National Stroke Audit Program

Methodology

strokefoundation.org.au

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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 beat stroke.
- Raise funds from the community, corporate sector and government to continue our mission.

About the National Stroke Audit

The National Stroke Audit is a Stroke Foundation initiative delivered as part of the charity organisation's commitment to promoting 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 acute stroke services and inpatient rehabilitation services.

The report provided present data in an accessible format to help services and state clinical networks to identify where improvements are required, lobby for change and celebrate success. Audits are a quality improvement measure and one of the seven pillars of clinical governance.

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[1].

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

- Demographic characteristics
- Admission and transfer information
- Stroke severity measures
- 30+ 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 Framework and provides information about resources available to deliver inpatient stroke care across Australia.

The national *Acute Stroke Services Framework 2019* makes recommendations about statewide systems of care as well as hospital-level procedures. In addition to the survey of inpatient services during the acute audit, the state clinical networks were also asked to complete a spreadsheet with four organisational questions related to system-wide stroke services.

The national *Rehabilitation Stroke Services Framework 2013* provides national recommendations related to stroke rehabilitation elements of care, including effective links with acute stroke service providers, early assessment for neurorehabilitation, written goal setting processes and community reintegration.

The organisational survey questions are annually reviewed based on the current Framework and comments received from previous National Stroke Audits. All feedback is discussed, and changes approved by the Stroke Foundation Clinical Council.

Clinical Audit

The clinical audit involves a systematic process of abstracting data from patient medical records at each participating service. The data collected through the clinical audit are designed to report on adherence to recommendations outlined in the *Clinical Guidelines for Stroke Management 2017*. The clinical audit questions are reviewed annually to correspond with the *Clinical Guidelines for Stroke Management 2017* and adjusted based on comments received from previous National Stroke Audits. All changes are approved by the Stroke Foundation Clinical Council.

Acute clinical audit results are presented based on the Australian Commission on Safety and Quality in Health Care (ACSQHC) *Acute Stroke Clinical Care Standard* with associated indicators[2]. These processes of care include assessment by clinicians, diagnostic procedures, early interventions, interdisciplinary care and discharge planning. Timing of the delivery of various aspects of care and discharge outcomes are also measured.

To ensure standardised data collection and reporting in Australia, the *National Stroke Data Dictionary* (NSDD)[3] 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*[4]. The ACSQHC indicators were reported using the definitions included in the ACSQHC Standard (http://www.safetyandquality.gov.au/our-work/clinical-care-standards/acute-stroke-clinical-care-standard/).

In feedback from previous audits, auditors requested that the volume of data collected be reduced. This has lead to the development of data linkages with the Australian Stroke Clinical Registry (AuSCR), Australasian Rehabilitation Outcomes Centre (AROC), and Western Australia also created an in-house data collection system that allowed relevant data to be imported for use in the National Stroke Audit. These linkages were able to reduce the burden of data entry in the current National Stroke Audit through cooperation via de-identified data importation.

Definitions of the indicators reported (including numerators and denominators, and exclusion criteria) are available in the report supplement at https://informme.org.au/stroke-data.

Recruitment

Eligible services were identified through previous participation in the National Stroke Audit, the AROC, partnerships with state-based clinical networks and relationships with key health providers.

To be eligible for participation in the National Stroke Audit – Acute Services any service admitting at least 40 patients with acute stroke is eligible to participate in the organisational survey component. Services admitting 40 or more patients with stroke per year were invited to participate in the clinical audit. Smaller services were able to participate in the clinical audit but were not actively recruited.

To be eligible for participation in the National Stroke Audit – Rehabilitation Services, hospitals were required to provide an inpatient rehabilitation service and have admitted at least 5 patients with stroke for rehabilitation care in previous 12 months.

Services were asked to complete a consent form to confirm participation and requested to give permission for the Stroke Foundation to share summarised data with relevant state-based clinical networks, to promote transparency and facilitate support for quality improvement.

Training

The AuSDaT is used for the National Stroke Audit program. This is a purposefully designed, integrated, web-based data collection and management platform. The audit program transitioned from the Stroke Foundation online system to the AuSDaT in 2015 and it 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 to give a rationale for each question as well as definitions and help notes.

The Stroke Foundation project team were always available for questions leading up to, and during, the data collection period. For more information regarding AuSDaT, please refer to the Australian Stroke Coalition website https://strokefoundation.org.au/Australian%20Stroke%20Coalition/AusDAT

Data collection

All respondents from participating services completed the organisational survey via the AuSDaT in the first month of the audit opening. The full list of organisational survey questions is presented online in the report supplement (www.informme.org.au/stroke-data).

The services participating in the clinical audit have 4 months to complete a retrospective case note audit of up to 40 consecutive stroke admissions to their service. To minimise selection bias, data for the first 40 consecutive stroke admissions over a pre-defined time period were extracted.

Patients with the following ICD-10 codes are eligible for inclusion:

- I61.0–I61.9 (intracerebral haemorrhage)
- I63.0–I63.9 (cerebral infarction)
- I64 (stroke not specified as haemorrhagic or infarction)
- I62.9 (intracerebral haemorrhage unspecified) were eligible for inclusion.

The specificity for diagnosing stroke (any type) using these ICD-10 codes is greater than 95%[5].
The full list of clinical audit questions is presented online in the report supplement (www.informme.org.au/stroke-data).

Auditors at participating services were required to log in to enter and access data on the AuSDaT in accordance with AuSDaT *Data Security Policy*[4]. The Security and confidentiality were maintained by

each auditor having an individual account, with email and password specific to the auditor. No patient-identifying data were collected by the Stroke Foundation.

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 another 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.

The Translational Public Health and Evaluation Division, Monash University, performs programmed logic checks on the anonymised data at completion of the data collection period. Site coordinators are asked to check data flagged in the logic check to maximise the accuracy of the data and minimise missing items.

Data verification

To ensure the accuracy of the organisational survey component of the National Stroke Audit it is requested that the completed survey be reviewed by the most senior staff member on the stroke unit (stroke unit head or medical lead, or for smaller services without a stroke unit this might be the director of medicine or director of nursing). This process was introduced in 2019 to ensure the reliability of answers in the organisational survey.

Programmed logic checks of the clinical audit data is conducted and 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 was provided.

The data were analysed using computer software including Stata 15.0 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC) and Excel (Microsoft Excel 2016). The data were exported from the AuSDaT 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 a stroke unit.

The few patients with stroke type recorded as TIA were analysed as having ischaemic stroke, due to these patients often being clinically managed in a comparative manner to patients with minor ischaemic stroke. As TIA was not an inclusion criteria, these cases were assumed to be minor stroke and included in the cohort given there is uncertainty in TIA/minor stroke differentiation and are clinically managed in a comparative manner.

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 was 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 was calculated only for patients presenting with ischaemic stroke who were discharged.

Derived variables relating to outcomes of care, such as length of stay, were calculated based on admission and discharge dates.

To minimise data being excluded, cases with known dates but unknown times for processes of care had an assumed time of 00:00 allocated to them. For patients suffering an in-hospital stroke, stroke onset date and time were used for date and time of ED presentation. Derived variables relating to outcomes of care, such as length of stay, were calculated based on admission and discharge dates.

The median (50th percentile) and first (Q1) and third (Q3) quartiles (25th percentile and 75th percentile) were reported for skewed (e.g. data not normally distributed) continuous data from questions such as the number of stroke admissions each year.

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[6].

Participating 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+)
https://www.abs.gov.au/websitedbs/D3310114.nsf/home/remoteness+structure

Defining remoteness areas
The Australian Statistical Geography Standard (ASGS) defines Remoteness Areas into five classes of relative remoteness across Australia.
These 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 three classes of remoteness (Major Cities of Australia, Inner Regional Australia, Outer Regional Australia) as none of the participating hospitals are classified as Remote Australia or 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-kilometer grid that covers all of 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 1 below.

Table 1: 2016 Remoteness Area Category Names for Australia and SA1 Average ARIA+ Value

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

The urban centres and localities referenced in the above criteria are defined according to the ABS publication Australian Statistical Geography Standard (ASGS) Volume 4 - Significant Urban Areas, Urban Centres and Localities, Section of State, July 2016 (cat no. 1270.0.55.004) .

Site-specific feedback

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[7]. 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 at www.informme.org.au. They are also able to benchmark their performance against similar services across Australia for continuous quality improvement purposes.

Ethics

The Stroke Foundation has sort independent advice from various experts in ethics who all agreed the National Stroke Audit does not require formal ethics application as evaluating and improve clinical care is deemed to be routine clinical practice.

The audit does not collect patient identified data and there are processes involved to ensure the third party commissioned to analyse the data are not aware of hospital level performance (hospital site ID numbers are used rather than hospital name). However, staff from the Translational Public Health and Evaluation Division, Monash University have formally applied for ethics approval to cover analysis and publications related to the National Stroke Audit given this is now seen as best practice for the publication of such data.

Privacy

In complying with Australian Privacy Principle 11, the Stroke Foundation is committed to ensuring that any person or organisation using our services or affected by our operations has the right to expect that Stroke Foundation will take reasonable steps to protect the data they receive and hold from misuse, interference, loss and from unauthorised access, modification or disclosure in accordance with *Stroke Foundation Privacy Policy*[8].

A policy for request to use data from the National Stroke Audit governs third party access. For more information please contact audit@strokefoundation.com.au.

Acknowledgements

The Stroke Foundation would like to thank all who have participated in the National Stroke Audit program over the years. We recognise their significant commitment to this process.

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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.

The data were collected using the Australian Stroke Data Tool (AuSDaT), an integrated 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 to monitor stroke care in Australia.

References

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Web Links

National Stroke Audit Reports: https://informme.org.au/stroke-data
National Stroke Clinical Guidelines: https://informme.org.au/guidelines

Stroke FOUNDATION

How to get more involved

- **Give time** – become a volunteer.
- **Raise funds** – donate or hold a fundraising event.
- **Speak up** – join our advocacy team.
- **Leave a lasting legacy** – include a gift in your Will.
- **Know your numbers** – check your health regularly.
- **Stay informed** – keep up-to-date and share our message.

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