Stroke FOUNDATION

National Stroke Audit

Rehabilitation Services Report 2020

strokefoundation.org.au

About the Stroke Foundation

The 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 enhance recovery after 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 its commitment to promote the delivery of evidence-based stroke care. The National Stroke Audit provides longitudinal data on clinical performance. The National Stroke Audit first commenced in 2007 and each alternate year the Stroke Foundation switches focus between inpatient rehabilitation services and acute stroke services.

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Clinical governance and advice were provided by the Stroke Foundation's Clinical Council and the report was reviewed by the Stroke Foundation's Consumer Council.

Data analysis was undertaken by the Translational Public Health and Evaluation Division, Stroke and Ageing Research, School of Clinical Sciences at Monash Health, Monash University.

Data were collected using the Australian Stroke Data Tool (AuSDaT), an integrated, web-based data management system developed through a collaboration of programs and led by the Stroke Foundation and the Florey Institute for Neuroscience and Mental Health. AuSDaT was specifically produced as a consensus-based, fit-for-purpose tool for monitoring stroke care in Australia.

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Foreword

On behalf of the Stroke Foundation and our Clinical Council, I present the National Stroke Audit Rehabilitation Service Report. The National Stroke Audit – Rehabilitation Services 2020 provides an important insight into the care provided by inpatient stroke rehabilitation services across Australia.

The National Stroke Audit is essential to our efforts to enhance recovery and help Australians live well after stroke. One in four people globally will have a stroke in their lifetime and incidence of stroke among younger Australians is increasing. The good news is advancements in stroke treatment mean more Australians are surviving stroke. We now have an opportunity to increase the focus on rehabilitation in recovery. Co-ordinated rehabilitation is fundamental to long term recovery and living well after a stroke.

Rehabilitation provides survivors of stroke with a pathway to attaining independence and self-determination – these are tools survivors need to live well after stroke. Stroke attacks the human control centre – the brain – and it strikes in an instant, changing the lives of the survivor and their loved ones forever. With no time to prepare for the long, often challenging, and at times isolating journey of recovery ahead, the potential for a meaningful recovery from stroke is why multidisciplinary rehabilitation services are so important.

Recovery from stroke extends beyond the physical, however our current rehabilitation system is designed to focus on the physical aspects of recovery. Learning to walk and talk after a stroke are vitally important but those living with stroke often experience a range of cognitive and psychological challenges which, if left untreated, can impair their ability to actively engage with all aspects of their rehabilitation and recovery.

As with previous years, the 2020 National Stroke Audit Rehabilitation Service Report shows improvements have been made and I congratulate those teams whose strive year on year to improve outcomes for survivors of stroke.

Results of this year's Audit also provide insight into Australian stroke rehabilitation services and the health system more broadly within the shadows of the coronavirus (COVID-19) pandemic.

Survivors of stroke are among our communities most vulnerable to the virus due to their age, underlying medical conditions and the impact of suffering an acute brain injury. Those living with stroke were also impacted by the diversion of resources within our health system to manage the pandemic. Many of those who experienced stroke in this period experienced early discharge and found themselves self-isolating at home with minimal access to therapy as stroke units were dismantled and rehabilitation services suspended. In the midst of this disruption, the expansion of telehealth was embraced as clinicians and researchers collaborated to deliver innovative pathways to rehabilitation services.

With this backdrop the Audit Report demonstrates the potential impact of these changes and priorities for government, health care administrators and clinicians to address as we transition from emergency pandemic response to a "living with COVID-19" world with all its social, health and economic impacts.

As a community, and particularly in responding to COVID-19, we have recognised the importance of mental health to overall wellbeing. This recognition must be extended more broadly across the health system to support those living with chronic disease including stroke. Year after year we see mental health support overlooked in the Audit Report results.

We must also do more to empower those impacted by stroke and their families to stay well and be able to participate in the community after stroke.

Four in 10 survivors of stroke will go on to experience another stroke within 10 years. We must improve patient information and education and extend this to family and carers. This encompasses lifestyle advice for secondary prevention, general information about stroke and recovery – including continence management, returning to work, driving and other aspects important to community participation.

In the wake of the COVID-19 emergency response, we have an opportunity to learn from this experience, including the innovations in care delivery, expansion of telehealth and increased support for mental health to deliver a more equitable and sustainable health system. This means recognising the importance of specialised stroke services, striving for a better-connected health system, and utilising telehealth in the rehabilitation to remove geographical barriers to care delivery. It also means ensuring our hard-working health professionals have the support, resources, and education they need to deliver world-class stroke care in line with best practice clinical guidelines.

2020 has been an unprecedented year but despite the challenges of a pandemic, we saw continued support and participation in the National Stroke Audit. Thank you to the many health professionals and health services for their time and for their commitment to improving stroke rehabilitation services in Australia. This is your report and I know you will use it to continue striving to prevent stroke, save lives and enhance recovery.

Sharon McGowan
Chief Executive Officer
Stroke Foundation

Executive Summary

Rehabilitation of people with a stroke enables survivors to live well. It helps those living with stroke achieve the highest level of optimal wellbeing across all areas of life including physical, intellectual, mental, and social.

The Stroke Foundation's 2020 National Stroke Audit – Rehabilitation Services Report is the 7th national report the Stroke Foundation has produced on the status of inpatient stroke rehabilitation services. It is part of Stroke Foundation's broader National Audit program promoting evidence-based stroke care. The National Stroke Audit first commenced in 2007 and each alternate year the Stroke Foundation switches focus between acute stroke services and inpatient rehabilitation services.

It provides a robust and representative assessment of inpatient rehabilitation services in Australia. The report aims to highlight areas where the system is working well, and where improvements or changes are needed. It is important to note the coronavirus pandemic (COVID-19) has impacted rehabilitation services.

COVID-19 has resulted in significant changes within our hospital system. Dedicated stroke resources have been re-distributed within health services, patients have been discharged home early, and some on-site rehabilitation services were suspended. As a result, there has been a decline in participation in quality improvement activities including the National Stroke Audit. It is also important to note there has been an increase in rehabilitation services being provided via telehealth.

Results of the 2020 National Stroke Audit – Rehabilitation Services Report provide an important snapshot in time. It monitors the performance of stroke care against evidence-based Clinical Guidelines for Stroke Management and the National Rehabilitation Stroke Services Framework 2013. This is the first time rehabilitation services have been audited against the updated stroke guidelines (released in 2017).

This year the survey of resources provides an indicator of COVID-19's impact on stroke and broader rehabilitation services.

It reflects challenges and lessons from the pandemic, as well as opportunities to strengthen services as we transition from a COVID-19 emergency response to ongoing management and recovery. It will help guide government, healthcare administrators, and clinicians into the future.

The National Stroke Rehabilitation Audit collected data in two components:

1. *Organisational Survey* – Survey of resources, processes and infrastructure assessed against the National Rehabilitation Services Framework completed by 111 stroke rehabilitation services.

2. *Clinical Audit* – Retrospective audit of 2842 case notes (from 90 rehabilitation services) assessed against the Clinical Guidelines for Stroke Management.

These results are highly representative of rehabilitation across Australia with 96 public services and 15 private services completing the *Organisational Survey.* Among these, 83 public services and nine private services participated in the *Clinical Audit.*

Rehabilitation services that participated in the audit reported 9,373 patient admissions for stroke in the previous 12 months and the retrospective audit accounting for 30% of all inpatient stroke admissions (2019, pre-COVID). Findings of the Audit indicate there has been small improvements across most areas of care compared to the previous audit (2017 stroke admissions) some significant gaps remain.

Mental health diagnosis and consequent support for both patient and families continue to be overlooked in the rehabilitation journey. A stroke attacks the brain, and its impact extends well beyond the physical. Mood changes, such as anxiety and depression, frequently occurs following a stroke.

Emotional, personality and behavioural changes are also common, and can cause problems with community participation and relationships with family and carers can suffer. Mood impairment is common during rehabilitation and has been found to negatively affect patient outcomes. The importance of mental health to overall wellbeing and recovery from stroke has been recognised as crucial for more than a decade, it has been included as a recommendation in response to the Audit Report for many years.

Further, the Audit Report again highlights inconsistencies in care provided to those impacted by stroke. All Australians need and deserve access to best-practice care, recovery from stroke should not be determined by where you live and access to specialist services. Australia's response to the COVID-19 pandemic and the expansion to telehealth into allied and mental health services demonstrates geography no longer needs to be, nor is an acceptable barrier to rehabilitation services.

Supporting our clinicians to help Australians live well after stroke

The National Rehabilitation Services Framework helps guide service planning, and monitoring, to support the delivery of best practice care in all rehabilitation services. This includes ensuring all staff within rehabilitation services receive ongoing, stroke specific education and training. As well as the use of evidence-based guidelines to encourage staff to routinely use clinical guidelines to inform and involve patients in their goal setting, whilst developing written discharge care plans, and systems for the follow up of patients and support for carers.

Areas highlighted in the Organisational Survey representing resources within rehabilitation hospitals reported in first quarter 2020 were:

- 30% of rehabilitation services reported no access to a program of continuing education for staff relating to develop their knowledge around the latest evidence-based stroke care recommendations or basing patient care on current research in the living guidelines. Likewise, 34% of services confirmed they did not routinely use evidence-based guidelines to inform patient care.
- Only 16 rehabilitation services (14%) reported providing care in a specified, geographically defined stroke unit. On the day of completion of the organisational survey, 640 patients with stroke were admitted to an inpatient rehabilitation service. Among these, 134 patients (21%) were being cared for in a dedicated stroke rehabilitation unit, an increase from 12% in 2018.
- One third of services (32%) reported no access to clinical or neuropsychologists in stroke rehabilitation. This is problematic when the Audit Report shows 44% of patients had a mood impairment present and less than 50% of these patients were assessed by a psychologist.
- The amount of active rehabilitation being provided was suboptimal with 75% of services not providing the recommended amount of therapy (three or more hours of supervised therapy per day at least five days per week).
- Only 50% of services were found to have standardised early assessment for rehabilitation and 37% have effective links with acute stroke service providers for acute/rehab handover. Furthermore, less than half of these services (41%) have a comprehensive system for transfer of care, follow up and re-entry (if required) into hospital-based rehabilitation.

Best-practice care empowering Australians to live well after stroke

The Clinical Audit is a mechanism to contrast documented care provided in hospitals to evidence-based recommendations detailed in the national clinical guidelines. Data for the Clinical Audit represent the care provided to patients admitted to the participating inpatient rehabilitation services between 1 January – 31 December 2019 (pre-COVID).

Areas highlighted were:

- 92% of patients were involved in setting their goals with the rehabilitation team and 89% of patients had a meeting with the team to discuss the management of their care. Such collaboration should be the cornerstone of all rehabilitation care as we know that the impact of stroke can be substantial and far-reaching.
- Mood assessment has consistently improved from 34% in the 2012 audit to 56% in 2018 to 63% in the 2020 audit. However, of those with mood impairment present in the 2020 audit, only 49% had input from a psychologist indicating significant gaps still remain in ensuring specialist management is provided. Further efforts are required to improve management of mood.
- Post-stroke urinary incontinence is also common (40%), yet only 57% of those who have this uncomfortable issue had a documented management plan to aid with recovery. This is an increase since the last audit (52% with a plan in 2018) and further efforts are required to improve management of continence.
- One-in-five (22%) patients were discharged home without a collaboratively developed plan for their ongoing care.
- Despite claims that 97% of services provide tailored information to patients and their family/carers, only 63% of patients received tailored information regarding stroke rehabilitation and recovery based on the clinical audit. This gap may be due to a lack of documentation or poor internal recording processes. Services are encouraged to explore reasons why and implement changes to these processes.
- Information and support regarding intimate relationships after stroke continues to be poor with only 24% of people offered written information about the impact of stroke on intimate relationships or being provided with the opportunity to speak to someone about their needs.
- 67% of those who worked prior to their stroke were provided with information and advice on return to work if they wanted to resume employment, an increase from 59% in 2018.
- Preventing further strokes is essential. In this audit, medication to thin the blood remained excellent (94%), cholesterol lowering medication had risen from 77% in 2016 to 87% in 2020. However, medication to lower blood pressure remained unchanged (79%), leaving one in five patients at risk of a future stroke from this important modifiable risk factor.
- The empowerment of stroke survivors to make lifestyle changes has increased from 42% in 2014 to 65% in 2020, although this still means one in every three people are not provided this essential advice to assist them to reduce their future stroke risks.
- Carers play a critical role providing physical, emotional, recreational, and financial support after stroke. Carers are being assisted in the transition home with 84% of carers provided with relevant training, and 76% of carers have a documented assessment of their needs after hospital discharge.

Conclusion

The aim of effective rehabilitation is to enable survivors to live a life of their choosing whether it be through education, returning to work, an active retirement, family, or community life.

Effective stroke rehabilitation empowers the person with stroke to live their best life after stroke and a comprehensive discharge process is essential to enhance their success.

Overall, the data in this Audit Report outlines small gains in several areas when contrasted to prior audits. However, with a significant proportion of the Australian population impacted by stroke, and the cost of poor outcomes, there are great benefits to be achieved by the delivery of appropriate interventions. Reinforced is the value of regularly monitoring clinical practice and an ongoing commitment to improve the overall quality of care provided. It is clear more effort needs to be applied by all if we are going to adequately serve the needs of all Australians living with stroke.

Recommendations

- **Further focus to ensure the mental health needs of all patients is assessed and appropriate support is provided during and after inpatient rehabilitation.**
- **Services with larger stroke volumes (that have adequate bed capacity) need to ensure patients are cared for on the one ward with a dedicated stroke/neurological team.**
- **Improve access to adequately resourced stroke early supported discharge services.**
- **Ensure the patient receives recommended amount of practice to maximise recovery during inpatient rehabilitation. Sites could also consider additional resources to have physical therapy available seven days a week.**
- **Improve provision of information and education to patients and their family/carers. This includes lifestyle advice for secondary prevention, general information about stroke and recovery, information on returning to work (for those of working age), and especially on intimacy after stroke.**
- **Ensure all staff within rehabilitation services receive ongoing, stroke-specific education and training. Staff should be encouraged to routinely use clinical guidelines in the delivery of best-practice care.**

At a glance

111
Stroke Rehabilitation services

9,373
Patient admissions

2,842
Case notes

Inpatient stroke rehabilitation services

4 services achieved all
10 elements

of the National Rehabilitation Services Framework BUT

1 in 5 services
met less than half the **Framework elements**

especially services in **remote areas** that have **reduced resources**

Discharge for life in the community

64% of patients referred for further rehabilitation and have **ongoing disabilities**

78% of patients have a **care plan** developed with the team and patient for **discharge into the community BUT**

Only **63%** receive **information on stroke, lifestyle management, secondary prevention and recovery**

Even fewer **(1 in 5)** receive any **information about intimacy after stroke**

Mood

44% of patients **experienced mood problems BUT**

Only **63%** of patients received an assessment for **depression and anxiety**

31% or one-third of services had **no access to clinical or neuropsychologists**

Secondary prevention

94%

of patients discharged on **antithrombotic medication** (ischaemic)

87%

of patients discharged on **lipid lowering medication** (ischaemic)

79%

of patients discharged on **blood pressure lowering medication** BUT

35%

had no **education** about **behaviour change** and **modifiable risk factors** to **prevent another stroke**

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.[1] In 2017 there were almost 56,000 new and recurrent strokes – that is one stroke every nine minutes.[2] More than 475,000 people are living with the effects of stroke. This is predicted to increase to one million by 2050.[3]

Stroke is a leading cause of disability in Australia with around 25% of stroke survivors of working age (under the age of 65).[4] In a survey of Australian stroke survivors and their carer's, of the survivors who were working prior to their stroke, almost three quarters (71%) reported a change in their work activities since their stroke.[5] Sixty-five percent of stroke survivors suffer a disability that impedes their ability to carry out daily living activities unassisted.[3]

Secondary prevention is important with almost half of all stroke survivors experiencing another stroke within 10 years.[6] In 2015, stroke accounted for 2.5 percent of the total burden of disease in Australia and was the seventh leading specific cause of disease burden. The financial cost of stroke in Australia is estimated to be $5 billion each year.[7]

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 are an important tool that empowers clinicians in understanding the best evidence-based interventions to help people recover from stroke. The *Clinical Guidelines for Stroke Management*[8] present evidence-based recommendations for clinical stroke care and are approved by the National Health and Medical Research Council (NHMRC) and help to form the basis of the National Stroke Audit, determining what clinical care data should be collected.

Clinical guidelines are only useful when they are used effectively in clinical practice. The audit and feedback process are an important strategy to encourage change in line with what is known to be best practice.[9] The National Stroke Audit was designed by the Stroke Foundation to measure adherence to the best practice recommended in the *Clinical Guidelines for Stroke Management*. As well as monitoring stroke care at national and state levels, the National Stroke Audit promotes quality improvement by providing a report back to individual services. These individualised reports enable teams to compare their performance against aggregated averages, achievable benchmarks[10], and other stroke services of similar size. The National Stroke Audit commenced in 2007 and provides longitudinal data to track changes over time; allowing hospitals to understand where they have, and have not, improved between each National Stroke Audit.

1.2 The National Stroke Audit program

The National Stroke Audit - Rehabilitation Services comprises:

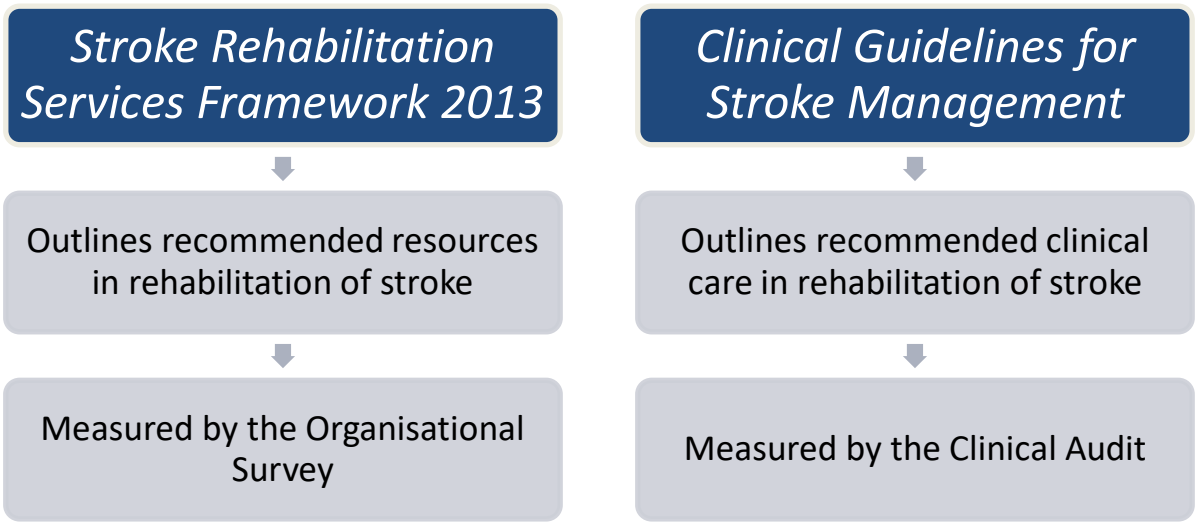
- An Organisational Survey of stroke rehabilitation services across Australia. The survey questions assess the resources available at each service to deliver evidence-based stroke care such as the availability of activity levels, treatment, goal setting and interdisciplinary staff. The Organisational Survey questions specifically reflect the *Stroke Rehabilitation Services Framework 2013*[11] (the Framework) which provides

national recommendations related to rehabilitation stroke elements of care.

- A Clinical Audit involving the retrospective review of up to 40 consecutive patients admitted to the participating inpatient rehabilitation services between 1 January – 31 December 2019. The Clinical Audit measures the delivery of, and adherence to, evidence-based processes of care such as timely assessment by clinicians, interdisciplinary care, secondary prevention, and discharge planning.

The basis of the Organisational Survey and Clinical Audit is represented in Figure 1.

Figure 1: Components of rehabilitation care reflected in this report



The National Stroke Audit - Rehabilitation Services is conducted biennially to provide standardised, cross-sectional data on clinical performance. The methodology for the audit is outlined in Appendix 1.

1.3 Structure of the report

For this report 'rehabilitation care' refers to services providing inpatient rehabilitation care for stroke patients from arrival to discharge from rehabilitation service, statistical discharge to a different ward/unit in the same hospital, or transfer to another inpatient facility.

Outline in this report are the resources and structures available at the participating rehabilitation services mapped to the Framework, as well as adherence to the *Clinical Guidelines for Stroke Management*.

- Chapter 2 includes details of the participating inpatient rehabilitation services.
- Chapter 3 includes the responses to the Organisational Survey, analysed at a hospital level.
- Chapter 4 provides results of the Clinical Audit, which reflects individual patient care.
- Chapter 5 includes changes in stroke care delivered over the three rehabilitation audit since 2016.
- Chapter 6 includes discussion and recommendations regarding the data from the National Stroke Audit – Rehabilitation Services 2020.

Chapter 2: Participating Inpatient Rehabilitation Services

The 111 services that completed the Organisational Survey reported a total of 9,373 admissions for patients requiring inpatient rehabilitation services for stroke in the previous year (2019).

The information provided in this report will help to guide areas for quality improvement activity and improve patient outcomes. Rehabilitation services are encouraged to assess their service's performance by comparing themselves to the national, state, common rurality, and annual admissions peer groups.

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.

These 5 classes of remoteness are:

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

The audit only used four classes of remoteness (Major Cities of Australia, Inner Regional Australia, Outer Regional Australia, and Remote Australia), as none of the participating services are classified as Very Remote Australia (refer to Appendix 1 for more information). Tables 1, 2, and 3 below show the characteristics of services participating in the 2020 audit.

Table 1: Number of stroke admissions per annum by rurality

	Australia (N=111)	Rurality			
		Major Cities (N=62)	Inner Regional (N=35)	Outer Regional (N=12)	Remote (N=2)
Total number of stroke admissions per annum reported in survey	9,373	6,546	2,213	589	25

Table 2: Number of stroke admissions per annum by volume

	Australia (N=111)	Reported annual stroke admissions		
		≤29 (N=23)	30 - 79 (N=53)	≥80 (N=35)
Total number of stroke admissions per annum reported in survey	9,373	443	2,857	6,073

The number of patients with stroke admitted per year to the 111 rehabilitation services in 2020 ranged from 33 to 94, with just under half the services (48%) reporting between 30 and 79 stroke rehabilitation admissions in 2019. Services that reported 29 or fewer annual inpatient stroke rehabilitation admissions (N=23) accounted for 443 (5%) of all reported admissions. Rehabilitation services admitting 80 or more patients with stroke per year (N=35) admitted 6,073 (65% of all patients). The 90 services participating in the Clinical

Audit accounted for a total of 7,865 admissions or 83% of the reported caseload for 2019 in participating inpatient rehabilitation services.

Table 3: Participating rehabilitation services by location, rurality and setting, and number of rehabilitation beds and annual stroke admissions

	Median number of beds (Q1: Q3)	Median number of annual stroke admissions (Q1: Q3)	Reported annual stroke admissions		
			≤29	30-79	≥80
Location					
Australia (N=111)	**24 (16, 36)**	**60 (33, 94)**	**23 (21%)**	**53 (48%)**	**35 (32%)**
NSW (N=36)	21 (17, 36)	56 (31, 74)	8	21	7
NT (N=2)	Min 10, Max 24	Min 15, Max 59	1	1	0
QLD (N=22)	21 (16, 25)	64 (50, 93)	1	14	7
SA (N=8)	48 (6, 62)	63 (30, 180)	2	3	3
TAS (N=4)	22 (15, 35)	31 (14, 53)	2	2	0
VIC (N=28)	30 (18, 32)	58 (31, 120)	7	10	11
WA (N=11)	30 (15, 52)	115 (51, 149)	2	2	7
Rurality					
Major Cities (N=62)	32 (24, 52)	69 (48, 122)	9	25	28
Inner Regional (N=35)	17 (14, 21)	48 (30, 70)	7	23	5
Outer Regional (N=12)	13 (6, 22)	50 (16, 69)	5	5	2
Remote (N=2)	Min 0, Max 10	Min 10, Max 15	2	0	0
Setting					
Public (N=96)	21 (16, 32)	62 (37, 103)	18	44	34
Private (N=15)	37 (30, 64)	39 (25, 62)	5	9	1

Q1: 1st quartile; Q3: 3rd quartile

2.2. Dedicated Stroke Rehabilitation Units beds

Sixteen rehabilitation services (14%) reported having co-located stroke beds within a geographically defined unit. Stroke units that have been shown to deliver highly effective stroke care share several characteristics, including:

- Location in a geographically discrete unit;
- Co-located beds within a geographically defined ward. Beds must be those set aside for the rehabilitation of stroke patients only. Beds don't necessarily need to be located within the same bay/room but do need to be located within one ward;
- A dedicated multidisciplinary team (MDT) with an interest in stroke or rehabilitation;
- Staff with a special interest and expertise 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); and
- Active encouragement of stroke survivors and their carers/families to be involved in the rehabilitation process.[8]

A total of 212 dedicated stroke rehabilitation unit beds were reported at the 16 services with dedicated stroke rehabilitation units (median: 12; Q1: 6; Q3; 18). On the day of completion of the Organisational Survey, 640 patients with stroke were admitted to an inpatient rehabilitation service. Among these, 134 patients (21%) were being cared for on a dedicated stroke rehabilitation unit, an increase from 12% in 2018.

Chapter 3: Organisational Survey Results

The capacity to plan, deliver and evaluate high quality stroke rehabilitation services is essential for improvement of healthcare delivery and patient outcomes. The aim of the Framework is to improve the quality of Australian stroke rehabilitation services by outlining the recommended structures, networks, settings, and criteria for monitoring. The Framework comprises 10 recommended elements that all rehabilitation services should be actively ensuring they meet.

This section of the report describes the current resources available in Australia to support best practice stroke care and each services adherence to the Framework. Performance by location is shown in Table 4 below.

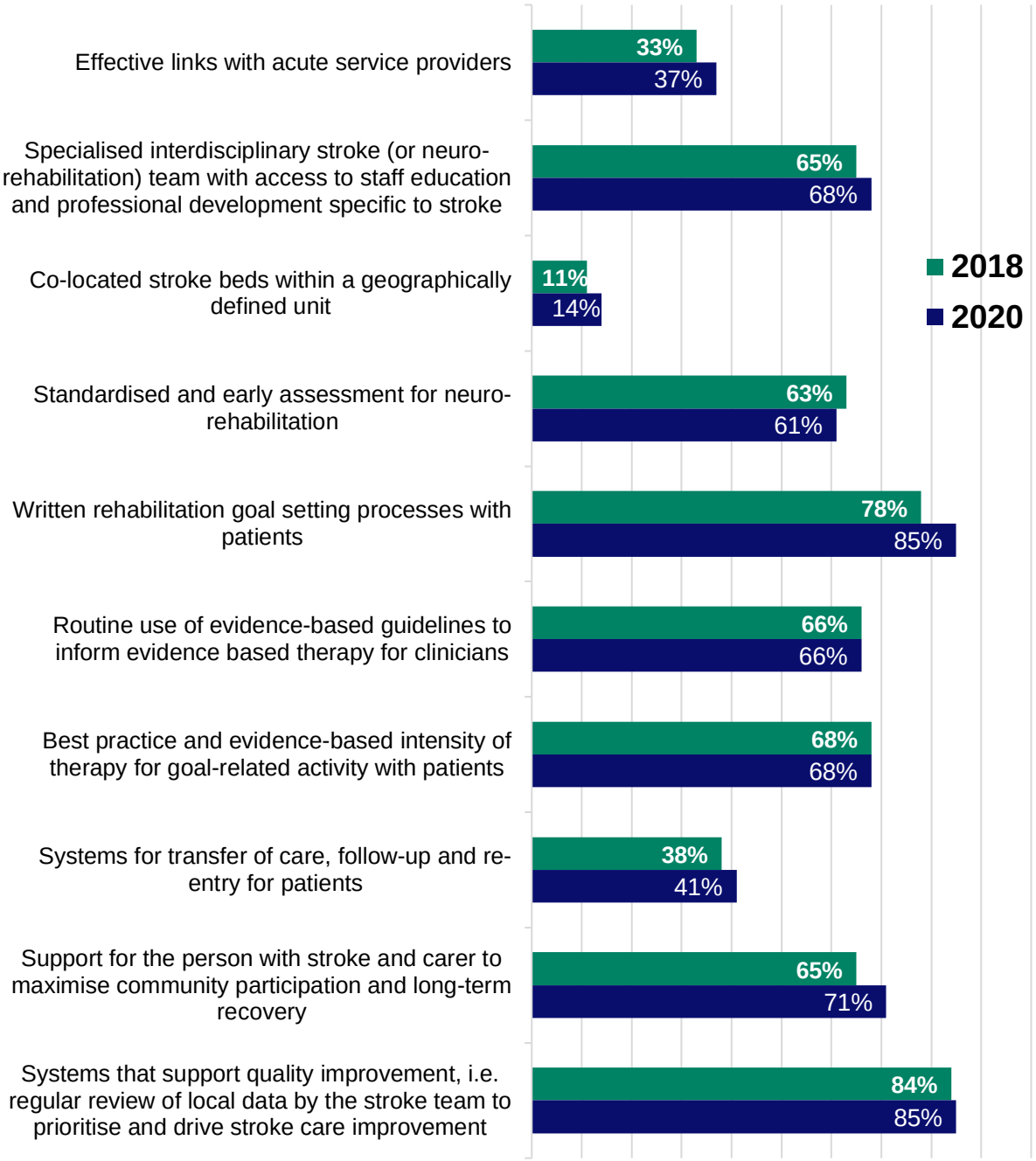
3.1 Individual elements of the Framework

Table 4. Adherence to the individual elements of the Framework by location

Elements of the Framework	Australia (N=111)	NSW (N=36)	NT (N=2)	QLD (N=22)	SA (N=8)	TAS (N=4)	VIC (N=28)	WA (N=11)
Effective links with acute service providers	37%	19%	50%	73%	50%	50%	29%	27%
Specialised stroke (or neuro-rehabilitation) team	68%	61%	50%	73%	38%	50%	79%	82%
Co-located stroke beds	14%	6%	0%	9%	25%	0%	11%	64%
Standardised and early assessment	61%	61%	50%	64%	75%	0%	71%	45%
Written rehabilitation goal setting processes	85%	92%	50%	73%	100%	100%	79%	91%
Routine use of evidence-based guidelines	66%	69%	100%	55%	88%	50%	64%	64%
Best practice and evidence-based intensity of therapy	68%	67%	0%	73%	100%	75%	61%	64%
Systems for transfer of care, follow-up and re-entry for patients	41%	39%	0%	36%	75%	0%	43%	55%
Support for community participation and long-term recovery	71%	72%	0%	68%	100%	100%	64%	73%
Systems that support quality improvement	85%	81%	50%	86%	88%	50%	93%	91%

Figure 2 below shows Australia's aggregated adherence to the 10 individual elements of the Framework in the 2018 and 2020 National Stroke Audit – Rehabilitation Services.

Figure 2. Australia's aggregated adherence to the 10 elements of the Framework over two audit cycles.



3.2 Overall adherence to the Framework

Among the 111 rehabilitation services completing the Organisational Survey, the median number of Framework elements met nationally were six. Four services (4%) from different states were found to meet all 10 elements. The largest proportion of services (22 services, 20%) met eight elements. It is important to note that 24 services (22%) met less than half the Framework elements (≤ 4 elements) in 2020. A further breakdown by rurality and volume is shown in Table 5 and 6.

Table 5: Medium number of Framework elements by rurality

	Australia (N=111)	Rurality			
		Major Cities (N=62)	Inner Regional (N=35)	Outer Regional (N=12)	Remote (N=2)
Median number of Framework elements met (Q1, Q3)	6 (4, 8)	7 (4, 8)	6 (3, 7)	6 (5, 7)	2 (1, 3)

Q1: 1st quartile; Q3: 3rd quartile

Table 6: Median number of Framework elements by volume

	Australia (N=111)	Reported annual stroke admissions		
		≤29 (N=23)	30 - 79 (N=53)	≥80 (N=35)
Median number of Framework elements met (Q1, Q3)	6 (4, 8)	5 (3, 7)	6 (4, 7)	8 (5, 9)

Q1: 1st quartile; Q3: 3rd quartile

The median number of elements met increased slightly for:

- Rehabilitation services with a dedicated stroke unit (nine elements met), and
- Services with a larger volume of patients with stroke admitted (eight elements met).

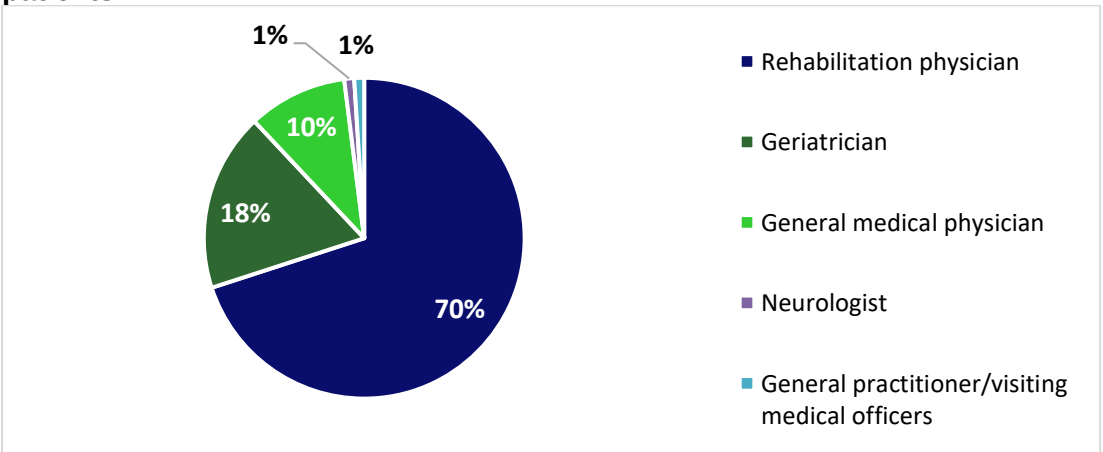
3.3 Stroke rehabilitation management

An important component of rehabilitation is a specialised interdisciplinary team of health professionals that provides a coordinated program and includes individual assessment, treatment, regular review, discharge planning and follow-up. The rehabilitation team may include many disciplines combining and coordinating the use of medical, nursing, and allied health skills, along with social, educational, and vocational services. The expansion of telehealth to deliver a more sustainable health system has led to the utilising of telehealth in rehabilitation to remove geographical barriers to care delivery. The onsite use of telehealth to inform clinical decision making within the last six months has increased nationwide from 38% in 2018 to 56% in 2020.

Results

For 94 rehabilitation services (85%), the medical leadership for stroke were formally recognised. Responsibility for management mostly fell to rehabilitation physician (Figure 3).

Figure 3. Medical leader responsible for the management of stroke rehabilitation patients.



Allied health staff were well represented in the composition of specialised interdisciplinary teams across Australia, with 100% of rehabilitation services reporting access to physiotherapists (PTs), occupational therapists (OTs) and speech pathologists; 99% having a dietitian and allied health assistants, and 97% having access to a social worker. The lowest number of services provided access to recreational therapists (13%) and diversional therapists (15%).

Clinical psychologists were present at 62 services (56%) and 51 services had access to a neuropsychologist (46%) with 35 services having neither a clinical nor a neuropsychologist actively involved in the management of stroke patients. Therefore, nearly one third of participating services (32%) do not have access to psychological services.

3.3.1 Team communication

Regular communication amongst the interdisciplinary team is vital to address the various issues that may arise in a timely manner. Case conferences and team meetings facilitate coordinated communication. Respondents were asked to report the frequency of case conference meetings.

Results

Regular team meetings (case conferences) occurred at 108 rehabilitation services (97%). Of these, 66/108 (61%) met four times per month (once per week), 40/108 (37%) met five or more times per month, and 2/108 only met one or two times per month.

Overall, 63 (57%) services reported having a dedicated person liaising between acute and rehabilitation services, with 50 services meeting with acute service at least once per week.

3.3.2 Professional development

Provision of targeted education and collaborative involvement in data collection and quality improvement can facilitate and embed a culture of evidence-based practice. Access to regular stroke-specific education is a core component of organised stroke care.

Results

A total of 78 rehabilitation services (70%) reported access to a program of continuing education for staff relating to stroke management. There was variability across states, ranging from 50% to 82%, and it appears that staff in larger services are more likely to have opportunities for professional development (89%) as shown in Table 7 below.

Table 7. Staff development

	Location	**Reported annual stroke admissions**		
	Australia (N=111)	***≤29 (N=23)***	***30-79 (N=53)***	***≥80 (N=35)***
Rehabilitation services with access to a program of continuing education for staff relating to stroke management	70%	61%	62%	89%

3.3.3 Assessment for rehabilitation

Access to rehabilitation, and the case mix of rehabilitation inpatients, is dependent on the assessment for suitability and acceptance for rehabilitation. Consideration for further rehabilitation needs is done in the acute setting but may involve rehabilitation team members. Respondents were asked to describe how patients were assessed for admission to the rehabilitation service.

Results
Suitability and acceptance for rehabilitation were commonly assessed by the joint acute and rehabilitation team members (67%). A total of 101 services (91%) reported using a standardised process for assessing suitability for rehabilitation admission. Routinely, assessment usually occurred within the first week of acute admission (70%) and 50% occurred within the first 3-4 days of admission.

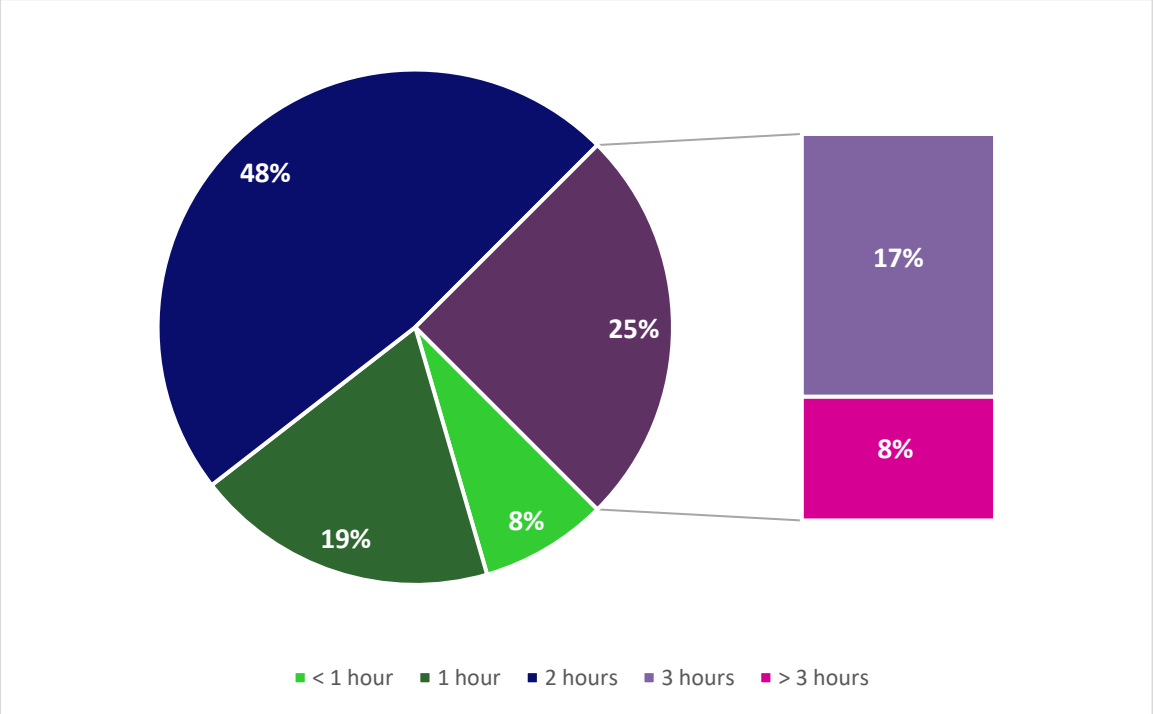
3.4 Intensity of therapy

The amount and intensity of rehabilitation provided to stroke survivors greatly affects their outcomes. The recommendation is that patients be provided as much therapy as possible with a minimum of three hours of scheduled practice, involving at least two hours of actual active practice each weekday for physical therapy and as much therapy for dysphagia or communication difficulties as can be tolerated. Group therapy is suggested as one strategy to increase amount of practice.

The routine provision of exercise to improve cardiorespiratory fitness (e.g. exercises that specifically increase heart rate to achieve greater cardiorespiratory fitness) is provided at 82 services (74%).

Results
Most services (73%) reported providing on average two or more hours of active therapy per day (at least five times per week), with 25% of services providing three or more hours (Figure 4). Group circuit classes were provided by 87 services (78%). Therapists (physiotherapists or occupational therapists) are available to provide active clinical care 5 days at 73% of services, and 28 services (25%) also have these staff available on at least one day over the weekend.

Figure 4. Average time that patients with motor impairments undertake active physical therapy (Physiotherapy or Occupational Therapy) per day.



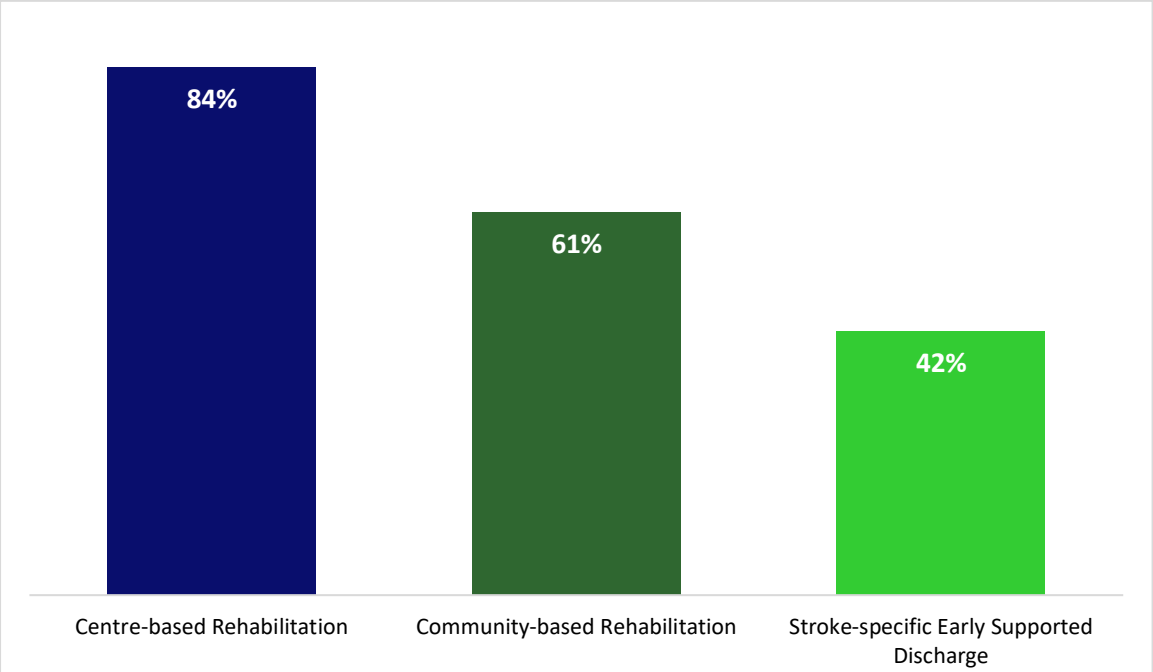
The average number of minutes of active physical therapy provided per patient per week were 600 minutes. This included total therapy delivered by any mechanism such as one-on-one therapy, group circuit classes, allied health assistance, etc. Putting this total into context, 600 minutes equates to 10 hours of active physical therapy per week, for example, 2 hours per day if provided 5 days per week or 1.4 hours per day if provided 7 days per week.

Provision of the right amount of physical activity were reported as being limited by patient factors (86%) e.g. capacity, dependence, co-morbidities; staff factors (72%) e.g. time, skill, experience; and time spent on non-patient contact activity (59%), including time spent in information exchange with other clinicians, is also a limiting factor.

3.5 Community rehabilitation services

Centre-based rehabilitation (e.g. outpatient rehabilitation or day hospital) were provided at 93 services, and community-based rehabilitation provided in the home were accessible at 68 services. Most services had a minimum of two community further rehabilitation services available (Figure 5).

Figure 5. Community rehabilitation services available for further rehabilitation



There was a significant increase in reported stroke-specific Early Supported Discharge (ESD) services, with 42% of services providing this in 2020 compared to 17% in 2016. This may in part be due to ‘transitional care programs’ being labelled as ESD by auditors.

Chapter 4: Clinical Audit Results

The results of the clinical audit relate to the uptake of the *Clinical Guidelines for Stroke Management*[8] in rehabilitation services that participated in the clinical component of the audit (Table 8). There are seven stroke rehabilitation indicators which are key performance indicators used to measure quality of care and demonstrate the effectiveness of stroke rehabilitation services.

Table 8: Participating clinical audit services by location, rurality and setting

	Reported annual stroke admissions		
	≤29	**30-79**	**≥80**
Australia (N=90)	**14**	**48**	**28**
NSW (N=31)	4	20	7
NT (N=2)	1	1	0
QLD (N=16)	0	11	5
SA (N=8)	2	3	3
TAS (N=3)	1	2	0
VIC (N=23)	5	9	9
WA (N=7)	1	2	4
Rurality			
Major Cities (N=49)	3	24	22
Inner Regional (N=30)	6	19	5
Outer Regional (N=10)	4	5	1
Remote (N=1)	1	0	0
Setting			
Public (N=81)	13	41	27
Private (N=9)	1	7	1

Key performance indicators: comparison of 2018 to 2020 audit data showed improved performance in three main areas of rehabilitation care:

- Patient's mood assessed during admission (56% to 63%)
- Patient received education about behaviour change for modifiable risk factors prior to discharge (60% to 65%)
- Carer received relevant carer training (74% to 84%)

Further information on Australian performance in the seven key indicators from 2016 to 2020 is presented in Chapter 5.

4.1 Characteristics of patients from the clinical audit

A total of 2,842 patient case notes were audited, this is 29% of the total number of episodes reported in The AROC Annual Report: the state of rehabilitation in Australia in 2019 (9,870 AROC episodes[14]). Most clinical audit patients were managed in major city rehabilitation services: 1,689 cases in major cities (59%) compared with 864 from inner regional (30%) and 273 from outer regional (10%) locations (Table 9). Sixteen cases were audited by the one service in a remote location and these cases have been included in the outer regional cohort.

Demographics in this audit (median age 75 years, male 57%) were slightly different to those reported by AROC (AROC median age 73.3 year, male 55.1%).

Table 9. Patient demographics

Patient demographics	Australia (N=2,842)	Major Cities (N=1,689)	Inner Regional (N=864)	Outer Regional (N=273)	Remote (N=16)
Age - years (median, Q1, Q3)	75 years (65, 83)	76 years (65, 84)	75 years (66, 83)	69 years (58, 78)	63 years (53, 74)
Sex – male	57%	54%	59%	62%	44%
Patient identifying as Aboriginal and/or Torres Strait Islander background	4%	2%	3%	15%	69%
Patient requiring interpreter	7%	10%	2%	8%	31%
Stroke type					
Ischaemic stroke	73%	74%	72%	69%	81%
Haemorrhagic	17%	18%	15%	16%	19%
Undetermined stroke type	6%	4%	9%	8%	0%

4.2 Specialist inpatient rehabilitation

The majority of the audited cases were managed in general rehabilitation wards (68%). Less than one-fifth of the cases audited (17%) were treated in either a specialist stroke or neuro-rehabilitation unit (Table 10). The benefits of stroke unit care have been attributed to the expertise of staff (particularly nursing staff) due to greater experience and specific interest in stroke rehabilitation. Three trials included in the Cochrane review indicate that stroke dedicated rehabilitation units may reduce death and disability compared to general/mixed rehabilitation services.[15] However, these trials are all more than 20 years old and numbers are small so no firm conclusions can be made.

Table 10. The ward patients were treated on during inpatient rehabilitation

Location	*Australia (N=2,842)*
Dedicated stroke rehabilitation unit	**8%**
Neuro-rehabilitation unit	**9%**
Combined acute/rehabilitation unit	**15%**
Mixed rehabilitation ward	**68%**

4.3 Patient assessment

Respondents were asked to provide the dates of assessment by members of the interdisciplinary team for each audited case. Eligibility for an assessment by allied health was determined from the medical record. Reporting of assessment rates for dietitians and psychologists considered the presence of nutrition complications and mood impairment, respectively.

Results

Most members of the MDT assessed the majority of patients at some point during their admission (Table 11). Some patients were not seen by certain allied health disciplines because the particular therapist was not on staff.

This was problematic for patients with mood impairment where clinical psychology was not available. For patients where a mood impairment was reported, less than 49% were assessed by a psychologist and, in 26% of cases, there were no psychologist or neuropsychologist on staff as reported in the Organisational Survey.

Table 11. Multidisciplinary Team assessment

	Eligible for assessment N	Received assessment n (%)
Physiotherapy	2,819	2,808 (100%)
Occupational therapy	2,831	2,821 (100%)
Speech pathology	2,388	2,307 (97%)
Social work	2,530	2,255 (89%)
Dietetics	841*	783 (93%)
Psychology	635†	341 (54%)

*Known N includes patients with nutrition complications identified on admission
†Known N includes patients with mood impairment identified on admission

4.4 Management of impairments

Participants were asked to audit impairments on admission to the inpatient rehabilitation service and the subsequent management of these impairments.

Results

The impairments found on admission and the use of therapy or management strategies varied (Table 12). Most patients had difficulties with activities of daily living (87%), were unable to walk (76%), or experienced an arm deficit (72%).

Table 12. Management of impairments (management by each discipline may overlap)

Impairment	Patients assessed N	Not documented n (%)	Impairment present n (%)*	Type of therapy	Therapy provided n (%)+
Physiotherapy management					
Difficulty walking independently	2,830	(<1%)	2,163 (76%)	Tailored, repetitive practice of walking	1,989 (92%)
				Cueing of cadence	902 (42%)
				Mechanically assisted gait	314 (15%)
				Joint position biofeedback	403 (19%)
				Other therapy	1,342 (62%)
Occupational Therapy management					
Difficulties with ADL	2,830	(<1%)	2,457 (87%)	Task specific practice	2,311 (94%)
				Trained use of appropriate aids	1,628 (66%)
				Other therapy	1,051 (43%)

Speech Pathology management					
Aphasia	2,766	(3%)	935 (34%)	Alternative means of communication	543 (58%)
				Phonological and semantic interventions	664 (71%)
				Constraint-induced language therapy	131 (14%)
				Supported conversation techniques	776 (83%)
				Delivery of therapy programs via computer	130 (14%)
				Group therapy	282 (30%)
				Other therapy	432 (46%)
Occupational Therapy and Physiotherapy management					
Neglect/ inattention	2,599	(9%)	706 (27%)	Visual scanning with sensory stimulation	508 (72%)
				Prism adaption	24 (3%)
				Eye patching	27 (4%)
				Simple cues	615 (87%)
				Mental imagery training	129 (18%)
				Other therapy	286 (41%)
Dietitian management					
Nutrition complication	2,724	(4%)	877 (32%)	Ongoing monitoring by dietitian	789 (90%)
				Nutritional supplementation	667 (76%)
				Alternative feeding	161 (18%)
Psychologist, Nurse and Medical management					
Mood impairment	1,734†	(3%)	765 (44%)	Antidepressants	413 (54%)
				Psychological interventions (e.g. cognitive-behavioural)	377 (49%)
				Other therapy	313 (41%)
Occupational Therapy and Physiotherapy management					
Upper limb difficulty	2,806	(1%)	2,028 (72%)	Constraint-induced movement therapy (in selected people)	232 (11%)
				Repetitive task-specific training	1,759 (87%)
				Mechanically assisted training	249 (12%)
				Other therapy	1,217 (60%)

ADL: Activities of daily living

*Known N includes all patients with assessment recorded (excludes not documented responses)

+N (denominator) is all patients with impairment present

†Known N includes only those who had their mood assessed

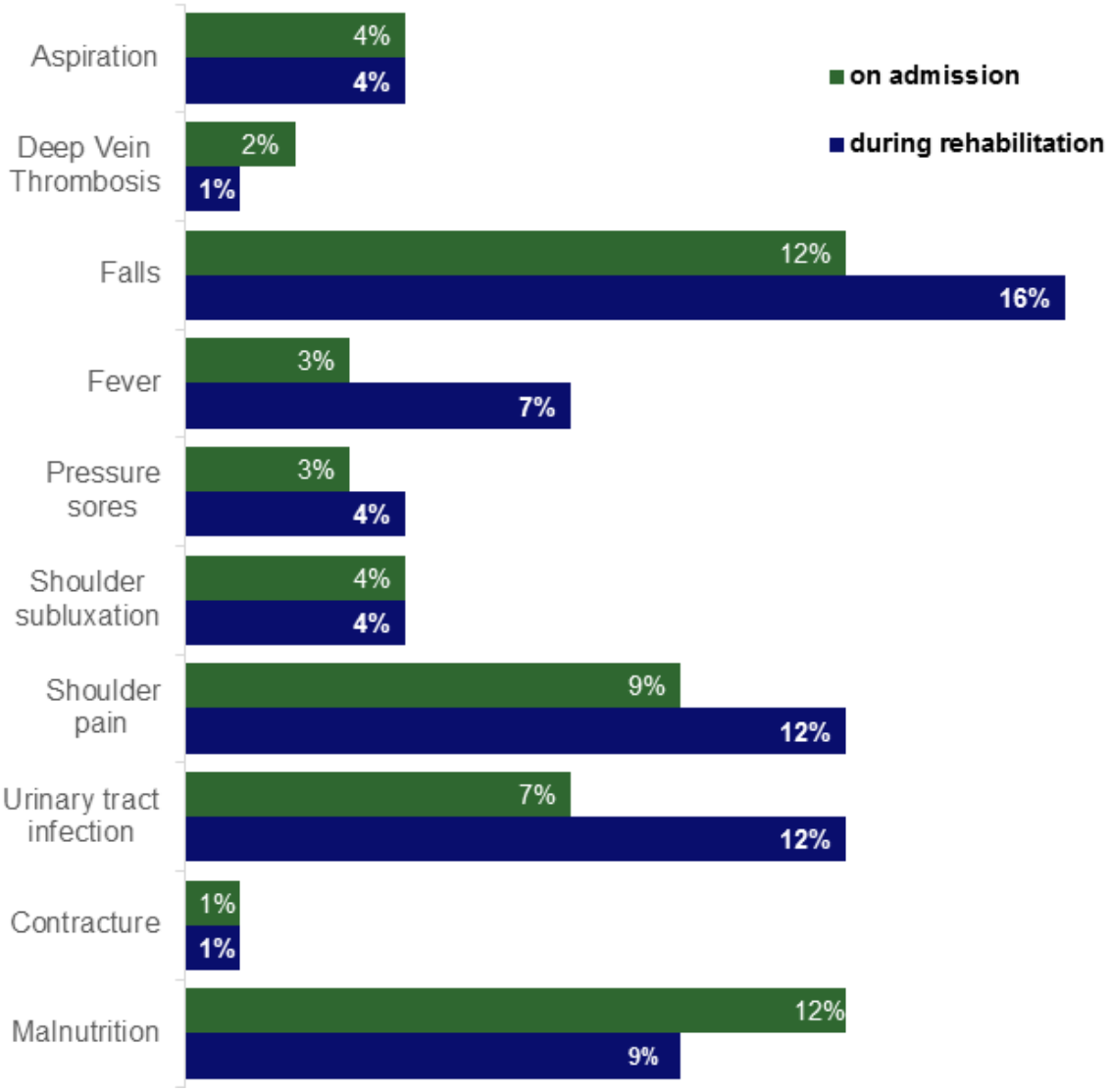
4.4.1. Incontinence

In all, 2,419 patients (85%) were assessed for urinary incontinence within 72 hours of their admission to rehabilitation; this percentage is unchanged over the last two audit cycles. In the 2020 audit, 1,121 patients (40% of those assessed) were incontinent of urine during their rehabilitation care. Of these patients who were incontinent, only 57% had a documented management plan, a slight improvement from 52% in 2018. Of those with identified urge incontinence, 65% had a documented prompted, scheduled, voiding regime. Of those with urinary retention, intermittent catheterisation was documented for 45%.

4.5 Complications during inpatient admission

Figure 6 depicts the proportion of patients with complications present on admission to rehabilitation and the proportion of those who developed complications during the rehabilitation stay. Of note, 441 (16%) of the audited patients had a fall and 354 (12%) developed a urinary tract infection (UTI) during the rehabilitation admission. Importantly, as mentioned previously, only 57% had a documented incontinence management plan. Atrial fibrillation was newly diagnosed in 97 patients (3%) during admission.

Figure 6. Complications on admission and during rehabilitation



4.6 Communication with patients

Communication with the patient is an integral component of stroke rehabilitation. It is important that the patient is provided the opportunity to discuss their desired goals for rehabilitation with the MDT. Goal setting is performed with the team to ensure that the goals are relevant to the stroke survivor and enables the team to evaluate the progress of the patient throughout their admission.

Respondents were asked to describe how goal setting was performed and to audit the practice related to goal setting from the clinical case notes.

Results

A high number of services (91% in 2020 Organisational Survey) had a formal process in place for developing and documenting goals with patients. The processes used for establishing goals are outlined in Table 13. The most common practice for goal setting was an interview with the patient by individual disciplines followed by a review at the MDT meeting (61%). All participating services reported patient involvement in setting goals.

In total, 2,426 patients (89%) without severe cognitive and/or communication difficulties had the opportunity to meet and discuss their management with the MDT. In addition, 118 family members met with the team in lieu of the patient to discuss their management, leaving 10% of patients with no documented evidence of discussing their management with the team.

From the clinical audit 2,492 patients without cognitive or severe communication difficulties (92%) were central to the process of setting their goals with input from the MDT and 123 patients with severe cognitive or communication difficulties had goals set by their family/carer with input from the MDT.

Table 13. Patient involvement in goal setting processes and methods that goals are usually established (combined Clinical Audit and Organisational Survey data)

Organisational Survey	**Australia (N=111 services)**
Patient-directed goals usually established	
Patient interviewed by each discipline only	**6 (5%)**
Goals discussed and reviewed at team meeting after patient meets with each discipline separately	**68 (61%)**
Patient and full multidisciplinary team set goals together	**32 (29%)**
Ad hoc (no consistent processes used)	**2 (2%)**
Other	**3 (3%)**
Clinical Audit	**Australia (N=2,842 case notes)**
Patients met with team to discuss management*	**2,426 (89%)**
Goals set with input from the team and patient*	**2,492 (92%)**
Patients/family received information regarding stroke	**1,782 (63%)**

*Patients without cognitive/communication difficulties

4.7 Secondary prevention

Four in 10 stroke survivors will go on to experience recurrent stroke within 10 years.[6] Hence, there are clear recommendations for the use of blood pressure–lowering, cholesterol-lowering and antiplatelet or anticoagulation pharmacotherapy to prevent further vascular events. All stroke survivors should also be assessed and educated on lifestyle risk factor modification.

Results

Antithrombotics were prescribed on discharge to 94% of ischaemic stroke patients, while under two-thirds of patients (65%) received education about risk factor modification prior to discharge (Table 14). Few patients had a documented contraindication to antithrombotics (2%) or antihypertensives (5%) on discharge.

Table 14. Secondary prevention measures on discharge

	Australia n (%)
On antithrombotics on discharge*† (N=2,032)	**1,916 (94%)**
On antihypertensives on discharge† (N=2,678)	**2,106 (79%)**
Patient received education about behaviour change for modifiable risk factors prior to discharge† (N=2,821)	**1,843 (65%)**
On lipid-lowering treatment at discharge*† (N=1,952)	**1,699 (87%)**

*Ischaemic strokes only

†Patients discharged alive, and with no contraindication

4.8 Preparation for discharge

A range of physical, psychosocial, social and financial consequences can create challenges for the stroke survivor's adjustment to life in the community following discharge.[16] 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. Carers (and patients) have often reported they are underprepared to support the stroke survivor living with stroke in the community.

Results

Of the 111 rehabilitation services that completed the Organisational Survey, 96% stated that patient education was routinely provided at their hospital and 73% of the services surveyed reported that they routinely provided a discharge care plan. The clinical audit confirmed that 78% of patients received a discharge care plan (Table 15) - this has decreased slightly since the 2018 audit (80%) - and consequently 22% of patients discharged miss out.

Table 15. Use of discharge-planning processes

	Australia n (%)
Discharge care plan provided (N=2,595)*	**2,012 (78%)**
GP sent discharge summary (N=2,636)*	**2,522 (96%)**
Contact provided for post-discharge programs (N=2,821)*†	**2,115 (75%)**

GP: general practitioner; *Known N is limited to eligible patients alive at discharge

†Contact provided to patient or family

4.9 Life after stroke for patient and family

The *Clinical Guidelines for Stroke Management* covers a range of topics including return to driving, return to work, leisure activities, sexuality, accessing support for the patient and their carer. The information provided to stroke survivors and carers regarding preparation for life in the community varied (Table 16 and 17). Nearly half of the patients were provided with information about self-management programs (48%) and driving (47%), but only 24% received information on sexuality (15% in 2018).

Table 16. Preparation of stroke survivor for life in the community

	Australia n (%)
Offered written information on sexuality* (N=2,821)	**689 (24%)**
Provided information about self-management programs* (N=2,821)	**1,368 (48%)**
Offered information about peer support* (N=2,821)	**1,208 (43%)**
Offered assistance to return to work if wanted to return to work† (N=265)	**177 (67%)**
Offered some assistance to return to driving if wanted to return to driving† (N=767)	**705 (92%)**

*Known N is limited to patients alive at discharge
†For those patients discharged to private residence.

In all, 84% of carers were provided training but only 55% were offered information about peer support resources for carers.

Table 17. Preparation of carer for life in the community

	Australia n (%)
Number of reported carers*	**1,045**
Carers provided with training†^ (N=712)	**596 (84%)**
Carers identified and discussed post-discharge needs†^ (N=712)	**538 (76%)**
Carers offered information about peer support† (N=723)	**399 (55%)**

*Total cohort
† Known N is limited to carers of stroke survivors who were discharged to private residence
^Excludes where carer declined

4.10 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 (Functional Independence Measure - FIM[14]). The FIM score were recorded on admission and discharge (Table 18).

Table 18. Distribution of Functional Independence Measure (FIM) scores on admission and discharge

			Rurality			
	Australia		*Major Cities*		*Regional/Remote*	
FIM Range	Admission	Discharge	Admission	Discharge	Admission	Discharge
18–60	**37%**	**14%**	**39%**	**15%**	**34%**	**14%**
61–78	**21%**	**11%**	**21%**	**12%**	**20%**	**9%**
79–99	**26%**	**20%**	**26%**	**19%**	**26%**	**21%**
100–126	**16%**	**55%**	**13%**	**54%**	**20%**	**56%**
Median FIM change	**21%**		**22%**		**20%**	

FIM: Functional Independence Measure
Regional/Remote is a combined score of inner regional, outer regional and remote

4.10.1 Mortality, length of stay and functional outcomes

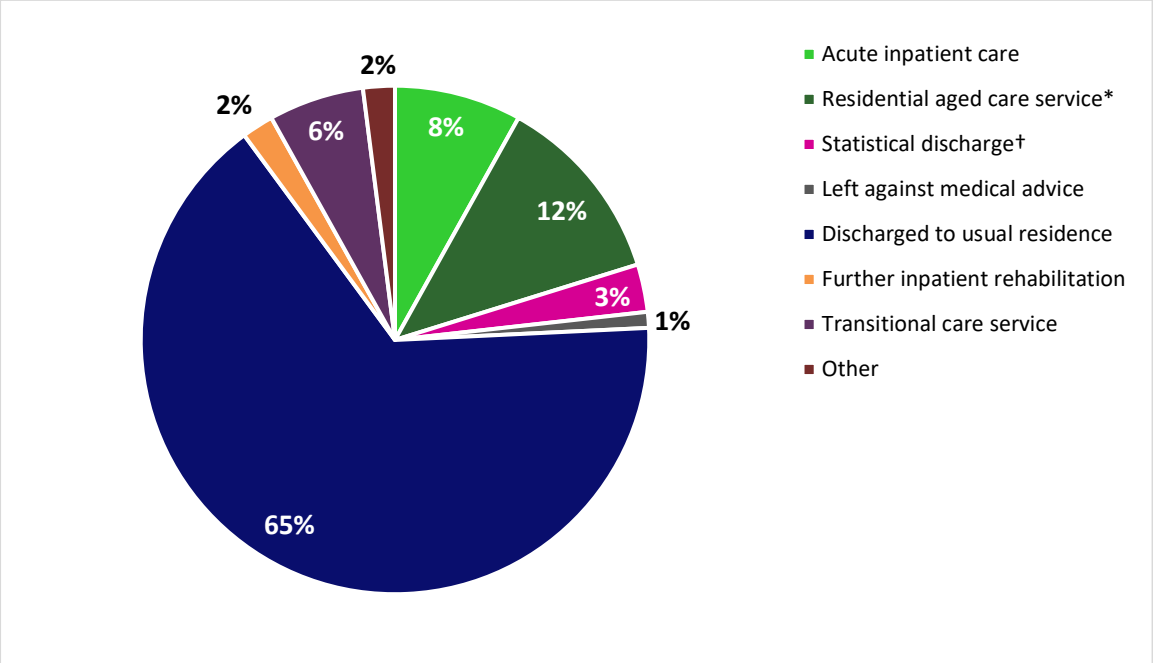
Of the 2,842 patients audited, 21 people (1%) died while in hospital, with the median time from admission to death being 28 days (Q1 13, Q3 43). The median length of inpatient rehabilitation stay were 22 days (Q1 13, Q3 37), which is the same as in 2018.

The median total FIM score on discharge were 103. The FIM efficiency for all stroke patients discharged in this audit were 0.92 per day (FIM change/LOS). FIM efficiency is defined as the mean change in FIM score from the beginning to the end of rehabilitation divided by the mean length of stay. The higher the value, the greater the level of functional improvement per day. The case-mix adjusted FIM efficiency reported by AROC for all stroke patients in 2019 were 0.9.[14] Any comparison between AROC FIM efficiency and the audit results must be made with caution as the audit data is not case-mix adjusted.

4.10.2 Discharge destination

The discharge destinations of the audited patient cases are outlined below (Figure 7). Of the 1,825 stroke survivors discharged to their usual residence, 339 (19%) had formal supports on discharge. For many stroke survivors requiring ongoing rehabilitation and/or require supports for a disability this was a change from their reported level prior to the stroke with 57% of patients (n=1,040) discharge to usual residence prescribed supports.

Figure 7. Discharge destination



* Includes high- and low-level supported accommodation

† Statistical discharge means the patient was re-coded and was no longer participating in rehabilitation at the service.

4.11 Access to community rehabilitation

Rehabilitation often needs to continue after discharge from inpatient admission and this can be undertaken in various settings depending on availability. Community-based allied health practitioners monitor the need for, and encourage actual participation in, community and exercise activities.

Based on 111 responses to the Organisational Survey, most participating services (93%) had access to at least one form of community rehabilitation service. Table 19 represents the stroke survivors referred for community rehabilitation regardless of discharge destination. Of the 2,842 patients audited, 64% were referred for further rehabilitation in the community.

Table 19. Patients referred for community rehabilitation

	Australia (N=2,842) n (%)
Not referred for further rehabilitation	**951 (33%)**
Not known if referral made for further rehabilitation	**59 (2%)**
Referred for further rehabilitation:	**1832 (64%)**
Inpatient rehabilitation (N=1,832)	**256 (14%)**
Outpatient rehabilitation (N=1,832)	**517 (28%)**
Home-based community rehabilitation (N=1,832)	**447 (24%)**
Day hospital-based community rehabilitation (N=1,832)	**250 (14%)**
Early Supported Discharged service (N=1,832)	**43 (2%)**
Other (N=1,832)	**319 (17%)**

4.12 Key performance indicators based on location

The following presents adherence to select clinical indicators with results split by hospital location and hospital volume (Table 20).

Table 20. Adherence to key performance indicators by hospital location

Location										Achievable Benchmark
	AUS	AUS 95% CI	NSW	NT	QLD	SA	TAS	VIC	WA	AUS
Patient-centered care										
Goals set with input from the team and patient*	**92%**	**91%- 93%**	90%	89%	92%	97%	100%	92%	90%	98%
Patient's mood assessed during admission	**63%**	**61%- 64%**	60%	68%	63%	76%	78%	58%	69%	93%
Discharge planning										
Evidence that care plan developed with the team and patient (or family alone if patient has severe or cognitive impairments)†	**78%**	**76%- 79%**	83%	64%	80%	76%	83%	68%	79%	97%
Patient and/or family received information covering stroke, hospital management, secondary prevention and recovery (e.g. My Stroke Journey booklet)	**63%**	**61%- 64%**	61%	68%	66%	69%	85%	55%	71%	95%
Carer provided with training+	**84%**	**81% -86%**	87%	85%	86%	65%	80%	83%	81%	95%
Secondary prevention										
Patient received education about behaviour change for modifiable risk factors prior to discharge†	**65%**	**64%- 67%**	65%	63%	67%	71%	89%	59%	69%	93%
On antihypertensives on discharge^	**79%**	**77%- 80%**	78%	74%	78%	86%	86%	77%	79%	92%

CI: Confidence Interval

Achievable Benchmark: National benchmarks are based on a modified version of the *Achievable Benchmark of Care* (*ABC*™)[10]

* Set with patient, therefore those without severe cognitive and/or communication difficulties

† Patients discharged alive

+ Included carers of stroke survivors discharged to a private residence, excluding if carer declined training

^ Eligible patients only, without contraindications for drug

4.13 Key performance indicators based on specialisation of rehabilitation service

The following presents adherence to key performance indicators with results split to show care provided on a dedicated stroke rehabilitation unit or neurological rehabilitation unit (Table 21). While information provision and education about behaviour change for modifiable

risk factors appear higher in specialised services, there were lower mood assessment and care planning in these services.

Table 21. Adherence to key performance indicators for specialist services

	***Dedicated stroke/neuro-rehabilitation unit* (N=915)**	***General/mixed rehabilitation unit* (N=1,927)**
Patient-centered care		
Goals set with input from the team and patient~	807 (92%)	1,685 (92%)
Patient's mood assessed during admission	554 (61%)	1,228 (64%)
Discharge planning		
Evidence that care plan was developed with the team and patient (or family if severe or cognitive impairments) †	583 (71%)	1,429 (81%)
Patient and/or family received information covering stroke, hospital management, secondary prevention, and recovery	608 (66%)*	1,174 (61%)
Carer provided with training+	177 (85%)	419 (83%)
Secondary prevention		
Patient received education about behaviour change for modifiable risk factors prior to discharge†	634 (70%)*	1,209 (63%)
Discharged on blood pressure-lowering medication (antihypertensives)^	707 (81%)*	1,399 (77%)

* Significant difference (P<0.5), from multivariable regression models adjusted for hospital clustering
~ Set with patient, therefore those without severe cognitive and/or communication difficulties
† Patients discharged alive
+ Included carers of stroke survivors discharged to a private residence, excluding if carer declined training
^ Eligible patients only, without contraindications for drug

4.14 Key performance indicators based on services offering 7 day a week therapy

Eight services (n=288 cases) reported providing therapy 7 days per week compared to 69 services (n=2106 cases) offering therapy 5 days per week. Analysis adjusting for patient and hospital level factors found those at sites offering 7 day a week therapy had a significantly shorter length of stay (mean 19 days vs 23 days). There was no difference in any of the seven core indicators or mean change in FIM. The FIM efficiency (change in FIM/LOS) was non-significantly higher in 7 day a week services compared to 5 day a week (1.01 vs 0.88; OR 0.14 95%CI -0.07 to 0.34).

Chapter 5: Clinical Audit changes over time

Changes in key performance indicators and recommended processes of care over time provide a useful comparator to assess improvements, stagnation, or deterioration in clinical practice. Table 22 details selected recommended care indicators over three audit cycles.

Table 22. Key performance indicators and recommended processes of care

Australia	2016	2018	2020
Hospitals using formal process for goal setting with patients	88%	85%	91%
Goals set with input from the team and patient†	89%	94%	92%
Patient's mood assessed during admission	53%	56%	63%
Patient received education about behaviour change for modifiable risk factors prior to discharge+	51%	60%	65%
Discharged on antithrombotic medication if ischaemic stroke and not contraindicated+	94%	94%	94%
Discharged on lipid–lowering medication if ischaemic stroke and not contraindicated+	77%	85%	87%
Discharged on blood pressure–lowering medication and not contraindicated+	78%	79%	79%
Evidence that care plan developed with the team and patient (or family alone if patient has severe or cognitive impairments)+	78%	80%	78%
Patient and/or family received information covering stroke, hospital management, secondary prevention and recovery (e.g. My Stroke Journey booklet)	50%	62%	63%
Post-discharge contact provided to stroke survivor/family	65%	67%	75%
Stroke survivor received information on sexuality post stroke	17%	22%	27%
Carer received relevant training^	75%	74%	84%
Post-discharge needs discussed with carer^	65%	63%	76%
Carer offered information about peer support	44%	43%	55%
Access to any community rehabilitation services	100%	97%	93%
Access to continuing education relating to stroke management to facilitate improved adherence to evidence-based care	65%	69%	70%

† For patients without severe cognitive/communication difficulties
+ For those alive at discharge
^ Included carers of stroke survivors discharged to a private residence, excluding if carer declined training

Some indicators have improved, such as mood assessment, behaviour change education for modifiable risk factors, and carer training. Other processes of care that have improved are post stroke sexuality information, post discharge contact, carer needs assessment and information for carers on peer support.

Chapter 6: Discussion and recommendations

The National Stroke Audit - Rehabilitation Services Report 2020 provides a snapshot of the care provided by inpatient rehabilitation services for stroke in Australia. The results are presented according to the Framework and *Clinical Guidelines for Stroke Management.* Providing an important and informed baseline for updating the *Living Guidelines* which details the latest in evidence-based clinical practice.

The information provided in this report is a guide to areas for quality improvement activities and improvements in patient outcomes. Rehabilitation services are encouraged to assess their stroke service's performance by comparing themselves to the national, state and annual admission-specific averages presented. The main purpose of the audit is to assist stroke rehabilitation teams to identify where improvements are required, lobby for change and celebrate success.

Overall, it is positive to see incremental improvements across a range of stroke care indicators, however the following areas warrant further discussion:

Mood assessment
The impact of a stroke on mood is well known. Assessment of mood is the critical first step to then ensure appropriate treatment is provided. It is pleasing to see the steady improvement in mood assessment over the last three audit cycles from 53% to 63%. Further focus is required to ensure the psychological needs of all patients is assessed and appropriate support is provided during and after inpatient rehabilitation. Importantly, 32% of services reported no access to clinical or neuropsychologists in stroke rehabilitation. This impacts the ability to provide appropriate treatment advice with the clinical audit showing of the 44% of patients who a documented mood impairment present less than 50% of these patients were assessed by a psychologist.

Specialised inpatient rehabilitation for stroke
Only 16 rehabilitation services (14%) reported in the organisational survey to have a dedicated rehabilitation service in a specified, geographically defined stroke unit. However, in the clinical audit 32% of cases were seen on a stroke rehabilitation unit, comprehensive (acute and rehabilitation) unit, or neurological rehabilitation unit. Although there is a slight discrepancy, some services that recorded a dedicated rehabilitation stroke unit in the organisational survey did not treat any audited patients on a stroke unit, and vice versa. This issue is being reviewed and is a focus area for the audit's continuous improvement program.

In this audit, sites that did provide specialist rehabilitation provided higher adherence to three of the seven recommended quality care indicators. To improve patient outcomes, it is recommended that rehabilitation services that have higher stroke volumes that have more than one rehabilitation ward review the way neurological rehabilitation is provided and centralise care to one ward ensuring there is adequate beds to meet demand.

Specialised early supported discharge services
Data from this audit notes the significant increase in reported stroke-specific Early Supported Discharge (ESD) services, with 42% of services providing this in 2020 compared to 17% in 2016. This may in part be due to 'transitional care programs' being labelled as ESD by auditors but is likely to reflect an important trend to moving inpatient rehabilitation services into the community, particularly seen during 2020 due to the impact of the COVID-19 pandemic. ESD services are recommended in the national guidelines based on robust evidence from a Cochrane review, however, it is important to note that such services are staffed by a stroke or neurological specialist multidisciplinary team with almost daily input for several weeks. It is estimated that ESD could care for approximately 15% of current patients

based on eligibility criteria. Clearly ESD services should be considered for metropolitan areas at least.

Evidence-based Care
Knowledgeable and skilled staff are fundamental to good patient outcomes. This audit found 30% of services reported a lack of professional development in stroke and 34% did not routinely use evidence-based guidelines to inform patient care. Further work is required to ensure the development of a range of online training is promoted and used. Local services must also ensure there is ongoing education and training specific to stroke care built are built into regular staff in-service programs.

Active Therapy
Ensuring the person receives recommended amount of practise is fundamental to promote recovery. With increased awareness and research in this area, active therapy has steadily increased and in 2020 the majority of services (73%) reported providing an average of two or more hours of active therapy per day (52% in 2018).

7 day a week service
Eight services (n=288) reporting weekend therapy provision were found to have a significantly shorter length of stay (mean 4 days) compared to 69 services (n=2106) offering therapy 5 days per week. There was no difference in any of the seven core indicators or mean change in functional outcome meaning services offering 7 day a week therapy provided similar quality of care and patient outcomes over a median 19 days in rehabilitation compared to 23 days in services with therapy provided 5 days per week. Analysis was adjusted for age, sex, stroke type, severity and hospital clustering but was based on relatively small numbers (n=288) and further data is needed before further recommendations can be made.

Secondary prevention
Stroke survivors have an increased risk of further stroke and increased disability. To prevent this medication prescribed on discharge is important. The audit found the prescription of antithrombotic medication remains high (94%), lipid-lowering medication has improved to 88%, but blood pressure lowering therapy remained at 79%. Achievable benchmark data from high performing sites indicates BP lowering medication was 92% indicating further improvements are required to ensure future strokes and other events are minimised.

Patient information and discharge planning
Information and support regarding intimate relationships after stroke continues to be poor with only 24% of people offered written information about the impact of stroke on intimate relationships. On a positive note, there has been an increased awareness in the effects of a stroke on survivors of working age (also termed as Young Stroke) with 74% (70% in 2018) of those who worked prior to their stroke were asked if they wished to return to work and 67% offered information about services to resume employment, an increase from 59% in 2018.

Improvement needs to be made in discharge care planning with one-in-five (22%) patients being discharged home without collaboratively developed plans for their ongoing care. Tailored information regarding stroke rehabilitation and recovery were provided to only 63% of stroke survivors discharged to their usual residence. This is much lower than that reported in the organisational survey, where 97% of services claimed to provide tailored information to patients and their family. This gap may be due to a lack of documentation or poor internal process of care and we encourage services to explore reasons and implement change.

Community rehabilitation services
It is also reasonable to recommend greater resources for outpatient and community rehabilitation services as over 66% of those receiving inpatient care are referred to a service and 33% miss out.

6.1 Strengths and limitation of the data

Strengths of the data
The National Stroke Audit - Rehabilitation Services provides a cross-sectional overview of stroke rehabilitation services in Australia. The sample size provides a robust and reliable overview of inpatient rehabilitation services and their adherence to 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 then independent logic checks were conducted with each service for verification.
- Data were analysed by an independent organisation, which minimised interpretation bias.

Limitations of the data
There are several limitations to the data 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.
- No case-mix adjustments were undertaken for outcomes, except the p-values in Table 21 (adherence to key performance indicators for specialist services).
- The audit is undertaken once every two years, and the patient cohort were 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.

6.2 Recommendations

This report outlines evidence of improvements in resources and clinical care. However, 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 rehabilitation.

The significant proportion of the Australian population impacted by stroke, the cost of poor outcomes and the benefits that can be achieved by the delivery of appropriate interventions highlight the value of regular monitoring of care and ongoing efforts to improve quality. It is

clear more effort needs to be applied by all if we are going to adequately serve the needs of our communities. The national rehabilitation services audit key messages are:

- Further focus to ensure the psychological needs of all patients is assessed and appropriate support is provided during and after inpatient rehabilitation.
- Services with larger stroke volumes (that have adequate bed capacity) need to ensure patients are cared for on the one ward with a dedicated stroke/neurological team.
- Improve access to adequately resourced stroke early supported discharge services.
- Ensure the patient receives recommended amount of practise to maximise recovery during inpatient rehabilitation. Sites could also consider additional resources to have physical therapy available seven days a week.
- Improve provision of information and education to patients and their family/carers. This includes lifestyle advice for secondary prevention, general information about stroke and recovery, information on returning to work (for those of working age), and especially on intimacy after stroke.
- Ensure all staff within rehabilitation services receive ongoing, stroke-specific education and training. Staff should be encouraged to routinely use clinical guidelines to guide practice.

Appendix 1: Audit program methodology

Development of the National Stroke Audit questions

The National Stroke Audit was first developed under the guidance of a National Advisory Committee including national representation from medical, nursing, allied health and clinical research groups.[17]

Some items contained in the National Stroke Audit have been refined over time based on feedback from previous years and changes in national reporting standards or the clinical guidelines. However, most items have remained consistent from year to year to allow comparisons over time. Data collected includes:

- Demographic characteristics
- Admission and transfer information
- Stroke severity measures
- 20+ evidence-based processes of care
- Discharge outcomes.

Organisational Survey

Data collected through the Organisational Survey enables reporting of services against each required element outlined in the national *Stroke Rehabilitation Services Framework 2013*. The Organisational Survey questions have been reviewed based on the Framework and comments received from previous National Stroke Audits. All feedback has been discussed and changes approved by the Stroke Foundation Clinical Council.

The Framework makes recommendations about the resources required to provide evidence-based care. Some changes were made to the Organisational Survey to better understand the amount of active therapy patients receive. New questions in the Organisational Survey include:

- Number of days per week the service provides active physical therapy
- Average time patients with motor impairment undertake active therapy per day
- Average number of minutes of active physical therapy (including group, circuit classes) provided per patient per week.
- Factors that limit the right amount of physical therapy activity
- Availability of individually tailored exercise interventions to improve cardiorespiratory fitness

Clinical Audit

The Clinical Audit involves a systematic process of abstracting data from patient medical records. The data collected through the Clinical Audit are designed to report on adherence to recommendations outlined in the *Clinical Guidelines for Stroke Management*. The Clinical Audit questions have been reviewed to correspond with the *Clinical Guidelines for Stroke Management* and adjusted based on comments received from previous National Stroke Audits. All feedback has been discussed and changes approved by the Stroke Foundation Clinical Council.

To ensure standardised data collection and reporting in Australia, the *National Stroke Data Dictionary* (NSDD)[18] is used for the National Stroke Audit. The NSDD is regularly reviewed and updated in accordance with the AuSDaT *National Stroke Data Dictionary Operational Policy.*[19]

In feedback from previous audits, auditors requested that the volume of data collected be reduced. This year participating services that collect data for the AuSCR were able to use data entered in AuSCR for the National Stroke Audit. Western Australia also created an in-

house data collection system that allowed relevant data to be imported for use in the National Stroke Audit. Both systems reduced the burden of data entry for services participating in the National Stroke Audit.

The seven key performance indicators assess quality of care and have been determined by expert opinion, statistical significance, level of evidence, influence on patient outcome measures, international comparison, consumer consultation of stroke survivors and their carer's. These clinical indicators are consistent with current practice recommendations so that clinicians may use the indicator set in a meaningful and continuous way. Definitions of the reported indicators (including numerators and denominators, and exclusion criteria) are in the national report supplement, available at: https://informme.org.au/stroke-data/Rehabilitation-audits

New questions in the Clinical Audit include:

- Reasons for not providing carer support needs assessment
- Reasons for not providing relevant carer training

Recruitment

To be eligible for participation in the National Stroke Audit - Rehabilitation Services 2020, hospitals were required to be a provider of inpatient rehabilitation service and have admitted at least 5 patients with stroke for rehabilitation care in 2019. Eligible services were identified through communication with the AROC, previous participation in the National Stroke Audit, partnerships with State-based Clinical Networks and relationships with key health providers.

Rehabilitation services were recruited between December 2019 and February 2020, where the clinical lead from both public and private rehabilitation services were emailed a letter of invitation. Services were asked to complete and return a consent form to confirm participation. The consent form provided permission for the Stroke Foundation to share summarised data with relevant State-based Clinical Networks or Departments of Health, to promote transparency and facilitate support for quality improvement. Each participating service nominated a coordinator to receive all correspondence during the National Stroke Audit period. The coordinator was responsible for data completion and data quality at their service.

All Organisational Survey and Clinical Audit data were aggregated to provide national estimates. Subcategories for analyses included breakdown by state, regional status, public/private status, admission volume and presence of a stroke unit. Two hundred and nine rehabilitation services were identified as potentially eligible to participate in the National Stroke Audit - Rehabilitation Services, with 126 public services deemed eligible. The number of eligible private services is unknown; however, based on previous participation and desk top review, 83 private services were identified, and invitations were sent to 30 services where a contact could be determined.

The eligible services were targeted with active recruitment procedures that included phone contact and email. In total, 96 public services and 15 private services completed the Organisational Survey, and, among these, 80 public services and 9 private services participated in the Clinical Audit. This represents a 76% participation rate in the Organisational Survey and a 64% participation rate in the Clinical Audit by eligible public services. A total of 21 eligible public services did not agree to participate for various reasons ranging from resource issues, transitioning staff, to COVID-19 preparation and quarantine. Nine public services were uncontactable, and no services participated from the Australian Capital Territory (ACT).

Training

The Australian Stroke Data Tool (AuSDaT) was used for data entry for the National Stroke Audit -Rehabilitation Services. This is a purposefully designed, integrated, web-based data collection and management platform. The audit program transitioned from the Stroke Foundation to this integrated data collection system known as the AuSDaT in 2015. The AuSDaT has been designed to reduce the data entry burden and time for data collection. All auditors were required to complete standardised training regarding the AuSDaT and the NSDD was made available, providing a rationale for each question as well as definitions and help notes. The Stroke Foundation Data and Quality Coordinator was available for questions at all times during the data collection period. For more information regarding AuSDaT refer to the Australian Stroke Coalition website: www.australianstrokecoalition.com.au

Data collection

All respondents from participating services completed the Organisational Survey via the AuSDaT between 2 March and 6 April 2020. The full list of Organisational Survey questions is presented online in the national report supplement.

The services participating in the Clinical Audit component completed a retrospective case note audit (data collected 2 March - 29 May 2020) those of up to 40 consecutive stroke admissions to their service. To minimise selection bias, data are extracted for the first 40 consecutive rehabilitation stroke admissions over a pre-defined time period. For the vast majority of these cases, admission and discharge dates had to fall between 1 January and 31 December 2019.

Patients with an ICD-10 code of I61.0-I61.9 (intracerebral haemorrhage), I63.0-I63.9 (cerebral infarction), I64 (stroke not specified as haemorrhagic or infarction) and I62.9 (intracerebral haemorrhage unspecified) were eligible for inclusion. The specificity for diagnosing stroke (any type) using these ICD-10 codes is >95%.[20] The full list of Clinical Audit questions is presented online in the national report supplement.

Auditors at participating services were required to log in to access the AuSDaT and carry out data collection. Each auditor had an individual account, with email and password specific to them to enter to access data on the AuSDaT to ensure security and confidentiality were maintained. The Stroke Foundation did not collect patient-identifying data. However, to facilitate data checking and quality as part of verification processes, services were asked to keep a list of the cases they entered for their own records.

Data quality checks

The AuSDaT contains pre-defined data fields with inbuilt programmed logic checks. Manual reliability checks are also performed via re-auditing of 3-5 cases by a second auditor. This helps to ensure data is being reliably collected by identifying whether a case note audited independently by two people provides the same responses. A total of 168 reliability records were completed. Coordinators were also asked to check their data at completion of the data collection period to maximise the accuracy of the data and minimise missing items. The results of this data quality procedure are not reported here, but the information gathered will be used to refine future National Stroke Rehabilitation audits.

Data verification

Auditors were able to change their entered data up until 23 June 2020, at which point all data were locked. Programmed logic checks of the data were then conducted and were used to validate data from the Organisational Survey and the Clinical Audit. Queries were sent back to services where assumptions about true values could not be made. Where data

appeared incorrect, further changes were permitted. The final, cleaned data were then used for the analysis process.

Data analysis

Staff from the Translational Public Health and Evaluation Division, Monash University, independently analysed the anonymised data. Names of services were excluded from the data submitted to Monash University; only the site identification number were provided.

The data were analysed using computer software including Stata 16.0 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC) and Excel (Microsoft Excel 2016). The data were exported from the web-based data entry terminal as an Excel spreadsheet and transferred into Stata.

All Organisational Survey and Clinical Audit data were aggregated to provide national estimates. Subcategories for analyses included breakdown by state, regional status, public/private status, admission volume and presence of /treated in a rehabilitation stroke unit. For medical history and impairment data, only valid responses (e.g. Yes/No) were included in the analysis. 'Not documented' responses to these questions were reported separately and were excluded from the denominator. Data relating to processes of care, e.g. received advice about risk factor modification, 'not documented' and 'unknown' responses, were assumed to be negative (e.g. a care process not provided) and were included in the denominator.

Adherence to processes of care were generally calculated on the entire sample. When reporting adherence to care, 'Known N' refers to all eligible patients. In some instances, eligibility criteria for processes of care were specified. For example, adherence to the process of care relating to the use of antithrombotics on discharge were calculated only for patients presenting with ischaemic stroke who were discharged.

Data were described using proportions for categorical variables, with the median (50th percentile), first (Q1) and third (Q3) quartiles (25th percentile and 75th percentile) being reported for skewed (e.g. data not normally distributed) continuous data from questions such as the number of stroke admissions each year, or length of stay. The sum of individual proportions in tables may not add to 100% due to rounding up/down of totals for simplicity in this report. Denominators reported in column headings of tables may not be applicable to all processes reported within, as many relate to only those eligible to receive the process. Aboriginal and Torres Strait Islander and impairment data – only valid yes/no responses included in the analysis.

The Achievable Benchmark of Care (ABC™) methodology was used to create benchmarks for several nationally relevant indicators based on the average performance of the top 15% of hospitals for each indicator.[10]

Rehabilitation Service Regional Classifications

Classification of participating services as metropolitan/major cities or regional/rural was based on the Accessibility and Remoteness Index of Australia (ARIA+).[12]

Defining remoteness areas

The Australian Statistical Geography Standard (ASGS) defines Remoteness Areas into five classes of relative remoteness across Australia.[12]

The five classes of remoteness are:

- Major Cities of Australia
- Inner Regional Australia

- Outer Regional Australia
- Remote Australia
- Very Remote Australia

The five classes of remoteness are determined using a process that allows statistical data to be classified in a consistent way with which users can analyse changes in data for different remoteness categories over time. The audit only used four classes of remoteness (Major Cities of Australia, Inner Regional Australia, Outer Regional Australia, Remote Australia) as none of the participating hospitals are classified as Very Remote Australia.

Relative remoteness is measured in an objective way using the Accessibility and Remoteness Index of Australia (ARIA+), which is developed by the Hugo Centre for Migration and Population Research at the University of Adelaide. ARIA+ is derived by measuring the road distance from a point to the nearest urban centres and localities in five separate population ranges. For more information on how ARIA+ is created see the University of Adelaide website at https://www.adelaide.edu.au/hugo-centre/services/aria

The University of Adelaide supplies ARIA+ to the ABS as a one-kilometre grid that covers all geographic Australia. Each grid point contains a value representing its relative remoteness, derived using the methodology described in the link above. The resulting average score determines which remoteness category is allocated to each ASGS Statistical Area Level 1 (SA1); these categories are shown in Table 23 below.

Table 23: 2016 Remoteness Area Category Names for Australia and SA1 Average ARIA+ Value [13]

Remoteness Area Category	Remoteness Area Name	SA1 Average ARIA+ Value Ranges
0	Major Cities of Australia	0 to 0.2
1	Inner Regional Australia	greater than 0.2 and less than or equal to 2.4
2	Outer Regional Australia	greater than 2.4 and less than or equal to 5.92
3	Remote Australia	greater than 5.92 and less than or equal to 10.53
4	Very Remote Australia	greater than 10.53

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.[9] Each participating service receives a site-specific 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 on their My Sites page available at: https://informme.org.au/sign-in. Services are also able to gauge their 2020 performance against similar services across Australia for continuous quality improvement purposes.

In addition to this report, a supplement containing:

- list of auditors from each service
- numerators and denominators used for analysis
- exclusion criteria used for analysis
- details of questions from the Organisational Survey and Clinical Audit
- further detail regarding the Framework and key performance indicators

The supplementary report is available at www.informme.org.au/stroke-data.

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The full National Stroke Audit Rehabilitation Services Report 2020 can be downloaded at **informme.org.au/stroke-data**

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