National Acute Stroke Services Framework 2019

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Introduction

Delivering optimal stroke services equitably across Australia remains a challenge with access to best practice stroke services variable, particularly in rural and regional areas. One of the most effective ways of reducing death and disability following a stroke is to provide evidence-based, dedicated hospital services. Capacity to plan, deliver and evaluate acute stroke services is essential for improvement of health care delivery and patient outcomes.

A framework to guide the establishment and evaluation of stroke services to support equitable delivery of best practice care was first developed by the Stroke Foundation (with support from the Australian Government Department of Health and Ageing) in 2002. This was reviewed in 2008, 2011 and 2015 to ensure it was aligned with the current Australian Clinical Stroke Management Guidelines.

This document outlines the fourth iterative update of the Acute Stroke Services Framework. The current review process has included a:

a) literature review (from January 2015 to June 2018);
b) review of the data from the National Stroke Audit Acute Services;
c) review of information from international work and systems;
d) targeted consultation about the scope of the review, and
e) consultation on the revised draft framework.

Aims of the framework

The aims of the framework is to outline criteria for the organisation of acute hospital services for stroke to ensure equitable access to best practice stroke care and provide a mechanism for monitoring and then targeting improvements to the quality of Australian acute stroke services.

The intended use of the framework is to:

1. **Provide a basis for measuring the adequacy of current services and their resources for delivering best practice stroke care.**
2. **Identify where stroke services should be developed including the services that should be provided to support future planning.**
3. **Make information available to be used to advocate for improved services where gaps are identified.**
4. **Guide decisions about resource requirements (including minimum stroke unit bed numbers in comprehensive stroke services).**
5. **Encourage ongoing monitoring of the quality of acute care provision.**

The framework has not been developed for use in hospital accreditation purposes but may be viewed as complementary to the National Safety and Quality Health Service (NSQHS) Standards along with the Acute Stroke Clinical Care Standard developed and launched in 2015 by the Australian Commission on Safety and Quality in Health Care (ACSQHC).

Further information about these two resources can be found at:
www.safetyandquality.gov.au/our-work/assessment-to-the-nsqhs-standards/

www.safetyandquality.gov.au/our-work/clinical-care-standards/acute-stroke-clinical-care-standard/

Definitions

Acute care is defined as care within the first week of stroke onset or until discharged (or formally transferred to inpatient rehabilitation).

Hyperacute care is care delivered within first twenty-four hours after stroke.

Comprehensive Stroke Centres (CSC) are large, tertiary referral centres that have highly specialised services including endovascular thrombectomy and neurosurgery and personnel available (24 hours a day, seven days a week) to treat acute stroke.

Primary Stroke Centre (PSC) are hospitals that offer dedicated stroke services (e.g. stroke unit and thrombolysis) and have clinicians who have stroke expertise but do not normally offer endovascular thrombectomy and neurosurgery.

General Hospitals are smaller centres that are either bypassed by emergency services or have formal support from a primary or usually comprehensive centre (via telestroke) to assess the patient and offer thrombolytic therapy before transfer to a dedicated stroke centre.

Stroke Unit (SU) care is organised care within a specific ward in a hospital provided by a multidisciplinary team who specialise in stroke management.

Section 1: Recommended pre-hospital services and statewide systems

Hyperacute care can substantially reduce the risk of death and disability. Reperfusion therapies (intravenous thrombolysis and endovascular thrombectomy) are extremely time critical and reducing the delay from stroke onset to treatment directly benefits patients. Furthermore, endovascular thrombectomy for large vessel occlusion is one of the most potent therapies in modern medicine but this intervention is only available at a limited number of CSCs. Finely-tuned coordination of multiple systems (the ambulance service, medical retrieval service, emergency department, radiology department, stroke and neurointervention teams) is therefore required to improve access to reperfusion therapy and reduce treatment delays.

A systematic approach to resolving barriers that delay hyperacute stroke care and the implementation of geographically appropriate models of emergency care should help achieve increased access to reperfusion therapies, ensure faster treatment delivery and improved access to SU care across Australia. These include:

- effective community education campaigns for stroke recognition;
- well-organised pre-hospital care systems (activation, stroke and large vessel occlusion screening tools, pre-notification and bypass to stroke-capable hospitals);
- telemedicine stroke services for rural and regional centres (where not bypassed) specifically to support decision making around reperfusion therapy, potential retrieval for endovascular thrombectomy as well as early access to SU care;
- rapid assessment in the Emergency Department (including 'code stroke' input from stroke team);
- rapid brain imaging including access to CT perfusion and angiography wherever possible;
- thrombolysis and access to comprehensive centres for endovascular thrombectomy, and
- early rehabilitation.

It is imperative that those responsible for statewide health system delivery work with the relevant pre-hospital emergency services to ensure a consistent approach to accessing stroke-capable centres in their jurisdiction. This should include statewide protocols for transfer of suspected acute stroke patients to the initial hospital, secondary transfers for additional treatment and subsequent repatriation transfers for further acute, rehabilitation or palliative care services. Emergency services may employ a dedicated statewide stroke coordinator to ensure appropriate policies and processes are developed and monitored in cooperation with the health system. CSCs may also be involved in leading regional or area health service level planning and coordination of stroke services (see section 4).

In regional and rural areas, the use of telemedicine is strongly recommended to provide specialist assessment and management support to general hospital centres within agreed system of care. Telemedicine support can also assist in deciding whether to transfer the patient for a higher level of care and interventions including endovascular therapy.

Telestroke is also applicable for stroke assessments including rehabilitation, remote therapy provision, and education and support following hospital discharge, reducing the need for patients and their families to travel long distances.

Table 1: Recommendations for statewide systems of care
Organised pre-hospital services specific to stroke should be developed and coordinated across each jurisdiction. This should include agreed mapping of stroke-capable services and hospitals to bypass, validated stroke screening protocols and pre-notification systems.
Health services should develop agreed statewide service plans that identify primary and comprehensive stroke centres, general hospital services with telestroke services, and policies governing rapid assessment and transfers.
Where no on-site stroke medical specialists are available and there is agreement not to bypass the hospital, telestroke consultation should be used to assess eligibility for acute stroke therapies and/or transfer to stroke specialist centers.
Telestroke should be used to improve ongoing assessment and management of rehabilitation where there is limited access to on-site stroke rehabilitation expertise.

Section 2: Recommended hospital stroke services

a) Comprehensive Stroke Centre (CSC)

CSCs have highly specialised resources and personnel available (24 hours a day, seven days a week). These services are located in large, tertiary referral services which see high volumes of stroke patients (usually over 350 annual admissions) including the most complex presentations. In addition to all PSC capabilities, CSCs offer endovascular thrombectomy

and neurosurgery (24/7/365), along with links to other specialist services such as cardiology, palliative care and rehabilitation. These services have a leadership role in establishing partnerships with other local hospitals for supporting stroke care services (e.g. formal networks, specialist education and clinical advice including outreach visits or telemedicine links) and leading clinical research.

CSC's must be located strategically across Australia to ensure the greatest equity of access to highly specialised interventions. CSC's should have sufficient dedicated stroke bed numbers to ensure stroke patients access SU early and remain for over 90% of their acute stay. CSCs will normally have a minimum of eight dedicated stroke beds in their stroke unit for centres admitting 350 stroke patients annually increasing proportionally to around 22 stroke beds for services that see >1000 stroke admissions. Recommended bed numbers are for acute stroke units only (not combined acute/rehabilitation units) with the actual capacity of a CSC stroke unit dependent on local factors including referral patterns, case mix, access to further rehabilitation services and the efficiency of repatriation to the health network of origin when patients have been transferred in for thrombectomy. CSC's should take a lead in coordinating stroke care across their local health district.

b) Primary Stroke Centre (PSC)

All services with 75 stroke patients or more per year should have PSC capability.

These services have a dedicated SU with clinicians who have stroke expertise; written stroke protocols for emergency services, provide hyperacute stroke treatments and rehabilitation. PSCs should have well organised systems to link emergency services (e.g. pre-notification and code stroke alert systems with direct transport to CT scanner on ambulance stretcher); rapid brain imaging and reporting including advanced imaging (for possible referral to CSC for endovascular thrombectomy); ability to offer thrombolytic therapy 24/7 (either via onsite specialist or supported by telemedicine); protocols to transfer appropriate patients to a CSC as needed (e.g. for neurointerventional or neurosurgical services, including transfers back for ongoing care); strong links with rehabilitation services to ensure early assessment and transfer (if not co-located) and secondary prevention services. Depending on local factors (previous and existing services, geography etc.) these services may be supported by telestroke, or may have some of the additional elements of comprehensive stroke services and/or responsibility for regional coordination of stroke services.

c) General Hospital

Hospitals admitting less than 75 stroke patients per annum may not have sufficient demand to justify specialised in-hospital resources such as a stroke unit, clinicians with stroke expertise or advanced neuroimaging and should be bypassed by ambulance services when stroke is suspected –this is especially the case for outer metropolitan or regional centres within approximately 1 hour transport time from a primary stroke centre (PSC) or comprehensive stroke centre (CSC). However, regional and larger rural hospitals who are not bypassed due to geography and local factors should have links, ideally including telestroke, to a PSC or CSC to facilitate initial assessment, thrombolysis and, if on-site provision is not feasible, transfer for further treatment and stroke unit care. Suspected stroke patients who self-present to hospitals without access to acute stroke therapy or have a stroke while in such a hospital should be immediately transferred to a stroke-capable hospital.

Table 2. Features of hospital stroke services

Element of service	Comprehensive Stroke Centre	Primary Stroke Centre	General Hospital (in regional and rural settings where not bypassed)
Receive pre-notification and prepare to rapidly accept potential stroke patient from pre-hospital services	✓	✓	✓
Coordinated emergency department systems (includes use of validated screening tools; agreed triage categories; rapid imaging; rapid referral and involvement of stroke team, protocols for IV thrombolysis and ECR intervention/transfer)	✓ including code stroke activation and possible direct transport to CT	✓ including code stroke activation and possible direct transport to CT	✓ initial assessment and thrombolysis via telestroke followed by transfer
Stroke unit	✓	✓	×
Rapid access to onsite CT brain (24/7) including CT perfusion and aortic arch to cerebral vertex angiography	✓	✓	✓ plain CT ✓/× CTP/CTA highly preferable
Delivery of intravenous thrombolysis	✓24/7#	✓24/7#	✓ With telestroke support followed by transfer
On-site endovascular stroke therapy	✓24/7#	Optional¥	×
On-site neurosurgical services (e.g. for hemicraniectomy due to large middle cerebral artery infarcts)	✓	Optional¥	×
Ability to provide acute monitoring (telemetry and other physiological monitoring) for at least 72 hours	✓	✓	×
Acute stroke team (see Table 3)	✓	✓	Optional
Dedicated stroke coordinator position	✓	✓	Optional
Dedicated medical lead	✓^	✓	×
Access to HDU / ICU (for complex patients)	✓	✓	×
Rapid (within 48 hours) Transient Ischaemic Attack (TIA) assessment clinics/services (including early access to carotid and advanced brain imaging)	✓	✓	initial assessment and referral
Use of telestroke services for acute assessment and treatment	✓ (providing advice)	Optional (if required for 24/7 service)	✓
Standardised processes that ensure ALL stroke patients are assessed for rehabilitation. This includes use of standardised tools to determine individual rehabilitation needs and goals (ideally within 48 hours of admission).	✓	✓	✓*
Coordination with rehabilitation service providers (this should include a standardised process, and/or a person, used to assess suitability for further rehabilitation).	✓	✓	Optional*
Routine involvement of patients and carers	✓	✓	✓
Routine use of guidelines, care plans and protocols	✓	✓	✓
Regular data collection and stroke specific quality improvement activities	✓	✓	Optional
Access and collaboration with other specialist services (cardiology, palliative care, vascular)	✓	Optional onsite	Referral

reperfusion therapies provided 24/7, 365 days/year onsite (including via telemedicine for thrombolysis)
¥ requires clear transfer arrangements to services with this capacity if not available onsite
^ Dedicated medical lead who has primary focus on stroke (stroke service director)
* Patients should be transferred out for further specialist care including stroke unit care after acute assessment and initial treatment. Patients may be assessed and accepted back for rehabilitation following acute therapy at stroke centre.

Section 3: Stroke unit care definition

The foundation of any stroke service is the provision of SU care. To ensure SU care is consistent across Australia, it is important that each SU component be defined and measurable. SU care remains the single most important recommendation in the national stroke guidelines (accessible from https://informme.org.au/Guidelines). Recommendations state:

Stroke unit care

- All people with stroke should be admitted to hospital and be treated in a stroke unit with an interdisciplinary team. (Strong recommendation)
- All people with stroke should be admitted directly to a stroke unit (preferably within three hours of stroke onset). (Practice point)
- For patients with suspected stroke presenting to non-stroke unit hospitals, transfer protocols should be developed and used to guide urgent transfers to the nearest stroke unit hospital. (Practice point)
- Where transfer is not feasible, smaller isolated hospitals should manage stroke services in a manner that adheres as closely as possible to the criteria for stroke unit care. Where possible, stroke patients should receive care in geographically discrete units.(Practice point)
- All acute stroke services should implement standardised protocols to manage fever, glucose and swallowing difficulties in stroke patients. (Strong recommendation)

Table 3 outlines the *minimum* criteria of SU care. Other important features include routine involvement of patient and family/carers, early and active rehabilitation, routine use of guidelines and protocols (e.g. fever, swallowing, incontinence, hyperacute therapy).

Table 3. Stroke Unit definition

Minimum criteria:

1. Co-located beds within a geographically defined unit
2. Dedicated, interprofessional team with members who have expertise in stroke and/or rehabilitation. The minimum team would consist of dedicated medical (stroke) lead, nursing and allied health (including occupational therapy, physiotherapy, speech pathology, social work and dietitian) and stroke coordinator
3. Interprofessional team meet at least once per week to discuss patient care.
4. Regular programs of staff education and training relating to stroke. (e.g. dedicated stroke in service program and/or access to annual national or regional stroke conferences/ educational webinars)

Section 4: Regional coordination responsibility for acute stroke

Some services will take on responsibility for planning and coordination of stroke services for a designated local area (e.g. health district) and provide a 'hub' for less specialised stroke care at other services. In metropolitan areas these services are usually CSCs as described above. However, in regional and rural areas sites with regional responsibility may be a PSC but only if they have formal links to a CSC for coordination of endovascular therapy.

Where a stroke service has regional responsibility, additional resources should be allocated to coordinate care in and from 'spoke' sites. Elements of care specific to services with responsibility for regional coordination are listed in table 4.

Table 4. Regional or hub service features

• Responsibility for regional stroke planning and local stroke network (this may be coordination across a local health district)
• Collaboration with ambulance services to plan and monitor adherence to protocols and policies for emergency transfers along with back transfers across a local health district
• Extra capacity for specialist clinical support (outreach or via telemedicine)
• Extra capacity for educational outreach (including medical, nursing [educator or consultant], allied health and research).
• Extra capacity to respond to/accept additional transfers
• Dedicated stroke coordinator position and stroke medical lead to coordinate care between sites
• Regional coordination of hyperacute therapy
• Use of telemedicine links to comprehensive stroke centres (for primary stroke centres)

Section 5: Workforce requirements

Skilled inter-professional stroke teams are an essential component of best practice stroke care. Staffing levels are expected to vary depending on local considerations such as hospital service and clinical profile (based on all suspected strokes and TIAs). It is important to note that other essential considerations in determining the most appropriate stroke unit staffing levels include skill mix (i.e. adequate numbers of permanent highly skilled and experienced staff who can support any less experienced or new staff), capacity within stroke unit and cross-cover with other non-stroke services (e.g. stroke teams asked to review outlying stroke patients not on the stroke unit), weekend cover, telestroke provision, and additional time allocated to professional development, research and quality improvement activities.

Section 6: Patient safety and quality improvement

Capacity to evaluate the quality of health care delivery is essential for informing clinical practice and improving patient outcomes and ideally should cross the care continuum. Over the past ten years a significant amount of work has occurred to develop national clinical indicators for stroke. Figure 1 below shows the links between the different indicator sets and the nature and purpose of each.

As a minimum, all hospitals should participate in routinely collecting and monitoring a minimum data set for all acute stroke admissions and participate in periodic national organisational survey and use these data to inform quality improvement activity. In addition, CSCs and PSCs should routinely be involved in periodic detailed data collection (clinical audit) and participate in ongoing quality improvement programs.

Description of systems established for systematically monitoring stroke

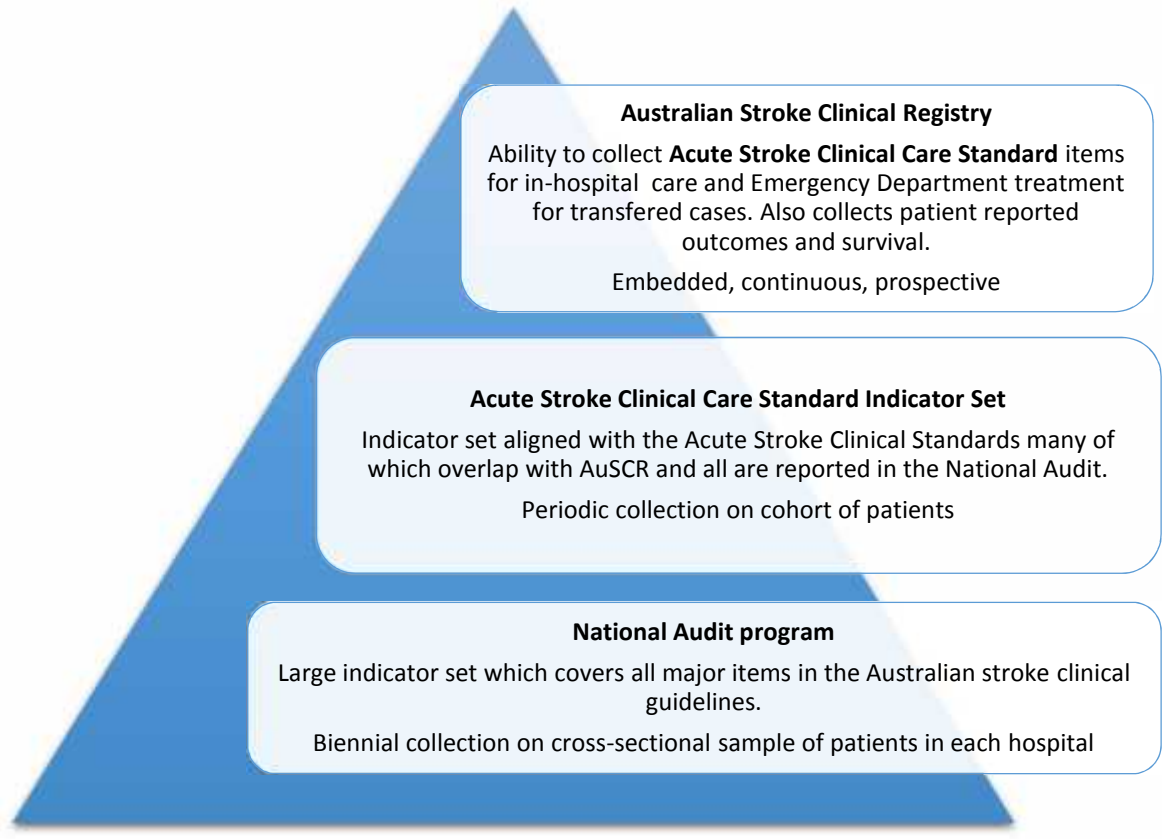
Australian Stroke Clinical Registry (AuSCR): To be collected on all patients in a prospective manner with the aim to enable reporting on the national MDS and the Acute Stroke Clinical Care Standard Indicator Set. The ability to describe the associations between the quality of care in hospitals and longer-term patient outcome is an advantage of the registry. Currently, national coverage is growing but many General Hospitals do not

participate. See: www.auscr.com.au. The dataset is also fully described within the National Stroke Data Dictionary (www.australianstrokecoalition.com.au/ausdat).

Acute Stroke Clinical Care Standard Indicator Set: The Australian Commission on Safety and Quality in Health Care (ACSQHC) has developed national Standards for acute Stroke Care. The AuSCR covers many of the indicators linked to the seven areas recommended in the Standard and the National Audit expands to report against all possible indicators. See: www.safetyandquality.gov.au/our-work/clinical-care-standards/acute-stroke-clinical-care-standard/

National Audit: large data set including questions measuring many processes across all dimensions of care (e.g. acute and rehabilitation phases of hospital care) obtained every alternating two years or as spot audits in approximately 40 consecutive patients per hospital as outlined in the Australian Stroke Clinical Guidelines. The dataset forms the foundation of the smaller subsets of variables that are continuously collected (i.e. in AuSCR) as well as providing greater information on aspects of acute and rehabilitation care and covers all indicators in the Acute Stroke Clinical Care Indicator Set.

Figure 1: Systems of monitoring acute stroke care



It is recommended for the collection of any stroke data that the Australian Stroke Data Tool (AuSDaT) be used to enable efficient entry of data across various data collection activities (See: http://www.australianstrokecoalition.com.au/). The advantage of AuSDaT is that because the AuSCR and National Audit program are able to be collected in this single integrated data management system, common variables can be prepopulated for more than one data collection program to avoid duplication of effort.

Section 7: Summary

All efforts should be made to improve patient access to evidence-based acute stroke care in Australia. Capacity to evaluate the quality of acute stroke services is essential for improvement of health care delivery and patient outcomes. The proposed policy framework should be used by healthcare policy makers, hospital managers and clinicians to identify gaps in recommended evidence-based service provision for stroke or plan for new services. It is recommended that for acute hospital stroke services:

- All hospitals that admit over 75 stroke patients each year should, as a minimum, have Primary Stroke Centre capability.
- Comprehensive Stroke Centres should be established so that equitable access to highly specialised hyperacute interventions is ensured.
- There should be a system wide (regional and state) approach to map and develop stroke services to ensure equity of access for all Australians related to stroke care. This involves collaboration and coordination between prehospital and hospital systems ensuring patients with suspected stroke are delivered to stroke specialist centres, or to stroke-capable general hospitals with established telestroke systems.
- All hospitals that manage acute stroke should be collecting data that monitors the care provided. A broad set of clinical indicators (e.g. the national stroke audit) should also be used routinely (at least every second year) to monitor important processes of care involved in acute stroke services. Primary and comprehensive centres should also prospectively monitor and improve acute stroke care based on a minimum number of process indicators (e.g. AuSCR).
- Finally, this framework should be used in conjunction with the most recent Clinical Guidelines for Stroke Management to increase access to evidence-based stroke care throughout Australia.

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