ADLs through task-specific practice and training in the use of appropriate aides. Tailored interventions and strategies should be initiated for deficits such as confirmed limb apraxia or visual field loss. [38, 89, 90]

Communication

Speech pathologists should provide or oversee targeted rehabilitation of aphasia (e.g. language interventions based on cognitive neuropsychological models, use of gesture, constraint-induced language therapy, supported conversation techniques, computer delivery of therapy); dyspraxia of speech (e.g. targeted articulatory placement/transitioning/rate/rhythm, the use of cuing and feedback, PROMPT therapy); dysarthria (e.g. targeted strategies to improve clarity of speech). The aim is maximising communication skills and opportunities. Training should be provided in augmentative or alternative communication modalities if necessary. [43, 76] Interpreter services should be utilised for patients where English is not the first language.

Vision

Occupational therapists and physiotherapists should provide or oversee rehabilitation for recovery of functional vision or compensatory skills for visual field loss, acuity and eye movement disorders. Therapy may include task specific practice, computer based visual training, scanning techniques, prism glasses. [91, 92] Early referrals to neurological vision specialists should be facilitated.

Loss of Sensation

Occupational therapists and physiotherapists should provide or oversee individualised sensory-specific training and therapy for sensory loss, or training in compensatory techniques. . Interventions include sensory discrimination training for goal-directed functional tasks, in a graded and progressive discrimination for various textures, object recognition, feedback and self-checking [81, 93-95]

Perception, Limb Apraxia & Neglect

Occupational Therapists and Physiotherapists should provide or oversee therapy to promote recovery of functional ability or the use of compensatory strategies for identified perceptual difficulties, unilateral neglect or impairment of spatial awareness. Interventions for unilateral neglect such as cueing, visual scanning training, sensory stimulation, prism glasses, mirror therapy, mental imagery eye patching and feedback should be considered and relative to functional goals. For patients with limb apraxia, interventions such as gesture training, strategy training and errorless learning in the context of functional tasks should be considered [81, 93-95]

Cognition

Patients identified from screening as having cognitive deficits should be referred for comprehensive neuropsychological investigations.

Goals of therapy if deficits are shown include incorporation of cognitive remediation and compensatory strategies.

Neuropsychologists in the subacute / rehabilitation setting will support the patient and lead the team in the provision of tailored cognitive rehabilitation using cognitive training alongside compensatory strategies targeting attention, concentration, memory, and executive functions.

Other compensatory techniques to reduce disability may include orientation boards, diaries, calendars, iPad apps.

Emotional/psychological

The team should monitor for signs of emotional distress and suspected altered mood (e.g. depression, anxiety, emotional liability). Patients with suspected altered mood should be screened with a standardised and validated scale to enable early intervention. Diagnosis of mood disorders should only be made by clinical assessment.

Referral pathways for patients experiencing emotional distress, depression, anxiety, and/or emotional lability include social work (supportive and grief counselling, response to acute distress) and psychology (formal biopsychosocial assessment and psychological intervention). Further management of depressive or anxiety symptoms may also include the use of medication.

Any signs or emotional distress or depression identified in an Aboriginal and Torres Strait Islander patient should trigger a referral to the Liaison Service, who should provide care in collaboration with the treating team. Referral to other services may be appropriate, including but not limited to diversional art therapy, animal assisted therapy, and volunteer services.

Therapy should be tailored to increase motivation and engagement or participation in rehabilitation. [97-99]

Burden of care/carer support

The team should consider carer needs as part of the ART, through liaison by the key worker, and at family meetings. Carers should be provided with psychosocial support to ensure carer wellbeing and sustainability of the care arrangement. This may include being supported to explore and develop problem solving strategies, coping strategies, stress management techniques and protecting relationships.[144]

Where it is the wish of the patient, carers should be actively involved in goal setting, therapy sessions and discharge planning. Prior to discharge home, carers should be educated and trained in essential skills such as communication strategies, physical handling techniques, safe swallowing, dietary modifications, management of behaviours and personal care techniques. Carer training can be considered a valid reason for admission of the patient to inpatient rehabilitation. Carers should be referred to community support services as appropriate, and informed about stroke-specific and generic support networks that may be useful prior to discharge home. [21]

The support services available within the community should be carefully considered when providing information on carer support. There are limited services available in rural and remote locations. This is of particular consideration for Aboriginal and Torres Strait Islander patients from rural and remote locations. Additional supports may need to be put in place prior to discharge to ensure the carer is supported.

16.3 Palliative care

More than 10% of patients with stroke may die in the acute setting and thus best-practice palliative care practices must be incorporated into stroke team practices, consistent with the Standards for Providing Quality Palliative Care for All Australians.

All patients with severe stroke, or who are deteriorating, should have an accurate assessment of prognosis or need for palliative care. Decisions are led by a Medical Consultant and should involve discussions with the patient/family or the family's knowledge of the wishes of the patient. Decisions for care should ideally involve other team members such as the SW, SP, DN (oral intake issues), to ensure holistic consideration and support for the patient/family. Practical end-of-life issues should be discussed, such as the use of advance care directives, 7 step pathway and/or organ donation where appropriate. [100, 101]

The patient and family should have access to specialist palliative care teams as needed. Palliative care pathways suitable for stroke can be used to support the patient and family and improve care for people dying after stroke (e.g. The Stroke Palliative Approach Pathway, Victorian Department of Health).

The stroke team or key worker should ensure that the family have information/contacts for bereavement follow-up.

For Aboriginal and Torres Strait Islander patients, there may be specific considerations which need to be discussed in a cultural context. Patients may wish to leave a hospital to be able to travel home to be on Country or near family. Aboriginal Liaison Officers and family should be involved in any discussions regarding end of life.

16.4 Secondary prevention

Lifestyle modification

Every stroke patient will be assessed and informed of their risk factors for further stroke and possible strategies to modify identified risk factors. Individualised interventions should be delivered using behavioural techniques (educational or motivational counselling). Risk factors and interventions include:

a. Stopping smoking: nicotine replacement therapy, bupropion or nortriptyline therapy, varenicline therapy and/or behaviour therapy. [102-105]

   Varenicline does not increase cardiovascular risk (including stroke) and therefore can be commenced if necessary during the inpatient stay of a stroke patient. [142]

b. Improving diet: a diet low in saturated fat and sodium but high in fruit, nuts fish, olive oil and vegetables e.g. the Mediterranean diet. [106-108]

c. Increasing regular exercise. [109-110]

d. Avoiding excessive alcohol (i.e. no more than two standard drinks per day, one for females). [111-112]

Adherence to pharmacotherapy

Interventions to promote adherence with medication regimes are often complex and should include combinations of the following: reminders, self-monitoring, reinforcement, counselling, family therapy, telephone follow-up, supportive care and dose administrations aids, education in hospital and in the community. [113-115]

For Aboriginal and Torres Strait Islander patients from rural and remote areas, it is important to consider timely access to pharmacotherapy. There may be a need to work with the primary health care service to ensure there is a supply of pharmacotherapy. It may also be advisable to discuss medication regime in terms of a patient's daily routine, not by measures of time.

Blood pressure lowering

All stroke and TIA patients, whether normotensive or hypertensive, should commence or intensify blood pressure lowering therapy, unless contraindicated by symptomatic hypotension, or if BP is already less than 120mm Hg systolic, or where hypoperfusion is the stroke aetiology. [116]

New blood pressure lowering therapy should commence before discharge for those with stroke or TIA, or soon after TIA if the patient is not admitted. Low dose combination therapy (e.g. perindopril 2.5mg

/indapamide 0.625mg) may be better tolerated and more effective than single agent at discharge. The ideal target for blood pressure is not known, however a target of <130 systolic is reasonable, especially in patients with stroke due to small vessel disease or following ICH. Caution should be taken for patients who are at high risk of symptomatic hypotension e.g. the elderly and patients with a persisting vascular occlusion or high-grade stenosis. [117, 118]

Cholesterol lowering

Depending on comorbidities and life-expectancy, therapy with a high-intensity statin should be used for all patients with non-cardioembolic ischaemic stroke or TIA, and in cardioembolic stroke especially if there is evidence of atherosclerosis on imaging. Atorvastatin 80mg and rosuvastatin 20mg are 'high-intensity'. Statins should NOT be used routinely for haemorrhagic stroke. [124, 125]It is reasonable to add in ezetimibe in situations of very high atherosclerotic risk.

Carotid surgery [126-130]

Carotid endarterectomy should be undertaken in patients with non-disabling carotid artery territory ischaemic stroke or TIA with ipsilateral carotid stenosis measured at 70-99% (NASCET criteria) when it can be performed by a specialist surgeon with low rates (<6%) of peri-operative mortality/morbidity.

Carotid endarterectomy can be undertaken in selected ischaemic stroke or TIA patients (considering age, gender and co-morbidities) with symptomatic carotid stenosis of 50-69% (NASCET criteria).

Eligible stable patients should undergo carotid endarterectomy as soon as possible after the stroke event, but not hyperacutely (i.e. it should ideally occur between 2-7 days post-event).

Carotid endarterectomy should only be performed by a specialist surgeon in centres where outcomes of carotid surgery are routinely audited.

Carotid endarterectomy is NOT recommended for those with symptomatic stenosis <50% (NASCET criteria) or asymptomatic stenosis <60% (NASCET criteria).

Carotid stenting should NOT routinely be undertaken for patients with carotid stenosis, but can be considered in patients under 70 years of age and in patients too medically unstable for carotid endarterectomy.

Diabetes management

Patients with glucose intolerance or diabetes should be managed in line with national guidelines for diabetes (see Fess Sugar Protocol).

Patent foramen ovale [131]

All patients with ischaemic stroke or TIA, and a patent foramen ovale should receive antiplatelet therapy as first choice. Anticoagulation therapy can also be considered taking into account other risk factors and the increased risk of harm.

In patients under 60 with embolic stroke of undetermined source, a moderate to large patent foramen ovale, or a small –moderate shunt with an associated atrial septal aneurysm, patent foramen ovale closure is recommended, with an absolute risk reduction in stroke of around 1% per year. The relevance of small PFOs in embolic stroke of undetermined source is unknown, however closure could be considered in these patients where paradoxical embolism is clearly demonstrated (i.e. coexisting DVT/PE).

Hormone replacement therapy

Following a stroke event, hormone replacement therapy should be reconsidered, as it is associated with a higher risk of stroke and fatal stroke. The decision whether to start or continue hormone replacement therapy in patients with a history of previous stroke or TIA should be discussed with the individual patient and based on an overall assessment of risk and benefit. [132-134]

Oral contraception

The decision whether to start or continue oral contraception in women of child-bearing age with a history of stroke should be discussed with the individual patient and based on an overall assessment of risk and benefit. Non-hormonal methods of contraception should be considered. [135-37]

16.5 Discharge from acute care

Repatriation to network of origin

Patients may be admitted to a non-local stroke service, either because of RAH hospital bypass protocols, or by chance when a stroke has occurred out-of-area. Hospital network staffing and bed planning requires patients being looked after by their local hospital network, wherever possible.

Once a patient has been identified as being suitable for transfer back to their network of origin, this should be communicated to the hospitals 'stroke phone' (or ward team leader after hours), via email and logged on the LARS stroke system. The patient should be accepted back within 24 hours.

On occasions it may be more suitable for the patient to continue to be admitted out of area for social reasons. Likewise, if the acute hospital admission is expected to be <72 hours, transfer to another acute hospital will only lengthen overall length of stay. Discharge to rehabilitation in the network of origin, or directly home with follow-up arranged in the network of origin, may be more appropriate in these cases. If the admitting team deems there is sufficient justification not to repatriate, these cases will not be considered for penalty payments.

Comprehensive handover of all the medical, nursing and allied health assessments conducted at the hospital the patient was initially admitted to will accompany the patient on repatriation. Assessments and therapy should not be delayed whilst patients are awaiting transfer.

Education for stroke patients and family [21, 138-40]

Individually tailored information, education or training should be provided to the patient/family as required, using relevant language and communication formats, especially for those returning directly to home. This may be provided by the key worker or specific specialist team members. Hospital pharmacists should provide education on discharge medications. In addition to face-to-face education and training the provision of the following is recommended:

a. My Stroke Care Plan pack as developed by the SF, or other written information about any referrals or appointments that have been arranged for post-discharge.
b. Information on fitness to drive for the patient.
c. Appropriate written information and leaflets developed by the SF, including information about the enableMe website
d. A copy of the GP discharge summary.

For Aboriginal and Torres Strait Islander patients, particularly those living in regional and remote locations, the primary health care provider should receive notification of admission for stroke and details of the discharge prior to the patient being discharged from hospital.

Transition information and handover

A seamless transition from the acute setting to inpatient rehabilitation, residential care facilities or back to the community is facilitated by timely referrals and comprehensive discharge information (medical, nursing and allied health information). Every attempt should be made to avoid the duplication of assessments and tests already conducted in the acute setting.

Irrespective of the discharge destination, the relevant GP should receive a comprehensive handover summary within 48 hours of acute discharge; which includes diagnoses, relevant test results, functional status on discharge, medications, referrals made and follow-ups arranged or required. For Aboriginal and Torres Strait Islander patients from rural and remote areas, there should be communication with the

primary health care provider prior to discharge regarding medication requirements, and patients should receive 14 days medication to account for delays in access.

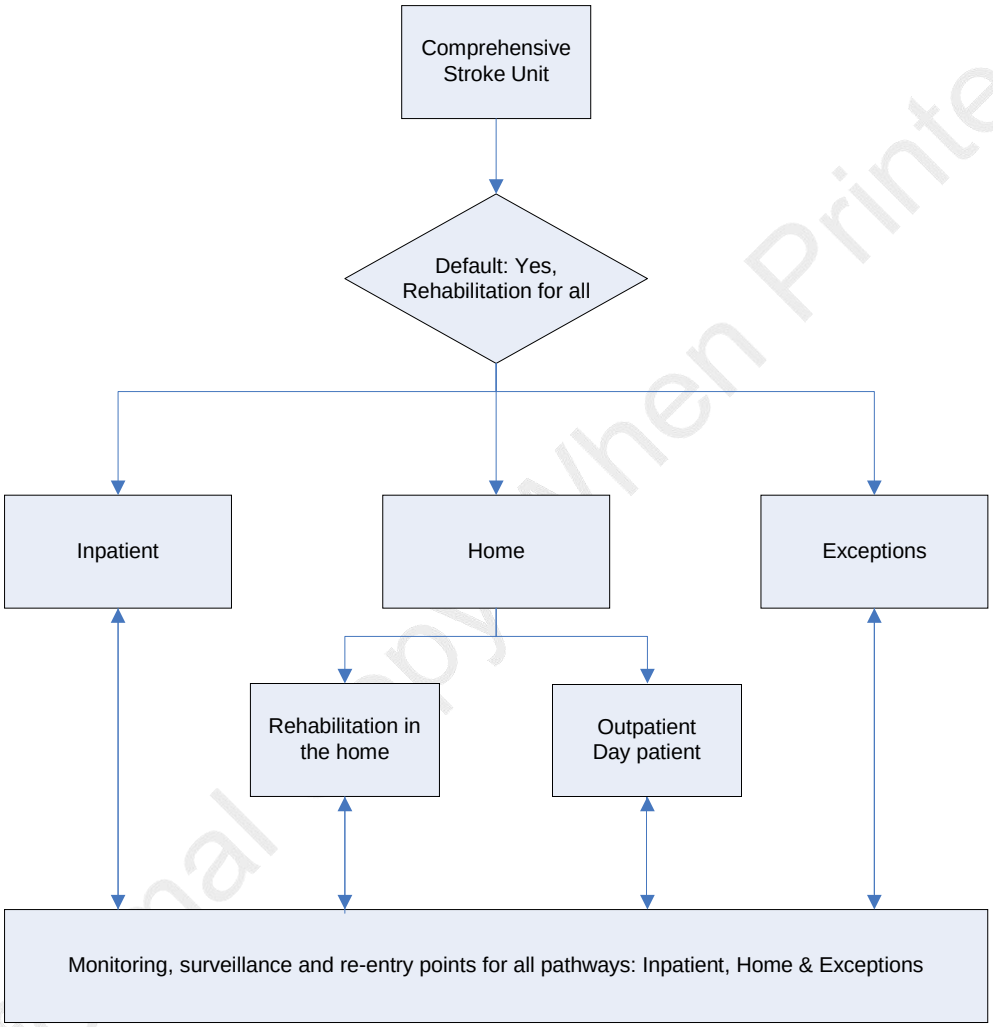
For patients transferred to rehabilitation services or community support services, a discharge letter as above is provided to the rehabilitation/service providers along with the Assessment for Rehabilitation Tool or locally relevant direct referral forms. These providers may also receive information about advance care directive (if in place, including person who provides consent), and a further detailed summary of recently assessed functional abilities, assistance required, identified goals and other relevant information such as rehabilitation strategies used in the acute setting.

Particularly for patients discharging directly home, a comprehensive discharge care plan should be developed in conjunction with the patient and family, addressing their specific needs. Consider whether input from primary health care providers is needed. Critical information to primary health care providers should be handed over verbally as well as via the discharge summary.

17. Stroke rehabilitation pathway

The following pathways are the result of work from the Australian Stroke Coalition and the previous statewide Stroke and Rehabilitation Clinical Networks. The pathways also reflect the National Stroke Rehabilitation Framework and the national Stroke Guidelines.

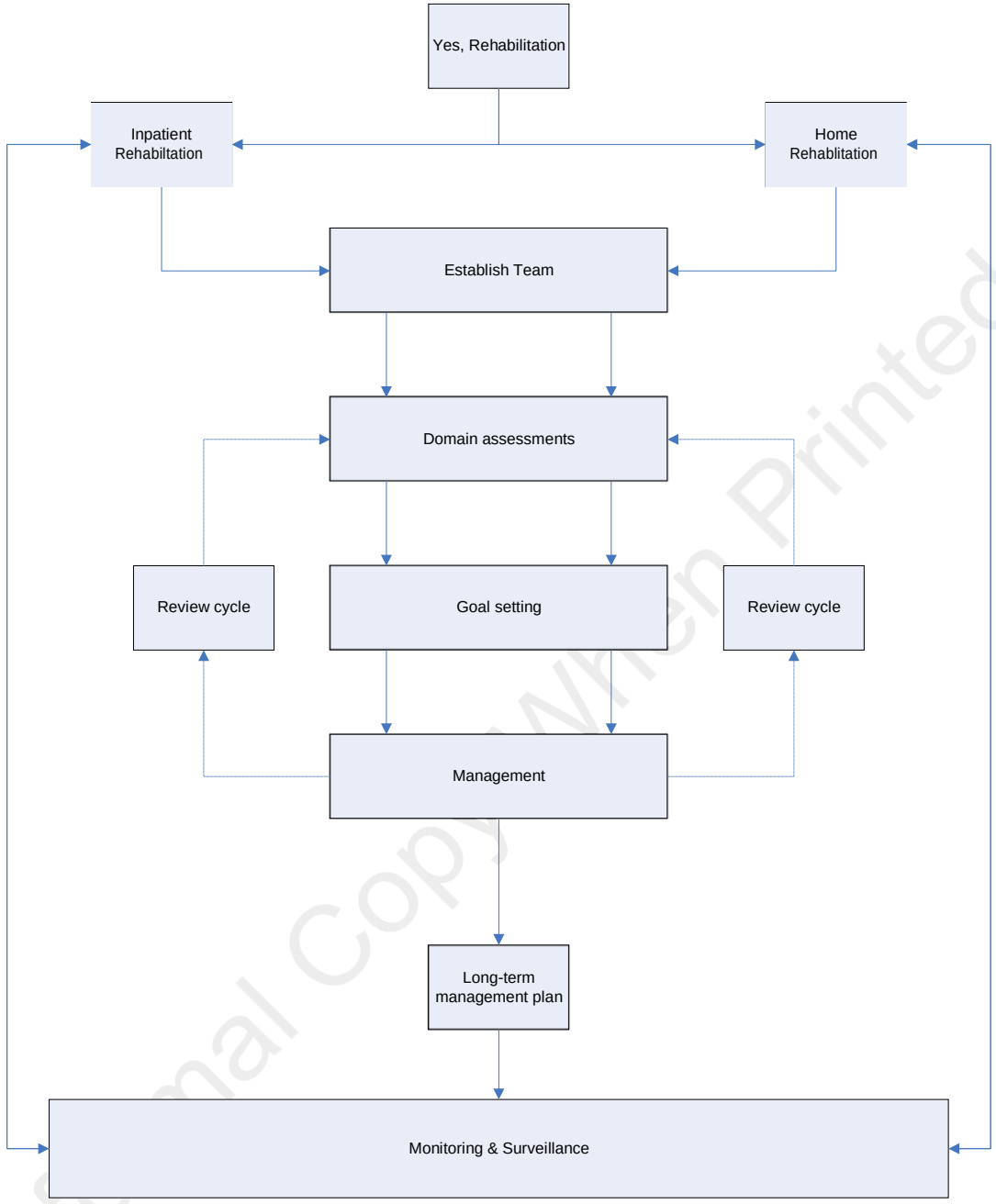
The Assessment for Rehabilitation Tool (ART) has been developed to assist in the decision-making process and provides a place where the patient needs only tell their story once. A medical record has been developed based on the ART and can be found at Appendix 15. It is recommended this be commenced and updated regularly throughout the acute care stay and accompanies the patient to the next stage of their stroke journey.



Comprehensive Stroke Unit	Patient receives acute stroke care, including rehabilitation from day one (Acute Stroke Care Protocol, ctrl+click to select link) until their acute phase is passed.
Yes, Rehabilitation for all stroke patients.	Patient assessed in the stroke unit to receive rehabilitation unless he/she meet the exception rules. The default is that all stroke patients should receive rehabilitation unless the exceptions apply. This is based on the literature that confirms there is evidence that all can benefit from rehabilitation and there is no evidence that particular groups do NOT benefit from rehabilitation. The decision for the model of care for rehabilitation is driven by: > client preference and need, i.e. ability to function in their own versus an alternate environment, as well as > expert opinion and > best available evidence. The model provides flexibility and is inclusive. Decision making about where rehabilitation occurs is based on the ART. This requires analysis of where the identified needs are best met for the various domains. The evidence supports that early supported discharge home is preferable if possible. The ART becomes the rehabilitation plan and forms the basis for all subsequent reviews.
Home	The aim for discharge (transition) is for the patient to return home either directly from the stroke unit as early supported discharge OR via an inpatient unit. Access to rehabilitation either at home or as a day/out patient is available to all patients as appropriate. Home may be a residential aged care facility and if there is no access to rehabilitation or resources there, then they may access other options as described.
Rehabilitation in the home	Patient receives (multi-disciplinary) rehabilitation in their home, with flexibility to be able to access day patient or outpatient services in a hybrid model. This option is preferred based on the evidence.
Outpatient Day patient	Patient is able to attend (day) hospital or clinic rehabilitation services as a day patient or an outpatient. Transport options are available should they be required.
Telerehabilitation	Telerehabilitation is a term used to define telehealth services provided within the rehabilitation pathway and utilises videoconferencing, technology and a range of therapeutic applications to remotely link consumers with all members of the health care team and enhance the rehabilitation care received.
Inpatient sub-acute	The patient is assessed as requiring inpatient care using the ART. The patient is transferred to a specialist rehabilitation centre where they receive care and regular assessments with the view to going home
Exceptions to receiving rehabilitation	1. Return to pre-morbid function: patient has made a 'full' recovery in all aspects, such as functional (physical, communication etc.), emotional/psychological and cognitive. 2. Palliation: Death is imminent, refer to palliative care team. 3. Coma and/or unresponsive, **not** simply drowsy. 4. Declined rehabilitation. All exceptions feed into monitoring/surveillance and re-entry so they can receive rehabilitation should their circumstances change.

Monitoring, surveillance and re-entry	All patients have ability to re-access any rehabilitation services at any time during their ongoing recovery or long term care. Overall aim is to promote/maintain best level of function in all domains. **Principles to drive processes** > Focus on patients and their supports. > Available and accessible. > Maintain relationship with expert team. > Link with Australian Stroke Clinical Registry (AuSCR). > All information travels with patient/family as well as maintained at the facility they attend. This includes discharge/transition summaries. This may also be held at web-based system in future. > Self-referral is available (via central number for appointment with closest facility/team). **Two functions of monitoring, surveillance and re-entry** 1. Monitor status/needs for change and update plan/pathway; > Improving → continue > Static – follow most appropriate path – continue or re-enter > Declining → re-enter pathway. 2. Monitor secondary prevention/self-management. **Two tiers of monitoring:** 1. Complex - requires access to all/part of MD team. 2. Simple – single discipline review (e.g. GP). **Process** is that review appointment is always scheduled at the completion of any stage in the pathway. The level of monitoring is also established as complex or simple at this time and the appointment made with the relevant staff. The staff then utilise the ART to evaluate across all domains and flag status/need.
Special need flags:	These flags are not exclusionary, but may indicate more intensive rehabilitation or referral to specialist areas, such as psychiatry or complex medical. Flags may be: > Pre-morbid conditions > Non-compliance > Decreased pre-morbid function > Decreased social support > Incontinence (urinary and faecal) > Decreased engagement > Conversion disorders > Decreased accommodation options > Co-morbidities > Apathy.

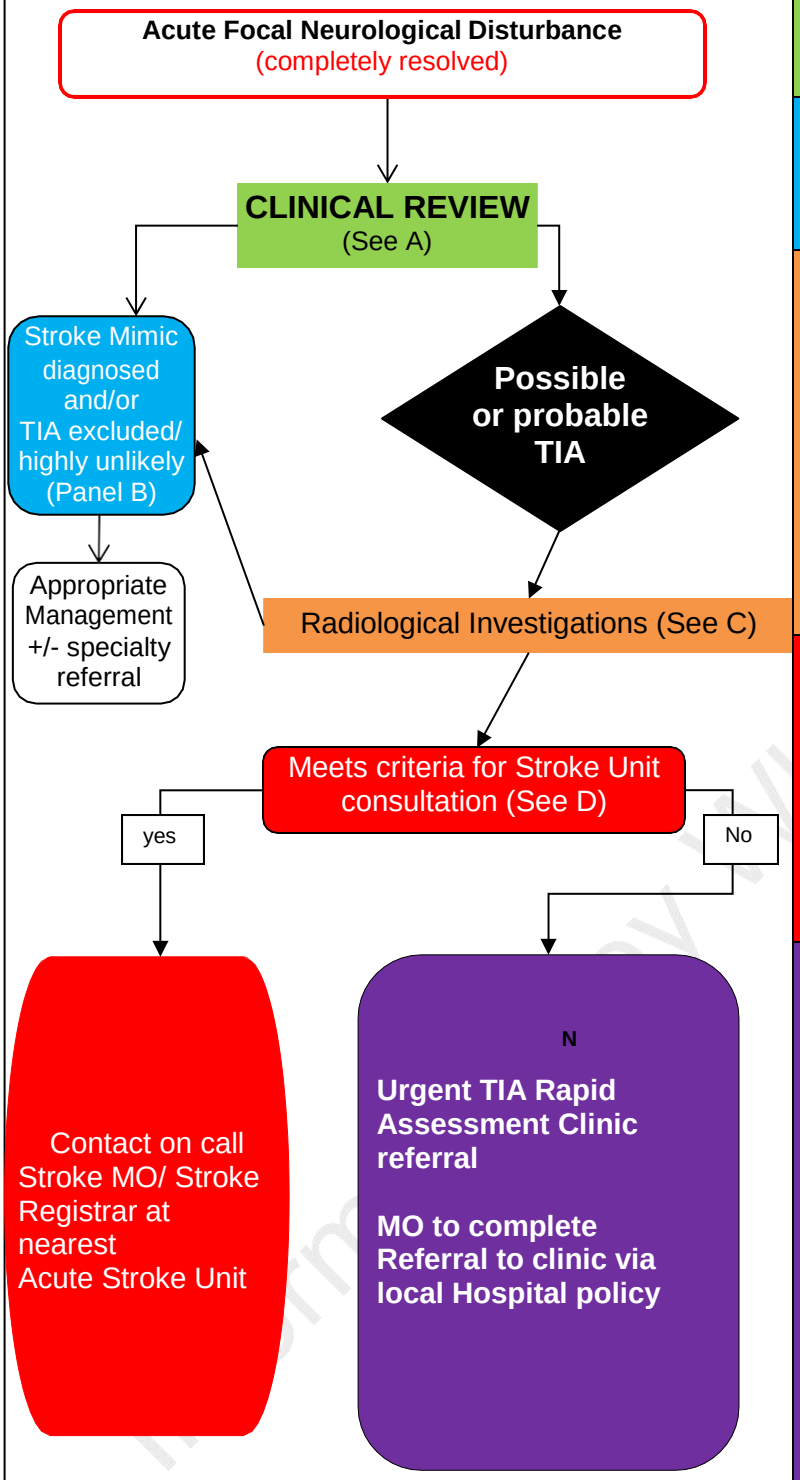
Home and inpatient pathway



Yes, rehabilitation for all stroke patients.	All patients from the stroke unit are referred to receive rehabilitation unless they meet the exception rules. The model of care for rehabilitation is driven by client preference and level of need, i.e. level of support/ability to function in their own environment. The model provides flexibility and is inclusive. Decision making about where rehabilitation occurs is based on the ART.
Establish team and key worker identified	Identifying the likely rehabilitation team. This includes the designation of a Key Worker as well as the possible/main disciplines as suggested by the needs analysis. The Key Worker model > allows for the family and patient to have 'one contact' for organisational or general inquiries or to direct their specific inquiries > facilitate all aspects of the rehabilitation plan, ensure meetings etc. are scheduled and occur within the necessary timeframes and with the salient people/processes > remains a constant for the patient and their family for the service duration > has credibility/experience in stroke rehabilitation and can confidently guide the patient and family through the process/es > Key Worker roles spread across specialist team – alternate model may be one coordinator.
Domain assessment	This is performed by the identified personnel and will build on the initial needs analysis in the relevant domains. Every effort will be made to avoid duplication – this will require team communication and planning so that information required across personnel is only gathered once (e.g. demographics, FIM, stroke severity, home situation etc.). It is anticipated that each discipline/personnel will also have specific assessments to inform the management plan/s.
Goal setting	This process begins informally between the individual team members and the patient/family as the assessment occurs. It may be facilitated by the patient being given a 'goals menu' to consider. Goals are documented and agreed to by all parties in a scheduled meeting between the patient/family and the relevant team members. The emphasis will be on client-centred goals. Various models may be used including Goal Attainment Scaling; SMART goals etc.
Management	Based on the best available evidence and wherever possible following the SF Clinical Guidelines for Stroke Management. Key features are: > Intensity – maximise engagement and opportunities for practice at all times – including weekends. > Carer training and education. > Stroke team has at least one senior/experienced stroke clinician for each core discipline (medical, nursing and each AH). These lead clinicians can mentor younger/less experienced team members. > Access to specialty clinical areas for screening/support/intervention including: psychology; neuropsychology, dental, dietary/nutrition and neuro-ophthalmology and Aboriginal Health Practitioner/Aboriginal Health Worker.

Management continued	> Access to complex interventions/management: spasticity management (BOTOX, splinting/casting); driving clinic; vocational rehabilitation; sexuality issues. > Enabling environment - quiet rooms; physically accessible, appropriate communication strategies (taking into account cultural and social needs, language skills and literacy levels); assistive technology. > Rehabilitation is task specific – functionally orientated with opportunities for practice and feedback. > Participate in Australasian Rehabilitation Outcomes Centre (AROC) benchmarking, SF auditing for accountability. > Encourage and promote research – both initiating and participating in research that furthers stroke rehabilitation. > Establish network (requisite skills and knowledge) to enable long term planning/lifestyle approach. > Secondary prevention is ongoing – medical management as well as lifestyle approach with self-management.
Review cycle	This is an ongoing cycle of review that occurs informally between the individual team members and the patient, and occurs formally at case conferences between team members and at family meetings. Goals are reviewed and amended and if a transition point (e.g. discharge home) is imminent, this is also planned for and action plans will result.
Monitoring, surveillance and re-entry	All patients have ability to re-access any rehabilitation services at any time during their ongoing recovery or long term care. See above for details.
Long term management plan Lifestyle	Involves various other agencies – community integration focus includes self-management. Refer to relevant working group within Australian Stroke Coalition. Still allows for rehabilitation monitoring/re-entry.

TIA Triage Protocol



A. An Initial Clinical review
Clinical history and neuro exam
Investigations: ECG/ BGL/ Bloods- FBC, urea, creatinine, electrolytes, eGFR, LFTs

B. Stroke Mimics
Subarachnoid haemorrhage, syncope, recurrent migraine, seizure, sepsis, anxiety, hypotension, hypoglycaemia, delirium, subdural haematoma

C. Radiological Investigations
To exclude haemorrhage and determine high risk patients - CT/ CTA Aortic Arch to Circle of Willis (MR and intra/extracranial MRA an acceptable alternative)*. CTA not performed if unstable or rapidly deteriorating renal function or known hypersensitivity – then perform urgent MRI/A (aortic arch to COW (+/- gad enhanced MRA neck if no renal dysfunction).
Discuss with Stroke +/- Radiology Consultant if unsuitable for both MRI and CTA.

D. Criteria for discussion of Stroke Unit Admission
- Angiographic vascular stenosis > 50 % in an appropriate territory
- AF or other known cardioembolic source
- Recurrent episodes of hemiparesis
- SAAS has bypassed to RAH as 'borderline' code stroke especially for a resolved hemiparesis

E. Discharge Management
Antiplatelet therapy –
MUST BE COMMENCED OR ESCALATED BY REFERRING MO.
LOAD DOSE of aspirin 300 mg and Clopidogrel 600 mg then continue aspirin 100 mg daily and Clopidogrel 75 mg daily until patient seen in TIA clinic.
Inform patients not to drive until seen at TIA clinic
Document patients current phone number on referral
Patient will be contacted by the TIA Nurse Consultant on same/ next working day after referral received- (Monday to Friday)
Please give relevant TIA Nurse Consultant phone number to patient
Patient needs to be deemed safe for discharge from ED.

Any deviation from this pathway requires stroke consultant approval.

* Country hospitals without access to CT/CTA should adapt protocol to local imaging availability

18. TIA Triage Protocol

Transient ischaemic attacks (TIAs) confer a high natural history risk of subsequent stroke, as high as 10% within 90 days. Early assessment and treatment significantly decreases this risk.

The TIA triage protocol is designed for Emergency Department physicians, to help in identification and treatment of potential TIAs. Cardioembolism and large artery atherosclerosis aetiologies dictate the highest risk of future stroke. The algorithm utilizes clinical (ECG and history) and radiological (CTA from aortic arch to Circle of Willis) parameters to identify those at highest risk. It allows for early and safe treatment of a significant proportion of TIAs in an outpatient Rapid Assessment Clinic, while admitting those who are at higher risk for inpatient evaluation.

The TIA Rapid Assessment Clinic will organize an MR brain where appropriate, and review the patient within a semi-urgent timeframe.

This model has proven highly effective in both lowering the risk of recurrent stroke (90 day stroke risk of 2%) and in identifying patients at high risk of stroke (90-day recurrent stroke risk admitted patients was 5.8% vs 0.7% in patients discharged). Further, it helps reliably identify patients with a non-cerebrovascular diagnosis (no strokes occurred in 90 days post-event in the 69% with a final non-ischaemic diagnosis).

General considerations

In order to enter this pathway, the patient's acute neurological symptoms and signs must have completely resolved.

Emergent MR and intra/extracranial MRA (extracranial imaging preferably with gadolinium) may be utilized as an appropriate alternative imaging modality to CT/CTA according to local site preference and availability.

CTA is safe in patients with known stable renal dysfunction. The patient does not need to wait for a serum creatinine before imaging. Peri-imaging hydration can be used until discharge as appropriate if renal function unknown. Patients should not be discharged without a review of the CTA angiogram by one or more of the following: Stroke consultant/ radiologist/radiology registrar.

All patients who are to follow-up in TIA Rapid Assessment Clinic should only be discharged after appropriate loading and regular dual anti-platelet medications, and should be given antiplatelet medication supply on discharge.

Patients with minor ischaemic stroke or high risk TIA should receive dual antiplatelet treatment with aspirin and clopidogrel (300/600mg load followed by 100/75mg daily for 21-30 days, with concomitant pantoprazole 40mg daily), followed by monotherapy with aspirin, clopidogrel or aspirin/dipyridamole [141].

For country patients this pathway should be followed as closely as possible – local adaptation to available on-site and nearby resources is required (where CT and CTA is not available on site). Patients near Whyalla and Mount Gambier can have MRI follow-up locally, with review locally according to patient preference and local expertise.

ANY DEVIATION FROM THIS PATHWAY REQUIRES STROKE CONSULTANT APPROVAL (OR APPROVAL BY THE LOCAL SUPERVISING SENIOR MEDICAL OFFICER).

19. References

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20. Appendices

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).	_____

Instructions	Scale definition	Score
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 Arm** **5b. 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 Leg** **6b. 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.	____

Instructions	Scale definition	Score
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: Modified NIH Stroke Scale

Item	*Item name*	*Scoring guide*	*Score*
1b	LOC questions	0 = Answers both correctly. 1 = Answers one correctly. 2 = Answers neither correctly.	
1c	LOC commands	0 = Performs both tasks correctly. 1 = Performs one task correctly. 2 = Performs neither task.	
2	Gaze	0 = Normal. 1 = Partial gaze palsy. 2 = Total gaze palsy.	
3	Visual fields	0 = No visual loss. 1 = Partial hemianopia. 2 = Complete hemianopia. 3 = Bilateral hemianopia.	
5a	Left arm motor	0 = No drift 1 = Drift before 10 seconds 2 = Falls before 10 seconds 3 = No effort against gravity 4 = No movement UN = Amputation or joint fusion, explain:	
5b	Right arm motor	0 = No drift 1 = Drift before 10 seconds 2 = Falls before 10 seconds 3 = No effort against gravity 4 = No movement UN = Amputation or joint fusion, explain:	
6a	Left leg motor	0 = No drift 1 = Drift before 5 seconds 2 = Falls before 5 seconds 3 = No effort against gravity 4 = No movement UN = Amputation or joint fusion, explain:	
6b	Right leg motor	0 = No drift 1 = Drift before 5 seconds 2 = Falls before 5 seconds 3 = No effort against gravity 4 = No movement UN = Amputation or joint fusion, explain:	
8	Sensory	0 = Normal 1 = Abnormal	
9	Language	0 = Normal 1 = Mild aphasia 2 = Severe aphasia 3 = Mute or global aphasia	
11	Neglect	0 = Normal 1 = Mild 2 = Severe	

Int J Stroke. 2009 August; 4(4): 267–273.

Total score (out of 31)

Appendix 3: SAAS Clinical Practice Guideline

Government of South Australia
SA Health

SA Ambulance Service

SA Ambulance Service

Doc Control Ref: CPG-018-P	Version no: 4.4	Effective Date: 29/12/2017

Clinical Practice Guideline Paramedic
Stroke

1. Principle

Rapid early assessment and intervention in cases of stroke are associated with significant improvement in patient outcome, especially if managed in a Comprehensive Stroke Unit (CSU).

The ROSIER scale (recognition of stroke in the emergency room) is the preferred stroke recognition/assessment tool of the SA state-wide stroke clinical network and should be used in addition to a thorough history and clinical assessment to identify stroke and eligibility for thrombolysis.

Transport directly to a facility with a CSU or Stroke Thrombolysis Service (STS) should be considered for all eligible patients experiencing stroke symptoms where arrival can be achieved within 4 hours of the onset of symptoms. The transportation of eligible stroke patients that are outside of 60 minutes travel time to a CSU/STS should be managed in consultation with the EOC with the aim of achieving arrival within 4 hours of the onset of symptoms.

2. Clinical Practice Guideline Details

- Basic care including a ROSIER assessment and blood glucose level.
- If stroke is clinically suspected and;
  - onset of symptoms >4hrs; OR
  - ROSIER score is negative; OR
  - the patient has diminished pre-morbid independent living:
    - Then the patient is NOT considered eligible for thrombolysis.
    - Consider transport to closest CSU/STS, or, if this would create an excessive travel time, to the closest hospital.
- If stroke is clinically suspected and;
  - ROSIER score is positive (i.e. ≥1); AND
  - the patient had a pre-morbid level of independent functioning; AND
  - arrival at a CSU/STS will be within 4 hours of onset of symptoms; AND
  - travel time to the closest CSU/STS is less than 60mins:
    - Transport patient directly to the closest hospital with a CSU/STS for consideration for thrombolysis (consider the use of emergency driving procedures if required).
- If transporting a patient to a CSU/STS that may be eligible for thrombolysis:
  - Confirm the patient's identification details and obtain telephone contact details of the patient's substitute decision maker, close relative or carer.

- Notify the CSU/STS stroke coordinator via mobile phone using the mnemonic ISBAR including confirmation of the above criteria and ETA.
  - **Call 1300 365 211**
- If the phone number is not answered, request notification of the stroke coordinator via GRN to the receiving hospital Emergency Department.
- During transport, consider the following, provided that it does not delay transport time:
  - Preferably at least 18G IV access in each arm.
  - Acquire a 12 lead ECG.

Health facilities with recognised CSU/STS are as follows:

Comprehensive Stroke Units	Stroke Thrombolysis Services
Flinders Medical Centre (0800-2000 hours)	Riverland General Hospital (Berri)
Royal Adelaide Hospital	Mount Gambier Hospital
Lyell McEwin Hospital (0800-2000 hours)	Whyalla Hospital

3. Appendices

Appendix 1 ROSIER assessment tool

4. References/Associated Documents

Doc. Ref. Number	Document Title or Information Source
	National Stroke Foundation of Australia, Clinical Guideline for Stroke Management 2010
	Australian Resuscitation Council, Guideline 9.2.2 Stroke, December 2007
	State wide Stroke Clinical Network, Stroke Management Procedures and Protocols, September 2012

5. National Safety and Quality Health Service Standards

Standard 1 Governance for Safety and Quality in Health Service Organisations	Standard 2 Partnering with Consumers	Standard 3 Preventing & Controlling Healthcare associated infections	Standard 4 Medication Safety	Standard 5 Patient Identification & Procedure Matching	Standard 6 Clinical Handover	Standard 7 Blood and Blood Products	Standard 8 Preventing & Managing Pressure Injuries	Standard 9 Recognising & Responding to Clinical Deterioration	Standard 10 Preventing Falls & Harm from Falls
✓	☐	☐	☐	✓	✓	☐	☐	✓	☐

6. Definitions and Acronyms

Comprehensive Stroke Unit (CSU): units within hospitals that have specialist staff and services for stroke and are able to provide a range of care that is recommended of stroke units in national clinical guidelines.

SA Ambulance Service

Doc Control Ref: CPG-018-P	Version no: 4.4	Effective Date: 29/12/2017

Clinical Practice Guideline Paramedic

Stroke

Recognition of Stroke in the Emergency Room (ROSIER) scale: a validated stroke recognition tool with reported diagnostic sensitivity of 92%, specificity of 86%, positive predictive value of 88% and negative predictive value of 91%.

Stroke: interruption in the blood supply to the brain, either ischaemic due to a blockage of an artery or haemorrhagic due to a burst of an artery.

Stroke Thrombolysis Service (STS): service available within the hospital that is able to provide thrombolysis, a drug used within the first few hours of stroke to dissolve a clot causing the stroke.

Version control and change history

Version	Date from	Date to	Amendment
1.0	01/07/2009	09/03/2011	Original version
2.0			
3.0	09/03/2011	03/09/2014	Structural changes and additions to CSU facilities.
3.1	03/09/2014	01/10/2014	Changes to formatting to match ICP guidelines and include country stroke thrombolysis services.
4.0	01/10/2014	24/06/2015	Updated CSU and STS locations and times.
4.1	24/06/2015	18/10/2016	Updated LMHS CSU details.
4.2	18/10/2016	06/03/2017	Update to document control number.
4.3	06/03/2017	02/01/2018	Minor wording changes and update to LMH and FMC hours.
4.4	02/01/2018	current	Removal of 'limited hours of operation' for the regional STS, which are available 24/7 from 02-Jan-2018.

Document control information

Objective File Number:	
Key Words:	Stroke, stroke unit, code stroke, thrombolysis, ROSIER
Document developed by:	Patient Safety and Quality
Author:	Richard Larsen, Operations Manager Patient Safety and Quality
Endorser	Keith Driscoll, Executive Director Clinical Performance and Patient Safety
Approver:	Jason Killens, Chief Executive Officer
Review Date:	January-2020

SA Ambulance Service

Doc Control Ref: CPG-048-ICP	Version no: 5.3	Effective Date: 29/12/2017

Clinical Practice Guideline Intensive Care Paramedic
Stroke

1. Principle

Rapid early assessment and intervention in cases of stroke are associated with significant improvement in patient outcome, especially if managed in a Comprehensive Stroke Unit (CSU).

The ROSIER scale (recognition of stroke in the emergency room) is the preferred stroke recognition/assessment tool of the SA state-wide stroke clinical network and should be used in addition to a thorough history and clinical assessment to identify stroke and eligibility for thrombolysis.

Transport directly to a facility with a CSU or Stroke Thrombolysis Service (STS) should be considered for all eligible patients experiencing stroke symptoms where arrival can be achieved within 4 hours of the onset of symptoms. The transportation of eligible stroke patients that are outside of 60 minutes travel time to a CSU/STS should be managed in consultation with the EOC with the aim of achieving arrival within 4 hours of the onset of symptoms.

2. Clinical Practice Guideline Details

- Basic care including a ROSIER assessment and blood glucose level.
- If stroke is clinically suspected and;
  - onset of symptoms >4hrs; OR
  - ROSIER score is negative; OR
  - the patient has diminished pre-morbid independent living:
    - Then the patient is NOT considered eligible for thrombolysis.
    - Consider transport to closest CSU/STS, or, if this would create an excessive travel time, to the closest hospital.
- If stroke is clinically suspected and;
  - ROSIER score is positive (i.e. ≥1); AND
  - the patient had a pre-morbid level of independent functioning; AND
  - arrival at a CSU/STS will be within 4 hours of onset of symptoms; AND
  - travel time to the closest CSU/STS is less than 60mins:
    - Transport patient directly to the closest hospital with a CSU/STS for consideration for thrombolysis (consider the use of emergency driving procedures if required).
- If transporting a patient to a CSU/STS that may be eligible for thrombolysis:
  - Confirm the patient's identification details and obtain telephone contact details of the patient's substitute decision maker, close relative or carer.

- Notify the CSU/STS stroke coordinator via mobile phone using the mnemonic ISBAR including confirmation of the above criteria and ETA.
  - **Call 1300 365 211**
- If the phone number is not answered, request notification of the stroke coordinator via GRN to the receiving hospital Emergency Department.
- During transport, consider the following, provided that it does not delay transport time:
  - Preferably at least 18G IV access in each arm.
  - Acquire a 12 lead ECG.

Health facilities with recognised CSU/STS are as follows:

Comprehensive Stroke Units	Stroke Thrombolysis Services
Flinders Medical Centre (0800-2000 hours)	Riverland General Hospital (Berri)
Royal Adelaide Hospital	Mount Gambier Hospital
Lyell McEwin Hospital (0800-2000 hours)	Whyalla Hospital

3. Appendices

Appendix 1 ROSIER assessment tool

4. References/Associated Documents

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	State wide Stroke Clinical Network, Stroke Management Procedures and Protocols, September 2012

5. National Safety and Quality Health Service Standards

Standard 1 Governance for Safety and Quality in Health Service Organisations	Standard 2 Partnering with Consumers	Standard 3 Preventing & Controlling Healthcare associated infections	Standard 4 Medication Safety	Standard 5 Patient Identification & Procedure Matching	Standard 6 Clinical Handover	Standard 7 Blood and Blood Products	Standard 8 Preventing & Managing Pressure Injuries	Standard 9 Recognising & Responding to Clinical Deterioration	Standard 10 Preventing Falls & Harm from Falls
✓	☐	☐	☐	✓	✓	☐	☐	✓	☐

6. Definitions and Acronyms

Comprehensive Stroke Unit (CSU): units within hospitals that have specialist staff and services for stroke and are able to provide a range of care that is recommended of stroke units in national clinical guidelines.

SA Ambulance Service

Doc Control Ref: CPG-048-ICP	Version no: 5.3	Effective Date: 29/12/2017
Clinical Practice Guideline	Intensive Care Paramedic	

Stroke

Recognition of Stroke in the Emergency Room (ROSIER) scale: a validated stroke recognition tool with reported diagnostic sensitivity of 92%, specificity of 86%, positive predictive value of 88% and negative predictive value of 91%.

Stroke: interruption in the blood supply to the brain, either ischaemic due to a blockage of an artery or haemorrhagic due to a burst of an artery.

Stroke Thrombolysis Service (STS): service available within the hospital that is able to provide thrombolysis, a drug used within the first few hours of stroke to dissolve a clot causing the stroke.

Version control and change history

Version	Date from	Date to	Amendment
1.0	01/07/2009	09/03/2011	Original version
2.0			
3.0	09/03/2011	03/09/2014	Structural changes and additions to CSU facilities.
4.0	03/09/2014	17/04/2015	Changes to include country stroke thrombolysis services.
4.1	17/04/2015	24/06/2015	Review and content validated.
4.2	24/06/2015	12/08/2015	Updated LMHS CSU details.
5.0	12/08/2015	18/10/2016	Removal of TQEH as a CSU.
5.1	18/10/2016	06/03/2017	Update to document control number.
5.2	06/03/2017	02/01/2018	Minor wording changes and update to LMH and FMC hours.
5.3	02/01/2018	current	Removal of 'limited hours of operation' for the regional STS, which are available 24/7 from 02-Jan-2018.

Document control information

Objective File Number:	
Key Words:	Stroke, stroke unit, code stroke, thrombolysis, ROSIER
Document developed by:	Patient Safety and Quality
Author:	Richard Larsen, Operations Manager Patient Safety and Quality
Endorser	Keith Driscoll, Executive Director Clinical Performance and Patient Safety
Approver:	Jason Killens, Chief Executive Officer
Review Date:	January-2020

Appendix 4: Rosier Assessment Scale

SA Ambulance Service

Doc Control Ref: CPG-018-P Version no: 4.4 Effective Date: 29/12/2017

Clinical Practice Guideline Paramedic

Stroke

Appendix 1 ROSIER assessment tool

SA Ambulance Service

ROSIER Assessment Tool

This tool is to be used as part of a thorough stroke clinical assessment – all information must be included in a code stroke notification.

Assessment Date ____/____/____ Time _____

Symptom onset Date ____/____/____ Time _____

*If unknown onset time assume > 6 hours

GCS E= ☐ V= ☐ M= ☐ BP ☐ / ☐ BGL ☐ mmol/L

*If BGL<3·5 mmol/L treat urgently and reassess once blood glucose normal

	Yes (-1)	No (0)
Has there been loss of consciousness or syncope?	☐	☐
Has there been seizure activity?	☐	☐

Is there a NEW ACUTE onset (or on awakening from sleep) of:	Yes (+1)	No (0)
Asymmetric facial weakness	☐	☐
Asymmetric arm weakness	☐	☐
Asymmetric leg weakness	☐	☐
Speech disturbance	☐	☐
Visual field defect	☐	☐
Total ROSIER Score (-2 to +5)	☐	
Pre-morbid independence?	☐ Yes	☐ No

Witness / family contact phone no. _____

All information above must be recorded on the PCR.

Appendix 1 ROSIER assessment tool

SA Ambulance Service

ROSIER Assessment Tool

This tool is to be used as part of a thorough stroke clinical assessment – all information must be included in a code stroke notification.

Assessment Date ____/____/____ Time _____

Symptom onset Date ____/____/____ Time _____

*If unknown onset time assume > 6 hours

GCS E= ☐ V= ☐ M= ☐ BP ☐ / ☐ BGL ☐ mmol/L

*If BGL<3·5 mmol/L treat urgently and reassess once blood glucose normal

	Yes (-1)	No (0)
Has there been loss of consciousness or syncope?	☐	☐
Has there been seizure activity?	☐	☐

Is there a NEW ACUTE onset (or on awakening from sleep) of:	Yes (+1)	No (0)
Asymmetric facial weakness	☐	☐
Asymmetric arm weakness	☐	☐
Asymmetric leg weakness	☐	☐
Speech disturbance	☐	☐
Visual field defect	☐	☐

Total ROSIER Score (-2 to +5) ☐

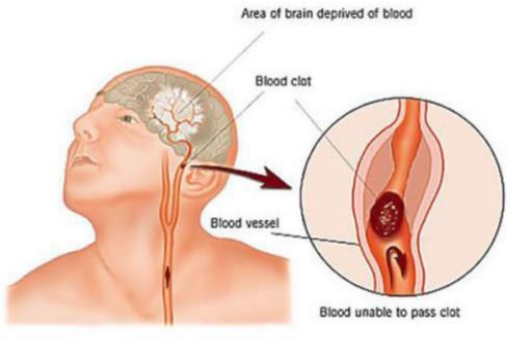
Pre-morbid independence? ☐ Yes ☐ No

Witness / family contact phone no. _____

All information above must be recorded on the PCR.

Reperfusion Treatment in Acute Ischaemic Stroke

The following information is for people or relatives of people experiencing an **acute ischaemic stroke,** in which a blood clot blocks an artery in the brain, preventing blood oxygen and nutrients from reaching brain tissue.



The brain tissue does not die immediately, so if the blockage is removed quickly enough, the at-risk brain tissue can be rescued and reperfused with blood.

We try to do this with **reperfusion treatments,** which restore the flow of blood. The type of treatments offered include 'clot busting' thrombolysis and/or endovascular clot retrieval (or 'thrombectomy').

Thrombolysis is a 'clot busting' medication injected directly into the vein. It works directly to break down the clot. **Endovascular clot retrieval** is the direct removal of a clot (thrombus) within an artery using a clot retrieval device.

Decision making about treatment options
The treatment decision is made by the consultant neurologist, often together with the consultant interventional neuro-radiologist (if clot retrieval is possible). This clot retrieval procedure is only possible if there is a clot seen in the artery and it can be reached with a retrieval device.

Important information about 'clot busting' thrombolysis
Treatment benefits
If thrombolysis is given early enough (<3 hours) studies have shown that for every 100 patients treated, 13 will make a full recovery, 19 will make a good recovery, three will be worse off than they would have otherwise been and one of these will be severely disabled or will die. Overall, the risk of death is no higher with or without treatment. Sixty-four out of 100 patients receive neither benefit nor harm.

Benefit is less if given between three to four and a half hours of stroke onset, and vanishes after four and a half hours.

The 'clot busting' medication is injected directly into the vein via a small plastic cannula. Not all types of strokes are suitable for this treatment. The recommendation for this treatment depends on the individualised chance of benefit versus the risk of brain bleeding.

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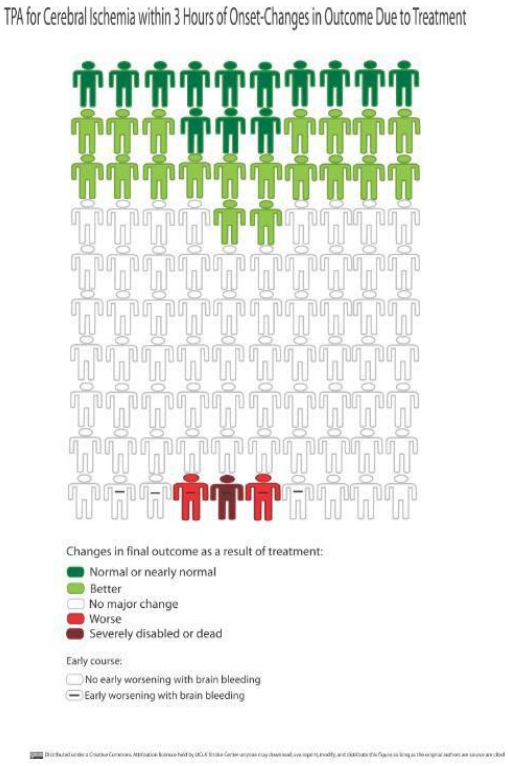

What are the risks of thrombolysis?

Serious side effects and complications of thrombolysis can occur in a small number of people, which may be fatal (see the diagram above).

1. The risk of serious brain bleeding which may worsen outcomes is about three per cent (fatal bleeding one per cent). Bleeding from skin, gut, bladder, or other major organs can occur, but this is usually manageable.
2. Allergic reactions occur in around five per cent, and are serious in one per cent. This can cause breathing difficulties, swelling of the mouth, face or airway and cause blood pressure drops.

Important information about endovascular clot retrieval

When a large vessel blockage is detected, direct clot removal often gives the best possible chance of recovery. This often occurs following thrombolysis. In around 10 per cent of cases, thrombolysis has worked by the time the procedure commences. However, because every minute counts, we don't wait to see if this has happened, but quickly transfer straight to the neuro- intervention suite. One in every two to three treated patients receive some benefit (improved post-stroke function).

In this procedure a small tube (catheter) is placed through a groin or radial (wrist) artery and up to the brain. Local anaesthetic numbs the groin or wrist area. An anaesthetist helps control blood pressure and ensures patient comfort (see below).

Removing the clot

Images of the blood vessels are obtained using dye similar to that used for the CT scan to confirm the blockage. Once this is confirmed the most appropriate device is used to attempt to remove the clot. This may involve clot suction or clot trapping with a metal retrieval device. Device and clot removal often causes a very brief headache which settles within seconds.

Sometimes it is necessary to repeat this stage of the procedure more than once before all of the clot is removed. Occasionally, if the vessel is very narrowed, a stent (small plastic tube) is inserted into the artery to keep it from closing or blocking after the procedure.

Risks

The main risk of endovascular clot retrieval is that it may not be possible to remove all (or very occasionally any) of the clot despite our best efforts, meaning blood flow cannot be restored to the at-risk brain (this occurs in one out of every five patients). **A significant, but rare risk (two per cent)** is that one of the brain blood vessels may tear and cause a bleed which can be fatal.

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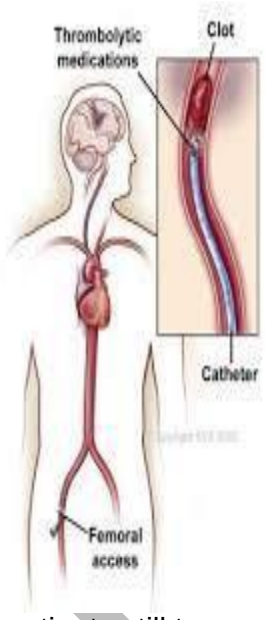

The groin artery wound is sealed using a natural tissue plug. Very rarely this seal is incomplete, causing significant local bleeding. For the radial artery a strap with an air filled cuff is used to apply pressure to the entry site for 60 minutes.

Important information about the anaesthetic

For clot retrieval procedures most patients require minimal or even no anaesthetic to keep them comfortable. Local anaesthetic numbs the place where the needle is inserted and usually there is no discomfort until the clot is removed. If this causes a brief headache the anaesthetist can give some short-acting pain medication.

It is ideal if patients stay awake, as symptoms can be monitored and any change immediately detected. However, this is balanced against the need to keep patients still to maximise clot removal success and lower bleeding risks.

Occasionally, usually due to movement or problems breathing, the doctors will decide that a general anaesthetic is needed. General anaesthesia is now very safe in Australia, and almost all associated risks depend on stroke severity and underlying medical conditions. The anaesthetist will discuss any specific risks for a general anaesthetic if required.

With the 'minimal anaesthetic' approach, risks are very low. Any discomfort can be communicated verbally or non-verbally, however if distress levels are high, the anaesthetist can give sedation, or change to a general anaesthetic.

With **sedation**, the risks include: nausea/vomiting (the anaesthetist can treat this very quickly), aspiration – when stomach contents rise and enter the lungs, causing a chest infection, allergic reactions to the sedating drugs (very rare indeed) and not remembering the procedure, even though you were awake

With a **general anaesthetic**, the risks include: nausea/vomiting, sore throat or hoarseness from the breathing tube (usually minor and brief), damage to teeth or lips (more likely if teeth are in poor condition, or if the breathing tube is difficult to insert), aspiration (as above), unexpected heart or lung problems (usually from previous heart or lung disease - risk increases with age) and allergic drug reactions (rare, but potentially life-threatening.)

With certain strokes or following general anaesthetic, waking up gradually is preferable to waking at the end of the procedure. This occurs in the Intensive Care until the sedation is allowed to wear off.

Care after these procedures

Patients are cared for in the Acute Stroke Unit or other high acuity unit. Patients receive one to one nursing and close observation of their medical condition and neurological symptoms. This includes heart monitoring, blood pressure control, and frequent neurological assessment. In the Acute Stroke Unit (Level 9G) a family member can stay with the patient.

For more information

- Lizzie Dodd
  Stroke Nurse Consultant
- Carole Hampton
  Stroke Nurse Consultant

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Telephone: 0437 649 904
(Monday-Friday)

Telephone: 0408 976 452
(Monday-Friday)

- Stroke Nurse (nights & weekends)
  Telephone: 0459 874 649

- Royal Adelaide Hospital Acute Stroke Unit
  Level 9 G1 – Telephone: 0466 460 507
  Level 9 G2 – Telephone: 0466 955 088

The information contained within this publication does not constitute medical advice, and is for general information only. Readers should always seek independent, professional advice where appropriate.

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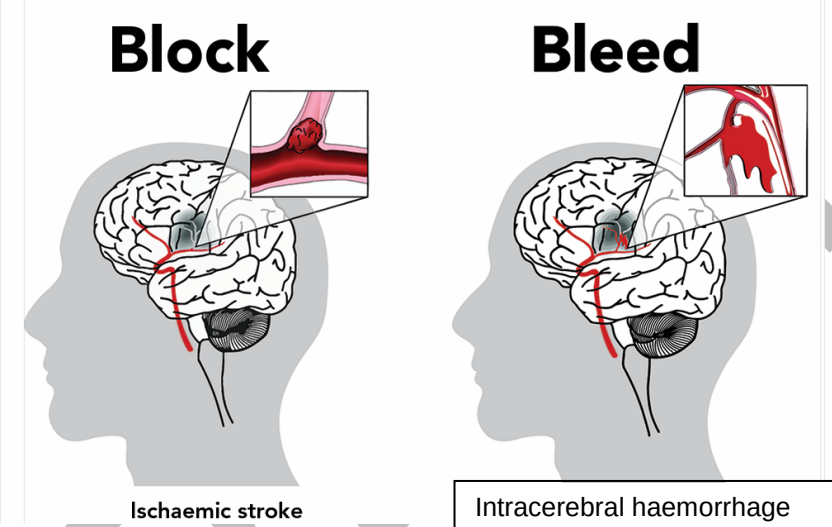
Appendix 6: Aboriginal Stroke Services

Patient Information Sheet: Stroke (1 of 3)

A stroke is when parts of the brain are not working because a blood vessel has burst or blocked. There are two kinds of stroke:

- blood clot blocking a blood vessel in the brain stopping enough blood from flowing in (ischaemic stroke)
- bleeding bursting out of a blood vessel harming brain tissue (intracerebral haemorrhage)



Time is very important

If you are having a stroke, getting medical help as soon as possible can help reduce the damage caused by the stroke. There are some treatments that may help stop damage to the brain, but they only work in the first 24 hours after the stroke has started.

Test to find out if you are having a stroke:

Brain scan (called a CT Scan)

A CT scan (special picture, more than an X-ray) of the brain can see if your stroke is the kind of stroke that can be treated. Treatments cannot be given without this test happening first. Only certain hospitals can do this test, and you may be taken to another hospital with the right scanning equipment and person to take the pictures. The pictures get sent to a specialist doctor who will decide if treatments can be given to you.

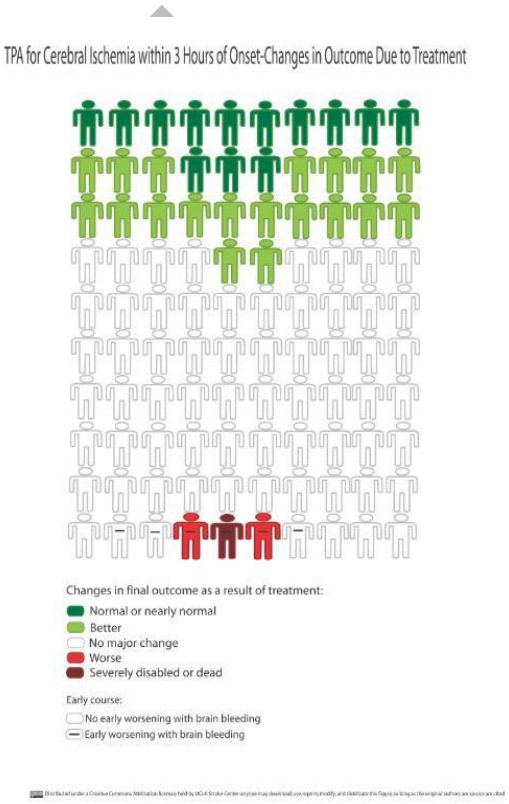
Patient Information Sheet: Stroke (2 of 3)

Possible treatments for a stroke:

There are some treatments that, if you get them quickly, can reduce or prevent brain damage from the stroke.

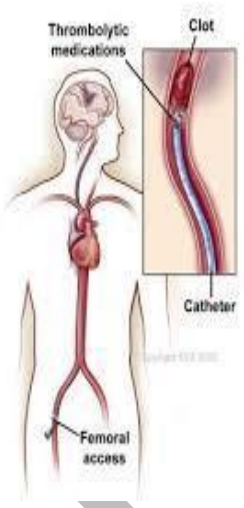
Clot-busting drugs (called Thrombolysis or tPA)

If the scan shows that there is a stroke and it has been caused by a blood clot that is blocking a blood vessel in the brain, then medication can be given to make that clot break up and dissolve. Blood can then get to the parts of the brain that have not been receiving blood and damage can be reduced. The sooner this happens the better. The medication needs to be given carefully and with specially trained people in a stroke unit of a hospital. The main danger of this treatment is causing bleeding in the brain. The chances of the average stroke person being helped or harmed by the treatment is shown here. You may need to be moved to a hospital with the right staff to get this care. (*This could be at Whyalla, Berri, Mt Gambier, Royal Adelaide Hospital, Flinders Medical Centre or Lyell McEwin Hospital)*



Patient Information Sheet: Stroke (3 of 3)

Clot-busting surgery (called Thrombectomy)



For some people, the clot has a small chance of being dissolved by the medication, or they have some reason that stops this medication being given. In these people, some very special surgery can be performed by a highly trained specialist doctor. A small device is threaded up through the

Patient Information Sheet: Stroke

blood vessels into the brain. This device can mechanically break up and remove the clot. Because this surgery is so delicate, only a few people can do it. If this is the case, the person will need to go to a major hospital (*In SA and NT this is the Royal Adelaide Hospital*).

Appendix 7: Acute screening of swallow in stroke/TIA: SA Health Swallow Screen for Acute Stroke Patients

S.A. HEALTH SWALLOW SCREEN FOR ACUTE STROKE PATIENTS
Pg1

Acknowledgments: "Dysphagia Screening Tool" (Davies,1999), 3Oz Water Test (Suiter and Leder 2008)

STEP ONE: **Pre-Swallow Checklist**

1. Is the pt alert and able to stay awake for 20 mins? ☐ YES ☐ NO
2. Is the pt able to be positioned upright & midline? ☐ YES ☐ NO
3. Is the pt able to swallow their saliva? ☐ YES ☐ NO
4. Is the pt usually on a general diet/thin fluids? ☐ YES ☐ NO ☐ Unknown

If you answer **NO** to **any** of the above questions **DO NOT CONTINUE**.
Make the pt **NIL BY MOUTH** and refer to Speech Pathology (SP).
Discuss hydration, nutrition & medications with the Medical Team.

If **YES** to **all** above questions proceed to step two = the 100ml water test

STEP TWO: **100ml WATER TEST**

1 sip of water from cup

Difficulties observed?

NO ☐ YES ☐ →

- ☐ No attempt to swallow
- ☐ Coughing
- ☐ Gurgly/wet voice
- ☐ Spillage ++
- ☐ Other

= If any of these items ticked, make NBM and refer to SP

SWALLOW SCREEN FAILED

3 single sips of water from cup

Difficulties observed?

NO ☐ YES ☐ →

- ☐ Coughing
- ☐ Gurgly/wet voice
- ☐ Spillage ++
- ☐ Slow++
- ☐ Other

= If any of these items ticked, make NBM and refer to SP

SWALLOW SCREEN FAILED

Give 100 ml of water from cup

Difficulties observed?

NO ☐ YES ☐ →

- ☐ Coughing
- ☐ Gurgly/wet voice
- ☐ Spillage ++
- ☐ Slow++
- ☐ Other

= If any of these items ticked, make NBM and refer to SP

SWALLOW SCREEN FAILED

Swallow Screen PASSED

Outcome of 100ml Water Swallow Screen

Passed ☐ OR Failed ☐

Commence regular fluids. Provide oral medications with supervision. Progress to compulsory first meal observation (Pg2)– check site specific protocol for trial diet texture

Make NBM
Refer to Speech Pathology
Discuss Alternative - hydration/medication/nutrition with medical team

Date:_____ Time:_____ Screened by:_____

See next page

S.A. HEALTH SWALLOW SCREEN FOR ACUTE STROKE PATIENTS
Page 2

COMPULSORY MEALTIME OBSERVATION

Food that the patient was observed with: _____

STEP THREE:

Observe Pt at mealtime

Difficulties observed?

NO ☐ YES ☐ →

- ☐ Coughing
- ☐ Gurgly/wet voice
- ☐ Spillage ++
- ☐ Slow++
- ☐ Other

= If any of these items ticked, **make pt NBM and refer to SP**

SWALLOW SCREEN FAILED

Continue Oral Intake

Diet: _____ (as per site specific protocol)

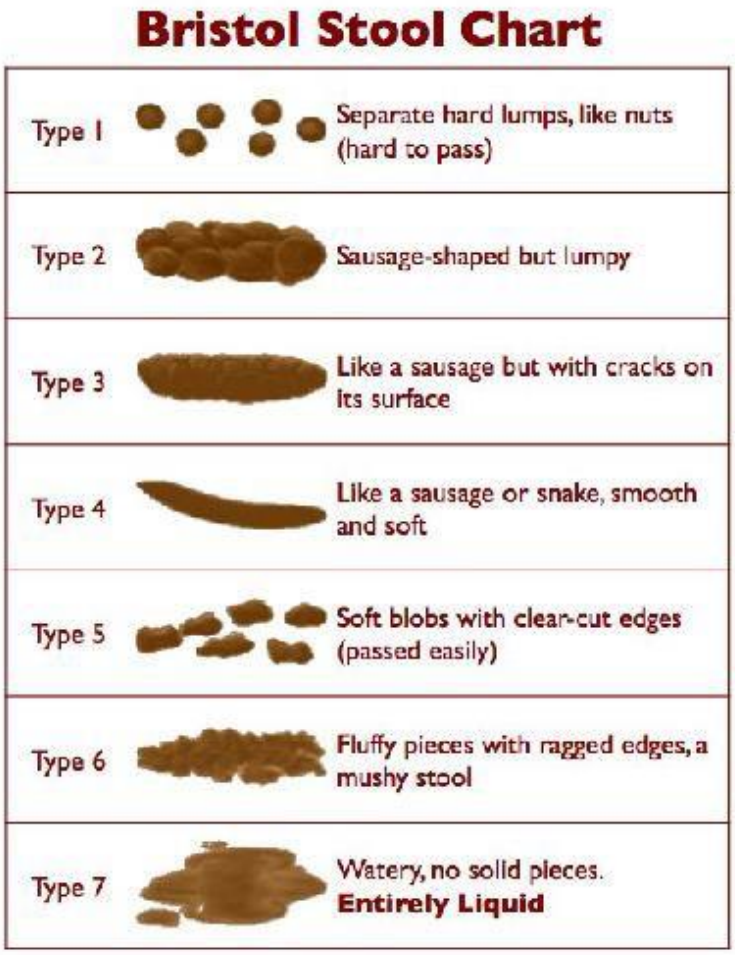
Fluids: _____

Referred to SP ☐

NBM & Refer to SP
Discuss alternative hydration/medication/nutrition with medical team

Date:_____ Time:_____Observed by:_____

Appendix 8: Bristol Stool Chart



Appendix 9: Gugging Swallowing Screen - GUSS

GUSS
(Gugging Swallowing Screen)[1]

Patient	Date:
	Time:
	Investigator:

1. Preliminary Investigation / Indirect Swallowing Test

	YES	NO
VIGILANCE *(The patient must be alert for at least 15 minutes)*	1 ☐	0 ☐
COUGH and/or THROAT CLEARING *(Voluntary cough! Patient should cough or clear his or her throat twice)*	1 ☐	0 ☐
SALIVA SWALLOW • **SWALLOWING SUCCESSFUL**	1 ☐	0 ☐
• **Drooling** *(Herausrinnen von Speichel aus dem Mund)*	0 ☐	1 ☐
• **VOICE CHANGE** *(hoarse, gurgely, coated, weak , choke on own saliva)*	0 ☐	1 ☐
SUM:		**(5)**
	1 – 4 = Investigate further[1] 5 = Continue with „Direct Swallowing Test"	

[1]**The Gugging Swallowing Screen**. *Stroke*. 2007;38:2948 Michaela Trapl, SLT, MSc; Paul Enderle, MD, MSc; Monika Nowotny, MD; Yvonne Teuschl, PhD; Karl Matz, MD; Alexandra Dachenhausen, PhD Michael Brainin, MD

Appendix 10: The ‘MUST’ Explanatory Booklet

A Guide to the ‘Malnutrition Universal Screening Tool’ (‘MUST’) for adults

http://www.bapen.org.uk/pdfs/must/must_explan.pdf

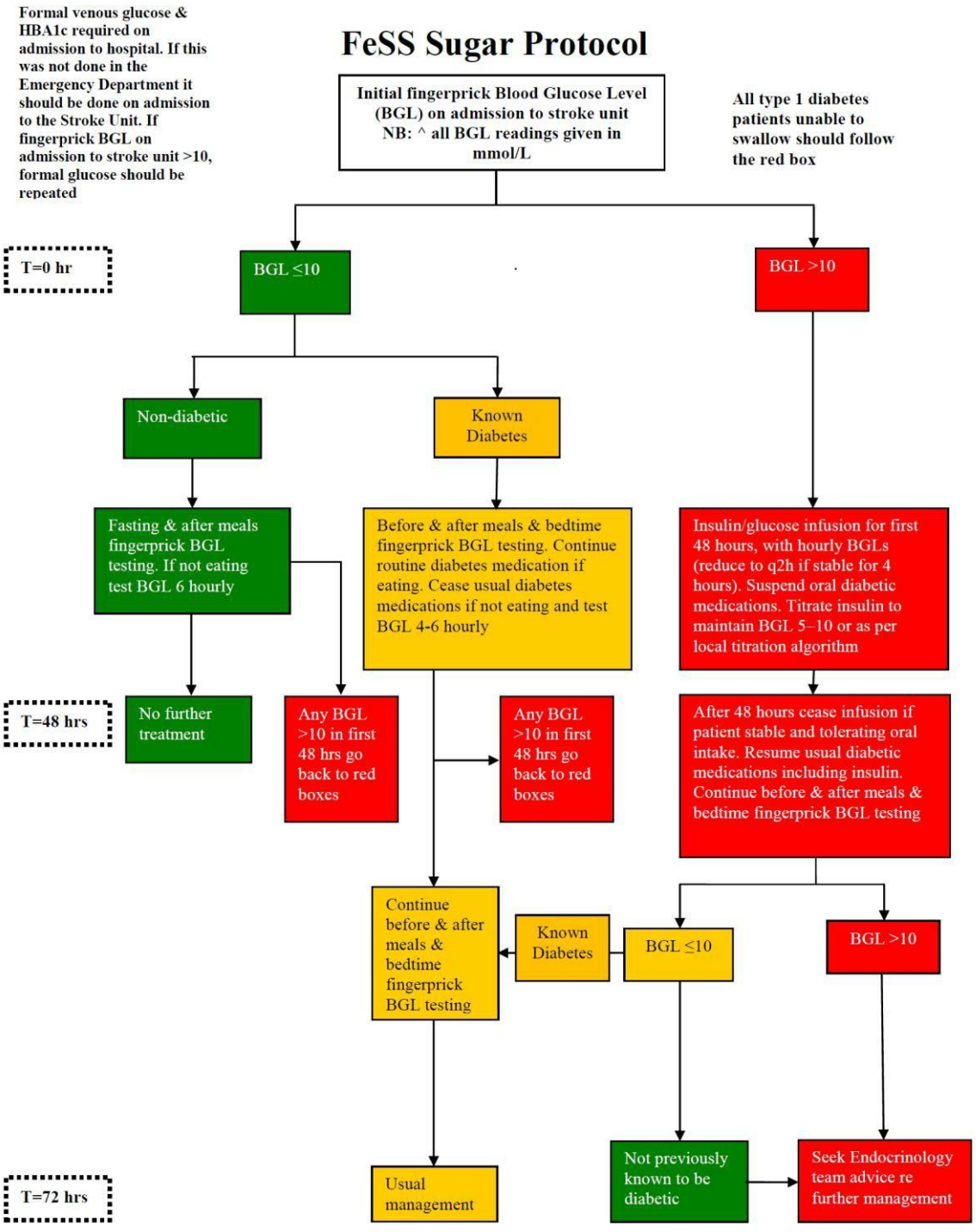
Appendix 11: FeSS Sugar Protocol

FeSS Sugar Protocol

The QASC Sugar Protocol consists of monitoring the patient's blood glucose levels for the first 72 hours following admission to the stroke unit, and the prompt treatment of a blood glucose level > 10mmols/L in the first 48 hours.

The QASC sugar protocol shown here has been modified slightly in response to feedback from participating sites, and to concord with the incoming Australian Diabetes Society Guidelines for routine glucose control in hospital.

This protocol was used in conjunction with the other FeSS protocols and the FeSS implementation strategies and not as a stand-alone protocol



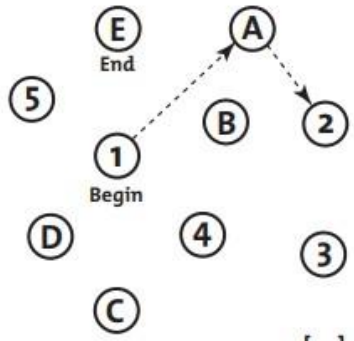
Developed for use in the Quality in Acute Stroke Care (QASC) Trial (www.acu.edu.au/QASC) and used with permission of

Appendix 12: Montreal Cognitive Assessment (MOCA)

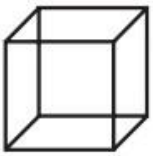
MONTREAL COGNITIVE ASSESSMENT (MOCA)

NAME :
Education :
Sex :
Date of birth :
DATE :

VISUOSPATIAL / EXECUTIVE — POINTS



Copy cube



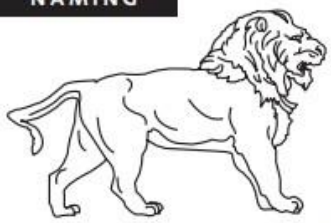
[ ] [ ]

Draw CLOCK (Ten past eleven) (3 points)

[ ] Contour [ ] Numbers [ ] Hands

__/5

NAMING



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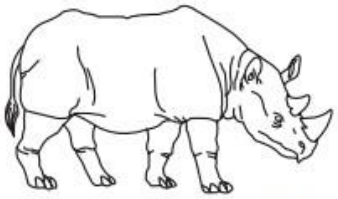

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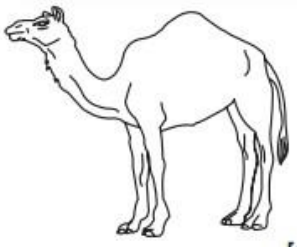

[ ]

__/3

MEMORY — Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION — Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order [ ] 2 1 8 5 4

Subject has to repeat them in the backward order [ ] 7 4 2

__/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

__/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**

__/3

LANGUAGE — Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]

__/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] ____ (N ≥ 11 words)

__/1

ABSTRACTION — Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler

__/2

DELAYED RECALL

	Has to recall words WITH NO CUE	FACE [ ]	VELVET [ ]	CHURCH [ ]	DAISY [ ]	RED [ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

__/5

ORIENTATION [ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City

__/6

© Z.Nasreddine MD Version November 7, 2004

www.mocatest.org

Normal ≥ 26 / 30

TOTAL __/30

Add 1 point if ≤ 12 yr edu

Appendix 13: Modified Rankin Scale (MRS)

MODIFIED RANKIN SCALE (MRS)

Patient Name: _____
Rater Name: _____
Date: _____

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

TOTAL (0–6): _____

References

Rankin J. "Cerebral vascular accidents in patients over the age of 60."
Scott Med J 1957;2:200-15

Bonita R, Beaglehole R. "Modification of Rankin Scale: Recovery of motor function after stroke."
Stroke **1988 Dec;19(12):1497-1500**

Van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJ, van Gijn J. "Interobserver agreement for the assessment of handicap in stroke patients."
Stroke **1988;19(5):604-7**

Provided by the Internet Stroke Center — www.strokecenter.org

Appendix 14: Patient health questionnaire (PHQ-9)

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ DATE:_____

Over the last *2 weeks*, how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite — being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
	add columns		+	+

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

10. If you checked off *any problems*, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all _____
- Somewhat difficult _____
- Very difficult _____
- Extremely difficult _____

Appendix 15: Assessment for Rehabilitation Tool (ART)

SA Health
Created Sept 2014

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ASSESSMENT FOR REHABILITATION

(MR96)

Hospital: .....

Rehabilitation Recommended
Date: __ __ / __ __ / __ __
☐ in home
☐ in-patient
☐ outpatient

Rehabilitation Not Indicated
☐ full recovery
☐ palliative
☐ patient refused
☐ non-responsive (coma)
☐ other reason (state why) .....

Affix patient identification label in this box
UR Number: .....
Surname: .....
Given name: .....
Second given name: .....
D.O.B: __ __ / __ __ / __ __ __ __ Sex: .....

Domain	Current level of function (brief description plus I A D*)	Assessment: Date	Rehab (Y/N)
Speciality needs (eg IV, PEGS)			
Swallowing			
Hydration, nutrition			
Eating and drinking			
Continence			
Mobility - transfer, gait			
Activities of daily living (incl personal +/- instrumental)			
Communication			
Level of alertness, engagement			
Cognition, insight			
Vision, sensory systems, perception			
Behaviour			
Emotional, pyschological			
Other			

Ready for Rehab - Date: __ __ / __ __ / __ __

Accepted for Rehab - Date: __ __ / __ __ / __ __
☐ in home ☐ in-patient ☐ outpatient

Page 1 of 2

** I= Independent; A = light or minimal support (including supervision); D = Significantly dependent (moderate to maximal support)*

Full Name (Please Print)	Designation (Please Print)	
Signature	Date __ __/__ __/20 __ __	Time __ __ : __ __ am pm

MR96 ASSESSMENT FOR REHABILITATION

ASSESSMENT FOR REHABILITATION

(MR96)

Hospital: .....

MEDICAL SUMMARY:

Affix patient identification label in this box
UR Number: .....
Surname: .....
Given name: .....
Second given name: .....
D.O.B: __ __ / __ __ / __ __ __ __ Sex: .....

Participation (consistent with ICF Framework)	Role/s pre-stroke	Need for rehabilitation/intervention? Y/N and if yes, plan?
Domestic		
Vocational		
Recreational		
Social		

Environment	Pre-stroke (note barriers and facilitators)	Need for intervention? Y/N and if yes, plan?
Home		
Extended		

Page 2 of 2

Optional: Are the rehabilitation services that were matched to the needs of the PWS able to be provided? If not, what services are not available and why?

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Appendix 16: Weblink to recognising and responding to clinical deterioration policy directive

http://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/clinical+resources/safety+and+quality/recognising+and+responding+to+clinical+deterioration

Appendix 17: Stroke Aphasic Depression Questionnaire Hospital Version (SADQ-H 10)

Please indicate how many days of the last 7 the participant has shown the following behaviours:

1. Did he/she have weeping spells?

(3)	(2)	(1)	(0)
Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

2. Did he/she have restless disturbed nights?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

3. Did he/she avoid eye contact when you spoke to him/her?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

4. Did he/she burst into tears?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

5. Did he/she indicate suffering from aches and pains?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

6. Did he/she get angry?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

7. Did he/she refuse to participate in social activities?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

8. Did he/she sit without doing anything?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

***** 9. Did he/she keep him/herself occupied during the day?

Every day this week (0)	On 4-6 days this week (1)	On 1- 4 days this week (2)	Not at all this week (3)

10. Did he/she get restless and fidgety?

Every day this week	On 4-6 days this week	On 1- 4 days this week	Not at all this week

Stroke Aphasic Depression Questionnaire Hospital Version (SADQ-H 10) Scoring:

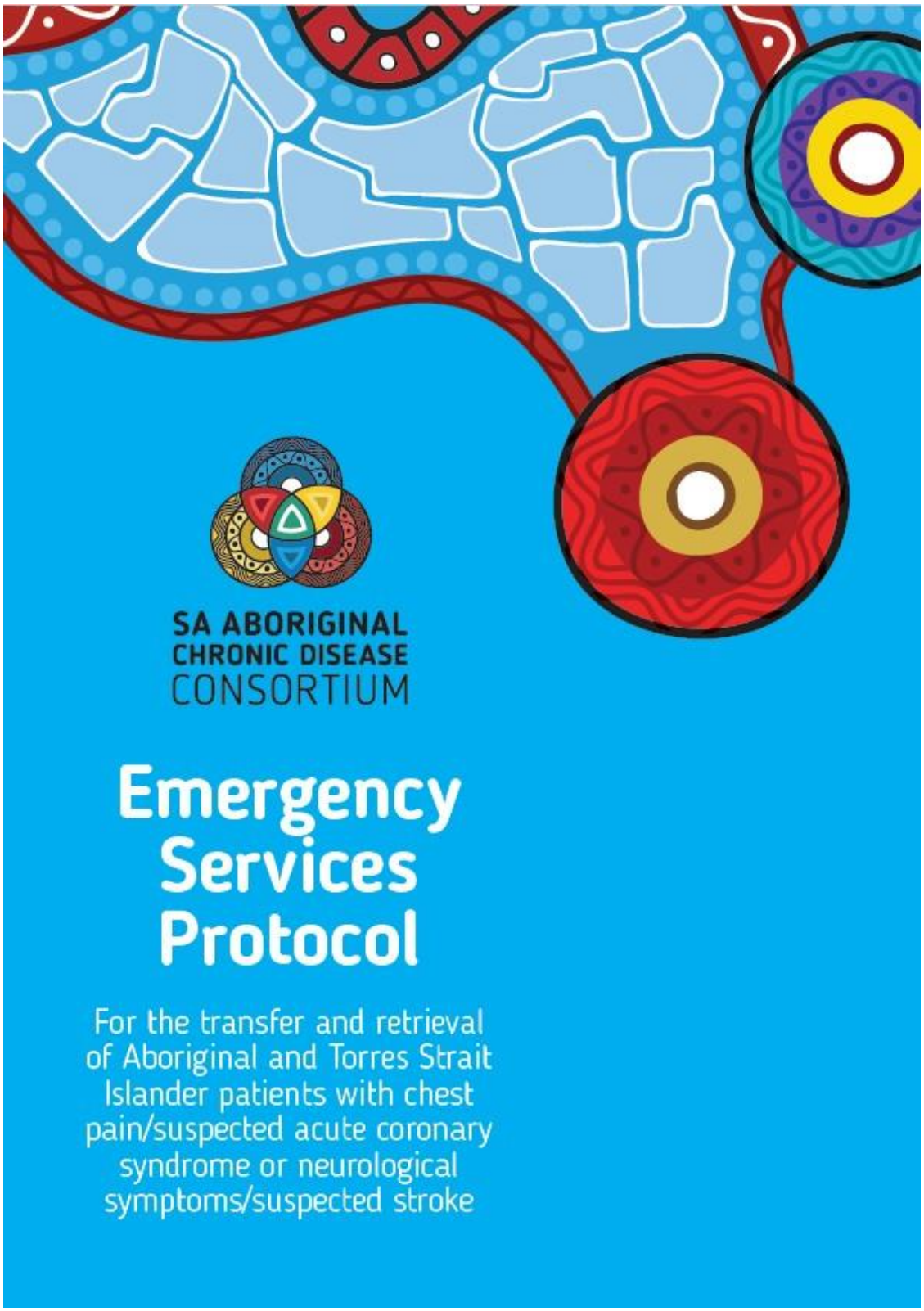
*Please note: Question 9 is reverse-scored

Every day this week = 3
On 4-6 days this week = 2
On 1- 4 days this week = 1
Not at all this week = 0

Total Score:_____/30

All patients should be screened prior to discharge or within the first seven days of admission. Scores of **6 and above** indicate **vulnerability for depression**. It may be indicated to refer to a psychologist for assessment and intervention.

Appendix 18: Emergency Services Protocol




ACKNOWLEDGMENT
OF COUNTRY
The South Australian Aboriginal Chronic Disease Consortium acknowledges and celebrates that Aboriginal and Torres Strait Islander people are the Traditional Custodians of the land, known as Australia.
We recognise that Aboriginal and Torres Strait Islander people are the First Peoples of Australia and that within these two distinct cultural groups, there is great cultural diversity.
We acknowledge and pay our respects to the Aboriginal people across South Australia, Elders, past and present, their continuing connection to this land and thriving cultural practices and knowledge.

Emergency Services Protocol

For the transfer and retrieval of Aboriginal and Torres Strait Islander patients with chest pain/suspected acute coronary syndrome or neurological symptoms/suspected stroke

Target Audience	• Community based Aboriginal Community Controlled Health Organisations (ACCHOs) and General Practitioners. • Royal Flying Doctor Services (RFDS). • South Australian Ambulance Service (SAAS). • Transferring and receiving Hospitals.
Purpose	• This protocol is intended to integrate within existing clinical pathways, policies, procedures and information management systems to provide culturally appropriate evacuation, transfer and retrieval of Aboriginal and Torres Strait Islander patients in an emergency.
Scope	• This protocol applies to all emergency services that have the responsibility for evacuating, transferring or retrieving Aboriginal and Torres Strait Islander patients.
Principles	Quality patient transfer and retrieval care is: • Responsive and equitable – appropriate, standardised, appropriate and accessible. • Safe and consistent – competent and capable. • Efficient and cohesive – integrated and inter-facilitated across the multiple providers.
Considerations	• The need for responsive, consistent collection and collation of feedback from Aboriginal patients regarding service delivery. • Location: Urban v Remote v Rural (Country). • High burden of disease – complex and chronic conditions can determine experience and behaviours. • Health literacy and beliefs and views on health impact understanding of causes, treatment and care. • Language – communication challenges when English is not a first language and access to an interpreter who may or may not be a carer/ family member.

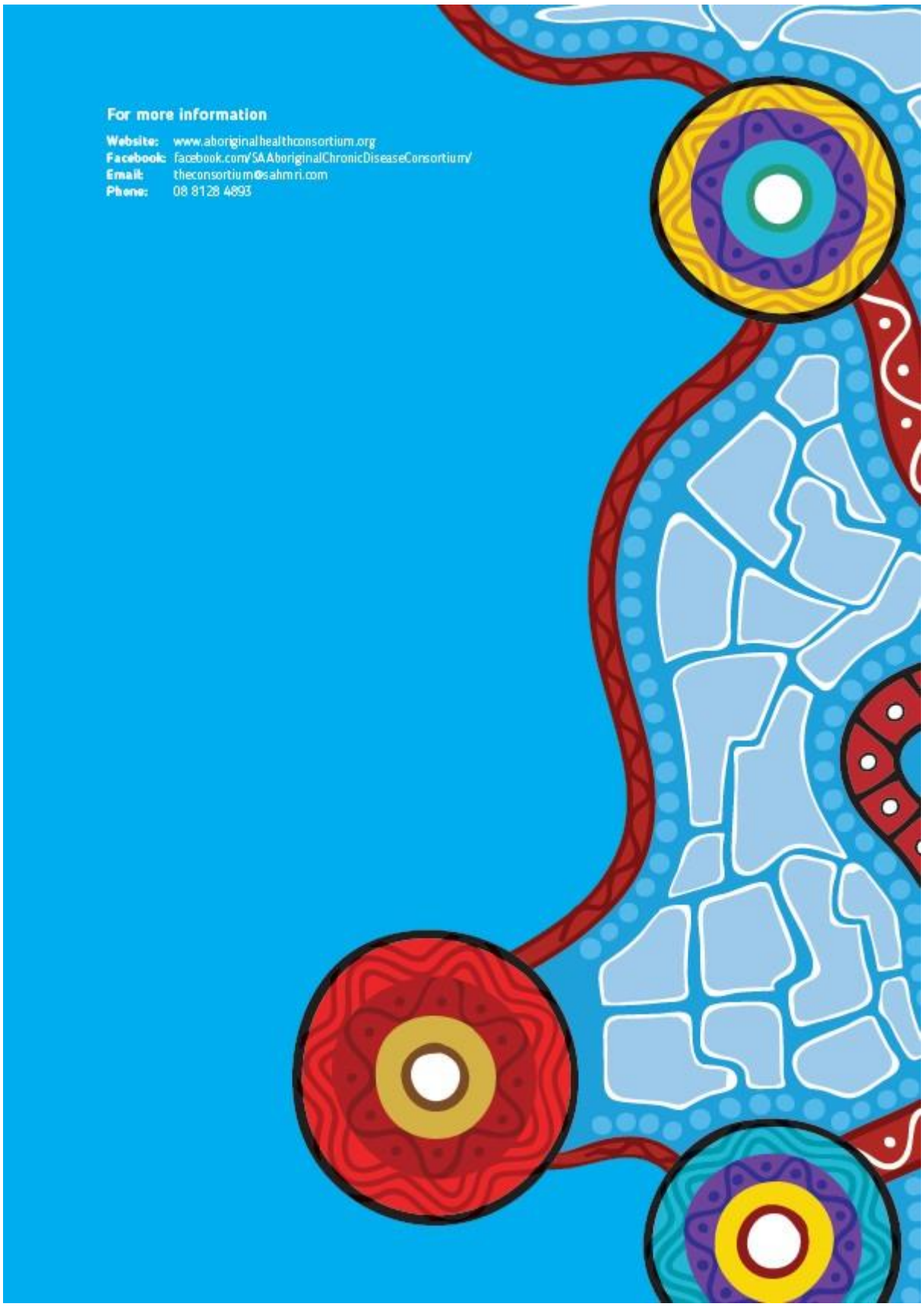
Considerations (continued)	• Impact of illness on cultural obligations, including kinship/carer and community relationships. • Financial resources – financial obligations or limited available finances greatly disadvantages patients and their families/carers ability to travel and live away from home. • What information do the patient and family need to address concerns they may have regarding cultural safety, transfer location, care and treatment. **Note: Patient summary informed by these considerations will need to be passed over to receiving hospital.**
Definitions	• Primary Evacuation – applies to retrieval from a location with no medical facility, and is conducted by the RFDS or SAAS. • Local Transfer – applies to the authorised medical emergency transfer of Aboriginal patients between inner city community health centres or general practice to emergency departments. • Remote and/or Country Transfer – applies to the medical emergency transfer of Aboriginal patients between remote and/or regional emergency departments to centralised emergency departments that has been authorised by a Duty Medical Practitioner, Clinical Director or equivalent. • Patient Travel – applies to the considerations and requirements relevant to the transport of Aboriginal patients under the Patient Assistance Travel Scheme (PATS) Guidelines.
Mandatory requirements	Comply with state-wide service standard operating procedures as outlined by the SA Health policy document reference G0168 and for iCCnet, RFDS and SAAS which include: • iCCnet management of chest pain / suspected ACS http://www.iccnetsa.org.au/Data/Sites/1/protocols/clinicalpathways/cat3_blank.pdf • Statewide standardised pathway for the acute and post-acute management of patients with high risk Acute Coronary Syndrome (SA Health Transforming Health).
Outcomes	An integrated state-wide transfer and retrieval system where Aboriginal patients receive quality, responsive and considered treatment and care.
Date	January 2019
Document Owner	South Australian Aboriginal Chronic Disease Consortium

The following elements should be included in the protocol. Dependent on whether it is a local or remote/country transfer or primary evacuation, and the time available prior to arrival of transport, there are varying levels of priority. This protocol should not delay transport or time-critical treatment.

Elements of protocol	Justification	Local transfer	Remote/ country transfer	Priority level 1–3 (1–highest)
Aboriginal and Torres Strait Islander identification	To initiate the Aboriginal and Torres Strait Islander aspects of the pathway, and to facilitate appropriate clinical decision making, and consideration of cultural elements of care to be incorporated into management.	✓	✓	1
Identification of languages spoken	If the Aboriginal patient's first language is not English, it is well recognised that limited access to interpreters is a barrier in providing time critical care. Identifying the patient's preferred language/s and communicating this to the receiving hospital can facilitate improved provision of interpreters if required, and support consenting processes.	✓	✓ particularly relevant in some rural and remote communities	1
Appropriate person/s to provide consent	In some cases, it may not be the patient or their direct family member who is appropriate to provide consent for travel or treatment. It is therefore important to establish who is/ are the appropriate person, and to initiate contact.	✓	✓ particularly relevant in some rural and remote communities	1
Selection of escort (if relevant)	Identifying an appropriate escort has been found to influence in-hospital care experiences. Considerations include: • Appropriate person to assist with or provide consent • Level of health literacy • Previous engagement with health services	✓	✓ particularly relevant in rural and remote communities	1

Elements of protocol	Justification	Local transfer	Remote/ country transfer	Priority level 1-3 (1-highest)
Initiating escort transport (if relevant)	Initiate escort transport. This may be in the emergency vehicle if capacity, or may be in alternative private transport. This process should prepare the escort for the travel, support organisation of transport, and facilitate communication with the receiving service	✓	✓ particularly relevant in rural and remote communities	2
Information and discussion on condition and possible treatment options	Retrieval and hospitalisation for a heart attack or stroke is a frightening experience. Preparing patients and their escort/s what to expect supports consent and reduces anxiety prior to transfer. This is particularly relevant for patients who will travel from remote or rural locations.	✓	✓	2
Initiating consent process	It has been identified that there are gaps in the consent process. Initiating consent can support this process in hospital. This is particularly relevant for patients who will travel from remote or rural locations.	✓	✓	2
Consider financial resources of patient and escort, if applicable	It is sometimes the case that Aboriginal patients and escorts arrive at hospital with limited finances and no identification. These act as barriers to accessing services whilst in the city. If possible, consider availability to financial resources on arrival to Adelaide.	✓	✓	3

Elements of protocol	Justification	Local transfer	Remote/ country transfer	Priority level 1-3 (1-highest)
Social preparation of patient and escort (if applicable)	It is sometimes the case that Aboriginal patients and escorts arrive at hospital with inappropriate clothing for the weather, no medications, and limited understanding of where they are. These act as barriers to accessing services whilst in the city. Consider barriers to care, where possible prepare the patient and escort, and facilitate coordination of social supports in the city.	✓	✓ particularly relevant in rural and remote communities	3
Regular primary health care provider	Supports consent process (particularly if it is most appropriate to have family or community consent), communication with family, communication of health information to patient, and for ongoing care.	✓	✓ In remote and country locations, this is critical. The provider may be able to support consent process, communication with family, and ongoing care	3
Communication of information to family not travelling with patient	An information sheet for family who are not travelling with patients can provide information on where the patient is likely to be taken, when they will be likely to hear how the patient is, how to contact the patient, and how to contact the Aboriginal Health Unit/ Aboriginal Liaison Unit.	✓	✓	3
Initiating escort accommodation (if relevant)	Initiate escort accommodation. This process should prepare the escort for the travel, and support organisation of accommodation.	✓	✓ particularly relevant in rural and remote communities	3


For more information
Website: www.aboriginalhealthconsortium.org
Facebook: facebook.com/SAAboriginalChronicDiseaseConsortium/
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21. Clinical and cultural considerations when providing care to Aboriginal and Torres Strait Islander patients

There are recognised gaps for Aboriginal and Torres Strait Islander people within our health care system:

- Aboriginal people experience worse health and social outcomes after stroke.
- Aboriginal people experience higher rates of stroke, at young ages, and have differing care needs.
- Disparities in care have been identified in hospital audits nationally.
- There is an increasing focus on providing culturally and clinically best-practice care in the National Safety and Quality Health Service Standards.
- Sometimes Aboriginal patients will require additional care in order to receive the same health outcomes.

The specific clinical and cultural needs of these patients need to be considered when providing acute and rehabilitation stroke care.

Aboriginal and Torres Strait Islander people experience stroke at significantly younger ages. Aboriginal and Torres Strait Islander people aged 25-34 are hospitalised at greater than 3 times the rate of non-Indigenous counterparts. This has implications for clinical recognition and can influence acute and rehabilitation decisions.

Timely identification
Timely identification of Aboriginal and Torres Strait Islander patients should occur at first point of contact with the health system, and identification should be considered in clinical communication. The standard identification question should be asked of all patients: “Are you [is the person] of Aboriginal or Torres Strait Islander origin?”.

Resources to assist provision of care
When providing care to Aboriginal and Torres Strait Islander patients, an Aboriginal Health Practitioner or Aboriginal Health Worker should be included in the stroke team. Some Aboriginal and Torres Strait Islander patients have English as a second language, in which case Interpreting services should be accessed. Consider what additional social support services are required.

When organising a transfer of a patient who has been identified as of Aboriginal and Torres Strait Islander origin, the protocol to meet Aboriginal and Torres Strait Islander cultural and social needs in an emergency should be followed. This protocol should not delay transfer or treatment.

The patient information sheet for Aboriginal and Torres Strait Islander patients should be used to prepare an Aboriginal and Torres Strait Islander patient and their family for possible tests and treatments. The information sheet should be used in conjunction with the Reperfusion Treatment in Acute Ischaemic Stroke (Appendix 5) where appropriate.

The Aboriginal and Torres Strait Islander family hospital referral flyer should be provided to family of Aboriginal and Torres Strait Islander patients being transferred to another hospital. The flyer provides information on how to contact the patient at the receiving hospital.

To view the Stroke Cultural Training Video please ctrl+click on the following link to the Stroke Resources page on the SA Health Intranet: Stroke Resources Page.

Respectful and effective communication
The approach to communication is important:

- Develop a relationship with the patient and family.
- Consider the language used. Explain medical terminology to ensure there is a clear understanding between patient, family and health professional.
- Be aware of body language.

- Some Aboriginal families are larger than 'nuclear' families, extended family members are often involved. Be guided by the family as to who are the appropriate people to be involved in discussions and decision making.
- For Aboriginal and Torres Strait Islander patients for whom English is not their first language:
    - Seek assistance from Interpreting services.
    - Be aware there may not be a direct translation for a word, concept or procedure. Interpreters may take time to explain a word or concept in another language, consider this in your explanation.

Rehabilitation considerations

There may be specific considerations for Aboriginal and Torres Strait Islander patients when planning rehabilitation:

- Explain what rehabilitation is, and why it is important. For some Aboriginal and Torres Strait Islander people, the concept of health related rehabilitation is new; some relate the term to drug or prison rehabilitation.
- Be clear about what rehabilitation options are available to patients given their specific needs. If they are from a rural or remote area, there may be limited resources and capacity to provide rehabilitation in the home.
- For younger patients or patients with complex care needs, consider the availability of accommodation options. Patients with multi-morbidity may require access to other health care services which requires accommodation close to services (ie. dialysis).
- Many Aboriginal and Torres Strait Islander patients wish to leave hospital as soon as possible to return home to family and community; resume work and community responsibilities; or be 'home on country'. However, is may result in reduced rehabilitation options, and have long term challenges to accessing rehabilitation.
- Provide sufficient information for the patient and family to make well informed decisions. Discuss short and long term benefits and challenges including the expected impact of personal and clinical needs. Provide transparency in decision making, and ensure the patient and family members know that conversations are leading to decisions being made.
- For Aboriginal and Torres Strait Islander patients from rural and remote areas:
    - Consider the transport requirements on discharge. Long journeys on a bus may compromise patient safety.
    - There may be complications in medication provision, so ensure the primary health care provider are aware of discharge and prepared to take over care.

22. Document Ownership & History

Document developed by: System Redesign & Clinical Engagement Branch/ Department for Health & Wellbeing in conjunction with the Stroke Model of Care Oversight Committee

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10/5/19	V3.0	SA Health Safety & Quality Strategic Governance Committee	Updated to incorporate latest evidence & models of care
14/10/14	V2.0	SA Health Safety & Quality Strategic Governance Committee	Amendment to original section, and additional: care post 48hrs
10/09/12	V1.0	SA Health Safety & Quality Strategic Governance Committee	Original Version.