About the National Stroke Foundation

The National Stroke Foundation is a national not-for-profit organisation working across the stroke journey, supporting stroke survivors, carers, health professionals, governments and the public to reduce the impact of stroke on the Australian community. We are the voice of stroke in Australia. Our mission is to stop stroke, save lives and end suffering.

We will achieve this by:

- Raising awareness of the risk factors, the signs of stroke and promoting healthy lifestyles.
- Improving treatment for stroke to save lives and reduce disability.
- Improving life after stroke for stroke survivors.
- Encouraging and facilitating stroke research.
- Advocating for improved stroke prevention, treatment and support.
- Raising funds from the community, corporate sector and government to continue our mission.

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National Stroke Audit Collaborative

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Participants of the National Stroke Audit – Acute Services Organisational Survey are listed in Appendix 5.2 Participating hospitals.
Glossary

ADL
Activities of daily living. The basic elements of personal care.

AIHW
Australian Institute of Health and Welfare. Australia’s national agency for health and welfare statistics and information.

ASSF
Acute Stroke Services Framework 2011 (or ‘the Framework’).

Carotid Doppler
An ultrasound scan used to show blood flow as a colour-coded dynamic image.

CT
Computerised tomography. A method of scanning the brain of people suspected of having a stroke.

DET
Data entry tool.

DVT
Deep vein thrombosis. A blood clot in the deep veins of the leg, arm or abdomen.

FTE
Full-time equivalent. Describes the number of hours or days worked per week; 1.0 being full-time work and 0.2 being one day a week.

ICD10
The International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). A coding of diseases and signs, symptoms, abnormal findings, complaints, social circumstances and external causes of injury or diseases as classified by the World Health Organization (WHO).

IQR
Interquartile range. The spread of the middle 50% of data values, i.e. the data range between 25th and 75th percentile.

Known N
The number of eligible cases for any indicator being measured. It excludes the denominator cases that do not qualify to be analysed, e.g. the Known N for analysis of treatment with antithrombotic medication would include patients with ischaemic stroke only.

MDT
Multidisciplinary team. Consists of medical, nursing and allied health practitioners.

Metropolitan
Used to describe population centres greater than or equal to 100,000 based on Australian Institute of Health and Welfare [AIHW] classifications.

MRI
Magnetic resonance imaging. A method of scanning the brain in suspected patients with stroke.

MRS
Modified Rankin Score. A global disability rating that records a patient’s functional ability on a scale of 0 to 6 (0 = no symptoms, 6 = death).

NHMRC
National Health and Medical Research Council. Australia’s peak body for health and medical research, health advice and ethics in health care and in health and medical research.

NSF
National Stroke Foundation.

Perfusion scanning
Advanced use of CT or MRI scanning where contrast agent is injected into the blood vessels and the passage of the contrast is observed, measured and quantified.

Urban
Used to describe metropolitan and large rural or regional areas with a population greater than or equal to 25,000 based on AIHW classifications.

Regional
Used to describe large rural centres with a population greater than or equal to 25,000 and less than 100,000.

Rural
Used to describe geographical regions which vary from remote rural centres to small urban centres with a population less than 25,000 based on AIHW classifications.

rt-PA
Recombinant tissue plasminogen activator. The drug administered intravenously to break up a blood clot. See ‘thrombolysis’.

Secondary prevention
Measures to prevent the recurrence of the same illness.

SUTC
Stroke Unit Trialist’s Collaboration. A group of authors who have written several landmark systematic reviews showing patients with stroke treated on stroke units have better health outcomes than those receiving conventional care.

Stroke unit (SU)
Organised stroke care. The key features of a stroke unit are found in the Acute Stroke Services Framework 2011.

TIA
Transient ischaemic attack. A ‘mini stroke’ in which all the symptoms of a stroke disappear within a 24 hours of onset.

Thrombolysis
The process of administering the drug rt-PA intravenously to break up a blood clot.
Executive Summary

Forming the first part of the National Stroke Audit 2013, the Acute Services Organisational Survey presents data central to understanding the nature of current stroke services in Australia. The survey aims to highlight areas where the system for acute stroke care is working well and to report on improvements or changes which may be needed. It is the only report of its kind in Australia and also tracks changes that have occurred since the National Stroke Audit commenced in 2007. Clinicians, health administrators and governments alike can use the valuable data provided in this report to inform planning for organisational change.

The data for this report has taken a robust and representative snapshot of acute stroke care services in Australia. Participation rates remain high with 177 (88%) of 195 eligible hospitals providing data. Participating hospitals reported admitting over 27,000 stroke admissions. The vast majority (89%) of patients admitted to 83 large hospitals (those providing care to over 100 stroke patients per annum).

The survey has revealed a marked decrease in the number of stroke units missing in large hospitals dropping from 46 in 2007 to five in 2013. The majority of stroke unit growth is in Queensland (QLD) with an increase from 13 in 2011 to 24 in 2013. Most of the larger hospitals requiring a stroke unit (four of five) are in regional New South Wales (NSW).

Whilst the number of stroke units is increasing, stroke unit access (the proportion of patients receiving stroke unit care) has not improved since 2011 with only 58% of stroke patients receiving stroke unit care. In some parts of the country access is worse now than it was two years ago (e.g. in Western Australia (WA) and NSW). The reason for poor access is complex but this data suggests capacity and bed management issues are contributing factors.

The reported size of stroke units in larger hospitals was smaller than in previous years with the median size of units decreasing from eight in 2007 to five in 2013. In addition to declining stroke unit size not all stroke unit beds were allocated to stroke patients. The large stroke unit hospitals reported a total of 566 stroke unit beds representing 92% of the total reported stroke unit beds nationwide. However, on the day of the survey 620 patients with stroke were being managed in these hospitals but only 394 patients (64%) were on the stroke unit on that day. This suggests about a third of stroke unit beds were either empty or not occupied by a patient with stroke.

Another critical finding of this report is the need for improvement in the systems of care for people with suspected transient ischaemic attack (TIA). Despite the need for rapid assessment and management of TIA, given increased risks of stroke in these patients, approximately 30% of hospitals that either admit all or selected TIA patients did not have access within 24 hours to imaging for the brain or neck arteries. Of the 121 hospitals that did not have an ‘admit all’ policy for people presenting with TIA only 38 (31%) had access to an out-patient TIA clinic to facilitate rapid assessment. Furthermore, the median waiting time for these clinics was seven days – much longer than assessment within the 1–2 days currently recommended. Clearly more focus is needed to improve access to early investigations, specialist assessment and early treatment for those with TIA no matter which model of care is being used.

Stroke is a time-critical medical condition and several interventions are effective in the early stages of stroke. This report notes there has been a significant improvement in the proportion of hospitals reporting arrangements with ambulance services and protocols in the emergency department (ED) for rapid triage for stroke, however, further action is still required. Only 53% of hospitals reported arrangements with ambulance while 80% had ED protocols for rapid triage. The use of protocols for rapid assessment and management are particularly important in hospitals admitting large numbers of patients with stroke. System-wide changes for ambulance bypass and ED arrival as demonstrated across NSW is needed in other jurisdictions to further improve getting the patients with stroke to the right hospital without delay.
Rapid imaging for all patients with suspected stroke within 24 hours is imperative for optimal diagnosis and treatment. The survey revealed 92% of hospitals admitting patients with acute stroke had immediate access to computerised tomography (CT) (either on or off-site) within 24 hours, an increase from 77% in 2007 and 85% in 2011. However, one in five rural hospitals did not have access to CT within 24 hours (either on or off-site) and 26% did not have access to Carotid Doppler services. These findings emphasise the need to improve processes that support protocols for timely transfer to larger stroke unit centres and establish support networks (e.g. via telemedicine) where patient transfer is not appropriate.

The administration of intravenous recombinant tissue plasminogen activator (rt-PA) for ischaemic stroke within 4.5 hours of symptom onset offers significant benefit for select stroke patients. At the time of the survey 93 (53%) hospitals reported offering thrombolysis nationally, representing a significant increase from the 58 hospitals offering this service in 2009. However, among hospitals reporting stroke units, only 79% offered thrombolysis. Furthermore many sites reported offering thrombolysis did not actively provide this therapy in the previous 12 months. As such, the total number of patients thrombolysed remains low with an estimated 1,472 (6%) of the 27,769 patients admitted with acute stroke receiving this therapy.

Coordination of care of a multidisciplinary team is also critical to patient outcomes. Two-thirds of hospitals (83% of large hospitals) are now using acute care pathways to improve and standardise essential elements of acute assessment and management. In just over half of all hospitals with stroke units, dedicated positions are available to coordinate care. With a greater demand on clinical staff and the need to efficiently coordinate complex care across multiple professionals the use of such a position would appear critical for all hospitals with a dedicated stroke service.

Access to psychology services remains alarmingly low with only 25% of hospitals having a protocol for referral to psychology services. Furthermore, median full-time equivalent (FTE) for clinical psychologists on stroke unit teams is only 0.08 indicated a real shortage of staff to manage the important psychological aspects of recovering from stroke.

The survey found whilst there was capacity to access community based rehabilitation in 145 (82%) hospitals, one in three hospitals did not routinely provide assessment for ongoing rehabilitation needs for patients with stroke. In addition, only one in five hospitals had access to early supported discharge teams. These figures represent little change since the 2011 and 2009 Organisational Surveys.

Discharge care planning is integral for ensuring patients with stroke receive the support required to optimise outcomes when transitioning from acute care. The survey revealed 40% of hospitals did not routinely provide a discharge care plan for their patients. Despite recommendations around this vital aspect of care, and its importance from a consumer perspective, this figure remains unchanged since the National Stroke Audit commenced in 2007.

In summary, the data from this survey revealed important improvements in hospital services, particularly the number of hospitals with stroke unit care, and in the processes to support evidence-based care for acute stroke. However, significant gaps remain, particularly in the 83 large hospitals that treat nine out of 10 patients with stroke. Because most patients are admitted to these hospitals, a focus on improvements in these services, particularly in accessing stroke unit care, will have the greatest impact. To ensure high-quality care for all patients with stroke, work is also required at many of the smaller hospitals admitting very few patients with stroke (i.e. < 100 per year) to ensure they are either bypassed or have systems for rapid assessment and transfer.

The National Stroke Audit along with other data collection programs, such as the Australian Stroke Care Registry, provide foundations to monitor and drive improvements in acute stroke care. Providing additional support to busy stroke teams in order to best utilise the data collected should also be encouraged, such as via the Stroke Foundation’s StrokeLink program.
Recommendations

→ Improve access to stroke unit care in Australia by
  – Ensuring all large hospitals (admitting more than 100 patients per year) have stroke units in place
  – Ensuring all stroke units have adequate capacity to accommodate stroke patients at all times
  – Developing processes to ensure designated stroke unit beds are available to accommodate stroke patients and are not occupied by patients without stroke at the expense of patients with stroke
  – Facilitating transfer of patients from small, non-equipped hospitals to larger stroke unit sites
  – Ensuring all stroke units have a dedicated stroke coordinator position

→ Improve rapid access to investigations, specialist assessment and early management for people with suspected TIA

→ Implement processes and tools to improve provision of patient information, discharge care planning, timely assessment and provision of rehabilitation needs and access to psychological services

→ Review the Acute Stroke Services Framework to explore appropriate models of stroke care for hospitals of varying size and location
Chapter 1

Introduction

1.1 Background

1.1.1 Stroke in Australia

Stroke is Australia’s second biggest killer after heart disease. It is estimated there were almost 50,000 new and recurrent strokes in 2012 in Australia and 35,300 hospital admissions due to stroke. The cost burden of stroke is estimated to be around $5 billion per year.

Evidence-based stroke care is proven to reduce death and disability and is cost effective. For example, stroke unit care reduces death and disability by about 20%. For ischaemic stroke, providing aspirin within 48 hours or intravenous thrombolysis with rt-PA within 4.5 hours is also associated with significantly improved outcomes. However, evidence-based care is not always provided in clinical practice.

Health care quality is variable. It has been reported 30–40% of patients do not receive treatments that are proven to be effective. In addition, 20–25% of patients receive unnecessary or potentially harmful treatments.

Programs to improve the delivery of evidence-based care involve many different strategies including clinical audits. A clinical audit is a process of assessment which can be used to motivate or guide behaviour change. It may also be used to explore the status of resources required to support the delivery of evidence-based care. International and local experience provides evidence that audits of medical records can be effectively used to influence and change clinical practice.

1.1.2 Clinical Guidelines and the National Stroke Audit

The Clinical Guidelines for Stroke Management 2010 provide an overview of the research evidence and present evidence-based recommendations for clinical care. These guidelines form the basis of the National Stroke Audit. The audit is a National Stroke Foundation initiative and is part of our commitment to promoting the delivery of evidence-based care for stroke.

The National Stroke Audit is used to examine how often nationally endorsed evidence-based recommendations are used in clinical practice and to determine what resources are available in hospitals to support best practice. It also provides national benchmarks for stroke care.

Each participating hospital receives an individual report that provides feedback on their audit results. The individual reports include information on national benchmarks so the participant can make informed decisions on where alterations should be focussed to improve the care delivered to patients with stroke. The process of audit and feedback is a crucial part of the National Stroke Foundation guidelines implementation process and a core component of continuous quality improvement. The results of the audit may also be used to inform planning at a local, state or national level to improve patient outcomes.

1.2 The National Stroke Audit

The National Stroke Audit – Acute Services comprises:

- An Organisational Survey of stroke services across Australia. The survey is used to examine the resources available locally such as stroke units, imaging (including CT) and multidisciplinary staff. The self-reported data is provided by a nominated clinician at each hospital. The survey questions are found in Appendix 5.1.
- A Clinical Audit involving the retrospective review of 40 or more consecutive patients admitted to participating hospitals during a defined time frame. The Clinical Audit examines adherence to processes of care such as diagnostic procedures (CT, MRI and Carotid Doppler), early interventions (such as rt-PA and aspirin) and compliance with the nationally endorsed evidence-based recommendations. Timing of the delivery of various aspects of care and discharge outcomes is also measured.

The Organisational Survey and Clinical Audit were conducted in tandem and the results should be considered together. Areas of ‘excellence’ and areas of ‘need’ identified in the Clinical Audit may be better understood in association with information about the available resources obtained in the Organisational Survey.

For this report acute care refers to hospital services from arrival at hospital to discharge from hospital or transfer to in-patient rehabilitation. Usually this care occurs in the first week of hospital admission.

The National Stroke Audit – Acute Services is conducted biennially to provide longitudinal data on clinical performance. Each alternate year the National Stroke Foundation undertakes an audit of in-patient rehabilitation services for patients with stroke. The first National Stroke Audit occurred in 2007 and was repeated in 2009 and 2011.
This document reports the results of the Organisational Survey conducted from 1 April to 31 May 2013.

In summary the National Stroke Audit aims to:

- Characterise the nature of Australia’s acute stroke services
- Identify resources available to support the delivery of evidence-based care
- Identify areas where hospital resources linked with focused strategies may facilitate evidence-based stroke care
- Monitor how well recommendations in the Clinical Guidelines for Stroke Management 2010\(^\text{12}\) are being implemented in hospitals
- Enable hospitals to benchmark nationally against similar hospitals
- Provide data to form the basis of a cycle of ongoing quality improvement
- Foster a culture of audit and feedback

1.3 Report structure

The Organisational Survey Report is used to outline how hospitals providing acute stroke care are organised and the resources they have available to provide stroke care. Where applicable, reference to the recommendations in the Clinical Guidelines for Stroke Management 2010\(^\text{12}\) is provided. The methods used to collect and analyse the data are described and information on changes found when compared to previous surveys is outlined. The results of the survey are presented by state, region, stroke unit status and number of annual stroke admissions.
Chapter 2

Methods

2.1 Review and finalisation of the Organisational Survey

The National Stroke Foundation audit project team and members of the National Audit Advisory Committee reviewed questions for the National Stroke Audit – Acute Services Organisational Survey 2013 using the 2011 survey questions in conjunction with the Clinical Guidelines for Stroke Management 2010.12

The 2011 survey questions were modified slightly to clarify the terminology and improve epidemiological soundness (i.e. to ensure the questions were answered consistently by different respondents). The questions are represented in Appendix 5.1.

2.2 Recruitment

The National Stroke Foundation attempted to recruit all eligible hospitals (i.e. hospitals required to admit and manage people with acute stroke) to participate in the National Stroke Audit – Acute Services 2013. Eligible hospitals were identified using information from the 2011 audit. Very small hospitals were excluded if they had a policy of transfer of all stroke patients for acute stay.

Chief executive officers from eligible hospitals were invited to have their hospital formally participate in the audit program (the Clinical Audit and Organisational Survey). Previously identified hospitals were also invited via an email outlining the requirements and benefits of participation. The hospital recruitment period was 1 November 2012 to 31 May 2013.

Follow-up emails and newsletters were sent during the recruitment period to encourage hospitals that declined to participate in the Clinical Audit to complete the Organisational Survey only. A paper-based copy of the survey was included as part of this follow-up contact.

Private hospitals known to admit patients with acute stroke were sent a letter inviting their participation. No other formal follow-up was implemented for these sites.

2.3 Training

All participants were given access to a web-based training resource on the operational functions of the online data entry tool (DET). The instructions in the web-based training resource explained how participants should complete the Organisational Survey and, where possible, ensure responses were based on evidence that could be verified. Following the training session auditors were given a data dictionary which provided a rationale for each question, as well as definitions and clarification of the data required. The National Stroke Foundation audit project team was available to assist participants at all times leading up to and during the data entry period. Some participants did not use the training resources because they had previously participated in the audit program or because they completed the Organisational Survey via email or on a hard copy.

2.4 Data collection

Clinicians at hospitals admitting and treating people with acute stroke completed the survey between 1 April and 31 May 2013.

Clinicians at most hospitals entered data using the online DET via a standard internet connection. Participants were able to change their responses prior to 31 May 2013, at which point all data was locked. Further changes were only permitted if programmed logic checks (see 2.5.1) identified answers that were inconsistent or appeared incorrect.

Security and confidentiality were maintained by assigning hospitals with a hospital identification code and password, each of which had to be entered to access the DET.

The DET had significant administrative functions including the monitoring of data collection at a local and central level as well as minimising missing data through inbuilt logic checks. The National Stroke Foundation project manager could view all hospitals’ data via a secure internet connection. The data was routinely monitored to identify missing data as soon as possible.

Audit project staff used the DET to enter data from hospitals that completed the survey via email or hard copy. Only valid data (i.e. data where a response was provided) is reported. The Known N is the denominator for valid responses and is reported in all tables.
2.5 Data verification

2.5.1 Data verification – logic checks

Programmed data logic checks using statistical software were implemented to ensure responses to questions that were sub-categories of a primary question were consistent with the primary question (e.g. if an answer was ‘no’ then no further subcategories should have been completed). Other more specific logic checks included cross-referencing the number of patients admitted with stroke and the number admitted to the stroke unit in the previous year. These data were verified with each of the participating hospitals.

2.5.2 Data verification – hospital follow-up

The audit project staff sent each participating hospital a copy of their raw data in an Excel spreadsheet to check their responses before undertaking the final analyses. Some hospitals changed their responses, modifying the numbers of FTEs for stroke unit staff, number of admissions of patients with acute stroke, number of stroke unit beds, etc.

2.6 Data analysis

Staff from the Translational Public Health Unit at the Stroke and Ageing Research Centre, Monash University, analysed all data in the Organisational Survey. For confidentiality the data was de-identified prior to transmission to Monash University. Only the hospital site identification number was provided.

The data was analysed using computer programs including Intercooled STATA 10.0 for Windows (Stata Corp, College Station, TX) and Excel (Microsoft Excel 2007). The data was exported from the web-based database as an Excel spreadsheet and transferred into STATA. Data was then recoded into variable definitions recording Yes=1, No=0 and Unknown=9. Variables were derived from the data for state, region, stroke unit status and number of stroke admissions.

2.6.1 Categories for analysis

All organisational data was aggregated to provide national estimates. Due to the small number of hospitals in the Australian Capital Territory (ACT), the ACT and NSW data was analysed and reported together.

Results are provided according to the number of stroke admissions, state, presence of a stroke unit and geographical location (urban or rural). The categorisation of urban or rural location is based on the definition provided by the Australian Institute of Health and Welfare (AIHW). Urban describes a population centre with greater than or equal to 25,000 people. Urban areas may, therefore, include regional centres and metropolitan locations.

3 Metropolitan hospitals were restricted to those with greater than or equal to 100,000 people in the surrounding population.

The median (50% percentile) and interquartile (25–75%) ranges were reported for skewed continuous data from questions such as the number of strokes admitted each year and the number of patients thrombolysed in the last 12 months.

2.6.2 Full-time equivalents (FTE) estimate for a 10-bed stroke unit

Hospitals were asked to provide an estimate of the number of full-time equivalents for each discipline working on their stroke unit. FTE describes the number of hours or days worked per week with 1.0 being full-time work for a five-day period and 0.2 representing one day a week. This data was summed for hospitals with 100 or more annual stroke admissions and used to estimate a weighted average of the FTE for each discipline for a single bed. This estimate was then multiplied by 10 to derive the FTE for a 10-bed unit by discipline.
3.1 Response rates and characteristics of respondents

We identified 195 eligible public hospitals. A total of 172 public hospitals (88% of eligible) and five private hospitals completed the 2013 Organisational Survey. This compares favourably with the 2011 survey in which 88% of eligible public hospitals participated. Overall, 177 hospitals participated in the 2013 survey of which 155 (88%) had also participated in the Acute Services Organisational Survey 2011. The number of participating hospitals was greatest in NSW reflecting the fact it has the largest number of eligible hospitals.

The majority of surveys were completed by senior hospital staff, such as the director of nursing or the director of medical services. Participants were primarily of a nursing background (54%), followed by managers (22%), allied health (11%) and medical staff (7%).

Table 1 Participating hospitals by state

<table>
<thead>
<tr>
<th>State</th>
<th>Eligible public hospitals N</th>
<th>Participating public hospitals n (%)</th>
<th>Participating private hospitals n</th>
<th>Total participating hospitals n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>195</td>
<td>172 (88)</td>
<td>5</td>
<td>177</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>72</td>
<td>67 (93)</td>
<td>1</td>
<td>68</td>
</tr>
<tr>
<td>NT</td>
<td>2</td>
<td>2 (100)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>QLD</td>
<td>38</td>
<td>30 (78)</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>SA</td>
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<td>20</td>
</tr>
<tr>
<td>TAS</td>
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<td>3 (100)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>VIC</td>
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<td>36 (95)</td>
<td>1</td>
<td>37</td>
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<td>WA</td>
<td>18</td>
<td>14 (78)</td>
<td>0</td>
<td>14</td>
</tr>
</tbody>
</table>

Table 2 Participation in the Organisational Survey by year

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2011</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible hospitals</td>
<td>237</td>
<td>209</td>
<td>195</td>
</tr>
<tr>
<td>Participating public hospitals, n (%)</td>
<td>203 (86)</td>
<td>184 (88)</td>
<td>172 (88)</td>
</tr>
<tr>
<td>Participating private hospitals</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>206</td>
<td>188</td>
<td>177</td>
</tr>
</tbody>
</table>
3.2 Characteristics of hospitals surveyed

Key findings
- 83 (47%) hospitals admitted large numbers of patients with stroke (100 or more) in a year
- 78 (44%) hospitals were classified as rural using the AIHW definition
- Participating hospitals reported admitting a total of 27,769 patients with stroke in the previous 12 months
- 89% of total stroke admissions were admitted to large hospitals admitting 100 or more patients with stroke a year
- 8% of total stroke admissions were managed in rural hospitals

Results
Of the participating sites, 99 (56%) were located in an urban area (population >25,000).
Participating hospitals reported 27,769 admissions of patients with acute stroke in the previous 12 months.
Of these, 24,809 (89%) were managed in hospitals admitting 100 or more strokes per year, 25,027 (90%) were managed in hospitals with stroke units and 2,186 (8%) were managed in rural (population <25,000) hospitals.

Figure 1 Participating Australian hospitals by number of stroke admissions in a year

<table>
<thead>
<tr>
<th>Number of stroke admissions</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>50-99</td>
</tr>
<tr>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Australia (N=177)</td>
<td>65</td>
</tr>
<tr>
<td>NSW/ACT (N=68)</td>
<td>25</td>
</tr>
<tr>
<td>NT (N=2)</td>
<td>0</td>
</tr>
<tr>
<td>QLD (N=33)</td>
<td>8</td>
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<tr>
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<td>TAS (N=3)</td>
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<tr>
<td>VIC (N=37)</td>
<td>11</td>
</tr>
<tr>
<td>WA (N=14)</td>
<td>6</td>
</tr>
<tr>
<td>Total admissions (N=27,769)</td>
<td>1,063</td>
</tr>
</tbody>
</table>
| Number admitted per year, median (IQR) | 12 (6-25) | 63 (52-75) | 148 (120-166) | 258 (208-285) | 500 (435-627) | 200 (120-350) | 15 (7-450) | + urban population => 25,000, rural population <= 25,000
3.3 Organisation of acute care

3.3.1 Stroke units in Australia – location and type

Key findings
- 78 (85%) of stroke units were in hospitals that admitted 100 or more strokes per year
- 83 hospitals reported admitting more than 100 stroke patient in a year and five of these did not have a stroke unit
- All stroke units in hospitals admitting more than 100 people with stroke per annum met the minimum standards defining a stroke unit
- 11% of hospitals without a stroke unit reported use of a mobile stroke team despite evidence against this model of care. One of these hospitals admitted more than 100 stroke patients per year.

Rationale

Stroke unit care is the single most important recommendation for stroke management and should be a high priority for clinicians and administrators. Stroke unit care significantly reduces death and disability after stroke compared with conventional care in general wards. There are different types of stroke units depending on the setting in which patients are treated. In acute care these include:
- Acute stroke unit: These accept patients acutely but discharge early, usually within seven days. This could include an intensive model of care with high nursing staff to patient ratios and continuous physiological monitoring for the first 24–72 hours.
- Comprehensive (integrated) stroke unit: These units do not delineate between acute and rehabilitation beds. They accept patients acutely but also provide rehabilitation for several weeks if necessary.

It is recommended all hospitals admitting 100 or more strokes per year should have a stroke unit and that all stroke units should meet minimum standards described in the Acute Stroke Services Framework 2011:
1. Co-located beds within a geographically defined unit.
2. Dedicated inter-professional team with members who have a special interest in stroke and rehabilitation. The minimum team would consist of medical, nursing and allied health (including occupational therapist, physiotherapist, speech pathologist, social worker and dietitian).
3. Inter-professional team meets at least once per week to discuss patient care.
4. Regular programs of staff education and training relating to stroke (e.g. dedicated stroke in-service program and/or access to annual national or regional stroke conferences).

Medium sized hospitals that admit less than 100 strokes per year should consider stroke services which reflect, where possible, criteria for stroke unit care. However, small hospitals that admit fewer strokes (<50 per year), especially those lacking access to fundamental diagnostic equipment like a brain CT, should have transfer protocols and agreements with the nearest hospital with a dedicated stroke service.

Participants were asked to report whether they had a stroke unit and, if so, to describe the type of stroke unit. They were also asked questions relating to the four stroke unit criteria listed above and the presence of alternative models for specialist stroke care (e.g. mobile stroke team).
Results

Of the 177 participating hospitals, 92 reported the presence of a stroke unit (see Table 4).

When assessed against the stroke unit criteria, described above, only one hospital had a stroke unit that did not meet the stroke unit minimum standards. This hospital was located in a rural area and admitted under 100 patients with stroke per year.

One hospital in Victoria (admitting <100 strokes) and one in NSW/ACT (admitting >100 strokes) without stroke units met all four minimum criteria for stroke units.

There were 13 more hospitals admitting >100 strokes per year reporting a stroke unit in 2013 compared to 2011 (78 v 65). However, there were still five hospitals admitting more than 100 people with stroke per annum in Australia that did not have a stroke unit (see Table 5).

There were five more hospitals admitting <100 strokes per year reporting a stroke unit in 2013 compared to 2011 (14 v 9).

Of the hospitals without stroke units (N=85), nine (11%) reported the use of a mobile stroke team. Eight of these hospitals had less than 100 stroke admissions per year.

Table 4 Hospitals with reported stroke units, classified by number of acute stroke admissions last year and location

<table>
<thead>
<tr>
<th>Stroke units, classified by number of stroke admissions</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 ( n )</td>
<td>50–99 ( n )</td>
</tr>
<tr>
<td>Australia (N=92)</td>
<td>4</td>
</tr>
<tr>
<td>NSW/ACT (N=35)</td>
<td>1</td>
</tr>
<tr>
<td>NT (N=1)</td>
<td>0</td>
</tr>
<tr>
<td>QLD (N=24)</td>
<td>2</td>
</tr>
<tr>
<td>SA (N=4)</td>
<td>0</td>
</tr>
<tr>
<td>TAS (N=2)</td>
<td>0</td>
</tr>
<tr>
<td>VIC (N=21)</td>
<td>1</td>
</tr>
<tr>
<td>WA (N=5)</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5 Stroke unit status in hospitals with 100 or more acute stroke admissions last year by state

<table>
<thead>
<tr>
<th>Recommended</th>
<th>Current number of stroke units</th>
<th>Still required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>83</td>
<td>78</td>
</tr>
<tr>
<td>QLD</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>VIC</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>WA</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>SA</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>NT</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TAS</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
3.3.2 Stroke unit access

Key findings

- Only 58% of patients with stroke were reported to be on a stroke unit on the day of the survey.
- The level of stroke unit access has not changed since 2011 and in some parts of the country is lower than in previous years.
- In hospitals with a stroke unit, only 65% of the patients were on the stroke unit on the day of survey (this access rate is lower than 2011).
- The median number of stroke unit beds in hospitals admitting >100 patients per year has dropped from eight in 2011 to five in 2013.
- Hospitals admitting >100 patients with stroke per annum reported on the day of the survey 394 stroke patients were on stroke units despite reportedly having 566 stroke unit beds. This suggests around 30% of stroke unit beds were not holding stroke patients.
- The majority (94%) of hospitals admitting >100 stroke patients per annum admitted patients directly to the stroke unit.
- 73% of hospitals with a stroke unit reported stroke specialist staff provided care to stroke patients on other wards in the hospital.

Rationale

As the number of stroke units in Australia increases there is a greater focus on access to these units (i.e. the proportion of patients able to receive care on the stroke unit). Not all stroke units have the capacity to admit all patients with stroke who present to their hospital.

Participants were asked to provide information about the number of patients with stroke on the stroke unit compared to the number admitted to the hospital on the day the survey was completed. This data was used to estimate the proportion of patients accessing the stroke unit as an indication of the capacity of stroke units. Hospitals were also asked to report the number of beds in their stroke unit.

This data should be interpreted with caution as it is a self-reported estimate. The audit project team did not verify the survey data against hospital admissions data. The estimate is for one day of the year only and cannot provide an indication of capacity throughout the year. The sample was not completely representative because there would have been stroke admissions in hospitals that did not participate in the survey. Verification of these survey results will be provided in the National Clinical Audit Report in which patient-level data is used to illustrate access to stroke units.

Results

The median number of dedicated stroke unit beds per hospital admitting over 100 strokes per year has dropped from eight (IQR 4-10) in 2011 (N=65) to five (IQR 4-8) in 2013 (N=78). There has been little change in dedicated beds per stroke unit hospitals for those admitting less than 100 stroke per year (2011 [N=9]: median 4, IQR 2-4; 2013 [N=14]: median 4, IQR 3-4).

Of the 92 hospitals with a stroke unit, 84 (91%) reported the stroke unit (acute or comprehensive) as the most likely ward for admission following stroke, four (5%) admitted directly to a general medical ward and one (1%) to a neurology with three (3%) admitting to a medical assessment unit prior to stroke unit admission.

73 of the 78 (94%) hospitals admitting greater than 100 strokes per year admit directly to the stroke unit and 11 of the 14 (79%) hospitals that admit less than 100 strokes per year admit directly to the stroke unit.

Of those hospitals with a stroke unit, 67 (73%) provided a service to patients with stroke who were admitted to other wards rather than the stroke unit.
### Table 6 Stroke unit size and capacity by state and location

<table>
<thead>
<tr>
<th>On day of survey</th>
<th>Stroke unit beds</th>
<th>Dedicated beds per SU hospital median (IQR)</th>
<th>Patients with stroke in all hospitals</th>
<th>Patients with stroke on a stroke unit (all hospitals) n (%)</th>
<th>Patients with stroke in hospitals with a SU n (%)</th>
<th>Patients with stroke on a stroke unit (hospitals with a SU only) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>615</td>
<td>4 (4-8)</td>
<td>728</td>
<td>425 (58)</td>
<td>654</td>
<td>425 (65)</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>192</td>
<td>4 (4-6)</td>
<td>264</td>
<td>140 (53)</td>
<td>234</td>
<td>140 (60)</td>
</tr>
<tr>
<td>NT*</td>
<td>4</td>
<td>4 (4-4)</td>
<td>10</td>
<td>3 (30)</td>
<td>6</td>
<td>3 (50)</td>
</tr>
<tr>
<td>QLD</td>
<td>149</td>
<td>4 (4-6)</td>
<td>122</td>
<td>82 (67)</td>
<td>119</td>
<td>82 (69)</td>
</tr>
<tr>
<td>SA</td>
<td>48</td>
<td>11 (7-17)</td>
<td>55</td>
<td>36 (65)</td>
<td>51</td>
<td>36 (71)</td>
</tr>
<tr>
<td>TAS</td>
<td>19</td>
<td>9.5 (8-11)</td>
<td>18</td>
<td>14 (78)</td>
<td>17</td>
<td>14 (82)</td>
</tr>
<tr>
<td>VIC</td>
<td>157</td>
<td>4 (3-10)</td>
<td>160</td>
<td>115 (72)</td>
<td>142</td>
<td>115 (81)</td>
</tr>
<tr>
<td>WA</td>
<td>46</td>
<td>8 (6-12)</td>
<td>99</td>
<td>35 (35)</td>
<td>85</td>
<td>35 (41)</td>
</tr>
<tr>
<td>&gt;100 annual admissions</td>
<td>566</td>
<td>5 (4-8)</td>
<td>639</td>
<td>394 (62)</td>
<td>620</td>
<td>394 (64)</td>
</tr>
<tr>
<td>&lt;100 annual admissions</td>
<td>49</td>
<td>4 (3-4)</td>
<td>89</td>
<td>31 (35)</td>
<td>34</td>
<td>31 (91)</td>
</tr>
<tr>
<td>Urban</td>
<td>595</td>
<td>4 (4-8)</td>
<td>678</td>
<td>413 (61)</td>
<td>637</td>
<td>413 (65)</td>
</tr>
<tr>
<td>Rural</td>
<td>20</td>
<td>2 (2-4)</td>
<td>50</td>
<td>12 (24)</td>
<td>17</td>
<td>12 (71)</td>
</tr>
</tbody>
</table>

*Only two NT hospitals participated in the survey, so the results should be interpreted with caution.

### Table 7 Changes in stroke unit access per state (% of patients on a stroke unit – all hospitals)

<table>
<thead>
<tr>
<th></th>
<th>2009 (N=206) %</th>
<th>2011 (N=188) %</th>
<th>2013 (N=177) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>51</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>56</td>
<td>62</td>
<td>53</td>
</tr>
<tr>
<td>NT</td>
<td>0</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>QLD</td>
<td>52</td>
<td>52</td>
<td>67</td>
</tr>
<tr>
<td>SA</td>
<td>50</td>
<td>63</td>
<td>65</td>
</tr>
<tr>
<td>TAS</td>
<td>59</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td>VIC</td>
<td>45</td>
<td>64</td>
<td>72</td>
</tr>
<tr>
<td>WA</td>
<td>41</td>
<td>38</td>
<td>35</td>
</tr>
</tbody>
</table>
3.3.3 Access to telehealth facilities

**Rationale**

Telehealth facilities play an important part in the delivery of stroke care, particularly in rural centres. They may be used to access ongoing professional development and to enable rural practitioners to access clinical expertise from urban centres. Moreover, such technology can be used to assist in diagnosis with tele-radiology or to enable an urban-based practitioner to review a patient in a rural setting.

Participants were asked if they had access to telehealth facilities for clinical and professional support.

**Results**

**Table 8 Telehealth facilities in participating sites by state, location and stroke unit status**

<table>
<thead>
<tr>
<th>Location</th>
<th>Hospital with access to telehealth for clinical support</th>
<th>Hospital with access to telehealth for professional development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia (N=177)</td>
<td>n (%) 130 (73)</td>
<td>n (%) 155 (88)</td>
</tr>
<tr>
<td>NSW/ACT (N=68)</td>
<td>n (%) 43 (63)</td>
<td>n (%) 57 (84)</td>
</tr>
<tr>
<td>NT (N=2)</td>
<td>n (%) 2 (100)</td>
<td>n (%) 2 (100)</td>
</tr>
<tr>
<td>QLD (N=33)</td>
<td>n (%) 29 (88)</td>
<td>n (%) 31 (94)</td>
</tr>
<tr>
<td>SA (N=20)</td>
<td>n (%) 16 (80)</td>
<td>n (%) 18 (90)</td>
</tr>
<tr>
<td>TAS (N=3)</td>
<td>n (%) 3 (100)</td>
<td>n (%) 3 (100)</td>
</tr>
<tr>
<td>VIC (N=37)</td>
<td>n (%) 26 (70)</td>
<td>n (%) 31 (84)</td>
</tr>
<tr>
<td>WA (N=14)</td>
<td>n (%) 11 (79)</td>
<td>n (%) 13 (93)</td>
</tr>
<tr>
<td>Urban (N=99)</td>
<td>n (%) 64 (65)</td>
<td>n (%) 80 (81)</td>
</tr>
<tr>
<td>Rural (N=78)</td>
<td>n (%) 66 (85)</td>
<td>n (%) 75 (96)</td>
</tr>
</tbody>
</table>
3.3.4 Neurovascular/TIA services

**Key findings**

- Access to essential rapid investigations (brain and carotid imaging) is poor. Approximately 30% of hospitals that either admit all or admit only selected cases do not currently have access to brain and carotid imaging within 24 hours. Some of these hospitals do not have access to CT or Carotid Doppler at all.

- Of the 121 hospitals not having an ‘admit all’ policy for people presenting with TIA, only 38 (31%) had an out-patient TIA clinic to refer patients with TIA for rapid assessment. Of these, 31 were large hospitals admitting >100 stroke patients per annum.

- The median waiting time for these clinics was seven days (2–14).

- 70% of hospitals reported using documented pathways for assessing people presenting with TIA.

- Hospitals with specialist stroke units were more likely to have organised pathway for TIA (85%) compared to hospitals without stroke units (63%).

**Rationale**

The aim of assessing a patient with suspected TIA is to confirm the diagnosis, identify and treat the cause, and guide relevant secondary prevention to reduce the complications or recurrent events. The *Clinical Guidelines for Stroke Management 2010* recommend all patients with suspected TIA should have a full assessment of stroke risk and should be managed in services that allow rapid assessment and treatment to be undertaken within 24–48 hours of symptom onset.

Participants were asked to describe their pathway for managing TIA, for example, whether a risk stratification tool is used to assist in the decision to admit a person with TIA and to identify whether they had access to a TIA out-patient clinic.

**Results**

Of the 177 participating hospitals, 56 (32%) had an ‘admit all’ policy for TIA assessment and management, 114 (64%) admitted selected patient and seven (4%) did not admit TIA patients at all (See Table 9).
## Table 9 Access to timely assessment for people with TIA

<table>
<thead>
<tr>
<th>Service</th>
<th>Hospitals with admit all policy (N=56) n (%)</th>
<th>Hospitals who admit selected patients (N=114) n (%)</th>
<th>Hospitals who admit none (N=7) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to CT within 24 hours</td>
<td>48 (86)</td>
<td>111 (97)</td>
<td>4 (57)</td>
</tr>
<tr>
<td>Access to MRI within 24 hours</td>
<td>20 (36)</td>
<td>63 (55)</td>
<td>1 (14)</td>
</tr>
<tr>
<td>Advanced imaging (CT/MRI perfusion)</td>
<td>26 (46)</td>
<td>81 (71)</td>
<td>2 (29)</td>
</tr>
<tr>
<td>Access to Carotid Doppler within 24 hours</td>
<td>39 (70)</td>
<td>83 (73)</td>
<td>2 (29)</td>
</tr>
<tr>
<td>Access to CT or MRI and Carotid Doppler within 24 hours</td>
<td>38 (68)</td>
<td>83 (73)</td>
<td>2 (29)</td>
</tr>
<tr>
<td>TIA clinic available</td>
<td>NA</td>
<td>37 (33)</td>
<td>1 (14)</td>
</tr>
<tr>
<td>Median waiting time for clinic Days (Q1Q3)</td>
<td>NA</td>
<td>7 (2-14)</td>
<td>NA*</td>
</tr>
<tr>
<td>SU</td>
<td>22 (39)</td>
<td>69 (61)</td>
<td>1 (14)</td>
</tr>
<tr>
<td>Non SU</td>
<td>34 (61)</td>
<td>45 (39)</td>
<td>6 (86)</td>
</tr>
<tr>
<td>Urban</td>
<td>23 (41)</td>
<td>74 (65)</td>
<td>2 (29)</td>
</tr>
<tr>
<td>Rural</td>
<td>33 (59)</td>
<td>40 (35)</td>
<td>5 (71)</td>
</tr>
</tbody>
</table>

*only one site runs a clinic

Of the 170 hospitals admitting some or all of their TIA patients, 18 (11%) did not have access to Carotid Doppler at all (including access within 24 hours), nine (5%) did not have access to CT at all (including access within 24 hours). Of these, eight (5%) did not have access to both brain imaging or Carotid Doppler at all.

Of the 121 hospitals that do not admit all people with suspected TIA, 83 (69%) did not have access to a TIA clinic for rapid specialist assessment. Of these, 31 were large hospitals admitting 100 or more strokes and the remaining 52 were smaller sites predominantly in rural settings. The median waiting time to access the clinic was seven days (Q1Q3, 2-14).

123 (70%) hospitals reported having documented pathways to facilitate assessment of people presenting with TIA and 106 (62%) hospitals used a risk stratification tool to guide decisions around admission. The use of a documented pathway was much higher in hospitals with a stroke unit (78, 85%) compared to hospitals without stroke units (45, 53%). Similarly the use of risk stratification tools is higher in hospitals with stroke units (67, 74%) compared to hospitals without stroke units (39, 49%).
3.3.5 Systems for rapid assessment and transfer where required

Key findings
- 53% of hospitals reported having arrangements with ambulance services to facilitate rapid assessment
- 80% had ED protocols for rapid triage
- 27% of hospitals that needed to transfer patients with stroke to larger hospitals did not have formalised documented transfer arrangements
- Of the 12 hospitals without access to CT (where transfer for immediate CT is required), only one reported having no formal transfer protocols

Rationale
There is growing evidence early stroke management can reduce damage to the brain and minimise the effects of stroke. Early recognition of stroke and the subsequent response by individuals and the health system is, therefore, integral to achieving optimal health outcomes. Arrangements with ambulance for rapid transport to stroke unit hospitals and protocols in the emergency department (ED) can facilitate rapid assessment and management.

The Clinical Guidelines for Stroke Management 2010\textsuperscript{12} recommend stroke unit care for all patients with stroke. In areas where stroke units are not feasible or not recommended, transfer protocols are required to facilitate timely and coordinated transfer to a larger hospital that has appropriate resources for the management of stroke.

Participants were asked if they had arrangements with their local ambulance provider, protocols for use in the ED to enable rapid assessment and triage of people presenting with stroke, and formalised transfer protocols with other hospitals (for hospitals who report not managing all strokes, including complex strokes).

Results
Of the 111 hospitals that reported not managing all strokes including complex strokes, 30 (27%) did not have formal protocols to guide transfer. Of these hospitals, 14 (47%) were classified as rural and 11 (37%) admitted 100 or more patients with stroke per year.

Of the 12 hospitals without access to CT (where transfer for immediate CT is required), one had no formal transfer protocols.

Table 10 Processes to facilitate rapid assessment and treatment by state, location and stroke unit status

<table>
<thead>
<tr>
<th></th>
<th>Hospitals N</th>
<th>Hospitals with ambulance arrangements n (%)*</th>
<th>Hospitals with ED protocol for rapid triage n (%)</th>
<th>Hospitals with ED transfer protocols n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>177</td>
<td>94 (53)</td>
<td>142 (80)</td>
<td>111 (63)</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>68</td>
<td>38 (56)</td>
<td>54 (79)</td>
<td>44 (65)</td>
</tr>
<tr>
<td>NT</td>
<td>2</td>
<td>0 (0)</td>
<td>1 (50)</td>
<td>1 (50)</td>
</tr>
<tr>
<td>QLD</td>
<td>33</td>
<td>10 (30)</td>
<td>25 (76)</td>
<td>19 (58)</td>
</tr>
<tr>
<td>SA</td>
<td>20</td>
<td>15 (75)</td>
<td>16 (80)</td>
<td>17 (85)</td>
</tr>
<tr>
<td>TAS</td>
<td>3</td>
<td>0 (0)</td>
<td>3 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>VIC</td>
<td>37</td>
<td>26 (70)</td>
<td>34 (92)</td>
<td>22 (59)</td>
</tr>
<tr>
<td>WA</td>
<td>14</td>
<td>5 (36)</td>
<td>9 (64)</td>
<td>8 (57)</td>
</tr>
<tr>
<td>Urban</td>
<td>99</td>
<td>56 (57)</td>
<td>83 (84)</td>
<td>50 (51)</td>
</tr>
<tr>
<td>Rural</td>
<td>78</td>
<td>38 (49)</td>
<td>59 (76)</td>
<td>61 (78)</td>
</tr>
<tr>
<td>SU</td>
<td>92</td>
<td>55 (60)</td>
<td>80 (87)</td>
<td>49 (53)</td>
</tr>
<tr>
<td>Non SU</td>
<td>85</td>
<td>39 (46)</td>
<td>62 (73)</td>
<td>62 (73)</td>
</tr>
</tbody>
</table>

*Includes sites who stated there is agreement to bypass hospital for another stroke specific service
3.3.6 Diagnostic imaging

Key findings

- Most (92%) hospitals admitting patients with acute stroke had immediate access to CT (either on or off-site) within 24 hours.
- The 14 hospitals admitting patients with acute stroke without access to CT imaging within 24 hours admitted a median of five strokes per year.
- 88% of stroke unit hospitals had access to MRI.
- 26% of rural hospitals did not have access to Carotid Doppler services.

Rationale

CT access within 24 hours has long been an important criterion that defines basic management of acute stroke. Immediate imaging for all patients is seen as the most cost-effective imaging strategy in acute stroke. The Clinical Guidelines for Stroke Management 201012 recommend all patients with acute stroke should have an urgent CT or MRI. Studies have reported MRI is more sensitive than CT for identifying ischaemic changes and is as sensitive as CT in identifying acute haemorrhagic change. Therefore, MRI is the diagnostic method of choice.14, 15

In patients with carotid territory symptoms, and where large artery disease is suspected, carotid imaging studies should be performed rapidly and the potential for surgery discussed.

Ideally patients who require carotid surgery should have this done within two weeks of stroke.12

Participants were asked about their access to brain imaging and other diagnostic services to enable appropriate imaging for stroke. Immediate access was defined as access within 24 hours.

Results

There were 137 hospitals with on-site CT (one of which could not routinely access CT within 24 hours) and a further 27 hospitals could access CT off-site within 24 hours. However, 14 hospitals admitting patients with acute stroke did not have access to CT imaging within 24 hours. These hospitals admitted a median of five strokes per year (Q1Q3, 2-6).

A total of 109 hospitals had access to advanced imaging, of which 74% had perfusion scanning accessible and 88% had access to angiography.
### Table 11: Availability of CT, MRI and Carotid Doppler by state

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177) n (%)</th>
<th>NSW/ACT (N=88) n (%)</th>
<th>NT (N=2) n (%)</th>
<th>QLD (N=33) n (%)</th>
<th>SA (N=20) n (%)</th>
<th>TAS (N=3) n (%)</th>
<th>VIC (N=37) n (%)</th>
<th>WA (N=14) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early access to on-/off-site CT (within 24hrs)</td>
<td>163 (92)</td>
<td>60 (88)</td>
<td>2 (100)</td>
<td>33 (100)</td>
<td>18 (80)</td>
<td>3 (100)</td>
<td>34 (92)</td>
<td>13 (93)</td>
</tr>
<tr>
<td>Access to on-site CT</td>
<td>137 (77)</td>
<td>48 (60)</td>
<td>1 (50)</td>
<td>27 (82)</td>
<td>6 (30)</td>
<td>2 (67)</td>
<td>25 (68)</td>
<td>8 (57)</td>
</tr>
<tr>
<td>Access to MRI</td>
<td>110 (62)</td>
<td>41 (60)</td>
<td>1 (50)</td>
<td>27 (82)</td>
<td>6 (30)</td>
<td>2 (67)</td>
<td>25 (68)</td>
<td>8 (57)</td>
</tr>
<tr>
<td>Access to Carotid Doppler</td>
<td>156 (88)</td>
<td>57 (84)</td>
<td>2 (100)</td>
<td>31 (94)</td>
<td>16 (80)</td>
<td>3 (100)</td>
<td>34 (92)</td>
<td>13 (93)</td>
</tr>
</tbody>
</table>

### Table 12: Availability of CT, MRI and Carotid Doppler by number of stroke admissions, location and stroke unit status

<table>
<thead>
<tr>
<th></th>
<th>Admissions</th>
<th>SU status</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;50 (N=65) n (%)</td>
<td>50-99 (N=29) n (%)</td>
<td>&gt;100 (N=83) n (%)</td>
</tr>
<tr>
<td>Early access to on-/off-site CT (within 24hrs)</td>
<td>52 (80)</td>
<td>26 (97)</td>
<td>83 (100)</td>
</tr>
<tr>
<td>Access to on-site CT</td>
<td>29 (45)</td>
<td>25 (86)</td>
<td>83 (100)</td>
</tr>
<tr>
<td>Access to MRI</td>
<td>21 (32)</td>
<td>12 (41)</td>
<td>77 (93)</td>
</tr>
<tr>
<td>Access to Carotid Doppler</td>
<td>46 (71)</td>
<td>27 (93)</td>
<td>83 (100)</td>
</tr>
</tbody>
</table>
3.3.7 Thrombolysis

**Rationale**

There is significant benefit associated with the administration of intravenous rt-PA for ischaemic stroke within 4.5 hours of symptom onset. The *Clinical Guidelines for Stroke Management 2010* recommend the use of intravenous rt-PA in acute ischaemic stroke should be undertaken in patients satisfying specific inclusion and exclusion criteria. The available evidence shows intravenous rt-PA therapy is beneficial for selected patients, but should be delivered in well-equipped and skilled EDs and/or stroke units with adequate expertise and infrastructure for monitoring, rapid assessment and investigation of patients with acute stroke.\(^{16}\)

Participants were asked to report on whether intravenous rt-PA was offered at their hospital and, if so, to estimate how many patients with acute stroke they had thrombolysed in the previous year.

**Results**

A total of 93 hospitals reported offering thrombolysis. However, 14 were not active with only 79 reporting they had thrombolysed at least one patient in the previous year.

Lack of resources, for example adequate staffing, was the most common reason hospitals did not offer thrombolysis (68 hospitals, 79%). A lack of facilities, for example access to rapid brain scanning, was also common (55 hospitals, 66%). Thrombolysis was not considered a treatment option in 41 hospitals.

Of the 20 hospitals without a stroke unit who reported providing thrombolysis, 17 (85%) were in rural locations. Of 19 (21%) hospitals with a stroke unit who don’t offer thrombolysis, only 2 (11%) were in rural areas.

---

**Key findings**

- Only 79% of hospitals with stroke units offer thrombolysis
- Hospitals reporting delivery of thrombolysis estimated that 1,472 patients had received it, of the 27,769 patients with stroke they reported admitting in the last 12 months
- The number of hospitals offering thrombolysis has increased from 58 (28%) to 93 (53%) nationally since 2009
- 20 hospitals without a stroke unit reported providing thrombolysis to 41 people
Table 13  Thrombolysis processes in hospitals providing thrombolysis and number of patients that had been thrombolysed last year by state, stroke unit status and location

<table>
<thead>
<tr>
<th></th>
<th>Total number of hospitals offering thrombolysis</th>
<th>% offering rt-PA on a 24-hour, 7 days per week basis, n (%)</th>
<th>Total number thrombolysed</th>
<th>Number thrombolysed last year per hospital, median (IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>93</td>
<td>81 (87)</td>
<td>1472</td>
<td>6 (2-24)</td>
</tr>
<tr>
<td>NSW/ACT</td>
<td>31</td>
<td>27 (87)</td>
<td>426</td>
<td>6 (2-22)</td>
</tr>
<tr>
<td>NT</td>
<td>0</td>
<td>0 (0)</td>
<td>0</td>
<td>0 (0)</td>
</tr>
<tr>
<td>QLD</td>
<td>20</td>
<td>16 (80)</td>
<td>179</td>
<td>4 (2-14)</td>
</tr>
<tr>
<td>SA</td>
<td>7</td>
<td>5 (71)</td>
<td>158</td>
<td>7 (1-51)</td>
</tr>
<tr>
<td>TAS</td>
<td>2</td>
<td>2 (100)</td>
<td>27</td>
<td>14 (1-26)</td>
</tr>
<tr>
<td>VIC</td>
<td>27</td>
<td>25 (93)</td>
<td>616</td>
<td>9 (2-42)</td>
</tr>
<tr>
<td>WA</td>
<td>6</td>
<td>6 (100)</td>
<td>66</td>
<td>8 (4-17)</td>
</tr>
<tr>
<td>Urban</td>
<td>71 (72)</td>
<td>62 (87)</td>
<td>1422</td>
<td>12 (5-29)</td>
</tr>
<tr>
<td>Rural</td>
<td>22 (28)</td>
<td>19 (86)</td>
<td>50</td>
<td>1 (0-3)</td>
</tr>
<tr>
<td>SU</td>
<td>73</td>
<td>64 (88)</td>
<td>1431</td>
<td>12 (5-28)</td>
</tr>
<tr>
<td>Non SU</td>
<td>20</td>
<td>17 (85)</td>
<td>41</td>
<td>1 (0-4)</td>
</tr>
</tbody>
</table>
3.3.8 Assessment protocols

**Key findings**

- Only 50% of hospitals reported the use of assessment protocols for mood impairment.
- Rural hospitals and hospitals without stroke units were less likely to use protocols for assessment of common impairments after stroke.
- Protocols for the assessment and management of fever, sugar and swallow (all demonstrated to be associated with reduced death and disability) were also less likely to be used in rural hospitals and hospitals without stroke units.

**Rationale**

Comprehensive assessments permit the stroke team to identify the sequelae of the stroke, identify therapy goals, assess changes in a stroke survivor’s function and independence and assess the efficacy of care pathways. While there is some evidence to suggest a structured assessment helps to identify particular problems\(^\text{17}\) there is little direct evidence guiding what should be included and when such assessments should be conducted. Protocols to guide assessment are considered helpful to support use of appropriate, timely and valid assessment processes.

Participants were asked to indicate if they had protocols for locally agreed assessment of impairments following stroke. Specific questions on swallow screening and communication assessment were included this year.

**Results**

In hospitals with a management protocol for swallow dysfunction, 109 (77%) reported having a specific program for training clinical staff on swallow screening.
Table 14 Proportion of hospitals reporting the use of locally agreed assessment protocols for common impairments after stroke by stroke unit status and location

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>No SU (N=85) n (%)</th>
<th>Urban (N=99) n (%)</th>
<th>Rural (N=78) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consciousness level</td>
<td>161 (91)</td>
<td>90 (98)</td>
<td>71 (84)</td>
<td>97 (98)</td>
<td>64 (82)</td>
</tr>
<tr>
<td>Motor impairment</td>
<td>145 (82)</td>
<td>88 (96)</td>
<td>57 (67)</td>
<td>93 (94)</td>
<td>52 (67)</td>
</tr>
<tr>
<td>Visual impairment</td>
<td>124 (70)</td>
<td>81 (88)</td>
<td>43 (51)</td>
<td>83 (84)</td>
<td>41 (53)</td>
</tr>
<tr>
<td>Sensory impairment</td>
<td>123 (69)</td>
<td>79 (86)</td>
<td>44 (52)</td>
<td>82 (83)</td>
<td>41 (53)</td>
</tr>
<tr>
<td>Executive function</td>
<td>121 (68)</td>
<td>79 (86)</td>
<td>42 (49)</td>
<td>83 (84)</td>
<td>38 (49)</td>
</tr>
<tr>
<td>Activities of daily living</td>
<td>139 (79)</td>
<td>84 (91)</td>
<td>55 (65)</td>
<td>89 (90)</td>
<td>50 (64)</td>
</tr>
<tr>
<td>Mood</td>
<td>88 (50)</td>
<td>57 (62)</td>
<td>31 (36)</td>
<td>59 (60)</td>
<td>29 (37)</td>
</tr>
<tr>
<td>Incontinence of urine</td>
<td>115 (65)</td>
<td>67 (73)</td>
<td>48 (57)</td>
<td>73 (74)</td>
<td>42 (54)</td>
</tr>
<tr>
<td>Incontinence of faeces</td>
<td>107 (60)</td>
<td>62 (67)</td>
<td>45 (53)</td>
<td>67 (68)</td>
<td>40 (51)</td>
</tr>
<tr>
<td>Nutrition</td>
<td>145 (82)</td>
<td>87 (95)</td>
<td>58 (68)</td>
<td>93 (94)</td>
<td>52 (67)</td>
</tr>
<tr>
<td>Hydration</td>
<td>124 (70)</td>
<td>74 (80)</td>
<td>50 (59)</td>
<td>80 (81)</td>
<td>44 (56)</td>
</tr>
<tr>
<td>Communication</td>
<td>137 (77)</td>
<td>84 (91)</td>
<td>53 (62)</td>
<td>89 (90)</td>
<td>48 (62)</td>
</tr>
</tbody>
</table>

Table 15 Proportion of hospitals reporting agreed protocols for assessment and management of other impairments by stroke unit status and location

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>No SU (N=85) n (%)</th>
<th>Urban (N=99) n (%)</th>
<th>Rural (N=78) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>130 (73)</td>
<td>76 (83)</td>
<td>54 (64)</td>
<td>81 (82)</td>
<td>49 (63)</td>
</tr>
<tr>
<td>Blood glucose level</td>
<td>137 (77)</td>
<td>77 (84)</td>
<td>60 (71)</td>
<td>82 (83)</td>
<td>55 (71)</td>
</tr>
<tr>
<td>Swallow dysfunction</td>
<td>142 (80)</td>
<td>86 (94)</td>
<td>56 (66)</td>
<td>90 (91)</td>
<td>52 (67)</td>
</tr>
</tbody>
</table>
3.3.9 Team communication

**Key findings**
- Care pathways were used in 67% of hospitals
- Rural hospitals and hospitals without stroke units were less likely to have regular team meetings

**Rationale**

Communication between the members of the stroke team is a fundamental element of an organised stroke service. Data from clinical trials included in the stroke unit meta-analysis provided evidence that organised stroke units were characterised by formal weekly meetings of the multidisciplinary team along with one or more informal meetings.\(^1\)

Clinical pathways (also known as care pathways or critical pathways) are recommended in the *Clinical Guidelines for Stroke Management 2010*\(^2\) and are defined as a plan of care that aims to promote organised and efficient multidisciplinary stroke management based on the best available evidence and guidelines. Care pathways are one way of promoting organised and efficient patient care and hence improve outcomes.\(^3\) However, the definition, structure and detail contained within the pathway may vary between settings.

Participants were asked if they held regular team meetings at their hospitals. They were asked to describe the frequency of these meetings and to identify the clinicians who routinely attended the team meetings. Participants were also asked if they routinely used clinical pathways at their hospital.

**Results**

**Table 16 Multidisciplinary collaboration by number of acute stroke admissions last year and location and stroke unit status**

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177)</th>
<th>&lt;100 (N=94)</th>
<th>&gt;100 (N=83)</th>
<th>Urban (N=99)</th>
<th>Rural (N=78)</th>
<th>SU (N=92)</th>
<th>Non SU (N=85)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals with regular team meetings: n (%)</td>
<td>149 (84)</td>
<td>67 (71)</td>
<td>82 (99)</td>
<td>98 (99)</td>
<td>51 (65)</td>
<td>92 (100)</td>
<td>57 (67)</td>
</tr>
<tr>
<td>Hospitals using care pathways: n (%)</td>
<td>119 (67)</td>
<td>50 (53)</td>
<td>69 (83)</td>
<td>81 (82)</td>
<td>38 (49)</td>
<td>77 (84)</td>
<td>42 (49)</td>
</tr>
</tbody>
</table>

**Figure 2 Multidisciplinary attendance at case meetings**

- Doctor 63%
- Nurse 82%
- Physiotherapist 63%
- Occupational therapist 71%
- Dietitian 63%
- Social worker 73%
- Speech pathologist 71%
- Psychologist 2%
3.3.10 Access to rehabilitation

**Key findings**

- One-third of hospitals did not routinely provide assessment for ongoing rehabilitation needs for patients with stroke.
- Only one in five hospitals had access to early supported discharge teams.
- Access to community based rehabilitation was reported in 145 (82%) of hospitals.

**Rationale**

Access to rehabilitation either as an inpatient or through early supported discharge is an important requirement for patients with acute stroke. However, hospitals may not always be able to provide adequate rehabilitation services to their patients.

Participants were asked if they assessed patients with stroke for the need for further in-patient rehabilitation in conjunction with a rehabilitation team. Participants were also asked if they had access to other rehabilitation services including early supported discharge or community based rehabilitation services (Table 17).

**Results**

**Table 17 Access to rehabilitation by state**

<table>
<thead>
<tr>
<th>Participating hospitals N</th>
<th>Hospitals providing routine assessments for all patients for the need for further in-patient rehabilitation n (%)</th>
<th>Hospitals with access to early supported discharge teams n (%)</th>
<th>Hospitals with access to community based rehabilitation n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia (N=177)</td>
<td>177</td>
<td>118 (67)</td>
<td>35 (20)</td>
</tr>
<tr>
<td>NSW/ACT (N=68)</td>
<td>68</td>
<td>43 (63)</td>
<td>13 (19)</td>
</tr>
<tr>
<td>NT (N=2)</td>
<td>2</td>
<td>2 (100)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>QLD (N=33)</td>
<td>33</td>
<td>27 (82)</td>
<td>9 (27)</td>
</tr>
<tr>
<td>SA (N=20)</td>
<td>20</td>
<td>12 (60)</td>
<td>2 (10)</td>
</tr>
<tr>
<td>TAS (N=3)</td>
<td>3</td>
<td>2 (67)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>VIC (N=37)</td>
<td>37</td>
<td>23 (62)</td>
<td>8 (22)</td>
</tr>
<tr>
<td>WA (N=14)</td>
<td>14</td>
<td>9 (64)</td>
<td>3 (21)</td>
</tr>
</tbody>
</table>
3.3.11 Provision of care plans and post-discharge support

Key findings
- Only 104 (59%) hospitals reported routinely providing discharge care plans developed with patient and family
- The provision of a post discharge contact to patients was reported by 126 (71%) hospitals
- More than two-thirds of hospitals did not use protocols to support post discharge review of patients with stroke

Rationale
A discharge care plan is completed prior to discharge and identifies appropriate management strategies to guide care when the stroke survivor returns to the community. The *Clinical Guidelines for Stroke Management 2010* recommend care plans should be used and include the development of self-management strategies, provision of equipment and support services, plans for further rehabilitation or out-patient appointments and an appropriate contact number for any queries. Providing post-discharge support (such as that provided by a stroke support group) is also recommended. People with stroke and their families often report being dissatisfied with the information, support services and therapy provided to them.

Participants were asked about the routine use of discharge care plans and post-discharge patient support (Table 18).

Results

<table>
<thead>
<tr>
<th>Table 18 Discharge planning processes by state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routinely providing a discharge care plan n (%)</td>
</tr>
<tr>
<td>Australia (N=177)</td>
</tr>
<tr>
<td>NSW/ACT (N=68)</td>
</tr>
<tr>
<td>NT (N=2)</td>
</tr>
<tr>
<td>QLD (N=33)</td>
</tr>
<tr>
<td>SA (N=20)</td>
</tr>
<tr>
<td>TAS (N=3)</td>
</tr>
<tr>
<td>VIC (N=37)</td>
</tr>
<tr>
<td>WA (N=14)</td>
</tr>
</tbody>
</table>
3.3.12 Provision of information

**Rationale**

The provision of information and education is particularly important for stroke survivors and their families. Stroke survivors report that it is an important component of their preparedness to go home, but also that it is not often available in the hospital. The Clinical Guidelines for Stroke Management 2010 make three recommendations:

1. All stroke survivors and their families/carers should be offered information tailored to meet their needs using relevant language and communication formats (Grade A).
2. Information should be provided at different stages in the recovery process (Grade B);
3. Stroke survivors and their families/carers should be provided with routine, follow-up opportunities for clarification or reinforcement of the information provided (Grade B)

Participants were asked to report on the routine provision of information about several topics before discharge.

**Results**

Of the 92 hospitals with a stroke unit, 91 (99%) routinely provided information about stroke to patients, compared to 43 (51%) of the 85 hospitals without stroke units. Aphasia friendly communication was available for all information provided to patients with stroke in 17 (10%) hospitals. ‘Some’ aphasia friendly material was available in 46% of hospitals.

**Key findings**

- Information about stroke was routinely available at 76% of hospitals
- Rural hospitals and hospitals without stroke units were less likely to routinely provide information to patients after stroke
- Information about stroke was rarely available in a format that supported those patients with language impairment after stroke
- Only 35% of non-stroke unit hospitals provide information about community stroke support groups

**Table 19 Provision of information by state, stroke unit status and location**

<table>
<thead>
<tr>
<th>Information is routinely available on:</th>
<th>State</th>
<th>Location</th>
<th>SU status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia (N=177)</td>
<td>134 (76)</td>
<td>97 (98)</td>
<td>91 (99)</td>
</tr>
<tr>
<td>NSW/ACT (N=68)</td>
<td>54 (79)</td>
<td>51 (75)</td>
<td>73 (74)</td>
</tr>
<tr>
<td>NT (N=2)</td>
<td>1 (50)</td>
<td>1 (50)</td>
<td>71 (77)</td>
</tr>
<tr>
<td>QLD (N=33)</td>
<td>31 (94)</td>
<td>24 (73)</td>
<td>45 (58)</td>
</tr>
<tr>
<td>SA (N=20)</td>
<td>8 (40)</td>
<td>11 (55)</td>
<td>47 (55)</td>
</tr>
<tr>
<td>TAS (N=3)</td>
<td>3 (100)</td>
<td>1 (33)</td>
<td></td>
</tr>
<tr>
<td>VIC (N=37)</td>
<td>29 (78)</td>
<td>22 (60)</td>
<td></td>
</tr>
<tr>
<td>WA (N=14)</td>
<td>8 (57)</td>
<td>8 (57)</td>
<td></td>
</tr>
<tr>
<td>Urban (N=99)</td>
<td>97 (98)</td>
<td>73 (74)</td>
<td>80 (81)</td>
</tr>
<tr>
<td>Rural (N=78)</td>
<td>37 (47)</td>
<td>45 (58)</td>
<td>25 (32)</td>
</tr>
<tr>
<td>SU (N=92)</td>
<td>91 (99)</td>
<td>71 (77)</td>
<td>76 (83)</td>
</tr>
<tr>
<td>Non SU (N=85)</td>
<td>43 (51)</td>
<td>47 (55)</td>
<td>29 (34)</td>
</tr>
<tr>
<td>Local community care arrangements</td>
<td>118 (67)</td>
<td>73 (74)</td>
<td>80 (81)</td>
</tr>
<tr>
<td>Community stroke support groups</td>
<td>105 (59)</td>
<td>80 (81)</td>
<td>76 (83)</td>
</tr>
</tbody>
</table>
3.3.13 Family meetings

**Rationale**

Ongoing communication between the stroke team and the family/carer is a key element of an organised and high quality stroke service. Communication is established through formal and informal meetings to discuss assessment results, management plans and discharge planning. Coordinated care aids the patient’s understanding of their condition and future progress.

The *Clinical Guidelines for Stroke Management 2010* recommends:

The stroke team should meet regularly with the patient and their family/carer to involve them in management, goal setting and planning for discharge. (Grade C)

Participants were asked to report on the routine use of family meetings with patients with stroke and/or their family in the hospital (Table 20).

**Results**

<table>
<thead>
<tr>
<th>Hospitals where team routinely meets with family</th>
<th>Australia (N=177) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>Non SU (N=85) n (%)</th>
<th>Urban (N=99) n (%)</th>
<th>Rural (N=78) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>148 (84)</td>
<td>82 (89)</td>
<td>66 (78)</td>
<td>84 (85)</td>
<td>64 (82)</td>
<td></td>
</tr>
</tbody>
</table>
3.4 Organisation of workforce

3.4.1 Access to multidisciplinary care

**Key findings**

- Only 62 (35%) of all hospitals (52 [57%] of stroke unit hospitals) reported access to stroke care coordinators.
- Access to psychology remains very low, with only one-third of hospitals with over 100 patients with stroke per annum having access to a psychologist.
- Specialist medical professionals remain difficult to access with only two (3%) rural hospitals reporting access to a neurologist and 20 (26%) with access to a geriatrician.
- Many rural hospitals did not have access to key therapists for stroke recovery, in particular psychologist, speech pathologists, occupational therapists and social workers.

**Rationale**

Multidisciplinary assessment and management are important in early assessment and rehabilitation. Effective care relies on a coordinated multidisciplinary approach. The multidisciplinary team may include many disciplines combining and coordinating the use of medical, nursing and allied health skills.

Participants were asked about their access to various members of the multidisciplinary team and to identify which medical team usually manages patients with stroke at their hospital.

**Results**
Table 21 Access to multidisciplinary team by number of annual stroke admissions, location and stroke unit status

<table>
<thead>
<tr>
<th>Medical</th>
<th>Australia (N=177) n (%)</th>
<th>&lt;100 (N=94) n (%)</th>
<th>&gt;100 (N=83) n (%)</th>
<th>Urban (N=89) n (%)</th>
<th>Rural (N=78) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>Non SU (N=85) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced trainee</td>
<td>60 (34)</td>
<td>13 (14)</td>
<td>47 (57)</td>
<td>51 (52)</td>
<td>9 (12)</td>
<td>47 (51)</td>
<td>13 (15)</td>
</tr>
<tr>
<td>General physician</td>
<td>90 (51)</td>
<td>39 (41)</td>
<td>51 (61)</td>
<td>65 (66)</td>
<td>25 (32)</td>
<td>58 (63)</td>
<td>32 (38)</td>
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<tr>
<td>General practitioner</td>
<td>72 (41)</td>
<td>67 (71)</td>
<td>5 (6)</td>
<td>11 (11)</td>
<td>61 (78)</td>
<td>6 (7)</td>
<td>66 (78)</td>
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<tr>
<td>Geriatrician</td>
<td>78 (44)</td>
<td>29 (31)</td>
<td>49 (59)</td>
<td>58 (59)</td>
<td>20 (26)</td>
<td>53 (58)</td>
<td>25 (29)</td>
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<tr>
<td>Neurologist</td>
<td>65 (37)</td>
<td>6 (6)</td>
<td>59 (71)</td>
<td>63 (64)</td>
<td>2 (3)</td>
<td>64 (70)</td>
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<tr>
<td>Rehabilitation physician</td>
<td>88 (50)</td>
<td>21 (22)</td>
<td>67 (81)</td>
<td>76 (77)</td>
<td>12 (15)</td>
<td>72 (78)</td>
<td>16 (19)</td>
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<tr>
<td>Nursing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Clinical nurse specialist*</td>
<td>93 (53)</td>
<td>34 (36)</td>
<td>59 (71)</td>
<td>68 (69)</td>
<td>25 (32)</td>
<td>66 (72)</td>
<td>27 (32)</td>
</tr>
<tr>
<td>Nurse practitioner</td>
<td>7 (4)</td>
<td>4 (4)</td>
<td>3 (4)</td>
<td>4 (4)</td>
<td>3 (4)</td>
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<tr>
<td>Nursing unit manager</td>
<td>154 (87)</td>
<td>72 (77)</td>
<td>82 (99)</td>
<td>97 (98)</td>
<td>57 (73)</td>
<td>90 (98)</td>
<td>64 (75)</td>
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<tr>
<td>Stroke care coordinator#</td>
<td>62 (35)</td>
<td>15 (16)</td>
<td>47 (57)</td>
<td>54 (55)</td>
<td>8 (10)</td>
<td>52 (57)</td>
<td>10 (12)</td>
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<tr>
<td>Stroke nurse educator</td>
<td>18 (10)</td>
<td>3 (3)</td>
<td>15 (18)</td>
<td>16 (16)</td>
<td>2 (3)</td>
<td>16 (17)</td>
<td>2 (2)</td>
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<tr>
<td>Allied Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietitian</td>
<td>165 (93)</td>
<td>84 (89)</td>
<td>81 (98)</td>
<td>97 (98)</td>
<td>88 (87)</td>
<td>90 (98)</td>
<td>75 (88)</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>165 (93)</td>
<td>82 (87)</td>
<td>83 (100)</td>
<td>99 (100)</td>
<td>66 (85)</td>
<td>92 (100)</td>
<td>73 (86)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>171 (97)</td>
<td>88 (94)</td>
<td>83 (100)</td>
<td>99 (100)</td>
<td>72 (92)</td>
<td>92 (100)</td>
<td>79 (93)</td>
</tr>
<tr>
<td>Psychology^</td>
<td>34 (19)</td>
<td>5 (5)</td>
<td>29 (35)</td>
<td>31 (31)</td>
<td>3 (4)</td>
<td>31 (34)</td>
<td>3 (4)</td>
</tr>
<tr>
<td>Social worker</td>
<td>153 (86)</td>
<td>71 (76)</td>
<td>82 (99)</td>
<td>98 (99)</td>
<td>55 (71)</td>
<td>90 (98)</td>
<td>63 (74)</td>
</tr>
<tr>
<td>Speech pathologist</td>
<td>167 (94)</td>
<td>84 (89)</td>
<td>83 (100)</td>
<td>99 (100)</td>
<td>68 (87)</td>
<td>92 (100)</td>
<td>75 (88)</td>
</tr>
</tbody>
</table>

* Clinical nurse consultant or clinical nurse specialist  
^ clinical psychology or neuropsychology  
# may be nursing or allied health background
3.4.2 Stroke workforce in hospitals with a stroke unit

Rationale

A major characteristic of stroke unit care is that it is provided by a multidisciplinary team. This team is comprised of specialists from a range of disciplines including medical, nursing and allied health. The availability of services provided by the multidisciplinary team is important for prompt assessment and to ensure immediate access to rehabilitation.

Participants at hospitals with stroke units were asked to provide an estimate of the number of FTE in terms of time available for each discipline on their stroke unit. This data was used to derive an estimate of FTE for a 10-bed unit for each discipline using a weighted average as described in Chapter 2, Methods.

<table>
<thead>
<tr>
<th>Table 22 Composition of stroke unit team and median FTE for a 10-bed stroke unit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced medical trainee</td>
</tr>
<tr>
<td>Clinical psychologist</td>
</tr>
<tr>
<td>Dietitian</td>
</tr>
<tr>
<td>General physician</td>
</tr>
<tr>
<td>Geriatrician</td>
</tr>
<tr>
<td>Neurologist</td>
</tr>
<tr>
<td>Occupation therapist</td>
</tr>
<tr>
<td>Physiotherapist</td>
</tr>
<tr>
<td>Rehabilitation physician</td>
</tr>
<tr>
<td>Social worker</td>
</tr>
<tr>
<td>Speech pathologist</td>
</tr>
</tbody>
</table>

*Interpret with caution: FTE for health professionals working in acute stroke units were self-reported. Furthermore, as units increase in size, they gain economies of scale and may have lower relative FTE for larger units. It is also important to note that the data is not provided as an indication of what FTE may be required to run a stroke unit as some units responding to the survey may have been under resourced. However, it does provide some insight into the staffing currently provided on stroke units across Australia. As the numbers of stroke units participating in each state was highly variable, disaggregation of FTE by health professional by state have not been provided because the data is unreliable at this level. Nursing FTE data is not provided since these data were too variable to be interpreted meaningfully.
3.4.3 Referring to allied health

**Key findings**

- Almost all urban or stroke unit hospitals use protocols to facilitate referral to allied health professionals with the most obvious discrepancy being the use of protocols for referrals to psychology which remains low (25% nationally)

**Rationale**

Early assessment and management are important interventions with evidence to show they result in improved outcomes. Early assessment and management is facilitated where there are processes for referral to allied health.

**Results**

**Table 23** Proportion of hospitals with a protocol for referral to multidisciplinary team members by location and stroke unit status

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177) n (%)</th>
<th>Urban (N=99) n (%)</th>
<th>Rural (N=78) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>Non SU (N=85) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietitian</td>
<td>147 (83)</td>
<td>93 (94)</td>
<td>54 (69)</td>
<td>87 (95)</td>
<td>60 (71)</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>154 (87)</td>
<td>97 (98)</td>
<td>57 (73)</td>
<td>91 (99)</td>
<td>63 (74)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>157 (89)</td>
<td>97 (98)</td>
<td>60 (77)</td>
<td>91 (99)</td>
<td>66 (78)</td>
</tr>
<tr>
<td>Psychologist</td>
<td>44 (25)</td>
<td>28 (28)</td>
<td>16 (21)</td>
<td>30 (33)</td>
<td>14 (17)</td>
</tr>
<tr>
<td>Social worker</td>
<td>136 (77)</td>
<td>93 (94)</td>
<td>43 (55)</td>
<td>86 (94)</td>
<td>50 (59)</td>
</tr>
<tr>
<td>Speech pathologist</td>
<td>156 (88)</td>
<td>98 (99)</td>
<td>58 (74)</td>
<td>92 (100)</td>
<td>64 (75)</td>
</tr>
</tbody>
</table>

**Table 24** Proportion of hospitals with protocol for referral to multidisciplinary team over time

<table>
<thead>
<tr>
<th></th>
<th>2009 %</th>
<th>2011 %</th>
<th>2013 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietitian</td>
<td>72</td>
<td>77</td>
<td>83</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>75</td>
<td>80</td>
<td>87</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>76</td>
<td>82</td>
<td>89</td>
</tr>
<tr>
<td>Psychologist</td>
<td>32</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Social worker</td>
<td>66</td>
<td>70</td>
<td>77</td>
</tr>
<tr>
<td>Speech pathologist</td>
<td>77</td>
<td>83</td>
<td>88</td>
</tr>
</tbody>
</table>
3.4.4 Continuing education and research

**Key findings**

- 121 (68%) hospitals reported having access to a program for continuing staff education in stroke management
- 72 hospitals reported involvement with research projects. Victoria and NSW were the states with the most involvement in research

**Rationale**

Education and research are important factors in creating an evidence-based stroke service. Access to ongoing professional development is a core characteristic of effective stroke unit care allowing the members of the multidisciplinary team to continue to develop their specialised skills in stroke care.

Participants were asked to report on their access to ongoing education for staff as well as their participation in research.

**Results**

There were 72 hospitals that reported involvement in 52 research studies relating to stroke. The majority of these were in Victoria (n=96) and NSW (n=72).

**Table 25 Access to continuing education by state, location and stroke unit status**

<table>
<thead>
<tr>
<th></th>
<th>Australia (N=177) n (%)</th>
<th>NSW/ACT (N=68) n (%)</th>
<th>NT (N=2) n (%)</th>
<th>QLD (N=53) n (%)</th>
<th>SA (N=20) n (%)</th>
<th>TAS (N=3) n (%)</th>
<th>VIC (N=37) n (%)</th>
<th>WA (N=14) n (%)</th>
<th>SU (N=92) n (%)</th>
<th>Non SU (N=85) n (%)</th>
<th>Urban (N=99) n (%)</th>
<th>Rural (N=78) n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals with</td>
<td>121 (68)</td>
<td>53 (78)</td>
<td>1 (50)</td>
<td>24 (73)</td>
<td>24 (50)</td>
<td>26 (70)</td>
<td>5 (36)</td>
<td>92 (100)</td>
<td>29 (34)</td>
<td>90 (91)</td>
<td>31 (40)</td>
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<tr>
<td>access to a</td>
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<td></td>
</tr>
<tr>
<td>program of</td>
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<tr>
<td>management</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals providing</td>
<td>111 (63)</td>
<td>46 (68)</td>
<td>1 (50)</td>
<td>24 (73)</td>
<td>10 (50)</td>
<td>2 (67)</td>
<td>23 (62)</td>
<td>5 (36)</td>
<td>86 (94)</td>
<td>25 (29)</td>
<td>86 (87)</td>
<td>25 (32)</td>
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<tr>
<td>on-site training</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals providing</td>
<td>75 (42)</td>
<td>39 (57)</td>
<td>1 (50)</td>
<td>14 (42)</td>
<td>2 (10)</td>
<td>2 (67)</td>
<td>16 (43)</td>
<td>1 (7)</td>
<td>58 (63)</td>
<td>17 (20)</td>
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<td>18 (23)</td>
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<tr>
<td>off-site training</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
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</tbody>
</table>
3.5 Stroke services in larger and smaller hospitals

**Key findings**

- Whilst larger hospitals had better access to resources and processes of care than smaller hospitals there were still many aspects of care that were not supported in these sites, which admit 88% of all stroke patients nationally. Notably:
  - 12 large hospitals did not have ED protocols for rapid triage
  - 10 large hospitals did not admit directly to the stroke unit
  - Only 80% of large hospitals offered rt-PA
  - One in five large hospitals did not routinely assess all patients for the need for ongoing rehabilitation
  - One-third of large hospitals did not routinely provide stroke patient with a care plan on discharge

- Larger hospitals were better organised for TIA services compared to smaller hospitals

**Rationale**

The Acute Stroke Services Framework 2011 identified stroke units should be located in all hospitals admitting 100 or more strokes per year. These hospitals are likely to have adequate numbers of patients with stroke to ensure staff are experienced and maintain their stroke specialisation and to warrant stroke specific resources and infrastructure. As these hospitals admit the majority of patients with stroke across Australia (88%), specific attention on these hospitals in reviewing the resources available to support evidence-based stroke care is important.

In hospitals admitting fewer than 100 patients with stroke per year, it is often not feasible to provide stroke unit care, however processes are still required to ensure prompt assessment and treatment. These include the ability to deliver acute interventions if appropriate, provide basic systems and resources for differential diagnosis, and ensure processes for timely and coordinated transfer.

In smaller hospitals (<50 admissions per year) it is not feasible to develop or maintain a level of stroke specialisation amongst staff. It is recommended patients be transferred to the nearest stroke unit.

This section looks specifically at the hospitals admitting large numbers of patients with stroke to better understand where gaps that undermine the delivery of best practice stroke care may exist. This has been done in parallel with consideration of the resources required in smaller hospitals to best facilitate access to early interventions and transfer to specialised hospitals so better outcomes can be attained for all patients with stroke in Australia.

**Results**

Hospitals admitting larger numbers of stroke patients have greater access to essential investigations (brain and carotid scanning) and use organised systems of care (care pathways and protocols within ED).
Table 26  Processes of care and resources to ensure timely assessment and delivery of evidence-based stroke care in centres by stroke admissions

<table>
<thead>
<tr>
<th>Process of care</th>
<th>Australia (N=177)</th>
<th>&lt;50 (N=65)</th>
<th>50-99 (N=29)</th>
<th>&gt;100 (N=83)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulance arrangements</td>
<td>94 (53)</td>
<td>29 (45)</td>
<td>15 (52)</td>
<td>50 (60)</td>
</tr>
<tr>
<td>Hospitals with ED protocols for transfer of patients to another hospital for care</td>
<td>111 (63)</td>
<td>50 (77)</td>
<td>19 (66)</td>
<td>42 (51)</td>
</tr>
<tr>
<td>ED protocol for rapid triage</td>
<td>142 (80)</td>
<td>46 (71)</td>
<td>25 (86)</td>
<td>71 (86)</td>
</tr>
<tr>
<td>Immediate access to on-/off-site CT (within 24hrs)</td>
<td>163 (92)</td>
<td>52 (80)</td>
<td>28 (97)</td>
<td>83 (100)</td>
</tr>
<tr>
<td>Access to on-site CT</td>
<td>137 (77)</td>
<td>29 (45)</td>
<td>25 (86)</td>
<td>83 (100)</td>
</tr>
<tr>
<td>Stroke unit most likely ward of first admission</td>
<td>86 (49)</td>
<td>5 (8)</td>
<td>8 (28)</td>
<td>73 (88)</td>
</tr>
<tr>
<td>Access to on-site Carotid Doppler</td>
<td>69 (39)</td>
<td>1 (2)</td>
<td>5 (17)</td>
<td>63 (76)</td>
</tr>
<tr>
<td>Access to on-site MRI</td>
<td>134 (76)</td>
<td>28 (43)</td>
<td>24 (83)</td>
<td>82 (99)</td>
</tr>
<tr>
<td>Offering rt-PA</td>
<td>93 (53)</td>
<td>16 (25)</td>
<td>11 (38)</td>
<td>66 (80)</td>
</tr>
<tr>
<td>Offering rt-PA on a 24-hour, 7 days per week basis*</td>
<td>81 (47)</td>
<td>15 (23)</td>
<td>9 (32)</td>
<td>57 (66)</td>
</tr>
<tr>
<td>Number of patients thrombolysed</td>
<td>1472</td>
<td>18</td>
<td>51</td>
<td>1403</td>
</tr>
<tr>
<td>Hospitals access to telehealth for clinical support</td>
<td>130 (74)</td>
<td>56 (86)</td>
<td>21 (72)</td>
<td>53 (64)</td>
</tr>
<tr>
<td>Hospitals with access to telehealth for professional development</td>
<td>155 (88)</td>
<td>62 (95)</td>
<td>26 (90)</td>
<td>67 (81)</td>
</tr>
<tr>
<td>Providing routine assessments for all patients for the need for further rehabilitation</td>
<td>118 (67)</td>
<td>28 (43)</td>
<td>24 (83)</td>
<td>66 (80)</td>
</tr>
<tr>
<td>Access to early supported discharge teams</td>
<td>35 (20)</td>
<td>3 (5)</td>
<td>5 (17)</td>
<td>27 (33)</td>
</tr>
<tr>
<td>Access to community based rehabilitation</td>
<td>145 (82)</td>
<td>41 (63)</td>
<td>26 (90)</td>
<td>78 (94)</td>
</tr>
<tr>
<td>Access to a program of continuing education of staff in stroke management</td>
<td>121 (68)</td>
<td>21 (32)</td>
<td>19 (66)</td>
<td>81 (98)</td>
</tr>
<tr>
<td>Providing on-site training</td>
<td>111 (63)</td>
<td>17 (26)</td>
<td>16 (55)</td>
<td>78 (94)</td>
</tr>
<tr>
<td>Hospitals with regular team meetings</td>
<td>149 (84)</td>
<td>41 (63)</td>
<td>26 (90)</td>
<td>82 (99)</td>
</tr>
<tr>
<td>Hospitals using care pathways</td>
<td>119 (67)</td>
<td>29 (45)</td>
<td>21 (72)</td>
<td>69 (83)</td>
</tr>
<tr>
<td>Hospitals routinely providing a discharge care plan to patients</td>
<td>104 (59)</td>
<td>37 (57)</td>
<td>14 (48)</td>
<td>53 (64)</td>
</tr>
<tr>
<td>Hospitals where team routinely meets with family</td>
<td>148 (84)</td>
<td>50 (77)</td>
<td>25 (86)</td>
<td>73 (88)</td>
</tr>
<tr>
<td>Hospitals routinely providing patient information on community stroke support groups</td>
<td>105 (59)</td>
<td>21 (32)</td>
<td>15 (52)</td>
<td>69 (83)</td>
</tr>
<tr>
<td>Hospitals with protocols for routinely reviewing patients with stroke discharged from hospital</td>
<td>54 (31)</td>
<td>11 (17)</td>
<td>6 (21)</td>
<td>37 (45)</td>
</tr>
<tr>
<td>Hospitals where patients/carers given details of a hospital contact on transfer from hospital to community</td>
<td>126 (71)</td>
<td>46 (71)</td>
<td>19 (66)</td>
<td>61 (74)</td>
</tr>
<tr>
<td>Hospitals routinely providing patient information on stroke</td>
<td>134 (76)</td>
<td>29 (45)</td>
<td>22 (76)</td>
<td>83 (100)</td>
</tr>
<tr>
<td>Hospitals routinely providing patient information on local community care arrangements</td>
<td>118 (67)</td>
<td>36 (55)</td>
<td>22 (76)</td>
<td>60 (72)</td>
</tr>
<tr>
<td>Stroke specialist who is the medical lead for acute stroke patients</td>
<td>46 (26)</td>
<td>2 (3)</td>
<td>0 (0)</td>
<td>44 (53)</td>
</tr>
<tr>
<td>Other specialist who is the medical lead for acute stroke patients</td>
<td>89 (50)</td>
<td>23 (35)</td>
<td>27 (93)</td>
<td>39 (47)</td>
</tr>
<tr>
<td>GP/VMO who is the medical lead for acute stroke patients</td>
<td>42 (24)</td>
<td>40 (62)</td>
<td>2 (7)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Hospitals with documented pathway for assessing people presenting with TIA</td>
<td>123 (70)</td>
<td>33 (51)</td>
<td>20 (69)</td>
<td>70 (84)</td>
</tr>
<tr>
<td>Hospitals using a risk stratification tool to guide decision to admit*</td>
<td>N=170</td>
<td>N=60</td>
<td>N=28</td>
<td>N=82</td>
</tr>
<tr>
<td></td>
<td>106 (63)</td>
<td>25 (42)</td>
<td>20 (71)</td>
<td>61 (74)</td>
</tr>
<tr>
<td>Hospitals with OP TIA clinic^</td>
<td>N=121</td>
<td>N=34</td>
<td>N=23</td>
<td>N=64</td>
</tr>
</tbody>
</table>

*Known N – includes only hospitals offering thrombolysis

^Known N – includes hospitals who do not ‘admit all’ TIA

#Known N – includes hospitals who admit all/select TIA patients
3.6 Organisation of acute stroke services over time

Key findings

– The number of stroke units missing from the country’s largest hospitals has decreased from 46 in 2007 to five in 2013. However, stroke unit access has not improved since 2011 and is still less than 60%

– The proportion of hospitals with ED protocols for rapid triage of stroke patients has increased over time and only one in five hospitals are now not using them compared to two-thirds of hospitals in 2007

– Hospitals offering rt-PA involved in surveys have increased from 61 in 2007 to 94 in 2013 and the number of patients thrombolysed has more than tripled in that time. However, we are still seeing only about 5% of all stroke patients accessing this treatment

– There has been no change in the proportion of hospitals routinely assessing for ongoing rehabilitation needs since 2007

– There has been no change in the provision of a care plan for patients after discharge and over 40% of hospitals still do not routinely provide this element of care

– There has been an increase in the proportion of hospitals routinely providing stroke information to patients but this still does not happen in one quarter of hospitals admitting stroke patients

Rationale

The biennial survey aims to facilitate longitudinal comparisons of stroke services in Australia. The National Stroke Audit – Acute Services Organisational Survey 2013 is used to describe variations in stroke services across the country.

A number of priority areas that need action were identified in 2011:

– Establish stroke units in larger hospitals admitting 100 or more patients with stroke per year and ensure these hospitals have appropriate processes and adequate resources to accept and care for all patients with stroke.

– Develop and establish processes to ensure patients with stroke in regions served by very small (<50 patients with stroke per year) and small hospitals (50–99 patients with stroke per year) are immediately transported to a stroke unit hospital or are rapidly assessed at the smaller hospital where there are systems for rapid assessment and management and adequate specialised support, and then transferred to a larger stroke unit hospital.

– Develop processes of care to support timely assessment, appropriate rehabilitation and discharge planning in hospitals admitting 100 or more patients with stroke per year.

– Develop models of care for TIA management that allow for rapid access to diagnostic imaging, and specialist assessment and management.

– Differences in the organisation of acute stroke care are described below.

Results
Table 27 Progress on resources and processes to deliver evidence-based care

<table>
<thead>
<tr>
<th></th>
<th>2007 (N=254)</th>
<th>2009 (N=206)</th>
<th>2011 (N=188)</th>
<th>2013 (N=177)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of stroke units missing where recommended (admit &gt;100 patients annually)</td>
<td>46 (N=90)</td>
<td>21 (N=83)</td>
<td>16 (N=81)</td>
<td>5 (N=83)</td>
</tr>
<tr>
<td>Number of dedicated stroke unit beds for patients with acute stroke</td>
<td>429</td>
<td>534</td>
<td>549</td>
<td>615</td>
</tr>
<tr>
<td>% Patients that are on a stroke unit (all hospitals)</td>
<td>41</td>
<td>51</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>% Stroke unit hospitals admitting directly to a stroke unit *</td>
<td>87</td>
<td>81</td>
<td>78</td>
<td>91</td>
</tr>
<tr>
<td>% Hospitals with ED protocols for rapid triage of patients with acute stroke *</td>
<td>38</td>
<td>48</td>
<td>64</td>
<td>80</td>
</tr>
<tr>
<td>% Hospitals with ED protocols for transfer of patients to another hospital for care *</td>
<td>44</td>
<td>51</td>
<td>58</td>
<td>63</td>
</tr>
<tr>
<td>% Hospitals with access to CT within 24 hours *</td>
<td>77</td>
<td>82</td>
<td>85</td>
<td>92</td>
</tr>
<tr>
<td>% Hospitals with access to MRI</td>
<td>55</td>
<td>58</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>% Hospitals with access to Carotid Doppler *</td>
<td>74</td>
<td>82</td>
<td>82</td>
<td>88</td>
</tr>
<tr>
<td>% Hospitals using a defined pathway for assessing TIA*</td>
<td>NA</td>
<td>42</td>
<td>53</td>
<td>70</td>
</tr>
<tr>
<td>% Hospitals with Neurovascular/TIA Clinic^ *</td>
<td>NA</td>
<td>19</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>% Hospitals offering rt-PA *</td>
<td>24</td>
<td>28</td>
<td>36</td>
<td>53</td>
</tr>
<tr>
<td>% Hospitals offering rt-PA on a 24-hour, 7 days per week basis *</td>
<td>NA</td>
<td>77</td>
<td>87</td>
<td>87</td>
</tr>
<tr>
<td>Number of patients thrombolysed</td>
<td>461</td>
<td>711</td>
<td>1170</td>
<td>1472</td>
</tr>
<tr>
<td>% Hospitals access to telehealth for clinical support *</td>
<td>58</td>
<td>60</td>
<td>67</td>
<td>73</td>
</tr>
<tr>
<td>% Hospitals with access to telehealth for professional development *</td>
<td>68</td>
<td>77</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>% Hospitals with access to program of continuing education for staff in stroke management</td>
<td>63</td>
<td>42</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td>% Hospitals with regular team meetings</td>
<td>82</td>
<td>70</td>
<td>78</td>
<td>84</td>
</tr>
<tr>
<td>% Hospitals using care pathways *</td>
<td>50</td>
<td>53</td>
<td>56</td>
<td>67</td>
</tr>
<tr>
<td>% Hospitals routinely providing a discharge care plan</td>
<td>62</td>
<td>58</td>
<td>60</td>
<td>59</td>
</tr>
<tr>
<td>% Hospitals where team routinely meets with family *</td>
<td>64</td>
<td>69</td>
<td>77</td>
<td>84</td>
</tr>
<tr>
<td>% Hospitals providing routine assessments for all patients for the need for further rehabilitation</td>
<td>NA</td>
<td>63</td>
<td>62</td>
<td>67</td>
</tr>
<tr>
<td>% Hospitals with access to early supported discharge teams</td>
<td>16</td>
<td>16</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>% Hospitals with access to community-based rehabilitation *</td>
<td>70</td>
<td>74</td>
<td>76</td>
<td>82</td>
</tr>
<tr>
<td>% Hospitals routinely providing patient information on community stroke support groups *</td>
<td>51</td>
<td>50</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>% Hospitals with protocols for routinely reviewing patients with stroke discharged from hospital *</td>
<td>21</td>
<td>27</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>% Hospitals where patients/carers given details of a hospital contact on transfer from hospital to community</td>
<td>67</td>
<td>72</td>
<td>72</td>
<td>71</td>
</tr>
<tr>
<td>% Hospitals routinely providing patient information on stroke *</td>
<td>64</td>
<td>63</td>
<td>72</td>
<td>76</td>
</tr>
<tr>
<td>% Hospitals routinely providing patient information on local community care arrangements</td>
<td>62</td>
<td>65</td>
<td>75</td>
<td>67</td>
</tr>
</tbody>
</table>

^Known N – includes hospitals who do not ‘admit all’ TIAs
# Known N – includes only hospitals offering thrombolysis
*Statistically significant change over time
Discussion/Recommendations

The National Stroke Audit – Acute Services Organisational Survey 2013 provides updated data on the nature of current acute stroke services including the resources available to implement evidence-based stroke care across Australia. The information in this report should be read in conjunction with the Clinical Audit Report 2013.

There were 172 public hospitals participating in the survey this year. 88% of eligible hospitals. The total number of stroke admissions reported has increased from 25,597 in 2011 to 27,769 in 2013.

Like the data from 2011, evaluation of services was made according to the number of strokes admitted by hospitals and against the agreed key elements of stroke care described in the Acute Stroke Services Framework 201113 (the Framework). The Framework recommends stroke units in all hospitals admitting 100 or more patients with stroke per year. Similarly, detail about state and territory variation is also provided in this report. Respondents from urban and rural areas and hospitals admitting small and large numbers of patients with stroke were used to provide an overview of current access to stroke units and other features of organised stroke services that support the implementation of evidence-based care.

The National Stroke Audit was established in 2007 to monitor and drive change in stroke care. This report provides evidence of improvements in several aspects of stroke care since 2007. However, the results also highlight there are ongoing resource deficits that still need to be addressed.

Access to specialist stroke units in Australia

It is widely recognised stroke units provide superior care to all patients with stroke.1 The Australian Acute Stroke Services Framework 201113 recommends stroke units be established in all large centres, defined as hospitals admitting over 100 stroke patients per year and smaller sites establish processes to ensure stroke patients are taken to larger, stroke unit sites. The Framework recognises larger sites are likely to be able to establish and maintain the stroke team’s expertise, a critical element of stroke unit care, and also they account for the bulk (almost 90%) of all stroke admissions in Australia. If services in these centres support delivery of best practice stroke care and other, smaller sites transfer to these centres, significant improvements in stroke outcomes can be achieved.

It was pleasing to see the number of stroke units missing in large hospitals has dropped significantly from 46 in 2007 to only 5 in 2013. This change has resulted from efforts in Queensland (where 11 units have been established since the last audit in 2011) and in South Australia, NSW and Victoria. The five remaining large hospitals which did not have a stroke unit are mainly in regional NSW.

Despite the increasing numbers of stroke units, their capacity and difficulty accessing designated beds continues to impact on stroke unit access. Only 58% of patients were reported to be receiving care in a stroke unit and this figure remains unchanged from 2011. There is considerable variation across Australia with some states increasing access (e.g. Queensland, Victoria and NT) while others have decreased access over the same time period (e.g. NSW/ACT and WA). Stroke unit access remains poor in WA.

The reasons for poor access are complex but this data suggests capacity and bed management issues are contributing factors. Whilst there are now more stroke units in Australia, the size of stroke units is decreasing. The number of stroke unit beds increased from 549 in 2011 to 615 in 2013 but the median size of stroke units has dropped, most noticeably in the larger centres. In 2011, the median size of a stroke unit in large hospitals was eight beds but in 2013, this had dropped to five.

The data also indicate not all stroke unit beds are allocated to patients with stroke. Hospitals admitting more than 100 patients with stroke per annum reported that on the day of the survey, 394 stroke patients were on the stroke unit despite reportedly having 566 stroke unit beds. This suggests that around 30% of stroke unit beds were not holding stroke patients. However, the data also indicate that these hospitals had more stroke patients than they had stroke unit beds with 620 stroke patients for 566 beds.

Whilst the larger centres provide care to almost nine in every 10 stroke patients, there are still many smaller sites (defined as admitting fewer than 100 patients per annum) admitting stroke patients. The Survey indicates some of these sites are establishing stroke units with 14 of the total 92 units in Australia in smaller centres. This is an increase of five units since 2011. The median size of these units is five beds. Whilst the Framework does not recommend stroke units in these centres, largely because maintaining stroke specialisation and stroke unit beds with such small number of stroke patients is difficult, the increasing numbers of stroke units suggests the need for specialised care.
Changes over recent years, including increasing access to telehealth facilities, regional networks around a larger stroke unit, and systems to direct patients into regional centres are all factors that suggest that the recommendation around where stroke units are established, and their characteristics in centres of varying sizes, may need to be reviewed. The need for review is also suggested by the increasing number of stroke units in the larger centres, with many of these stroke unit hospitals admitting between 200-349 patients (22 stroke units) and over 350 patients (27 units).

Whilst some of the smaller centres are establishing stroke units there are still some hospitals that manage acute stroke patients without important in-hospital resources such as a stroke unit, clinicians with stroke expertise or neuroimaging. Further work is required to ensure these centres have protocols for timely transfer to larger centres with these facilities or establish support networks (e.g. via telemedicine) where patient transfer is not appropriate. Among the cohort of hospitals without a stroke unit, 86% reported access to telehealth facilities for clinical support and 73% had transfer protocols.

Processes for rapid assessment and management

Agreement with pre-hospital services to bypass hospitals and preferentially take stroke patients to a hospital with a dedicated stroke unit has been recommended for some time. Just over half of all hospitals in this survey report having an agreement with the ambulance service for patient transfer to hospital. This is an improvement from previous years and would benefit from ongoing work particularly in WA and QLD where only about one-third of hospitals have ambulance arrangements. Work in NSW, where there is a new state-wide protocol for bypass across NSW hospitals for patients potentially eligible for thrombolysis, will also contribute to continued improvement in this area.

National guidelines state imaging assessments should be conducted rapidly in patients with suspected stroke and carotid territory symptoms. Specifically, this includes urgent brain imaging (within 24 hours) for patients with suspected stroke, and urgent Carotid Doppler scanning for patients with suspected carotid territory symptoms within the same time frame. Responses indicate enhanced level of access among rural hospitals since 2011, with 82% and 74% reporting access to urgent CT brain scanning and Carotid Doppler scanning respectively.

Hospitals in urban locations and hospitals with a stroke unit report almost universal access to brain and carotid scanning with MRI not available in 12% of stroke unit hospitals.

For the first time this audit sought to understand use of perfusion scanning and angiography. A total of 100 hospitals had access to advanced imaging, of which 74% had perfusion scanning accessible, and 88% had access to angiography. Some centres are moving to using CT angiography as a means to scan the arteries in the neck along with the brain, therefore, not requiring additional carotid duplex scans.

Hospitals admitting less than 50 strokes per year (usually small rural hospitals) are missing basic access to CT in 20% of sites. This reinforces recommendations in the Framework that these sites should not manage acute stroke (apart from palliative care) and should have protocols for bypass or transfer to the nearest center with appropriate diagnostic services.

Thrombolysis

Intravenous rt-PA can provide benefit for certain stroke patients. National stroke guidelines recommend administration to patients with ischaemic stroke within 4.5 hours of symptom onset when delivered by well-equipped and skilled EDs and/or stroke units with adequate expertise and infrastructure for monitoring, rapid assessment and investigation of patient with acute stroke. The increasing number of hospitals offering thrombolysis has resulted in more than three times the number of patients receiving the treatment since 2007 (461 in 2007; 1,472 in 2013). However, this is still only about 5% of all patients admitted with acute stroke. Further information about thrombolysis rates will be reported in the National Stroke Audit – Clinical Audit Report 2013.
TIA management

Different models of providing services to people with suspected TIA exist. The key aspect of any model is access to rapid, specialist assessment and commencement on early appropriate prevention therapy. Organised systems of stroke care (e.g. stroke units) improve systems for TIA patients.

Fifty-six (32%) hospitals had an ‘admit all’ policy for TIA assessment and management. Of these, 30% reported no access to Carotid Doppler within 24 hours, 14% reported no access to CT within 24 hours and 32% reported to have no access to either brain imaging or Carotid Doppler. This data reveals an admission policy alone does not necessarily translate into access to rapid investigations.

With access to a specialist TIA outpatient clinic, valuable resources might be saved without the need for hospital admissions. It is a concern that in circumstances where TIA patients are not routinely admitted, 47% of hospitals reported having no access to an out-patient clinic to refer patients to for rapid assessment. Of these, two-thirds were smaller hospitals predominantly in rural settings. Furthermore, where a clinic is available the median waiting time was seven days. Evidence recommends clinics should be available on the same day or within 1–2 days to reduce the risk of early stroke. Only one hospital reported a service model that exclusively used a rapid TIA service. Most clinics reported here are not ‘rapid’ and further improvements are needed, particularly for hospitals admitting 100 or more strokes per year.

When comparing hospitals in terms of their reported stroke unit status, the data indicates assessment and access to specialised treatments are more readily available among hospitals which have a stroke unit. Among this cohort, 85% report having a documented pathway for managing people presenting with suspected TIA compared to 53% of hospitals without a stroke unit. Of the hospitals that report admitting a selection of TIA patients, 61% with a stroke unit have access to timely early specialist TIA clinic compared to 39% of hospitals without a stroke unit. However, whilst hospitals with a stroke unit do appear to offer greater access to specialised treatment than hospitals without a stroke unit, it is concerning that in circumstances where TIA patients are not routinely admitted, many hospitals still do not have access to systems of care that ensure prompt assessment and management. This highlights TIA is still not viewed as an emergency by many hospitals and there is still a need for improvement in the management of TIA within the Australian hospital system.

Processes to support ongoing rehabilitation

The need to access further rehabilitation is common among patients with stroke and approximately 30% continue with in-patient rehabilitation. Rehabilitation may be offered in various forms (inpatient, outpatient and community). Assessment of ongoing rehabilitation needs and access to appropriate rehabilitation services is important to optimise health outcomes. Central to this is coordinated, timely assessment by trained professionals that accommodate the patient’s ongoing rehabilitation needs.

At the time of the survey one-third of hospitals reported routine assessments for considering the patient’s need for ongoing rehabilitation did not occur. Without this process, many patients are at risk of missing out on rehabilitation, or there are delays while rehabilitation needs are determined. The Australian Stroke Coalition has developed a new tool to assist in the assessment of rehabilitation needs (http://australianstrokecoalition.com.au/projects/assessment-for-rehabilitation-pathway-and-decision-making-tool/n) and use of this tool should be encouraged to meet this practice gap.

Only one in five hospitals has access to early supported discharge (ESD) services, a figure which has not changed since 2011. ESD has been shown to improve outcomes and reduce hospital costs. Several stroke specific services have recently been reviewed and funding cut which goes against evidence and reason. Further ESD should be considered where specialist inpatient stroke services exist.

Community based rehabilitation is available in 82% of sites. It is unclear the timeliness of access to such services after hospital discharge.
Processes to facilitate discharge and follow-up in the community

Stroke survivors and their families report the transition home after stroke is a critical time in their recovery and comprehensive planning to facilitate their return to the community is critically important in their recovery as is the provision of information and community services and supports. The Clinical Guidelines for Stroke Management 2010 recommend stroke survivors should have access to this information prior to discharge in order to optimise recovery and reintegration into the community.

Despite recommendations around post-discharge follow up and services, 40% of surveyed hospitals reported that they did not provide routine discharge care plan for their patients. Disappointingly this figure remains unchanged since the National Stroke Audit commenced in 2007, indicating there are still many patients missing out on this crucial service.

In the 2011 organisational survey, 25% of hospitals reported they did not routinely provide this information to their patients. Unfortunately, in the present survey, this figure remains virtually unchanged, indicating that one quarter of hospitals are still not providing information on stroke to their patients.

The Australian Stroke Coalition has developed a stroke specific care plan to facilitate care planning at discharge, which is linked to the National Stroke Foundation’s new information resources for survivors, My Stroke Journey. http://strokefoundation.com.au/health-professionals/nsf-programs/my-stroke-journey-resource. Processes to ensure patients receive the information kit and the care plan to address this significant practice gap should be encouraged.

The majority (71%) of hospitals reported providing contact details for patients to use after discharge from hospital. Clearly this is a simple support service to people following stroke. Only 31% of hospitals used discharge protocols for post-discharge review indicating little follow up support from acute services.

Encouragingly this survey noted hospital teams are routinely meeting with family/patient. 84% of hospitals reported routinely meeting with family and patient and unsurprisingly this is higher in stroke unit hospitals (89%) compared to hospitals without a stroke unit (78%). Patient-centred care should be a clear focus for all hospitals and greater opportunities for teams to interact with patients and their family to involve them in care delivery should be encouraged.

Stroke teams – access and specialisation

Multidisciplinary assessment and management are important in early assessment and rehabilitation. Effective care relies on a coordinated multidisciplinary approach that includes regular team meetings to plan and coordinate care. Hospitals with a stroke unit reported greater access to the allied health staff required for optimal stroke management and regular team meetings. These hospitals also reported better access to specialised medical and nursing staff than hospitals without a stroke unit, particularly the smaller hospitals. However, only about half (55%) of hospitals that have a stroke unit or those admitting more than 100 stroke patients each year have staff dedicated to care coordination. Anecdotally this role is critical to coordinate care, facilitate patient involvement in care, assist in discharge planning and provide support for data collection and quality improvement activities.

Access to psychology services remains a challenge and the use of protocols to facilitate referral to psychology has declined with only 25% of sites reporting their use in 2013 compared to 26% in 2011. This may reflect a lack of access to psychology services which is particularly poor in rural areas but still only available in about one-third of the large centres admitting more than 100 stroke patients per year. Greater access is clearly needed given the known psychological impacts of stroke.

Ongoing professional development allows members of the multidisciplinary team to continue to develop their specialised skills in stroke care. The survey revealed one-third of the participating hospitals did not have access to professional development. Whilst this figure has improved since 2011, it indicates there are still gaps in this fundamental element of stroke care. Geography should not be a barrier to accessing professional development for stroke. There is a national online education and resource centre specifically for Australia which is available to all health professionals which provides important training opportunities related to best practice stroke care (see www.estroke.com.au).
Limitations

The 2013 Organisational Survey provides an excellent cross-sectional overview of stroke services in Australia. However these data must be interpreted with caution. Participation in the National Stroke Audit is voluntary. The survey data were self-reported by a representative from participating hospitals and may be subject to reporting bias. Furthermore the accuracy of responses may vary depending on the respondent’s knowledge of their hospital’s stroke services. Verification of the perceptions conveyed by survey respondents will be performed using audit data from medical records in the National Stroke Audit – Clinical Audit Report 2013 and through logic checks inbuilt into the Organisational Survey component of the Audit.

The number of eligible hospitals has slowly declined since 2009 when a comprehensive process was undertaken to contact over 600 potentially eligible hospitals. This year particular emphasis during recruitment was undertaken to exclude very small hospitals who do not admit stroke patients as they routinely transfer patients to larger hospitals for assessment and acute care. The results of this survey indicate a higher number of hospitals with ambulance bypass arrangements as well as transfer protocols which may have contributed to a smaller number of eligible hospitals. An analysis of sites that participated in 2011 but were not involved in 2013 identified 34 hospitals of which 18 reported admitting 10 or less patients with stroke each year.

While total number of participating hospitals has reduced slightly, the total number of stroke admissions increased from 25,597 to 27,769. Hospital administrative data indicated there are 35,300 stroke admissions each year. The discrepancies may be due to a range of factors including differences in coding, hospitals choosing not to participate, reporting bias due to a different person completing the survey or other various factors. However, this report incorporates the vast majority of hospitals providing stroke care in Australia.

Whilst the Organisational Survey collected information about many components of stroke service organisation, not all components are required or recommended across the diverse range of settings represented by participants in this survey. Given that many participating hospitals were small centres and that in some states they were over-represented, the results may not always reflect the true nature of gaps in services and areas to focus service enhancements. The report has represented data for small and large hospitals by the number of admissions per year to accommodate this limitation. This enables comparison of changes over time with the entire cohort.

Conclusions

The Organisational Survey has highlighted some important areas of improvement since 2011. Most notably, the number of hospitals with a stroke unit and the number of hospitals offering thrombolysis have improved. However, the number of patients reported to receive stroke unit care has not changed and should be the focus for improvement.

There are still some hospitals that manage acute stroke patients without important resources such as a stroke unit, clinicians with stroke expertise or neuroimaging. This is evident in the services for patients with suspected TIA which continue to demonstrate a clear link between having an established organisation of stroke services (e.g. stroke unit) and access to appropriate structures and processes.

Further work is required in many of the smaller hospitals that admit a small number of acute stroke patients to ensure they are either bypassed or have systems in place for rapid assessment and transfer. As suggested in 2011, this may be better addressed with further analysis of jurisdictional data and establishment of regional models of stroke services (e.g. hub and spoke models).

The results from the Organisational Survey, coupled with an understanding of the current evidence-based recommendations, suggest a number of priorities for improving care of people with acute stroke in Australia.
Recommendations

→ Improve access to stroke unit care in Australia by
  – Ensuring all large hospitals (admitting more than 100 patients per year) have stroke units in place
  – Ensuring all stroke units have adequate capacity to accommodate stroke patients at all times
  – Developing processes to ensure designated stroke unit beds are available to accommodate stroke patients, and are not occupied by patients without stroke at the expense of patients with stroke
  – Facilitating transfer of patients from small, non-equipped hospitals to larger stroke unit sites
  – Ensuring all stroke units have a dedicated stroke coordinator position

→ Improve rapid access to investigations, specialist assessment and early management for people with suspected TIA

→ Implement processes and tools to improve provision of patient information, discharge care planning, timely assessment and provision of rehabilitation needs and access to psychological services

→ Review the Acute Stroke Services Framework 2011 to explore appropriate models of stroke care for hospitals of varying size and location
Appendix 5.1 Survey questions

1. Hospital details

1.1 Auditor discipline:
   - Doctor
   - Manager
   - Nurse
   - Allied
   - Other

1.2 Name of hospital

1.3 State

1.4 How many beds are there in your hospital?

1.5 Does your hospital have a specialist stroke unit(s)?
   a – How many beds are in the stroke unit?
   b – What type of stroke unit is it?
   i – Acute stroke unit
   ii – Integrated stroke unit (acute and rehabilitation care provided on same unit for a period up to four weeks)
   iii – Rehabilitation stroke unit

1.6 How many patients with acute stroke:
   a – are present in the hospital today?
   b – were admitted to your hospital in the last year (approx)?

1.7 How many patients with acute stroke:
   a – are present in the stroke unit today?
   b – were admitted to the stroke unit in the last year?

1.8 Does your hospital have:
   a – High Dependency/Intensive Care Unit?
   b – Access to onsite neurosurgery?
   c – Access to onsite physicians allocated to look after stroke patients?
   d – A stroke database or register listing all patients admitted to your hospital with a diagnosis of stroke?
   e – Access to telehealth facilities for clinical support?
   f – Access to telehealth facilities for professional education?
   g – Transfer protocols with other hospitals?
   h – Co-located stroke beds within a geographically defined unit specifically for stroke?
   i – A dedicated, multidisciplinary team with members who have a special interest in stroke?

1.9 Has there been any organisational change affecting the organisation of stroke services in the last six months?

2. Presentation at hospital

2.1 Are there arrangements with the local ambulance service for emergency/rapid transfer to your hospital for stroke patients with acute stroke over and above the regular system? Yes/no/no but, there is agreement to bypass our hospital for another stroke specific service/unsure

2.2 Are there Emergency Department protocols for:
   a – Rapid triage for patients presenting with acute stroke?
   b – Transfer of patients to another hospital for care?

2.3 Does your hospital manage all strokes, including complex strokes?
   a – If no, do you transfer:
   i – Moderately complex strokes; semi conscious with multiple deficits and/ or have co-morbid medical conditions that may require further management?
   ii – High complexity strokes; may require surgical intervention and/or have a tracheotomy and are not medically stable?

2.4 Which ward is a patient with acute stroke most likely to be admitted to first?
   Medical assessment unit/admission ward
   General medical ward
   Geriatric ward
   Geriatric rehabilitation ward
   Acute stroke unit
   Other stroke unit (e.g. rehabilitation stroke unit, comprehensive stroke unit Neurology ward)
   Other

2.5 Do you offer intravenous thrombolysis (rt-PA) for appropriate stroke patients at your hospital?
   If yes:
   a – Is this offered 24 hours a day, seven days a week?
   b – Are all patients who arrive within 4.5 hours from stroke onset assessed for rt-PA?
3. Imaging, TIA and Neurovascular Service

3.1 Does your hospital have access to any of the following for your patients:

a – CT Scanning?
If yes, answer if “yes” to 3.1a
i – Is it located in your hospital?
ii – Can you access onsite CT within 24 hours of stroke presentation to your hospital?
iii – Can you get CT offsite within 24 hours of stroke presentation to your hospital?

b – MRI scanning?
If yes, answer if “yes” to 3.1b
i – Is it located in your hospital?
ii – Can you access onsite MRI within 24hrs of stroke presentation to your hospital?
iii – Can you get MRI offsite within 24 hours of stroke presentation to your hospital?

c – Advanced imaging?
   i – Perfusion scanning (CT or MR) Yes/no
   ii – Angiography (CT, MR or Digital subtraction) Yes/No

d – Carotid Doppler ultrasound?
If yes, answer if “yes” to 3.1d
i – Is it located in your hospital?
ii – Can you access onsite Carotid doppler within 24 hours of stroke presentation to your hospital?
iii – Can you get a Carotid doppler offsite within 24 hours of stroke presentation to your hospital?

3.2 With respect to TIA patients presenting to your hospital emergency department:

a – Does your hospital have a defined and documented process, policy or clinical pathway for assessing TIA patients?

b – At your hospital are all TIA patients admitted or are only selected patients admitted? If yes; All, Only selected (select one option)
i – Does patient selection for admission incorporate one of the published TIA risk stratification scores (e.g. ABCD2)?

ii – For TIA patients not admitted to hospital is there a rapid access TIA clinic?

iii – What is the average waiting time for an appointment to this clinic?

iv – How often is the clinic run?

4. Organisation of workforce

4.1 Are the following health professionals actively involved with the management of stroke at your hospital?

Advanced medical trainee
Clinical psychology
Neuropsychology
Dietitian
General physician
General practitioner
Geriatrician
Neurologist
Clinical nurse consultant (CNC)
Clinical nurse specialist (CNS)
Stroke care coordinator
Stroke specialist research nurse
Stroke nurse educator
Other nurse educator
Nurse practitioners
Nursing unit manager (NUM)
Occupational therapist
Physiotherapist
Rehabilitation physician
Social worker
Speech pathologist
4.2 What is the total establishment of full-time equivalents (FTEs) of the following professionals for all your stroke unit beds? (Enter 0 if no establishment)
a – Advanced trainee
b – Clinical psychology
c – Dietetics
d – General physician
e – General practitioner
f – Geriatrician
g – Neurology
h – Nursing* (see help-note for calculation)
i – Occupational therapy
j – Physiotherapy
k – Rehabilitation physician
l – Social work
m – Speech pathology
n – Other
4.3 What team usually manages acute stroke patients?
a – General medical team
b – Stroke geriatric team
c – General geriatric team
d – Stroke neurology team
e – General neurology team
f – General practitioner/visiting medical officers
4.4 Is there a consultant physician with specialist knowledge of stroke who is formally recognised as having a principal responsibility for stroke at your hospital?
4.5 Does the team managing stroke have a protocol for referral to the following?
a – Physiotherapist
b – Speech pathologist
c – Occupational therapist
d – Dietitian
e – Psychologist
f – Social worker
4.6 Do you have a mobile in-patient stroke team? (question contingent on NOT having a stroke unit)
a – If yes, which of the following are regular members of the team:
i – Specialist doctor
ii – Occupational therapist
iii – Specialist nurse
iv – Dietitian
v – Social worker
vi – Psychologist
vii – Speech pathologist
viii – Physiotherapist
ix – Other
4.7 Does your stroke unit team routinely provide clinical care or advice for patients not on the stroke unit (i.e. as an ‘in-reach’ or ‘mobile’ service)? (question contingent on having a stroke unit)
5. Team Meetings and Assessment Measures
5.1 Does the hospital have clinical care pathways for managing stroke?
   If yes, do all relevant stroke team members contribute to documenting in the pathway records?
5.2 Do you have regular multidisciplinary team meetings for the interchange of information about individual stroke patients?
5.3 How often are these meetings held per month?
5.4 Which of the following disciplines regularly attend the team meetings?
   Dietitian
   Doctor
   Nurse
   Occupational therapist
   Physiotherapist
   Psychologist
   Social worker
   Speech pathologist
   Other
5.5 Are there locally agreed assessment protocols for the following?
a – Consciousness level
b – Motor impairment
c – Visual impairment
d – Sensory impairment
e – Executive function
5.6 Are there locally agreed management (including assessment/monitoring) protocols for the following?
   a – Fever yes/no
   b – Glucose yes/no
   c – Swallow dysfunction yes/no, If yes…
      i – Is there a specific program for training swallow screening yes/no
      ii – Which dysphagia screening tool is used (free text)

5.7 Is there a screening tool used to assess communication deficits? Yes/no
   If yes, which tool is used (free text)

5.8 Is functional communication support provided to those with aphasia?
   Always, Usually, Sometimes, Rarely, Never

6. Access to further services
   6.1 Are all your patients assessed in conjunction with a rehabilitation team for the need for further inpatient rehabilitation?

   6.2 Is there access to a stroke specialist early supported discharge team?

   6.3 Is there access to ongoing rehabilitation services either on-hospital/off-hospital?

   6.4 Is there access to community based rehabilitation for continuing longer term management?

   6.5 Are there local protocols for routinely reviewing stroke patients discharged from hospital?

   6.6 Does your hospital have access to palliative care services?

7. Communication with patient and carer
   7.1 Does the team routinely meet with the family (and/or) patient regarding care?

7.2 Is there patient information literature routinely available/offered on the following topics?
   a – Condition specific literature on stroke
   b – Patient versions of national or local guidelines/standards
   c – Local community care arrangements
   d – Local voluntary agencies
   e – Complaints procedure
   f – Community stroke support groups
   g – Is aphasia friendly communication available for all of the above (8.2a-f)? All/none/some

7.3 Are patients routinely given a discharge care plan?

7.4 Are patients/careers given details of a hospital contact on transfer from hospital to community?

8. Continuing education, research and quality improvement
   8.1 Is there a program for the continuing education of staff relating to the management of stroke?
      a If yes, is the training provided: (tick both options if relevant)
         onsite?
         offsite?

   8.2 How many stroke research studies are registered with your R&D dept (on the day you complete this form)? Please give as a total number of studies and then estimate by type of study;
      a – Total
         i – Acute
         ii – Early rehabilitation
         iii – Secondary prevention
         iv – Other

   8.3 Over the last two years has the stroke team been involved in quality improvement activities that have included reviewing local audit data and agreeing on strategies to improve care? Yes/no or unsure

   8.4 Overall, is there good executive support for quality improvement initiatives in stroke care at your hospital? Yes/no/unsure
      a – If yes, how would you rate this support (rating of 1–10 from limited/poor to highly supportive/exceptional)
## Appendix 5.2. Participating hospitals

### NSW/ACT
- Albury Wodonga Health Service - Albury Campus
- Armidale Hospital
- Ballina District Hospital
- Bankstown Lidcombe Hospital
- Batemans Bay Hospital
- Bathurst Hospital
- Belmont Hospital
- Blacktown Hospital
- Bowral & District Hospital
- Broken Hill Base Hospital
- Calvary Mater Newcastle Hospital
- Campbelltown Hospital
- Canberra Hospital
- Cessnock Hospital
- Coffs Harbour Base Hospital
- Concord Hospital
- Coonabarabran Hospital
- Cootamundra Hospital
- Corowa Hospital
- Deniliquin Hospital
- Dubbo Base Hospital
- Fairfield Hospital
- Gosford Hospital
- Goulburn Base Hospital
- Grafton Base Hospital
- Griffith Base Hospital
- Hornsby & Ku-ring-gai Hospital
- Inverell District Hospital
- John Hunter Hospital
- Kempsey District Hospital
- Kurri Kurri Hospital
- Lismore Base Hospital
- Lithgow Hospital
- Liverpool Hospital
- Macksville Health
- Maitland Hospital
- Manly Hospital
- Manning Rural Referral Hospital
- Moree Plains Health Service
- Moruya District Hospital
- Mudgee Hospital
- Muswellbrook Hospital
- Narrabri Hospital
- Nepean Hospital
- Orange Base Hospital
- Parkes District Hospital
- Port Macquarie Hospital
- Prince of Wales Hospital
- Royal Prince Alfred Hospital
- Ryde Hospital
- Shoalhaven District Memorial Hospital
- Singleton Hospital
- St George Hospital NSW
- St Vincent’s Hospital NSW
- St Vincent’s Private Hospital
- Sutherland Hospital
- Tamworth Base Hospital
- Temora Hospital
- Tocumwal Hospital
- Turnut Hospital
- Tweed Heads Hospital
- Wagga Wagga Base Hospital
- Wellington Hospital
- Westmead Hospital
- Wollongong Hospital
- Wyong Public Hospital
- Yass Health Service
- Young Health Service

### NT
- Alice Springs Hospital
- Royal Darwin Hospital

### QLD
- Bowen Hospital
- Bundaberg Base Hospital
- Caboolture Hospital
- Cairns Base Hospital
- Gatton Hospital
- Gladstone Hospital
- Gold Coast Hospital, Southport Campus
- Greenslopes Private Hospital
- Gympie Hospital
- Hervey Bay Hospital
- Ingham Hospital
- Ipswich Hospital
- John Flynn Private Hospital
- Kingaroy Hospital
- Logan Hospital
- Mackay Base Hospital
- Mater Adults Hospital Brisbane
- Mount Isa Hospital
- Nambour Hospital
- Normanton Hospital
- Prince Charles Hospital
- Princess Alexandra Hospital
- Queen Elizabeth II Jubilee Hospital
- Redcliffe Hospital
- Redland Hospital
- Robina Hospital
- Rockhampton Hospital
- Royal Brisbane and Women's Hospital
- Toowoomba General Hospital
- Townsville Hospital
- Warwick Hospital
- Wesley Hospital

### SA
- Angaston Hospital
- Crystal Brook District Hospital
- Flinders Medical Centre
- Gawler Health Service
- Kapunda Hospital – Eudunda
Lyell McEwin Hospital
Meningie & Districts Memorial Hospital
Millicent & District Hospital
Mount Gambier Hospital
Murray Bridge Hospital
Naracoorte Health Service
Port Augusta Hospital
Port Pirie Hospital
Riverland Regional Health Service – Barmera Campus
Riverland Regional Health Service – Berri Campus
Royal Adelaide Hospital
Strathalbyn & District Soldiers’ Memorial Hospital
Tanunda Hospital – Barossa Area Health Service
The Queen Elizabeth Hospital
Whyalla Hospital

**TAS**
Launceston General Hospital
North West Regional Hospital
Royal Hobart Hospital

**VIC**
Albury Wodonga Health Service - Wodonga Campus
Alfred Hospital
Angliss Hospital
Austin Hospital
Bairnsdale Hospital
Ballarat Health Services Base Hospital
Bass Coast Health
Bendigo Hospital
Box Hill Hospital
Central Gippsland Health Service
Colac Area Health
Dandenong Hospital
East Grampians Health Service Ararat
Echuca Hospital
Edenhope & District Memorial Hospital
Epworth HealthCare Richmond
Frankston Hospital
Geelong Hospital
Goulburn Valley Hospital
Kerang District Health
Latrobe Regional Hospital
Maroondah Hospital
Maryborough District Health Service
 Mildura Base Hospital
Monash Medical Centre
Northern Hospital
Portland District Health
Royal Melbourne Hospital
St Vincent’s Hospital Victoria
Stawell Hospital
Swan Hill District Health
Wangaratta Hospital
Warrnambool Hospital – Southwest Healthcare
West Gippsland Health Service
Western District Hospital, Hamilton
Western Hospital
Wimmera Health Care Group – Horsham Campus

**WA**
Albany Hospital
Bunbury Hospital
Busselton District Hospital
Carnarvon Hospital
Collie District Hospital
Esperance Hospital
Fremantle Hospital
Geraldton Regional Hospital
Hedland Health Campus
Kalgoorlie Regional Hospital
Rockingham General Hospital
Royal Perth Hospital
Sir Charles Gairdner Hospital
Swan Kalamunda Districts Hospital
References
