National Stroke Audit

Acute Services Report 2023

About the Stroke Foundation
Stroke Foundation is a national charity that partners with the community to prevent, treat and beat stroke. We stand alongside stroke survivors and their families, healthcare professionals and researchers. We build community awareness and foster new thinking and innovative treatments. We support survivors on their journey to live the best possible life after stroke. We are the voice of stroke in Australia, and we work to:

- Raise awareness of the risk factors, signs of stroke and promote healthy lifestyles.
- Improve treatment for stroke to save lives and reduce disability.
- Improve life after stroke for survivors.
- Encourage and facilitate stroke research.
- Advocate for initiatives to prevent, treat and beat stroke.
- Raise funds from the community, corporate sector, and government to continue our mission.

About the National Stroke Audit
The National Stroke Audit is a Stroke Foundation initiative and is part of a commitment to promote the delivery of evidence-based stroke care. The National Stroke Audit provides longitudinal data on clinical performance. It commenced in 2007 and switches focus between inpatient rehabilitation services and acute stroke services each year. Stroke Foundation receives no government funding for the National Stroke Audit.

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Note: The National Stroke Audit – Acute Services 2023 Report and additional documents are available at:
www.informme.org.au/stroke-data

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Foreword, At a glance

Stroke Foundation is pleased to present the 2023 National Stroke Acute Audit Service Report. I commend and thank the many health professionals across Australia who have contributed their time and data to this important stroke quality improvement initiative, despite the ongoing challenges experienced in the post pandemic era. Stroke Foundation's mission is to Prevent stroke, Save lives and Enhance recovery, and the National Stroke Audit is a key element that supports our mission, by providing important insights into the care provided by acute stroke hospital services across the country.

Stroke can be treated, yet it remains one of this country's biggest killers and a leading cause of disability. The good news is that advances in stroke treatment and the availability of state-wide telehealth across the nation, mean more Australians are surviving stroke, but there is still a long way to go. This audit highlights ongoing variation in care. All Australians should be confident of receiving the best care possible no matter which stroke-ready hospital they attend. However, this data shows that most indicators of care quality have failed to improve.
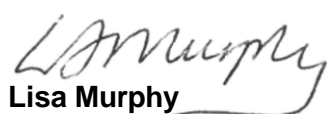
Most importantly, these data demonstrate a failure to achieve improvements to deliver time-critical reperfusion therapies such as thrombolysis (clot busting) and endovascular thrombectomy (clot removal). The rate of thrombolysis (10%) remains stagnant. More alarming is that timely access remains poor, with only 29% of patients receiving thrombolysis within 60 minutes of arriving to hospital, compared to 60% in both the US and the UK. Every 15 minutes of delayed treatment means an additional 1 in 25 people will die, 1 in 33 will go to a care home, and one month of disability-free life is lost, so it is imperative that improvements are made. We must collectively make a concerted effort to improve these services by working towards the nationally agreed targets for reperfusion and dedicated stroke unit access.

Community awareness of the Face Arms Speech Time (FAST) message is also vital to patients receiving timely treatment. Stroke is a medical emergency and the longer it goes untreated, the greater the chance of stroke related brain damage. Awareness of stroke signs and early action is essential. Unfortunately, this year's audit shows little change in patients arriving within the optimal treatment window and highlights the necessity of further promotion of the signs of stroke in the community and the need to act fast and ring an ambulance at the first sign of stroke.

We must also focus on supporting stroke survivors as they transition from acute hospital care back to the community. Recovery from stroke can be a long and challenging journey but with appropriate support, many can make a meaningful recovery. Co-ordinated discharge, secondary prevention advice and appropriated follow-up will ensure every survivor has the best chance possible of recovering well and remaining well.

Thank you again to the many health professionals and health services for your time in participating in the 2023 Acute Stroke Audit and for your commitment to improving stroke services in Australia.

With this data, we must collectively strive to do more to provide equity of access to emergency stroke treatment and support those impacted to live well after stroke.

Lisa Murphy
Chief Executive Officer
Stroke Foundation

2023 at a glance

> 107 Hospitals   > 33,229 Acute stroke admissions

> 4714 stroke cases audited

Time critical Stroke Therapy

38%

Of patients reached hospital in a 4.5 hour time window for time-critical emergency treatment

Thrombolysis in ischaemic stroke

10% 2019   **11%** 2021   **10%** 2023
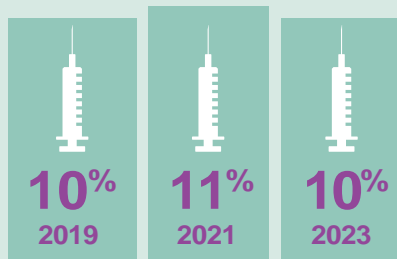
Thrombolysis in **60 MINUTES** (door-to-needle)

29% 2023

Door-to-needle within **60 MINUTES** internationally

68%   **61%**

Stroke unit care
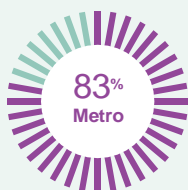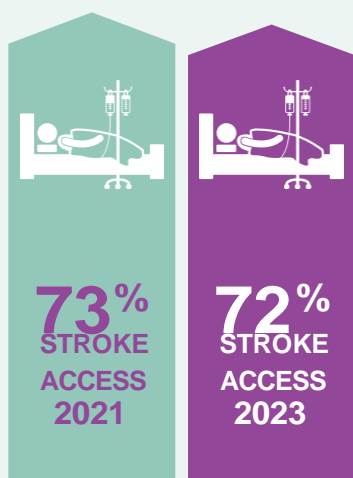
73% STROKE ACCESS 2021   **72% STROKE ACCESS 2023**

83% Metro

Patients who received stroke unit care

35% Regional

Routine use of **CLINCIAL GUIDELINES**, care plans and protocols:

75% 2021
in hospital **WITH** stroke unit

36%
in hospital **WITHOUT** stroke unit

78% 2023
in hospital **WITH** stroke unit

43%
in hospital **WITHOUT** stroke unit
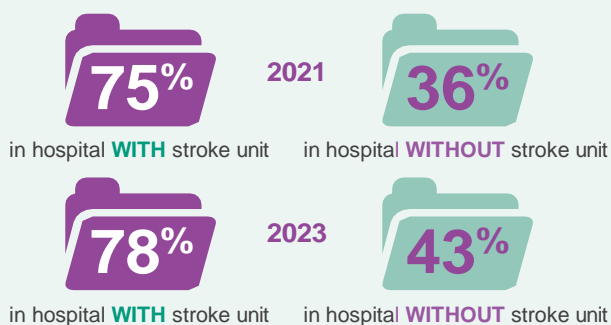
Patients had a **CARE PLAN** developed with the team before discharge

74% 2023
in hospital **WITH** stroke unit

62%
in hospital **WITHOUT** stroke unit

More patient care needed

30%
of patients did **not** receive a **DISCHARGE CARE PLAN**

58%
of patients did **not** receive an **INCONTINENCE MANAGEMENT PLAN**

28%
of patients did **not** receive **RISK FACTOR EDUCATION**
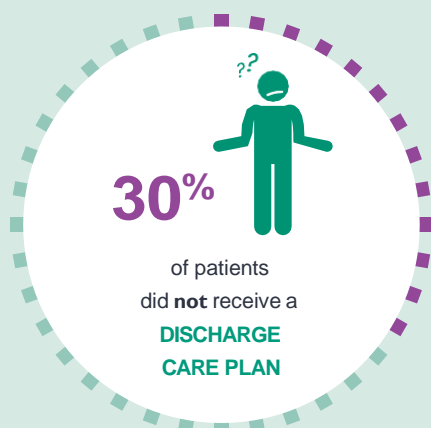
Executive Summary

The impact of stroke is felt by individuals in every community across Australia.[1] Stroke Foundation's 2023 National Stroke Audit – Acute Services report is the 9th national report on the status of inpatient acute stroke services. The National Audit Program is part of Stroke Foundation's commitment to promoting evidence-based stroke care by providing performance feedback to facilitate continuous quality improvement. The National Stroke Audit commenced in 2007 and switches focus between acute stroke services and inpatient rehabilitation services each year.

This report provides a robust and representative assessment of inpatient acute stroke services in Australia. It shows the performance of stroke care against evidence-based Acute Stroke Clinical Care Standard Indicators (2019)[2] and the National Acute Stroke Services Framework (2019)[3] and aims to highlight areas where the system is working well, and where improvements or changes are needed. Participation in 2023 has remained strong, despite the challenges that have arisen in the post pandemic era, demonstrating nationwide commitment to routine quality improvement activities.

In 2023, twelve participating Australian hospitals met all 20 elements of a comprehensive stroke centre (CSCs), ensuring they were equipped to deliver leading-edge care. All are in major cities within six states and territories. CSCs deliver hyperacute care 24 hours a day, seven days a week. This includes reperfusion therapies, which are endovascular thrombectomy (clot removal) services and thrombolysis (clot dissolving) services. The number of comprehensive centres and states they are within, is unchanged from the National Acute Audit 2021.

Inconsistencies of care provided to those impacted by stroke are also seen within states and territories. Hospital services in major cities were found to meet an average of 17/20 recommended elements, whereas hospitals from inner regional areas met 16/20 elements and those from outer regional areas met 13/20. Treatment and outcomes for Australians who experience stroke should not be determined by where they live. All Australians need and deserve access to best-practice care.

'Time is brain' therapies

When a stroke strikes, it can destroy 1.9 million brain cells per minute,[4] therefore 'time is brain'. Prompt treatment can restore blood flow before major brain damage has occurred and assist people to make a good recovery from their stroke. [4] However, prompt treatment involves several steps and multiple services from individuals calling 000, to ambulance services and then emergency departments and respective stroke teams.

In this year's audit, only 38% of all patients with acute stroke reached hospital within the critical 4.5-hour time window for thrombolysis treatment. As in 2021, this indicates that not enough Australians are aware that stroke is a time-critical medical emergency.

Reperfusion treatments, intravenous (IV) thrombolysis and/or endovascular thrombectomy, have not increased in Australia in 2023 with 4,815 receiving these therapies (4,899 reported in 2021).

Thrombolysis

The percentage of services reporting the ability to provide thrombolysis has increased to 90% (88% in 2021). However, actual delivery of this therapy for patients with ischaemic

stroke has not increased. The overall national median use of thrombolysis in the clinical audit for people with ischaemic stroke was 10% (11% in 2021), with a reported total of 2,710 treatments provided.

The speed of delivering reperfusion therapies remains significantly below the achievable benchmark, with only 29% of patients receiving thrombolysis within 60 minutes of hospital arrival (27% in 2021). This is well below rates achieved in other countries with similarly developed health systems, such as the UK[5] and US (both >60%). Every minute impacts patient recovery with 15 minutes shorter treatment times potentially resulting in one additional month of disability-free life.[6] Likewise, every 15 minutes that times are shortened by, can also lead to 1 in 25 people being alive at one year and 3% lower readmission rates.[7] Thrombolysis provision was lower in inner regional hospitals (9%) and outer regional hospitals (7%) compared to hospitals in major cities (12%).

Based on the benchmark set by high-performing services, a thrombolysis rate of almost 30% of all patients with ischaemic stroke is achievable. Australian hospitals reported a 10% thrombolysis rate in 2023, demonstrating that thousands of patients are missing out on a treatment that saves lives and reduces disability. **All services including state-wide systems (e.g. telestroke) that link regional services with comprehensive stroke centres, should be actively working toward meeting national targets for reperfusion.**

Endovascular thrombectomy

Endovascular thrombectomy is a specialist procedure requiring a specialist team, trained interventionists, and sophisticated imaging equipment. It is not practical to have the treatment available at all health services treating stroke. There is, however, the potential for all eligible Australians to access this treatment if early stroke diagnosis and patient transfer pathways are in place with the nearest comprehensive stroke centre.

Endovascular thrombectomy benefits patients with the biggest clots blocking arteries in their brains and subsequently causing strokes. Nineteen stroke services nationally, reported the availability of this treatment, with seventeen in major city locations; 15 of these provide the treatment 24 hours a day, seven days a week. For the 2023 audit, the 19 services that participated delivered this treatment in 2,105 of the reported cases.

Stroke unit care

All patients who are admitted to hospital with a stroke should be treated in a stroke unit.[3] Organisation of acute stroke services with dedicated personnel and processes is fundamental to maximising patient outcomes. **It is recommended that all acute stroke services undergo certification in the Stroke Unit Certification program (established by the Australian Stroke Coalition), to ensure quality of stroke unit care.**

Overall, 80% of participating hospitals reported having a stroke unit. Patient access to stroke unit care has remained relatively unchanged at 72% (compared to 73% in 2021), and only 48% of patients received the majority of their care (90%+ of their acute admission in hospital) in a stroke unit (47% in 2021) reflecting the challenges of increased demand for hospital services. This is well below the 73% of patients receiving 90%+ stroke unit care in England. Stroke unit access is markedly lower in inner (61%), and outer (35%) regional hospitals compared to major city hospitals (83%).

Stroke unit care requires specialist workforce. It is recommended that all primary and comprehensive stroke services have clear medical and nursing leadership, involvement of a comprehensive allied health team and a dedicated stroke coordinator role. Eighty-seven percent of services reported a dedicated multidisciplinary team with members who have a special interest in stroke (a decline from 92% in 2021). Twenty-nine services (27%) reported no medical lead principally responsible for stroke care. Furthermore, 13 services who reported offering stroke unit care had no medical stroke lead.

The stroke care coordinator (SCC) role is critical to ensuring coordinated, best-practice care. SCCs were reported to be working at 81 services (76%). In the services with a stroke unit, 70 out of 86 (81%) reported an SCC on staff. Among the 21 services without a stroke unit, where coordinated care maybe even more important, this role was reported in only 11 stroke services.

Early rehabilitation assessment

Assessment of patients with stroke within 48 hours of hospital arrival by physiotherapy, occupational therapy and speech therapy is similar to the 2021 audit (81% to 2021 79%, 63% to 2021 62% and 74% to 2021 75% respectively) in this audit. Patients treated in a stroke unit were more likely to be assessed by a physiotherapist within 48 hours of arrival (82% in stroke unit compared to 72% not treated in a stroke unit).

Swallow screening within 4 hours was only 30%, and swallow screening before the patient was given medications, food or fluids was 60% in this audit.

The provision of incontinence management plans remains low at 42%. This highlights a significant gap in care with less than half of all patients receiving this important intervention.

Early rehabilitation and appropriate assessment of ongoing rehabilitation needs is a critical component of best-practice stroke care. Services must also coordinate with rehabilitation services to facilitate seamless transfer of care for people with stroke. Positively, most services (95%) reported coordination between acute and rehabilitation services. Of the 83% patients assessed for rehabilitation (a significant improvement from 67% in 2021), 66% of patients were found to have ongoing rehabilitation needs. Patients treated on a stroke unit were significantly more likely to have an assessment for rehabilitation (89% compared with 69%). Those treated in major city hospitals were more likely to be assessed than hospitals in inner or outer regional areas (86% cities vs 80% inner regional vs 75% outer regional).

Helping patients to live well after stroke

When patients transition from acute hospital to inpatient rehabilitation or to their home, they need advice and support for themselves and their families in order to maximise their recovery and live well after stroke.

Discharge care plans, developed with patients and their families, have long been emphasised in Clinical Guidelines and advocated by people with lived experience of stroke. Only 70% of patients received a comprehensive discharge care plan (76% reported in 2021). Patients in stroke units were more likely to have access to a discharge care plan (74% vs 60%), further highlighting the benefits of stroke unit care.

Many survivors of stroke will go on to experience another stroke, however with medication and lifestyle modification many of these strokes could be prevented.

Disappointingly, the 2023 audit showed that patients were being discharged from hospital without comprehensive support to reduce their risk of having another stroke. Twenty-eight percent of patients were not given advice on lifestyle and other modifiable risk factors to avoid another stroke. Prescription of medications for stroke prevention, however, appear to have been done well for the majority of cases in this audit; prescription of blood pressure medication, lipid lowering medication and antithrombotics on discharge were 82%, 94% and 99% respectively.

In this audit, 28% of patients were identified as having a carer. Carers though, are often forgotten in the transition from hospital to home or rehabilitation. There was a decline in the support provided to carers of patients who were discharged home from the acute hospital, between 2021 and 2023. Overall, 62% of carers received a support needs assessment and 62% received relevant training to support the stroke survivor outside of hospital. Greater attention is needed to better prepare carers for their roles once a person returns to the community after stroke.

Support for the transition home was more likely to be provided where patients were treated in a stroke unit. Again, patients treated outside of stroke units were disadvantaged.

Scope for improvement

Overall, there has been little difference in acute stroke care relative to the previous audit in 2021. Reperfusion rates and timeframes continue to lag behind international rates and access to stroke unit care remains below agreed national targets. Significant variation across states and territories also remains a concern. These data, however, provide an opportunity to address gaps in care and ultimately reduce disability and save lives.

As well as national and state reports, the National Acute Stroke Services Audit provides individual services with data for their site and comparisons to state and national medians and achievable benchmarks. There are great benefits to be achieved by supporting all services caring for patients with stroke, to use their data to engage in evidence-based quality improvement initiatives in order to reach agreed national targets.

Recommendations

- **Improve community awareness of the F.A.S.T. signs of stroke to encourage earlier presentation to hospital.**
- **Reduce variability of care between sites and states, as well as disparity between metro and regional/rural sites.**
- **Improve timely access to reperfusion therapies to meet national targets.**
- **Ensure all dedicated services include a stroke coordinator and include nursing and medical leadership.**
- **Improve access to certified stroke unit care to meet national target.**
- **Improve holistic care including swallow screening, management of incontinence, and information and education provision.**
- **Ensure all patients receive a comprehensive, individualised discharge care plan.**

Chapter 1: Introduction

Stroke is one of Australia's biggest killers and a leading cause of disability.[1] Stroke kills more women than breast cancer and more men than prostate cancer. In 2020 there were estimated to be 27,428 people who experienced stroke for the first time – that is, one stroke every 19 minutes.[2] More than 445,000 people are living with the effects of stroke,[2] with around 24% of first-ever strokes occurring in people aged 54 years and under.[2] The direct financial cost of stroke in Australia is estimated to be $6.2 billion each year.[3]

1.1   Clinical Guidelines and the National Stroke Audit

The Stroke Foundation has coordinated the development of national clinical guidelines for stroke care since 2003. Clinical guidelines empower clinicians in understanding the best evidence-based interventions to help people recover from stroke. The living *Clinical Guidelines for Stroke Management*[4] are approved by the National Health and Medical Research Council (NHMRC) and help to form the basis of the National Stroke Audit, determining what essential clinical care data should be collected. The National Stroke Audit was designed by the Stroke Foundation in consultation with experts to monitor stroke care at nationwide and state-wide levels.

Clinical guidelines are only useful when they are used effectively in clinical practice. An important strategy to encourage change to be in line with what is known to be best practice, is an 'audit and feedback' process. The National Stroke Audit promotes quality improvement through a tailored report provided back to individual hospital services. These individualised reports enable teams to compare their performance against national averages, achievable benchmarks obtained from the top-performing services and peers, based on other similar-sized (admissions per year) stroke services.

1.2   The National Stroke Audit Program

The National Stroke Audit program commenced in 2007 and provides longitudinal, cross-sectional data to track changes over time, allowing services to understand where they have, and have not, improved between each National Stroke Audit.

The methods for the audit are outlined in the Appendices, but in essence the National Stroke Audit – Acute Services comprises two components (Figure 1):

> 1.   An Organisational Survey of acute hospital services across Australia.
> The Organisational Survey provides information about the resources available to deliver acute stroke care such as the availability of stroke units, imaging services and interdisciplinary staff. The Organisational Survey questions assess the adherence to the *National Acute Stroke Services Framework 2019*[5] (the Framework) which provides national recommendations related to acute stroke elements of care including what defines a stroke unit, Comprehensive Stroke Centre, Primary Stroke Centre and General Hospital services.[5]

> 2. A Clinical Audit involving the retrospective review of 60 or more consecutive episodes of care for patients with stroke. Eligible patients must be admitted to, and discharged from, the participating service between 1 June – 30 November 2022. The Clinical Audit specifically reports against the indicators in the *Acute Stroke Clinical Care Standard 2019*[6] and is used to measure the adherence to evidence-based processes of care such as timely assessments by clinicians, diagnostic procedures, early interventions, interdisciplinary care, and discharge planning as recommended in the living *Clinical Guidelines for Stroke Management* [4].

Figure 1: Components of acute care reflected in this report

National Acute Stroke Services Framework 2019 (the Framework)[5]	*Acute Stroke Clinical Care Standard 2019[6] and Clinical Guidelines for Stroke Management[4]*
↓	↓
Outlines recommended resources in acute stroke	Outlines recommended clinical care in acute stroke
↓	↓
Measured by the Organisational Survey	Measured by the Clinical Audit
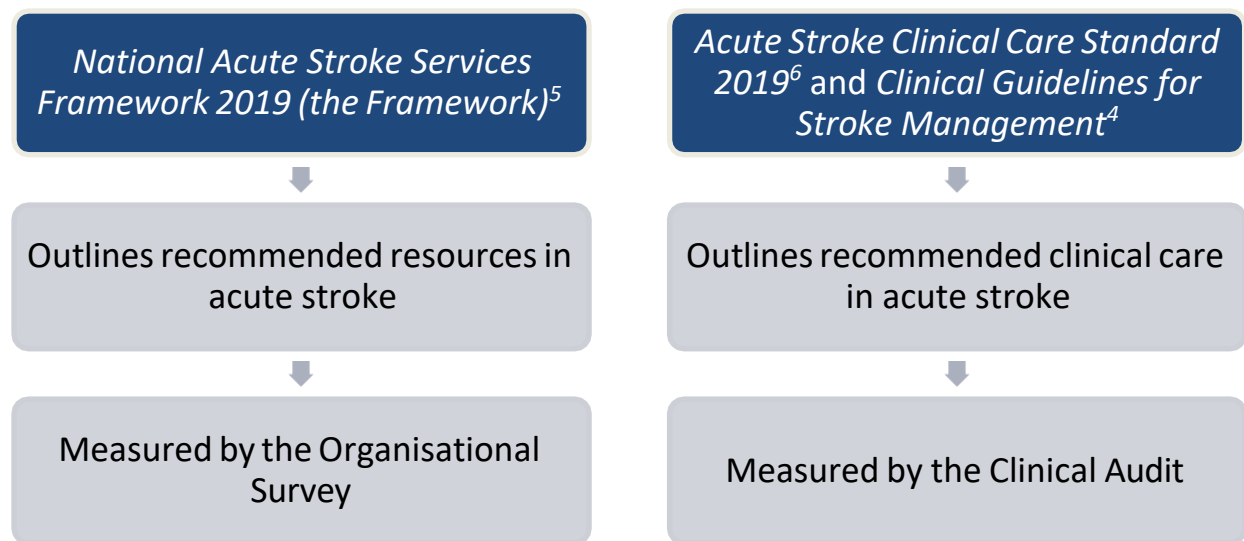
The National Stroke Audit – Acute Services is conducted biennially to provide standardised, cross-sectional data on clinical performance. On alternate years, the Stroke Foundation undertakes an audit of inpatient rehabilitation services for patients with stroke.

1.3 Structure of the report

For this report, 'acute care' refers to care provided in hospital following a new stroke event, from arrival to discharge from the acute care service. Discharge is classified as statistical discharge to a different ward/unit/care type in the same service, or transfer to inpatient rehabilitation, or discharge to the community (home or residential care).

This report outlines the resources and structures available at the participating stroke services and adherence to the Framework, as well as the Australian Commission of Safety and Quality in Health Care's (ACSQHC) *Acute Stroke Clinical Care Standard 2019[6]* and the *Clinical Guidelines for Stroke Management.[4]*

- Chapter 2 includes details of the participating acute services.
- Chapter 3 covers the stroke service responses to the Organisational Survey.
- Chapter 4 provides results of the Clinical Audit, which reflects individual patient care.
- Chapter 5 demonstrates the changes in stroke care delivered over three acute audit cycles.
- Chapter 6 includes discussion and recommendations from analysing and interpreting the results.

Chapter 2: Participating Acute Hospital Services

Acute hospital services were identified nationwide based on criteria of:
   a) admitting at least 60 patients with acute stroke in a year
   b) previous participation, and
   c) in consultation with state-based clinical networks.

2.1 Defining remoteness areas

Classification of participating services as metropolitan or regional/rural was based on the Accessibility and Remoteness Index of Australia (ARIA+). The Australian Statistical Geography Standard (ASGS) defines remoteness areas into 5 classes of relative remoteness across Australia (refer to Supplement). The participating audit services fall into four classes of remoteness:

- Major Cities of Australia
- Inner Regional Australia
- Outer Regional Australia
- Remote Australia

There was only one participating remote service, and this has been categorised as an Outer Regional service for these data analyses.

2.2 Participating acute service characteristics

There were 103 eligible public services, and four private services (Table 1), that completed the Organisational Survey. These services reported a total of 33,229 acute stroke admissions (Table 2) in the previous calendar year (2022).

Table 1: Participating services by location and region

	Organisational Survey			Clinical Audit		
	Total	Public	Private	Total	Public	Private
Australia	**107**	**103**	**4**	**88**	**85**	**3**
Australian Capital Territory (ACT)	2	2	0	2	2	0
New South Wales (NSW)	35	34	1	24	23	1
Northern Territory (NT)	2	2	0	2	2	0
Queensland (QLD)	23	22	1	19	19	0
South Australia (SA)	5	5	0	4	4	0
Tasmania (TAS)	4	4	0	3	3	0
Victoria (VIC)	26	24	2	25	23	2
Western Australia (WA)	10	10	0	9	9	0
Region*						
Major Cities	58	54	4	52	49	3
Inner Regional	32	32	0	25	25	0
Outer Regional	17	17	0	11	11	0

*Rurality by ARIA+ classification: Accessibility and Remoteness Index of Australia

Smaller services that reported 74 or fewer annual acute stroke admissions (N=14) accounted for 569 (1.7%) of all reported admissions. Services admitting 500 or more patients with acute stroke per year (N=18) reported admitting 14,722 patients (44%).

Table 2: Participating services by state, region, and annual stroke admissions

	Total annual stroke admissions	Participating services by annual stroke admissions			
		<75	75-349	350-499	≥500
Australia (N=107)	33,229	14	60	15	18
ACT (N=2)	647	0	1	1	0
NSW (N=35)	9,573	3	24	2	6
NT (N=2)	334	0	2	0	0
QLD (N=23)	6,618	3	15	1	4
SA (N=5)	1,993	2	0	2	1
TAS (N=4)	1,075	1	1	2	0
VIC (N=26)	9,329	4	13	5	4
WA (N=10)	3,660	1	4	2	3
Region					
Major Cities (N=58)	24,986	2	28	10	18
Inner Regional (N=32)	6,354	4	24	4	0
Outer Regional (N=17)	1,889	8	8	1	0

The median number of patients with stroke admitted per service (Table 3) in the Organisational Survey was 284; Q1: 146; Q3: 500.

Table 3: Participating services by size and capacity, by state and region

	Median number of acute beds per service (Q1, Q3)	Median number of annual stroke admissions (Q1, Q3)
Australia (N=107)	284 (146, 500)	232 (110, 400)
ACT (N=2)	427 (254, 600)	324 (200, 447)
NSW (N=35)	284 (141, 423)	250 (110, 346)
NT (N=2)	263 (180, 345)	167 (95, 239)
QLD (N=23)	264 (180, 522)	220 (151, 343)
SA (N=5)	364 (69, 593)	357 (50, 483)
TAS (N=4)	255 (120, 435)	280 (101, 437)
VIC (N=26)	322 (146, 550)	228 (91, 400)
WA (N=10)	308 (81, 488)	350 (93, 544)
Region		
Major Cities (N=58)	440 (284, 600)	345 (200, 597)
Inner Regional (N=32)	179 (107, 267)	182 (103, 265)
Outer Regional (N=17)	85 (64, 172)	80 (42, 141)

Q1: 1st quartile; Q3: 3rd quartile

Chapter 3: Organisational Survey Results

This section of the report describes the current resources reported to be available in participating Australian services to support best-practice stroke care, mapped to the Framework elements.

The aim of the Framework is to:
- Outline where stroke services should be developed and what they should include, to assist planning of stroke services.
- Provide a basis for measuring adequacy of current structures and resources for best-practice stroke care.
- Provide information to advocate for improved services where gaps are identified.
- Guide decisions about resource requirements (including minimum stroke unit bed numbers in comprehensive stroke centres).
- Provide an outline for monitoring quality of care delivered by stroke services.

The Framework comprises 20 elements (refer to Figure 2 for a list of elements). The number of elements met reflects the service level provided at the acute stroke service. A Comprehensive Stroke Centre (CSC) must obtain all Framework elements. A Primary stroke centre (PSC) should have most elements, and where they do not, they should have processes in place to transfer patients to a CSC for specialised care.

Key findings:
- There were 12 stroke services classified as a Comprehensive Stroke Centre (CSC) across Australia (the same number as 2021).
- There was an increase in the national median number of Framework elements met to 17 elements (from 15 in 2019 & 16 in 2021).
- More services offered thrombolysis. There was an increase from 82% (2019) to 88% (2021) to 90% (2023).
- Total reperfusion therapy has remained similar to 2021.
- Five services admitting ≥100 strokes annually did not offer stroke unit care.
- Sixteen services that offer stroke unit care did not have a stroke care coordinator in the team.
- Thirteen services that offer stroke unit care did not have a medical lead in the team.

3.1   Overall adherence to the Framework

The median number of the Framework elements met by the 107 services completing the Organisational Survey was 17 out of the 20 elements.

Table 4. Median number of the Framework elements met, by region and annual stroke admission numbers.

	Australia (N=107)	Region			Reported annual stroke admissions				
		Major Cities (N=58)	Inner Regional (N=32)	Outer Regional (N=17)	<75 (N=14)	75-199 (N=29)	200-349 (N=31)	350-499 (N=15)	500+ (N=18)
Median number of Framework elements met	17	17	16	13	11	14	17	17	19
(Q1, Q3)	(14, 18)	(16, 19)	(13, 17)	(10, 15)	(9, 13)	(11, 16)	(16, 18)	(17, 18)	(17, 20)

Q1: 1st quartile; Q3: 3rd quartile
Framework: National Acute Strokes Framework 2019

Figure 2 below shows the progress in Australia's aggregated adherence to the 20 individual elements of the Framework.

Figure 2. Australia's aggregated adherence to the Framework elements; 2019 - 2023

Figure 2. Australia's aggregated adherence to the Framework elements; 2019 - 2023

Element	2023
Receive pre-notification of potential stroke patient	85%
Coordinated emergency department systems	86%
Stroke unit	80%
Rapid access to onsite CT brain (24/7)	83%
On-site endovascular stroke therapy (24/7)	14%
On-site neurosurgical services	29%
Delivery of thrombolysis	90%
Ability to provide acute monitoring for at least 72 hours	98%
Acute stroke team	87%
Dedicated stroke coordinator position	76%
Dedicated medical lead	73%
Access to HDU/ICU (for complex patients)	93%
Carotid & brain imaging and early medications for suspected TIA*	81%
Provision of telehealth services	72%
Coordination with rehabilitation service providers	95%
Standardised processes for rehabilitation assessment	87%
Involvement of patients and carers in rehabilitation	97%
Routine use of guidelines, care plans and protocols	71%
Regular data collection and QI activities	88%
Access and collaboration with other specialist services	72%

■ 2019 ■ 2021 ■ 2023

Framework: National Acute Stroke Services Framework 2019. CT: computerised tomography; 24/7: 24 hours a day, 7 days a week. HDU: High Dependency Unit; ICU: Intensive Care Unit. TIA: transient ischaemic attack; QI: quality improvement.
Questions related to TIA were modified in 2023.

A systematic approach to resolving barriers that delay access to hyperacute stroke care is needed. The implementation of geographically appropriate models of emergency care should help achieve increased access to reperfusion therapies, ensure faster treatment delivery and improve access to stroke unit care across Australia. These measures must be met to achieve the agreed upon national targets for reperfusion and stroke unit care.[7]

It is imperative for those responsible for state-wide health system delivery to work with the relevant pre-hospital emergency services, to ensure a consistent approach to accessing stroke-capable centres in their jurisdiction. This should include state-wide protocols for transfer of suspected acute stroke patients to the initial hospital, secondary transfers for additional treatment if required and subsequent repatriation transfers for further acute, rehabilitation or palliative care services. In regional

and rural areas, telemedicine should be used to provide specialist assessment and management support to general hospital centres within the agreed system of care.

Telemedicine support assists in deciding whether to transfer the patient for a higher level of care and interventions including endovascular thrombectomy. Telestroke should also be utilised for assessments for rehabilitation, remote therapy provision, and education and support following hospital discharge, to reduce the need for patients and their families to travel long distances.

With Queensland's commitment to establishing a telestroke service, there is now national coverage for telestroke services (excluding ACT). Further work is needed to ensure maximum reach and effectiveness of these services.

Similar to 2021 audit, 12 services met all 20 elements and were therefore considered to be a CSC. Fifteen services reported offering endovascular therapy 24/7.

CSCs are services that have highly specialised resources and clinicians available 24 hours a day, 365 days a year. They can manage a large patient volume of annual stroke admissions, including the most complex presentations. They have a dedicated stroke unit, established and well-organised systems to link emergency services and hyperacute care, and coordinated processes for ongoing inpatient rehabilitation, secondary prevention, and community reintegration. They also have a leadership role in establishing partnerships with other local services for supporting stroke care. There were no CSCs identified in the Northern Territory or Tasmania.

Table 5. Median number of the Framework elements met and number of CSCs by state.

	Median number Framework elements met (Q1, Q3)	Number of Comprehensive Stroke Centres (meeting all 20 elements)
Australia (N=107)	17 (14, 18)	**12**
ACT (N=2)	Min 16, Max 20	1
NSW (N=35)	17 (14, 18)	3
NT (N=2)	Min 15, Max 19	0
QLD (N=23)	16 (13, 17)	2
SA (N=5)	17 (11, 17)	1
TAS (N=4)	14 (10, 17)	0
VIC (N=26)	17 (16, 18)	4
WA (N=10)	16 (13, 17)	1

Q1: 1st quartile; Q3: 3rd quartile, Min: minimum; Max: maximum

3.2   Adherence to aspects of the Framework

Rapid transfer, assessment, and investigations
Time is critical after stroke. Pre-hospital communication and clinical processes are designed to ensure prompt transfer to stroke services that have the resources to deliver appropriate care and ensure swift diagnosis and intervention. In this hyperacute phase of care, organised pre-hospital services and coordinated regional stroke systems are essential to support appropriate patient transfer, if required, and/or provide best-practice stroke management. Hospital-based emergency department (ED) systems include use of validated screening tools; agreed triage categories; rapid imaging; rapid referral and involvement of stroke team; protocols for intravenous thrombolysis and endovascular thrombectomy intervention or transfer.

Pre-hospital and ED systems of care including rapid brain scanning are much more common in major cities and moderate to large annual stroke admissions (Table 6).

Table 6. Adherence to recommended pre-hospital and emergency services, by region.

	AUS (N=107)	Region			Annual Stroke Admissions				
		Major Cities (N=58)	Inner Regional (N=32)	Outer Regional (N=17)	<75 (N=14)	75-199 (N=29)	200-349 (N=31)	350-499 (N=15)	500+ (N=18)
Receive pre-notification and prepare to rapidly accept potential stroke patient from pre-hospital services	91 (85%)	50 (86%)	29 (91%)	12 (71%)	10 (71%)	19 (66%)	30 (97%)	14 (93%)	18 (100%)
Coordinated ED systems	92 (86%)	52 (90%)	27 (84%)	13 (76%)	8 (57%)	22 (76%)	29 (94%)	15 (100%)	18 (100%)
On-site CT brain (24/7) including CT angiography and aortic arch to cerebral vertex angiography	89 (83%)	50 (86%)	30 (94%)	9 (53%)	6 (43%)	22 (76%)	29 (94%)	14 (93%)	18 (100%)

ED: emergency department; CT: computerised tomography; 24/7: 24 hours a day, 7 days a week

Support for all services that admit <75 patients with acute stroke each year is needed, as they have reported limited resources for recommended pre-hospital and emergency protocols.

Reperfusion services

Acute stroke services should provide access (on-site or by transfer) to recommended reperfusion therapy, including thrombolysis and endovascular thrombectomy for people experiencing ischaemic stroke. Reperfusion therapies are time dependent and should be provided rapidly (e.g., within hours after stroke onset). Prompt treatment with clot-dissolving (thrombolytic) drugs can restore blood flow before major brain damage has occurred and assist people to make a good recovery from their stroke.[4]

Ninety-six of the participating services (90%), reported ability to deliver thrombolysis. Endovascular thrombectomy is a highly effective treatment with evidence of benefit in selected patients with large vessel occlusion.[4] Treatment may occur either following thrombolysis or as initial treatment in patient's ineligible for thrombolysis. Given that this treatment is only appropriate to provide in very specialised services, system-wide transfer and management policies are needed to ensure efficient pathways between hospitals and ambulance services. Currently, 19 services offer endovascular thrombectomy, 15 of which have 24/7 access. Patients receiving reperfusion therapy was highest in the services with the highest annual stroke admissions who are in major city locations. There was little difference between overall reperfusion provided (4899 in 2021 and 4815 in 2023) although a small number of larger hospitals did not participate in 2023.

Table 7. Adherence to the Framework recommended reperfusion services, by region and annual stroke admissions

	Australia (N=107)	Region			Reported annual stroke admissions				
		Major Cities (N=58)	Inner Regional (N=32)	Outer Regional (N=17)	<75 (N=14)	75-199 (N=29)	200-349 (N=31)	350-499 (N=15)	500+ (N=18)
Delivery of thrombolysis	96 (90%)	51 (88%)	30 (94%)	15 (88%)	10 (71%)	22 (76%)	31 (100%)	15 (100%)	18 (100%)
On-site endovascular thrombectomy (24/7)	15	13	1	1	0	0	1	4	10

24/7: 24 hours a day, 7 days a week

Twenty-six services who deliver thrombolysis, reported thrombolysing 8 or less patients in the past 12 months. This includes four services that reported having capacity to perform thrombolysis services but did not thrombolyse any patients in the last 12 months. Three services thrombolysed over 100 times in a year with the highest reported volume being 155. Thrombolysis numbers increased as stroke volumes increased from a median of 4 per year for services admitting <75 patients to 56 per year for services admitting >500 patients. Reported number of patients provided with reperfusion are included in table 8.

Timeliness of receiving reperfusion stroke therapies is important for patient outcomes and is discussed with the Clinical Audit results in Chapter 4.

Table 8. Annual reperfusion therapy and endovascular and neurosurgical services available and annual reperfusion therapy provided by state.

	AUS (N=107)	ACT (N=2)	NSW (N=35)	NT (N=2)	QLD (N=23)	SA (N=5)	TAS (N=4)	VIC (N=26)	WA (N=10)
Patients receiving thrombolysis in 2022	2710	57	851	15	420	223	110	909	125
Patients receiving endovascular thrombectomy in 2022	2105	48	471	0	407	228	34	630	287
On-site endovascular thrombectomy, n (offered 24/7)	19 (15)	1 (1)	4 (3)	0	4 (4)	1 (1)	1 (1)	5 (4)	3 (1)
On-site neurosurgical services	31	1	10	1	6	2	1	8	2

24/7: 24 hours a day, 7 days a week

Telehealth and regional responsibility
Services may also have links to regional or 'spoke' services (in a hub and spoke referral system) to support acute clinical care and provide education to non-specialist staff. There were 62 services (58%) reporting they had regional responsibility for specialist stroke care and offering support to smaller services. However, medical leads were absent in twelve, stroke care coordinators absent in four, and clinical nurse consultant absent in 29 of the services providing regional support. Five services reporting regional responsibility did not report having access to stroke unit care (three of which admitted less than 100 patients annually).

Stroke unit care
The Framework recommends that all patients with suspected stroke should be transported to a hospital with a stroke unit. Organisation of acute stroke services with dedicated personnel and processes is fundamental to maximising patient outcomes and is explored further in the clinical audit results section of this report. It is recommended that all acute stroke services undergo certification in the Stroke Unit Certification program (run by the Australian Stroke Coalition), to ensure quality of stroke unit care.

A stroke unit differs from other wards. Stroke units that have been shown to deliver highly effective stroke care share several characteristics, [4] including:
- Location in a geographically discrete unit
- Comprehensive assessments
- A coordinated multidisciplinary team, consists of medical, nursing, and allied health professionals, including occupational therapy, physiotherapy, speech pathology, social work and dietetics.
- Early mobilisation and avoidance of bedrest
- Staff with a special interest in the management of stroke, and access to ongoing professional education and training
- Clear communication, with regular team meetings to discuss management (including discharge planning) and other meetings as needed (e.g., family conferences)

- Active encouragement of stroke survivors and their carers/families to be involved in the rehabilitation process.
- Monitoring of service quality.

Eighty-six services (80%) reported having a stroke unit, with 717 dedicated acute stroke beds (median 6 beds per unit [Q1 4, Q3 11]). Five services admitting ≥100 patients annually reported NOT having a stroke unit.

Stroke unit capacity at a single point in time was established by analysing the number of patients with stroke in a service on the day the Organisational Survey was completed, compared with the number of dedicated stroke unit beds in all services and in stroke unit services (Table 14). The analysis showed there was wide variability in the availability of dedicated stroke unit beds to manage patients with stroke.

On the day of completion of the Organisational Survey, 779 patients with acute stroke were present in services offering stroke unit care. Among these patients, 497 (64%) were being cared for in a dedicated acute stroke unit bed. Even if all stroke unit beds were occupied by stroke patients there is still higher demand than beds available nationally (717 SU beds for 779 stroke patients) and in most states. The clearest need is demonstrated in services that see very high volumes of stroke patients (262 beds for 350 stroke patients). Beds being occupied by non-stroke patients is common and bed management systems should be reviewed so that hospitals can prioritise the movement of patients with stroke into stroke unit beds.

Table 9. Stroke Unit Access on the day the organisational survey was completed

	Patients with acute stroke present (total)	Patients with acute stroke in a service with stroke unit	Total stroke unit beds available	Patients in stroke unit bed on day of audit
Australia (N=107)	823	779	**717**	497
ACT (N=2)	22	22	8	7
NSW (N=35)	271	262	229	156
NT (N=2)	9	6	4	3
QLD (N=23)	172	170	150	104
SA (N=5)	46	43	58	39
TAS (N=4)	26	22	19	15
VIC (N=26)	198	191	181	127
WA (N=10)	79	63	68	46
Annual stroke admissions				
<75 (N=14)	22	10	18	6
75-199 (N=29)	99	75	88	61
200-349 (N=31)	200	200	207	124
350-499 (N=15)	152	144	142	99
500+ (N=18)	350	350	262	207

Services for patients with transient ischaemic attack (TIA)
Hospitals should also have systems for rapid assessment and management of people with suspected TIA to prevent stroke. Diagnostic work-up and implementation of optimal therapy for patients with suspected TIA should be completed within 48 hours.[4] It is highly recommended that all services develop a local TIA pathway involving primary care, ED, and stroke specialist teams to ensure patients are managed as rapidly and comprehensively as possible, matching locally available resources.[4]

Eighty-seven services (81%) reported having access to early diagnostic assessments and initiation of medication for people with TIA. These was more common in larger volume services. Initiation of medication to prevent subsequent stroke was generally high. Brain imaging was routinely conducted for TIA patients in almost all services (98%) but 13 services reported that access was usually over 6 hours from hospital arrival. Eighty-eight services (82%) routinely conducted carotid imaging for TIA patients, however, 19 services reported no access to carotid imaging for patients with TIA and 14 services reported having access but being outside the recommended timeframe (48 hours). Initiation of secondary prevention was consistently high. Only eight services reported not routinely initiating medications within 48 hours.

Table 10. Adherence to recommended TIA services, by annual stroke admission

	Australia (N=107)	Reported annual stroke admissions				
		<75 (N=14)	75–199 (N=29)	200–349 (N=31)	350–499 (N=15)	500+ (N=18)
Carotid & brain imaging and early medications for suspected TIA	87 (81%)	9 (64%)	20 (69%)	27 (87%)	15 (100%)	16 (89%)
Stroke prevention medications (antithrombotics, cholesterol lowering and blood pressure lowering) are routinely initiated or intensified soon after TIA	101 (94%)	12 (86%)	25 (86%)	31 (100%)	15 (100%)	18 (100%)

TIA: transient ischaemic attack

Acute stroke team

The Framework specifies that the minimum criterion for acute stroke care is a "*dedicated, interprofessional team with members who have a special interest in stroke and/or rehabilitation*".[5] The team consists of medical, nursing, and allied health professionals, including occupational therapy, physiotherapy, speech pathology, social work and dietetics. It is recommended that all primary and comprehensive services have a stroke care coordinator (SCC) to facilitate integrated care across the patient journey.

A SCC is defined as overseeing the clinical organisation for stroke services or providing support for ensuring the quality of stroke care delivered at the service. Stroke care coordinators were reported to be working at 81 services (76%). In the services with a stroke unit, 70 out of 86 (81%) reported an SCC on staff. Among the 21 services without a stroke unit, where coordinated care may be even more important, this role was reported in only 11 stroke services.

Seventy-eight services (73%) reported that a consultant physician with specialist knowledge of stroke was formally recognised as having principal responsibility for stroke management at their service (Table 11). However, of the services with a stroke unit, 13 services reported not having a dedicated stroke medical lead.

Table 11. Acute stroke team, by location and stroke annual stroke admissions

	Stroke specialist medical lead	Stroke care coordinator	Multidisciplinary stroke team*
Australia (N=107)	78 (73%)	81 (76%)	93 (87%)
ACT (N=2)	2 (100%)	2 (100%)	2 (100%)
NSW (N=35)	22 (63%)	29 (83%)	31 (89%)
NT (N=2)	2 (100%)	2 (100%)	2 (100%)
QLD (N=23)	17 (74%)	14 (61%)	19 (83%)
SA (N=5)	4 (80%)	3 (60%)	4 (80%)
TAS (N=4)	2 (50%)	1 (25%)	1 (25%)
VIC (N=26)	22 (85%)	22 (85%)	25 (96%)
WA (N=10)	7 (70%)	9 (90%)	9 (90%)

Reported annual stroke admissions			
<75 (N=14)	4 (29%)	8 (57%)	8 (57%)
75–199 (N=29)	19 (66%)	19 (66%)	23 (79%)
200–349 (N=31)	23 (74%)	25 (81%)	30 (97%)
350–499 (N=15)	14 (93%)	14 (93%)	14 (93%)
500+ (N=18)	18 (100%)	15 (83%)	18 (100%)

*Multidisciplinary team consists of medical, nursing and allied health professionals, including occupational therapy, physiotherapy, speech pathology, social work and dietetics.

Almost all services with large annual stroke admissions (350+ per annum) reported having a neurologist actively involved in stroke management. Specialist neurologists were less prominent outside major city locations.

Specialist nurses are critical for supporting good nursing practice. There was variation in specialist nursing staff by state (Table 12). Most allied health staff were almost always available with the exception of clinical psychologists and neuropsychologists (Table 12).

Table 12. Specialist nurses actively involved in the management of stroke, by state

	AUS (N=107)	ACT (N=2)	NSW (N=35)	NT (N=2)	QLD (N=23)	SA (N=5)	TAS (N=4)	VIC (N=26)	WA (N=10)
Clinical nurse consultant (CNC)	51 (48%)	1 (50%)	18 (51%)	2 (100%)	12 (52%)	3 (60%)	3 (75%)	11 (42%)	1 (10%)
Clinical nurse specialist (CNS)	49 (46%)	2 (100%)	19 (54%)	1 (50%)	3 (13%)	0 (0%)	0 (0%)	16 (62%)	8 (80%)
Nurse practitioner	11 (10%)	1 (50%)	1 (3%)	1 (50%)	3 (13%)	0 (0%)	0 (0%)	4 (15%)	1 (10%)
Clinical psychologist	47 (44%)	1 (50%)	10 (29%)	1 (50%)	13 (57%)	3 (60%)	0 (0%)	13 (50%)	6 (60%)
Neuropsychologist	39 (36%)	1 (50%)	11 (31%)	0 (0%)	8 (35%)	1 (20%)	2 (50%)	12 (46%)	4 (40%)
Dietitian	106 (99%)	2 (100%)	34 (97%)	2 (100%)	23 (100%)	5 (100%)	4 (100%)	26 (100%)	10 (100%)
Occupational therapist	107 (100%)	2 (100%)	35 (100%)	2 (100%)	23 (100%)	5 (100%)	4 (100%)	26 (100%)	10 (100%)
Physiotherapist	107 (100%)	2 (100%)	35 (100%)	2 (100%)	23 (100%)	5 (100%)	4 (100%)	26 (100%)	10 (100%)
Social worker	106 (99%)	2 (100%)	35 (100%)	2 (100%)	22 (96%)	5 (100%)	4 (100%)	26 (100%)	10 (100%)
Speech pathologist	107 (100%)	2 (100%)	35 (100%)	2 (100%)	23 (100%)	5 (100%)	4 (100%)	26 (100%)	10 (100%)

Team communication and protocols

Regular communication among the interdisciplinary team is vital to address key issues that may arise during a patient's hospital admission in a timely manner. The Framework specifies that the "interprofessional team meet at least once per week to discuss patient care".[5]

Regular team meetings (case conferences) occurred at 98 services (92%). Of these, the median frequency of meetings was eight per month, or twice per week. Team meetings occurred in all services with SU care compared to only 57% of services without SU care.

The routine use of guidelines, care plans and protocols were slightly higher at services with SU care (78%) than those without (43%). Overall, 98 services (92%) reported having a clinical care pathway in place for managing stroke.

Rehabilitation

Acute services must coordinate with rehabilitation services to facilitate seamless transfer of care for people with stroke. Rehabilitation is a holistic process that should begin the first day after stroke, with the aim of maximising the participation of the person with stroke in the community.[4] Coordination with rehabilitation services was high in almost all services (95%) with little variation. Likewise, patients and carers are routinely involved in care (97%) with little variation. Most services (87%) reported a standardised process for assessment for rehabilitation was used. This was less common in smaller sites (71% in services with <75 admissions compared to 100% in larger volume services).

Regarding assessing suitability for rehabilitation, most services (97%) reported that the acute interdisciplinary team were responsible for making the referral to rehabilitation. Eighty-four services (79%) reported having a rehabilitation physician actively involved in patient management.

Access to other specialist services

Access and collaboration with specialist services (cardiology, palliative, and vascular surgery) were almost always reported in services with higher annual stroke admissions (350-499 and 500+ admissions) but were less common in services with low annual stroke admissions.

Quality improvement activities and ongoing professional development

Embedding a culture of evidence-based practice can be facilitated by targeted education and collaborative involvement in data collection for guiding quality improvement efforts. The Framework specifies that there be access to "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)".

A total of 98 services (92%) reported having access to a program of continuing education for stroke management staff. This was more common in services with SU care and in major cities. Similarly, 88% of sites reported regular (within the last 2 years) data collection and quality improvement activity. This was very common in large city hospitals (97%) but only reported by 65% of services in outer regional areas. It was much more common in stroke unit services (99%) compared to services without stroke unit care (43%).

Chapter 4: Clinical Audit Results

The *Acute Stroke Clinical Care Standard* (2019) outlines 16 suggested process indicators covering seven quality statements for stroke care. While many are based on existing national performance indicators for stroke, this report provides data for all indicators except assessment by ambulance services. It is important to note that in-hospital strokes and inter-hospital transfers were note included in the audit this year.

Key findings:
- Small improvements in only a handful of clinical indicators (stroke screen in ED, hyperacute antiplatelet therapy, incontinence management plan, secondary prevention medication and assessment of ongoing rehabilitation needs)
- Nationwide lack of improvement in hyperacute care and stroke unit care
- The national median time from onset (patient awareness) of stroke symptoms to thrombolysis was longer in this audit than previous audits (now 3 hours)
- Timely allied health assessment unchanged since last audit
- Lack of improvement for indicators related to preparing for discharge.

4.1 Characteristics of patients in the Clinical Audit

A total of 4714 patient case notes were audited from 88 services. The median age of patients was 75 years, 42% were female, only 3% of patients were identified as being of Aboriginal and/or Torres Strait Islander background, and 7% required an interpreter (Table 13). Outer regional services managed a higher percentage of First Nations people and lower number of patients requiring an interpreter than services in major cities.

Table 13. Patient demographics, by region

Patient demographics	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)
Age – median (Q1, Q3)	75 (64, 83)	75 (64, 83)	75 (66, 83)	73 (63, 81)
Sex – female	1988 (42%)	1251 (43%)	510 (41%)	227 (42%)
Patient identifying as Aboriginal and/or Torres Strait Islander background	162 (3%)	51 (2%)	35 (3%)	76 (14%)
Patient requiring interpreter	317 (7%)	282 (10%)	16 (1%)	19 (4%)
Stroke type				
Ischaemic stroke	4075 (86%)	2552 (87%)	1059 (85%)	464 (86%)
Intracerebral haemorrhage	510 (11%)	327 (11%)	125 (10%)	58 (11%)
Undetermined stroke type	129 (3%)	45 (2%)	68 (5%)	16 (3%)
Pre-stroke information				
Independence prior to admission (mRS 0–2)	3887 (82%)	2417 (83%)	1042 (83%)	428 (80%)

Q1: 1st quartile, Q3: 3rd quartile
mRS: modified Rankin Scale

Eighty-two percent of patients had a modified Rankin Scale (mRS) score of 0–2 prior to their stroke, indicating they had no disabilities or minor disabilities (mRS is a commonly used scale for measuring the degree of disability or dependence in the daily activities of people).

4.2 National Performance on the Acute Stroke Clinical Care Standard 2019 indicators

The ACSQHC provides a set of suggested indicators to assist with local monitoring of the Standard (https://www.safetyandquality.gov.au/our-work/clinical-care-standards/acute-stroke-clinical-care-standard). The definitions of the indicators reported (including numerators and denominators, and exclusion criteria) are available in the supplement for this report available at https://informme.org.au/stroke-data.

Further information on national performance in the clinical indicators from 2019 to 2023 is presented in Chapter 5. National adherence to select clinical recommendations outlined in the Standard is represented in Table 14 below. The national benchmarks are based on a modified version of the *Achievable Benchmark of Care* (*ABC*™) methodology[8] (refer to Appendix) whereby these measures represent the results for the top performing services that can be contrasted to the average performance of all services.

Table 14. Performance on *Acute Stroke Clinical Care Standard* Indicators, by location

	Australia	National Bench-mark	ACT	NSW	NT	QLD	SA	TAS	VIC	WA
Validated stroke screen in the ED	75%	96%	98%	81%	56%	72%	75%	63%	74%	75%
Thrombolysis (ischaemic stroke)	10%	24%	15%	12%	9%	7%	14%	15%	13%	5%
Thrombolysis within 60 minutes of hospital arrival	29%	66%	38%	41%	0%	18%	31%	5%	30%	16%
Median time from onset to thrombolysis (hours:minutes)	3:00		2:33	2:48	3:05	3:11	2:56	3:37	2:57	2:47
Stroke unit care	72%	96%	93%	72%	41%	77%	70%	46%	76%	57%
90% of acute hospital care on a stroke unit	48%	83%	51%	40%	27%	46%	54%	18%	62%	43%
Assessment by a physiotherapist within 24-48 hours of arrival to ED†	79%	92%	94%	75%	65%	80%	88%	76%	80%	82%
Assessment for ongoing rehabilitation completed using a structured assessment tool prior to discharge	83%	97%	92%	82%	70%	84%	75%	70%	84%	90%
Patient received education about behaviour change for for modifiable risk factors	72%	96%	100%	74%	33%	72%	70%	54%	71%	79%
Antihypertensives on discharge (all stroke types)§‖	82%	95%	71%	80%	72%	87%	75%	95%	82%	77%
Lipid-lowering treatment on discharge (ischaemic stroke)§‖	94%	97%	89%	94%	90%	96%	89%	95%	95%	90%
Antithrombotic on discharge (ischaemic stroke)§‖	99%	98%	94%	98%	96%	99%	99%	99%	99%	99%
Discharge on oral anticoagulants for atrial fibrillation (ischaemic stroke)§‖	79%	87%	33%	83%	83%	79%	96%	71%	80%	74%
Carer received support needs assessment‖¶	62%	87%	83%	65%	67%	48%	23%	42%	70%	71%
Carer received relevant training‖¶	62%	89%	83%	66%	67%	48%	30%	42%	64%	74%
Care plan developed with the patient and team (plus family)‖	70%	97%	83%	86%	60%	55%	96%	33%	70%	62%

Framework: *National Acute Stroke Services Framework 2019*

Services with low annual admissions (<75 per year), in outer regional areas, or without a stroke unit were the lowest performing groups for almost all indicators. Services adhering to more elements outlined in the Framework achieved better performance on almost all of the Standard indicators (Table 15).

Table 15. Service performance on indicators, by the Framework adherence and service level

	Framework elements met (% = patient cases)		
	0-10 (N=8 services)	11–15 (N=18 services)	16-20 (N=62 services)
Validated stroke screen in the ED*	66%	69%	77%
Thrombolysis (ischaemic stroke)	4%	7%	12%
Thrombolysis within 60 minutes of hospital arrival	0%	12%	31%
Median time from onset to thrombolysis (hours:minutes)	3:00	3:05	2:58
Stroke unit care	12%	38%	84%
90% of acute hospital care on a stroke unit	4%	20%	58%
Assessment by a physiotherapist within 24-48 hours of arrival to ED†	76%	75%	80%
Assessment for ongoing rehabilitation completed using a structured assessment tool prior to discharge	71%	75%	86%
Patient received education about behaviour change for modifiable risk factors‡‖	57%	56%	77%
Antihypertensives on discharge (all stroke types)§‖	76%	79%	83%
Lipid-lowering treatment on discharge (ischaemic stroke)§‖	91%	94%	94%
Antithrombotic on discharge (ischaemic stroke)§‖	99%	97%	99%
Discharge on oral anticoagulants for atrial fibrillation (ischaemic stroke)§‖	83%	81%	79%
Carer received support needs assessment‖¶	68%	49%	65%
Carer received relevant training‖¶	45%	47%	67%
Care plan developed with the patient and team (plus family)‖	68%	54%	74%

Framework: *National Acute Stroke Services Framework 2019*
CSC=comprehensive stroke centre; PSC=primary stroke centre; GH=general hospital

§Excludes those contraindicated to treatment, futile, or refused

‖Only includes patients discharged to the community

¶Excludes where carer has declined

4.3   Adherence to specific aspects of the Acute Stroke Clinical Care Standard indicators

Time-critical therapy

Access to appropriate screening, assessment, imaging, investigation, and treatment is essential for positive patient outcomes. This is especially the case for thrombolysis. Thrombolysis reduces overall disability and improves functional outcomes when administered as early as possible after onset of ischaemic stroke but is limited by a narrow therapeutic time window and important contraindications.[4]

Most patients with stroke arrived at hospital by ambulance (73%). Ambulance transport with hospital prenotification is preferred as it initiates code stroke protocols in EDs where preparations can be made for early intervention for time dependent care. The median time from stroke onset to arrival in the ED was 4 hours, 24 mins (slightly longer than 4 hours,18 minutes in 2021). Thirty-one percent of patients arrived at hospital within 3 hours (30% in 2021), and 38% arrived within 4 hours, 30 minutes of stroke symptom onset (37% in 2021).

Forty-nine percent of patients received a brain scan within one hour of arrival to hospital (45% in 2021), and 95% performed within 24 hours of arrival to hospital. The median time of brain scan from arrival to ED was 58 minutes (64 minutes in 2021)

Overall, 71% of all patients who presented to hospital were screened for thrombolysis eligibility (up from 63% in 2021) and 10% of all patients with ischaemic stroke received thrombolysis. Of all ischaemic patients who received thrombolysis, 29% commenced the procedure within 60 minutes of hospital arrival (27% in 2021). The national median time from onset of stroke symptoms to thrombolysis was 3 hours (Q1 2:17; Q3 3:41).

For those thrombolysed, the median time from arrival at hospital to brain scan (door to scan) was 25 minutes (Q1 15; Q3 :42 minutes), and the median time from arrival at hospital to receiving thrombolysis (door-to-needle time) was 80 minutes (Q1 56; Q3 1:47).

Time-critical metrics were greater in major city hospitals who see higher stroke volumes. Metrics were also best for services who met the highest number of Framework elements (especially CSCs).

Table 16. Early access and thrombolysis indicators, by region

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)
Validated stroke screen in the emergency department	75%	80%	68%	65%
Thrombolysis in ischaemic stroke	10%	12%	9%	7%
Thrombolysis in ischaemic stroke within 60 mins of hospital arrival	29%	33%	20%	13%
Median time from onset to thrombolysis (hours: minutes)	3:00	2:52	3:10	2:57

Stroke unit care

The organisation of hospital services to provide stroke unit care is the single most important recommendation for improving stroke management.[4]

Fifty-seven percent of patients were admitted directly to a stroke unit on arrival at hospital, with 28% of patients admitted to a medical ward on admission, and 6% of patients admitted directly to

ICU/HDU. The median time from hospital arrival to admission to a stroke unit was 11 hours (in 2021 it was 6 hours:42 minutes). Seventy-two percent of all patients received care during their acute admission in a stroke unit, and only 48% of these patients spent at least 90% of their acute hospital stay in a stroke unit. Nineteen percent of patients missed out on receiving stroke unit care when they were admitted to a hospital who provided such care. Access to stroke unit care varied considerably across region (Table 17).

Table 17. Stroke Unit care indictors, by region

	Australia (N=4714)	**Major Cities (N=2924)**	**Inner Regional (N=1252)**	**Outer Regional (N=538)**
Received stroke unit care	72%	83%	61%	35%
Received 90%+ of acute care in a stroke unit	48%	58%	36%	24%

All acute stroke services should implement standardised protocols to manage fever, glucose, and swallowing difficulties in patients with stroke.[4,9] Initiation of treatment to lower fever and reduce hyperglycaemia was lower in this audit than in 2021 (44% vs 50%; 27% vs 29%). Hospitals with stroke unit care performed lower than those without stroke unit care (Table 18). However, more patients treated on a stroke unit received swallow screening or assessment.

Table 18. Fever, glucose, and swallow process, by stroke unit access

	Australia (N=3714)	**Treated in a stroke unit (N=3380)**	**Not treated in a stroke unit (N=1334)**
Fever			
Patient developed fever ≥ 37.5°C within first 72 hours	10%	10%	10%
Paracetamol for the first elevated temperature administered within 1 hour*	44%	42%	48%
Glucose			
Hyperglycaemia (first 48 hours of admission)	22%	22%	23%
Insulin administered within 1 hour of the first elevated finger-prick glucose (>=10 mmol/L)	27%	27%	30%
Swallow			
Formal swallow screen performed	67%	74%	50%
Swallow screen within 24 hours	60%	67%	44%
Swallow screen within 4 hours of admission	27%	29%	20%
Swallow screen or assessment performed	91%	96%	81%
Swallow screen or assessment performed before given oral intake (medications, food or fluids)	60%	67%	43%

*Excludes those already receiving regular paracetamol or where contraindicated

Early interdisciplinary assessment and rehabilitation
A patient's rehabilitation needs and goals are to be assessed by staff trained in rehabilitation within 24 to 48 hours of admission, with rehabilitation started as soon as possible.[4] It is important that a formal assessment for rehabilitation is performed for all patients after stroke, as those patients with mild stroke often have impairments that can be overlooked unless specific assessments are conducted. Similarly, the rehabilitation needs of patients with severe stroke are inconsistently documented and these patients are not routinely referred to rehabilitation services for ongoing rehabilitation.[4]

Although most patients with stroke were assessed by a physiotherapist, occupational therapist or speech pathologist during their hospital admission, fewer patients were assessed by a dietitian or a social worker, and very few patients were assessed by a psychologist. Patients not treated in a stroke unit had less access to all allied health therapies especially social work and psychology services (Table 19). Timely access to most allied health has not changed since the last audit.

Table 19. Interdisciplinary assessment, by region and stroke unit access

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Physiotherapy						
Assessed*	96%	97%	95%	95%	98%	91%
Assessed within 48 hours	79%	80%	78%	77%	82%	72%
Occupational Therapy						
Assessed*	93%	95%	90%	92%	97%	84%
Assessed within 48 hours	62%	64%	58%	60%	65%	52%
Speech Pathology						
Assessed*	91%	92%	90%	91%	95%	81%
Assessed within 48 hours	74%	76%	70%	69%	79%	61%
Dietetics						
Assessed*‡	71%	71%	66%	77%	73%	62%
Median time to assessment	2 days	2 days	2 days	2 days	2 days	2 days
Social Work						
Assessed*	63%	67%	59%	54%	69%	49%
Median time to assessment	3 days	3 days	2 days	2 days	3 days	3 days
Psychology						
Assessed*	6%	10%	3%	3%	9%	2%
Median time to assessment	4 days	4 days	5 days	6 days	4 days	6 days

*Excludes where patient declined or not required
‡If failed swallow screen

Rehabilitation assessment was completed in 83% of patients. Assessment occurred more in services with stroke unit care (89% vs 69%). Two thirds of all patients had ongoing rehabilitation needs identified.

Table 20. Rehabilitation standards, by region and stroke unit access

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Assessment for rehabilitation performed	83%	86%	80%	75%	89%	69%
Assessment identified need for ongoing rehab‡	66%	66%	68%	68%	66%	68%
Referral made for ongoing rehabilitation (if need identified)	97%	97%	96%	96%	97%	95%

‡If assessment performed, excludes unknown responses

Twenty-seven percent of patients had urinary incontinence documented within the first 72 hours of stroke onset. Of these, only 42% were found to have a documented incontinence management plan (36% in 2021). A documented incontinence plan was more common if patients were treated in a stroke unit (44%) compared to not in a stroke unit (37%).

Information for the patient and family
All patients and their families should receive written information relevant to them and their recovery. An example of such information includes 'My Stroke Journey' and various fact sheets available from

the Stroke Foundation. Information provision was higher in larger services and those offering stroke unit care.

Table 21. Patient information, by region and stroke unit access

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Patient and/or family received information covering stroke, hospital management, secondary prevention, and recovery	62%	66%	54%	58%	69%	45%

Minimising risk of another stroke

At the point of discharge from the service, 28% of patients missed out on advice that can help to reduce the risk of subsequent stroke and only just over half (54%) were given smoking cessation advice (Table 22).

Table 22. Risk factor advice, by region and stroke unit access*

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Patient education about behaviour change for modifiable risk factors[†]	72%	78%	61%	65%	78%	57%
Smoking cessation advice if patient currently smoking or recently quit[†]	54%	60%	45%	47%	61%	40%

*Only includes patients discharged from stroke service

[†]Excludes patients who refused, futile, or patients with severe cognitive impairment or severe communication impairment, or where treatment was futile

Antihypertensive medication on discharge was higher than 80% for the first time. Lipid-lowering therapy was higher than previous audits also. All medication management was slightly higher in services offering stroke unit care.

Table 23. Secondary prevention medication on discharge, by region and stroke unit access*

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Discharged on antihypertensives (all stroke)[‡]	82%	83%	81%	79%	83%	79%
Lipid-lowering treatment on discharge (ischaemic stroke)[‡]	94%	94%	96%	92%	94%	92%
Antithrombotic on discharge (ischaemic stroke)[‡]	99%	99%	98%	98%	99%	97%
Discharged on oral anticoagulants for atrial fibrillation (ischaemic stroke)[‡]	79%	80%	76%	81%	79%	81%

*Only includes patients discharged from stroke service

[‡]Excludes patients where treatment was contraindicated, futile, or refused

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Transition from hospital stroke service care

Effective discharge planning facilitates the transfer of the stroke survivor to the community by maximising independence, minimising social isolation, and ensuring that the needs of the patient and carer are addressed.[4]

Twenty-eight percent of patients had a carer. For those deemed to need it, a carer needs assessment was provided to only 62% and training provided to 62%. One-in-three patients did not have a care plan developed when leaving hospital (Table 24). Those patients treated in a stroke unit were more likely to receive a care plan for discharge (stroke unit:74% vs 60%).

Table 24. Discharge planning indicators, by region and stroke unit access

	Australia (N=4714)	Major Cities (N=2924)	Inner Regional (N=1252)	Outer Regional (N=538)	Treated in a stroke unit (N=3380)	Not treated in a stroke unit (N=1334)
Care plan developed with the patient and the team (or family)*	70%	74%	60%	67%	74%	60%
Patient involvement in care plan†	96%	96%	96%	95%	97%	93%
Family involvement in care plan†	58%	64%	47%	45%	60%	53%

*Excludes death, if transferred to inpatient rehabilitation, acute care or refused plan, or where not applicable
†If had care plan

Patient outcomes

Outcome measures allow health professionals to evaluate the effectiveness and efficacy of rehabilitation interventions and therapies. Patient outcomes collected in the audit include discharge destination, length of stay and function on discharge (Modified Rankin Scale (mRS).

Twenty-seven percent of patients were transferred to inpatient rehabilitation, 38% went home with support and 19% went home without any additional support. Half (51%) of patients were independent on discharge (mRS 0-2). Services with a stroke unit discharged 52% independent compared to 48% in services without stroke unit care.

Over 200 people (229) died in this audit cohort (5%). The median time from admission to death was 5 days (Q1 2, Q3 11). Care in a hospital with a stroke unit had lower mortality (3%) compared with services without stroke unit care (10%).

The median length of acute care was 5 days (Q1 2, Q3 9).

Chapter 5: Clinical Audit Changes Over Time

Changes in key performance indicators over time provide a useful comparator to assess clinical practice. Table 25 includes national data from each of the last three cycles.

Multivariable regression models were used to assess the year effect (reflective of the audit year) on adherence to these indicators, considering age, sex, independence prior to admission, stroke type, stroke severity, and hospital clustering (refer to Appendix for more details).

Table 25. Changes over time to the Acute Stroke Clinical Care Standard Indicators and recommended national quality indicators

Australia	2019	2021	2023
Validated stroke screen in the emergency department	52%	69%	75%
Thrombolysis in ischaemic stroke	10%	11%	10%
Thrombolysis in ischaemic stroke within 60 mins of hospital	32%	27%	29%
Median time from onset to thrombolysis (hours:minutes)	2:45	2:50	3:00
Swallow screen or swallow assessment performed before given oral intake (medications, food, <u>and</u> fluids)	55%	60%	60%
Swallow screen or swallow assessment performed within 4 hours of arrival to the emergency department	23%	30%	27%
Hyperacute antiplatelet administered within 48 hours (ischaemic stroke)	70%	79%	83%
Received stroke unit care	67%	73%	72%
Received 90%+ of acute care in a stroke unit	41%	47%	48%
Assessment by a physiotherapist within 24-48 hours of arrival to emergency department	73%	81%	79%
Assessed by occupational therapy within 48 hours of arrival to emergency department	57%	63%	62%
Assessed by speech pathologist within 48 hours of arrival to emergency department	70%	75%	74%
Incontinent patients with continence management plan	37%	38%	42%
Patient received education about behaviour change for modifiable risk factors	72%	78%	72%
Antihypertensives on discharge (all stroke types)	77%	78%	82%
Lipid-lowering treatment on discharge (ischaemic stroke)	88%	92%	94%
Antithrombotic on discharge (ischaemic stroke)	98%	99%	99%
Discharge on oral anticoagulants for atrial fibrillation (ischaemic stroke)	74%	78%	79%
Discharge on statin, antihypertensive and antithrombotic medications (ischaemic stroke)	69%	72%	76%
Carer received support needs assessment	63%	65%	62%
Carer received relevant training	61%	64%	62%
Assessment for ongoing rehabilitation completed using a structured assessment tool prior to discharge	61%	67%	83%
Care plan developed with the team and the patient (or family alone if patient has severe aphasia or cognitive impairments)	69%	76%	70%

Chapter 6: Discussion and Recommendations

The National Stroke Audit - Acute Services Report 2023 provides a comprehensive snapshot of current hospital care for stroke in Australia. Services participating in this audit reported admitting 33,229 of the estimated 38,900 admissions for stroke nationally.[10] Importantly, the results are presented according to the living *Clinical Guidelines for Stroke Management*[4] and the Australian Commission on Safety and Quality in Healthcare's (ACSQHC*) Acute Stroke Clinical Care Standards*[6], and progress since the last National Stroke Audit is described.

Overall, there has been limited improvement since the 2021 audit.

Framework elements

In the Organisational Survey there was an increase in the number of elements met from the Framework, with the largest proportion of services meeting 17 of the 20 elements (median of 17). Large services provide care to most people with acute stroke with median of 19 of the 20 elements met. Twelve of the 18 large services were deemed to meet all 20 elements of the Framework qualifying them as a CSC. Of the six other sites admitting over 500 patients, three did not provide endovascular thrombectomy at all (due to location with existing services) and three did not provide endovascular thrombectomy 24/7. Six services (only one admitting over 100 patients each year) met less than half of the Framework elements.

Community awareness of the Face Arm Speech Time (FAST) message

A stroke is a medical emergency. The longer a stroke remains untreated, the greater the chance of stroke-related brain damage and awareness of stroke signs and early action is essential. The median time from stroke onset to arrival in the ED in this report is six minutes longer than in 2021 (median 4 hours:24 minutes in 2023) which is longer than pre-covid (3 hours:36 minutes in 2019). However, there has been little change in patients arriving at hospital within 3 hours or within 4.5 hours of stroke symptom onset. Arrival by ambulance is similar to previous years. Previous Australian data found patients with stroke who use ambulances arrived faster and were more likely to receive thrombolysis compared to those using personal transport.[11] Further promotion of the signs of stroke in the community and to act fast by phoning for an ambulance is warranted.

System wide coordination of services

State-wide coordination is recommended to ensure efficient and equitable access to acute stroke services. Results of this audit highlight that more needs to be done across all jurisdictions to ensure better coordination of acute stroke services.

It is imperative that those responsible for state-wide health system delivery work with the relevant ambulance and pre-hospital emergency services to ensure a consistent approach to accessing stroke-capable centres in their jurisdiction. Telehealth services remained commonly used across Australia with 72% of services reported to have the provision of telehealth at their centre. Not surprisingly, almost all (31/32) services admitting under 200 patients per year receive support via telehealth. It is pleasing to have Queensland health now implementing a state-wide telestroke service which essentially means there is nation-wide telestroke coverage.

Time-critical therapy access

Acute stroke services should provide access to time-critical therapies, such as thrombolysis and endovascular thrombectomy. More services are offering thrombolysis (90% vs 82% in 2019), but the national thrombolysis rate has been stagnant around 11% over the last three audits. Thrombolysis rates reported in the Australian Stroke Clinical Registry (AuSCR), the largest prospective acute data monitoring program, have similarly failed to change over the last 5 years (10% in 2022).[12] In 2022 the AuSCR collected data from 61 acute services across six states and included 17,184 episodes of care.

In this report, 26 services reported thrombolysing very small numbers (0-8) annually. Therefore, it is important to support smaller services particularly in regional centres, ideally by a formal telestroke support system. In this report, reperfusion metrics were greater in major city hospitals who see higher stroke volumes and for services who met the highest number of Framework elements (especially CSCs). Volume of thrombolysis has been found to improved hospital processes of care with fewer

complications[13] but few of the large volume services are routinely achieving door-to-needle times of <45 minutes and more work is needed.

Thrombolysis is to be administered as early as possible after onset of ischaemic stroke, but the therapeutic time window has expanded in recent years due to selection with advanced brain imaging.[4] The national median time from onset of stroke symptoms to thrombolysis increased further in this audit to 3 hours:00 minutes up from 2 hours: 45 minutes in 2019 (in the AuSCR it was 2 hours: 39 minutes). The median time in this audit was similar between settings (2:52 – 3:10). The median door to needle time in the audit was 80 minutes with the majority of the time being scan to thrombolysis time (median door to scan time is 25 minutes). In the AuSCR the median door to needle time was similar (74 minutes). Clearly more work is needed to improve hospital response rates and reduce door to needle times given the significant impact to the patient for every 15 minutes of delayed treatment.[14,15]

Embarrassingly, the rate of thrombolysis within 60 minutes of hospital arrival remains very low (29% in this audit, 34% in the AuSCR) compared to international comparisons (UK and USA are both 60%+).[16,17] It is hoped that significant focus to improve reperfusion nationally will occur following recently agreed national targets.[7]

Overall, access to endovascular thrombectomy is similar to previous audits. Only Northern Territory reported no patients in the previous 12 months receiving thrombectomy. It is noted that a recent agreement with South Australia has been made to facilitate access to this treatment to patients from the Northern Territory. Selection and referral of patients eligible for thrombectomy relies on access to advanced brain imaging (e.g., computed tomography angiography [CTA], computed tomography perfusion [CTP]). In this report the majority of services (83%) reported access to CT (24/7) including CTA. However, this was less available (~50%) in outer regional services or those with low annual admissions. Perfusion scanning was similarly less available in smaller services. This is an important element in ensuring efficient decision making at primary stroke centres and even stroke capable regional hospitals. In the AuSCR there were 12 hospitals that provided data on endovascular thrombectomy whereby 10% of all ischaemic strokes received this treatment with median door-to-groin puncture time of 115 minutes for primary presenters, illustrating there is a long way to go in reaching the national target of <90 minutes. Readers are referred to the AuSCR annual report for further details about timely access to thrombectomy as this was not collected as part of the clinical audit. As noted above, further concerted effort is required to improve reperfusion therapy and efforts to reach nationally agreed targets are strongly encouraged.

Stroke unit access and care
Access to stroke unit care is also unchanged from the last audit in 2021 (73% in 2021 and 72% in 2023). This is similar to data from the AuSCR (75%). There were five services admitting over 100 stroke patients that reported NOT offering aspects of stroke unit care. Nationally stroke unit access varied from 41% in the Northern Territory to 93% in the Australian Capital Territory, as well as regionally from 83% in major cities to only 35% in outer regional areas.

The median time from hospital arrival to admission to a stroke unit was 11 hours but concerningly almost 3 in every 10 (28%) were first admitted to a general medical ward rather than an acute stroke unit. Capacity continues to be a challenge with increasing demand for hospital services.
On a single day during the audit there was more patients present than stroke unit beds available. However, of more concern was the fact that there were 497 patients reported to be in one of the 717 stroke bed available indicating a sizable (31%) of stroke unit beds were being occupied by patients with non-stroke related illnesses. This pattern was consistent across all jurisdictions.

Stroke unit care is a complex intervention combining the right people and processes. Routine use of guidelines, care plans and protocols were reported more at services with stroke units (78%) than services without a stroke unit (43%). Patients admitted to a stroke unit received better treatment rates for key issues such as:
- swallow screening or assessment prior to oral intake (67% compared with 43%)
- incontinence management plan (44% compared with 37%)
- Assessed for rehabilitation (89% compared with 69%)
- Patient education about lifestyle risk factor modification (78% compared with 57%)

A robust review process to ensure the quality of stroke unit care has been established by the Australian Stroke Coalition. In the first 12-month pilot, 11 services underwent certification. All services offering stroke unit care should undertake certification and aim to reach the target of 90% of patients provided stroke unit care.

Transient Ischaemic Attack services

The vast majority (81%) of services reported access to early diagnostic assessments and initiation of medication for people with TIA. Nineteen services reported no access to carotid imaging for patients with TIA and a further 14 services reported having access but being outside the recommended timeframe (48 hours). Brain imaging was routinely conducted in almost all services (98%) but 13 services reported that access was usually over 6 hours from hospital arrival. Initiation of secondary prevention was consistently high. Only eight services reported not routinely initiating medications within 48 hours.

Access to rehabilitation

Although 95% of services reported good coordination with rehabilitation services and 87% reported a standardised process for assessing rehabilitation needs, in the clinical audit 83% of all patients had a documented rehabilitation assessment. Of those assessed, 68% of patients had a need for ongoing rehabilitation identified and 97% of these patients were referred for ongoing rehabilitation highlighting the need for all patients to receive an appropriate and thorough assessment in the acute setting.

Patients not treated on a stroke unit were less likely to have a rehabilitation assessment (69% compared to 89%). Early assessment by allied health staff was slightly lower this audit. One in five patients did not have a physiotherapy assessment within 48 hours and almost 40% did not see an occupational therapist within 48 hours. One quarter of patients did not see a speech pathologist within 48 hours and social work assessment occurred in under two thirds of patients and seen on day three. Given the average length of stay is so short (5 days), early assessment and commencement of patient centred goals and plans for discharge are critical. Hospital demand and staff expectations obviously compound the problem. Services with stroke unit care performed better for allied health assessment than those without again highlighting the importance of stroke dedicated services.

Secondary prevention

At the point of discharge from the acute service, 28% of patients did not receive advice about risk factor modification (up from 22% in the last audit). Risk factor advice including smoking cessation was higher in services with stroke unit care and in major cities.

It was pleasing to see an improvement in secondary prevention medication including antihypertensives (82%), lipid-lowering therapy (94%), antithrombotics for ischaemic stroke patients (99%), and anticoagulation for patients with atrial fibrillation (79%). Importantly there was little difference between services in different regions and in those that offer stroke unit care compared to those who do not. However, there was significant variation across states in almost all aspects of secondary prevention.

While the data in this report indicate a small improvement in medication prescription, almost one in five still are not prescribed blood pressure lowering medication on discharge or anticoagulation for those with atrial fibrillation. This is important as one in three patients discontinue their medications within one year.[18]

Support for transition from acute stroke service to private accommodation

Stroke survivors, their carers and families report that the transition from acute stroke service after stroke is a critical point in their recovery.

Indicators of support for carers was slightly lower this audit with only 62% of carers receiving a support needs assessment, and only 62% of carers receiving relevant training (for those deemed to need it). Only seven in every ten patients left hospital with a care plan for relevant aspects of care and recovery in this audit compared to 76% in the last audit. This was consistent with that reported by the AuSCR (69%). Again, patients who received stroke unit care had a higher likelihood of getting this care (74% compared to 60%). Given the complexity of stroke recovery, collaborative development of a care plan with the patient and their family is an essential element of good practice stroke care.

Specialist staffing

Stroke care coordinators (SCCs) were reported at 76% of services contributing data for this report (up from 70% in 2021). The presence of a SCC was more common (>80%) in medium to large services with only 27/81 based at services seeing less than 200 stroke patients annually. The presence of a defined SCC role has been found to improve clinical processes of care and reduce the length of stay in services with a stroke unit.[19] Therefore, this coordination role appears critical to the benefits found in stroke unit care. Further work is required to understand the roles and responsibilities of SCCs and other staff in coordinator roles (such as clinical nurse consultants) to ensure they maximise the benefits of patient care throughout the stroke survivor's journey.

Medical leadership specific to stroke outside of large volume services needs to improve. Of concern were 13 services offering stroke unit care that did not report having a medical lead for stroke. Telehealth services can assist in supporting regional/remote services. While stroke medical specialisation for acute stroke care is usually provided by neurologists or, geriatricians, general physicians or visiting medical officers including general practitioners may also need to take on this role in hospitals. This audit has found a need to increase the number of doctors who specialise in stroke to ensure all aspects of care (from hyperacute management to TIA services, secondary prevention and discharge care planning) are provided.

Access to allied health staff remains almost universal except for psychologists. As noted above, timely access to allied health staff does vary considerably and services need to ensure there is equity of access for all people with stroke.

Quality improvement and data collection

In this audit, 88% of sites reported regular data collection and stroke specific quality improvement activities. A focus on reviewing performance and prioritising areas for improvement were more common in services offering stroke unit care (99% compared to 43%) and in services with medium to large numbers of annual admissions for stroke (97-100%). Almost all services (92%) reported staff access to a program of continuing education on the management of stroke. However, it was a concern that staff education on stroke in services without a stroke unit was reported in only 57% (compared to 100% in stroke unit services). Promotion of various online education resources to all services who manage stroke must continue.

6.1   Strengths and limitations of the data

Strengths of the data

The National Stroke Audit – Acute Services provides a cross-sectional overview of acute stroke services in Australia. The number of sites who participate and depth of detail across a full range of measures provides a reliable overview of acute services and their adherence to the national stroke clinical guidelines. Furthermore, the following strategies were used to minimise potential biases:

- Use of a thorough process of standardised training for data auditors/abstractors, with ongoing support throughout the audit process.
- A comprehensive data dictionary was provided to assist interpretation of both the Organisational Survey and Clinical Audit questions.
- Each service conducted a reliability check in which data from three to five cases were entered by two auditors for comparison.
- Programmed logics were built into the AuSDaT to verify data at the point of entry and independent logic checks of completed data were conducted by Monash. The completed data logic check reports are sent to each service for verification.
- Data were de-identified, then analysed by an independent organisation, which minimised interpretation bias.

Limitations of the data

There are several limitations to the data that readers of this report should consider:

- Participation in the National Stroke Audit is voluntary and data self-reported, therefore, may be subject to reporting bias or response bias.

- Documentation issues should be considered; the Clinical Audit assumes that if a process were not documented, it was not performed, which may not always be the case. This is highlighted when data from the Organisational Survey and Clinical Audit provide conflicting information. However, as documentation of care is a medico-legal responsibility, where proof that care was delivered is required, care cannot be assumed in the absence of documentation. Better documentation will provide the ability to gather more robust data for monitoring stroke care and should be factored into all quality improvement activities.
- The audit is undertaken once every two years, and the patient cohort was relatively small in several of the participating services. Application of exclusion criteria and missing data further reduced the sample size for some indicator level analyses, e.g., carer training.
- Fewer hospitals were able to participate in this Audit although more case audits were included in this Audit compared to previous audits. To minimise this a separate analysis of sites from 2021 and 2023 was undertaken with almost no difference in overall results found.
- Changes to the Audit have occurred over time. The 2023 audit excluded cases of in-hospital stroke and inter-hospital transfers.

6.2 Recommendations

This report outlines limited improvement in resources and clinical care in acute stroke. Many gaps remain, and it is recommended that local and state-wide services use the feedback and assess local barriers and enablers, develop and implement improvement plans, and monitor the impact on the quality of care provided during inpatient acute admission. All services should review performance against the national stroke targets for reperfusion and stroke unit care.

The key messages of this national acute services audit are:

Federal and State governments
- Support and fund programs that improve community awareness of the F.A.S.T. signs of stroke to facilitate earlier presentation to hospital.

State health departments and clinical networks
- Actively use these data to support state-wide quality improvement initiatives that reduce variation in stroke care between services and the disparities between metro and regional/rural sites.
- Lead and/or support the development of statewide plans to monitor and reach national targets for reperfusion and certified stroke unit access.
- Ensure all dedicated stroke services have a stroke coordinator and include nursing and medical leadership (specialist stroke nurse and a consultant physician with primary responsibility for stroke).

Hospital services
Engage in continuous improvement activities that drive:
- timely access to reperfusion therapies to meet national targets.
- access to stroke unit care to meet the national targets.
- prioritising and addressing important aspects of allied health or nursing led care where improvements are needed such as swallow screening, management of incontinence, and information and education provision.
- provision of a comprehensive, individualised discharge care plan to all patients that they and their families have been involved in developing.

Site reports and supplementary information

Feedback to participants is an essential component of the National Stroke Audit program, considering the evidence that audit and feedback can influence and change clinical practice.[20] Each participating service receives a hospital stroke service level report highlighting their performance, so that informed decisions can be made to improve patient care and outcomes. In addition, all participating services have access to their own results at www.informme.org.au. They are also able to benchmark their 2023 performance against similar services across Australia for continuous quality improvement purposes.

In addition to this report, a supplementary document is available containing:
- List of auditors from each service
- Numerators and denominators used for analysis
- Exclusion criteria used for analysis
- Reliability record analysis
- Table of matched data analysis for "year effect"
- Details of questions from the Organisational Survey and Clinical Audit
- Further detail regarding the Framework and key performance indicators.

References

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