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Any enquires about, or comments on, this publication should be directed to:

Administration
Australian Stroke Clinical Registry Office
The Florey Institute of Neuroscience and Mental Health
245 Burgundy Street
Heidelberg, Victoria 3084, Australia

Ph: +61 3 9035 7264
Fax: +61 3 9035 7304
Email: admin@auscr.com.au

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CONTENTS

Contents 3

Summary **5**

Publications **6**

Public presentations (invited or peer reviewed) **6**

Acknowledgments **8**

Chairperson's Report: Steering Committee **10**

Chairperson's Report: Management Committee **11**

Funding 2013 ..... **13**

Introduction **14**

Partnerships and collaborations 15

Governance structure 16

Methods **17**

Methods for ensuring data quality 18

Researchers requesting to use data from the AuSCR 19

2013 data analysis methods 19

Findings from data collected in 2013 ..... **21**

Hospitals 21

Number of registrants 22

Cases registered per month 22

Time to creation of registrant records by hospitals 23

Registrants who nominated to opt-out of the AuSCR 23

Data completeness 24

Completeness of case ascertainment 25

Registrant characteristics 27

Processes of hospital care 29

Overall adherence to quality indicators 29

Adherence to quality indicators by size of hospitals registered in 2013 31

Overall adherence to quality indicators specific to Queensland hospitals 35

Patients admitted with transient ischaemic attack 35

Discharge coding of stroke type 35

Summary of the most common procedure codes assigned to registrants while in hospital 37

Discharge information **38**

Length of stay 38

Discharge status 39

Survival status 40
Post-discharge health outcome information **40**
Median time to follow-up 40
Survival and the influence of stroke unit care 43
Follow-up data 44
Readmissions 44
Health-related quality of life 44
Paediatric outcomes 46
Participation in future research 47
Unmet information needs 47
Discussion **48**
Future directions **49**
Ensuring complete case ascertainment from participating hospitals 49
Technology solutions for simplifying data collection for clinicians 50
Harmonisation of the National Stroke Foundation audit process with the AuSCR 50
Closing the quality feedback loop 50
Reducing the data collection burden associated with health services research 50
Maximising the use of data through data linkage 51
Concluding comments **51**
References **53**
Appendix B: Description of how results for particular variables were calculated in this report **55**
Appendix C: Adherence data by participating hospital **56**

SUMMARY

In 2013:

- Thirty-seven hospitals contributed data to the Australian Stroke Clinical Registry (AuSCR) (62% in Queensland and 30% in Victoria). This is a 6-fold increase in site participation since the 2009 inception year.
- The final 2013 data provided in this report include information on 7325 patients with 7614 admissions for acute stroke or transient ischaemic attack (TIA) admitted to the participating hospitals in 2013.
    - Summary data on adherence to the quality indicators are shown according to the number of episodes at a hospital level. The results highlight the variability in care amongst hospitals managing patients with acute stroke or TIA. The greatest variability was found for evidence that a care plan outlining post discharge care at home or in residential aged care was provided to a patient prior to discharge.
- Following approval by the AuSCR Steering Committee in 2011 to add four additional quality indicators for Queensland hospitals, this subset of variables went 'live' in August 2012 and continued to be collected in 2013. In this report, we provide results for these additional quality indicator variables.
    - In 2013, data from 3593 episodes of care from Queensland hospitals were entered into the AuSCR from 23 hospitals. This represents just under half of all data collected in 2013.
- Following close-off of the data for 2013 annual reporting (30 June 2014), among 4950 registrants eligible and known to be alive within 180 days of stroke; 3620 completed a follow-up interview (77%); 206 refused (4%) and 1029 (21%) were unable to be contacted within our restricted follow-up attempt protocol (two mailed surveys and then one to two telephone attempts to each contact provided)[*].
- In July 2014, for the first time the AuSCR data were linked to National Death Index (NDI) data. Using NDI data we are now able to provide complete mortality data for patients registered in the AuSCR between 2009 and 2013. In 2013, 1098 (15%) of registrants died within 90 days of their hospital admission.

All except two hospitals in 2013 using the AuSCR have a formalised Stroke Unit (defined in the AuSCR Data Dictionary at: http://www.auscr.com.au/health-professionals/forms-manuals/data-dictionaries/). Only 77% of the patients were managed on Stroke Units during 2013 which may indicate capacity issues within the hospitals that participated. Further, we found that patients who were treated on a Stroke Unit had a 51% reduced risk of death at 180 days when compared to patients not treated on Stroke Units when we casemix adjusted for patient differences such as age, stroke severity and stroke subtype. ***This finding reinforces the need to ensure all Australians have access to Stroke Unit care.***

[*] *Note that the AuSCR Office has limited resources to conduct follow-up and therefore the follow-up protocol is restricted to a fixed number of attempts to contact registrants to complete a survey about their health status.*

PUBLICATIONS

Relevant publications in peer-reviewed journals highlighting the AuSCR program or data:

Cadilhac DA, Moss K, Price C, Lannin N, Lim J, Anderson CA. Pathways to enhancing the quality of stroke care through national data monitoring systems for hospitals (Perspective). MJA. 2013; 199(10):650-51.

Cadilhac DA, Sundararajan V, Andrew N, Kilkenny M, Flack F, Anderson P, Boyd J, Katzenellenbogen J, Thrift AG. Using linked data to more comprehensively measure the quality of care for stroke - understanding the issues. Australasian Epidemiologist. 2013; 20(1):15-19.

Lannin NA, Anderson C, Lim J, Paice K, Price C, Faux S, Levi C, Donnan G, Cadilhac D. Telephone follow-up was more expensive but more efficient than postal in a national stroke registry. Journal of Clinical Epidemiology. 2013; 66(8):896-902.

Annual Report Publication

Cadilhac DA, Lannin NA, Anderson CS, Kilkenny M, Kung F, Grabsch B, Levi C, Faux S, Price C, Dewey H, Hill K, Donnan G, Middleton S on behalf of the AuSCR Consortium. The Australian Stroke Clinical Registry Annual Report 2012. The Florey Institute of Neuroscience and Mental Health; November 2013, Report No 4, pages 52.

PUBLIC PRESENTATIONS (INVITED OR PEER REVIEWED)

In 2013, the following presentations about the Australian Stroke Clinical Registry were given:

Grabsch B on behalf of the AuSCR Management Committee. An overview of the Australian Stroke Clinical Registry. Victorian Stroke Clinical Network (VSCN) Knowledge Exchange, 22nd January 2013.

Cadilhac D on behalf of the AuSCR Management Committee. Implementing the quality feedback loop: the Australian Stroke Clinical Registry. Clinical Registries seminar, Monash University, 15th February 2013.

Cadilhac D on behalf of the AuSCR Management Committee. Australian Stroke Clinical Registry: a national system for routine performance measurement. NSW clinical network meeting, 20th February 2013.

Grabsch B on behalf of the AuSCR Management Committee. The Australian Stroke Clinical Registry and its contribution to quality stroke data collection. Presentation to undergraduate Health Information Systems students, La Trobe University, 17th April 2013.

Cadilhac D on behalf of the AuSCR Management Committee. Update on the Australian Stroke Clinical Registry to improve the quality of care in hospitals and hurdles found in undertaking data linkage projects. Monash University, School of Population Health and Preventative Medicine Research Team Meeting, Clayton Campus, 14th May 2013.

Wilson I, Peake R, Grabsch B, Lim J, Anderson CS, Lannin NA, Cadilhac DA on behalf of the AuSCR Management Committee. Using data from the Australian Stroke Clinical Registry (AuSCR) for collaborative quality improvement projects at Tamworth Base Hospital. Stroke Society of Australasia Annual Scientific Meeting, Darwin, July 2013. [Poster]

Kilkenny MF, Dewey H, Andrew NE, Lannin NA, Anderson CS, Donnan GA, Cadilhac DA. Hospital re-admission following stroke. AuSCR and Victorian hospital discharge data linkage study. Stroke Society of Australasia Annual Scientific Meeting, Darwin, July 2013.

Cadilhac DA, Lannin NA, Grabsch B, Donnan GA, Anderson CS. Quality assurance in stroke care: the utility of the Australian Stroke Clinical Quality Registry (AuSCR). Stroke Society of Australasia Annual Scientific Meeting, Darwin, July 2013.

Cadilhac D on behalf of the AuSCR Management Committee. Setting the scene for stroke prevention. Stroke Society of Australasia Annual Scientific Meeting, Darwin, July 2013. [Workshop convenor and invited presenter.]

Fichera D, Atkinson P, Saines N, Grabsch B, Lim J, Anderson C, Lannin N, Cadilhac D on behalf of the AuSCR Management Committee. Wesley Hospital and the Australian Stroke Clinical Registry (AuSCR): working in partnership to improve the quality of clinical care in stroke. SmartStrokes 9th Australasian Nursing and Allied Health Stroke Conference, Brisbane, August 2013.

Lannin N, Cadilhac D, Grabsch B, Lim J, Hata J, Anderson C on behalf of the AuSCR Management Committee. Delivery of stroke care in hospitals participating in the Australian Stroke Clinical Registry. SmartStrokes 9th Australasian Nursing and Allied Health Stroke Conference, Brisbane, August 2013. [BEST ABSTRACT]

ACKNOWLEDGMENTS

We gratefully acknowledge contributions made by the AuSCR staff at The Florey Institute of Neuroscience and Mental Health: Karen Moss, Emma Tod, Adele Gibbs, Alison Dias, Gary Eaton, Steve Street and Renee Stojanovic. We also appreciate the contributions from the Information Technology teams at The Florey and The George Institute for Global Health in supporting the AuSCR migration, maintenance and other technical processes. Thanks also to Joyce Lim from The George for her contribution to the final tasks of the data custodian transition in early 2013.

Contribution to annual report:

Florey AuSCR Office: Brenda Grabsch is responsible for overall coordination of the AuSCR program and provides invaluable support to participant hospitals and other AuSCR program staff and collaborators. Francis Kung is the National Data Manager and is also recognised for his essential role in data quality. The tables on completeness of case ascertainment and data (Tables 1 to 5) were analysed by Josephine Nolan (4th year Health Information Management student from La Trobe University) under the direction of Francis Kung who ensured that the follow-up data only included relevant 2013 cases e.g. only for those whose admission date was in 2013.

Monash University: Monique Kilkenny, Nadine Andrew and Joosup Kim (Stroke and Ageing Research Centre, Monash University) conducted the AuSCR data analyses for this report and as required throughout 2013. We are most appreciative of their contributions. The majority of analyses presented in this report were undertaken by Dr Nadine Andrew, Research Fellow and Mr Joosup Kim, Research Fellow, under the supervision of Associate Professor Dominique Cadilhac using de-identified data supplied securely by Dr Francis Kung (AuSCR Data Manager). Ms Monique Kilkenny (Senior Research Officer) was responsible for the analysis of the casemix adjusted mortality data (in consultation with Associate Prof Leonid Churilov from the Florey).

We are grateful to the National Stroke Foundation for the compilation and mail out of the AuSCR follow-up questionnaires.

During 2013, members of the Management Committee (Dominique Cadilhac, Craig Anderson and Chris Levi) were supported by National Health and Medical Research Council (NHMRC) Fellowships that provided them with salary support to contribute to initiatives such as the AuSCR. Dominique Cadilhac's Fellowship was co-funded by the National Heart Foundation.

This report would not have been possible without the efforts of doctors, nurses, ward clerks and other relevant hospital staff who have contributed data to the AuSCR. Lead clinical staff for the AuSCR in 2013 and participating hospitals are gratefully acknowledged below:

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Rohan Grimley
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Graham Hall
Nicola Hall
Karen Hines
Francis Hishon
Joel Iedema
Perry Judd
Sarah Kuhle
Paul Laird
Sue MacLean
Graham Mahaffey
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Ian Meade
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Arman Sabet
Noel Saines
Eva Salud
Lyndell Scott
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Raylene Williams
Andrew Wong
Jerry Wong
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Victoria
Chris Bladin
Ernie Butler
Chris Charnley
Douglas Crompton
Helen Dewey
Sharan Ermel
Patrick Groot
Mark Mackay
Peter O'Brien
Anne Rodda
Zofia Ross
Kristen Rowe
Jamie Sta Ana
Margaret Stevenson
Belinda Stojanovski
Western Australia
Tim Bates
David Blacker
Naanke Noordzy
Tasmania
Helen Castley

Participating Hospitals

New South Wales
Armidale Rural Referral
Orange General
Royal North Shore
Royal Prince Alfred
Tamworth Rural Referral
Queensland
Bundaberg
Caboolture
Cairns
Gold Coast
Greenslopes Private
Gympie
Hervey Bay
Ipswich
Logan
Mackay
Mater Adult
Nambour
Prince Charles
Princess Alexandra
Queen Elizabeth II
Redcliffe
Redland
Robina
Rockhampton
Royal Brisbane and Women's
Toowoomba
Townsville
Wesley Hospital
Victoria
Austin Health
Bendigo
Box Hill - Eastern Health
Frankston - Peninsula Health
Northern
Royal Children's Hospital
Warrnambool- South West Healthcare
Western Australia
Swan District
Tasmania
Royal Hobart

CHAIRPERSON'S REPORT: STEERING COMMITTEE

The Steering Committee continues to oversee the governance and strategic direction of the Australian Stroke Clinical Registry (AuSCR). All Steering Committee members from 2012 agreed to continue their commitment and support into 2013, for which we are grateful. The members are representative of stakeholders from the wider professional and consumer stroke community across Australia.

Following the seamless transition, in 2012, of the AuSCR data custodianship from The George Institute for Global Health to The Florey Institute of Neuroscience and Mental Health, the final step of server and data migration was successfully completed in early 2013, with all data security and integrity maintained.

During 2013, the AuSCR Management and Steering Committees have continued to explore a range of options to ensure the viability of the AuSCR going forward; the hosting, financing and staffing of a registry is detailed and complex, especially where there is no core funding. As the AuSCR Office nears capacity to support participating hospitals we may need to reconsider how to maintain the basic AuSCR functionality e.g. universal follow-up may no longer be feasible and a sampling approach may have to be undertaken.

The *Australian Commission for Safety and Quality in Health Care* review of stroke standards (involving a number of the AuSCR committee members) highlighted the importance of attempts to reduce unwarranted variation in clinical care and reinforces the significant value of the AuSCR data to inform clinical practice and improvement. We are continually mindful that the Registry needs to remains a sustainable operation as the data collected in the AuSCR is not systematically and routinely available elsewhere.

Once again, on the broader stage, the AuSCR committee members submitted contributions to the NHMRC consultation on revisions to the opt-out/waiver of consent clauses in the *National Statement on Ethical Conduct in Human Research*. Such submissions aim to ensure that the Registry operates in a *milieu* that is conducive to *best practice* operations and in line with appropriate registry standards.

We have challenges ahead to embed the Registry into standard practice across the country and we hope that our regular dialogue with state and federal politicians, and health department staff, will bear fruit over the coming years.

I would like to extend my appreciation to all the AuSCR Management and Steering Committee members and the AuSCR staff who have contributed to maintaining and expanding the AuSCR. In particular, I would like to thank Dominique Cadilhac (Data Custodian) and Craig Anderson (Chair, Management Committee) for their oversight of the Registry operations.

Professor Sandy Middleton

CHAIRPERSON'S REPORT: MANAGEMENT COMMITTEE

As in past years, we have seen a steady increase in the number of hospitals participating in the AuSCR. We are encouraged by the ongoing recognition that data and quality are important elements for informing clinical practice and contributing to optimal outcomes for patients with stroke and transient ischaemic attack.

The AuSCR, however, does not operate in a vacuum. We are appreciative of the conference organising committees for the Stroke Society of Australasia and Smart Strokes in supporting our visible presence at their conferences. Additionally, the National Stroke Foundation (NSF) continues to resource the mail out of our follow-up (outcome assessment) surveys of participants. Through the Stroke123 Project (NHMRC-funded partnership grant) we harmonised, for the first time, the AuSCR and the NSF clinical audit data collection processes thereby reducing the data entry burden for participating eligible sites. We also worked with the NSF in initiating the Queensland quality improvement sub-study in Stroke123.

Going forward, the data harmonisation process has provided a pilot for the forthcoming Australian Stroke Data Tool (AuSDaT). Preliminary meetings and planning in 2013 between the AuSCR, NSF, SITS (Safe Implementation of Treatments in Stroke), and INSPIRE (International Stroke Perfusion Imaging Registry) plus the time limited T^3 Trial, TIPS (Thrombolysis Implementation in Stroke) and VST (Victorian Stroke Telemedicine) projects have laid the groundwork for more intensive activity in 2014 to create a common platform for stroke data entry.

Other achievements in 2013 included:

- 37 sites contributing data to the 2013 Annual Report, as compared with 31 in 2012
- AuSCR Research Task Group review, and approval, of two external projects
- AuSCR exhibits at the SSA (Darwin) and SmartStrokes (Brisbane) conferences. Two long-term AuSCR hospitals gave presentations on their use of the AuSCR live reports to inform clinical improvement
- Presenting the AuSCR data at the Queensland State-wide Stroke Clinical Network meeting
- Receipt of a year's funding from the Victorian Stroke Clinical Network to consolidate the AuSCR participation in Victoria with potential for future expansion to new sites
- Signing of a Memorandum of Understanding with the T^3 Trial investigators and receiving ethical clearance for them to share their 90-day follow-up data from patients common to both projects, thereby reducing participant burden by only needing to be surveyed once
- National Stroke Workshop (April 2013) held with focus on: data linkage, rehabilitation performance monitoring and telemedicine data spine as part of the Stroke123 partnership and translation activities
- The AuSCR Data Dictionary, Hospital User Guide and Training Exercises were updated and distributed to participating hospitals
- Ethics approval from the Australian Institute of Health and Welfare to link the AuSCR data with the National Death Index
- A successful submission to the Nancy and Vic Allen Trust for a small quality improvement project in Queensland using the AuSCR data

I wish to thank all staff and committee members for their commitment to the AuSCR over 2013.

Professor Craig Anderson

DATA CUSTODIAN REPORT

Since the successful transition of data custodianship to The Florey in 2013, we have operated the registry in line with the AuSCR Data Custodian policy (http://www.auscr.com.au/wp-content/uploads/AuSCR-Data-Custodian-V1.12-29Aug2012-APPROVED.pdf) under the direction of the AuSCR Management and Steering Committees. The Florey AuSCR program team includes eight staff who work for the Public Health and Epidemiology Unit in the Stroke Division.

In an effort to improve processes and ensure accuracy of data and efficiency of registry follow-up, we implemented the following enhancements to the web tool:

- Reviewed and updated existing live reports with adjustment of the business rules to ensure consistency
- Added two new live reports for Queensland specific variables
- Implemented changes to the question for Queensland sites, '*Aspirin given with 24 hours'* to '*Aspirin given within 48 hours'*. Also, replaced the '*Unknown'* response to '*Not Applicable'* in the drop down menu
- Added a new data item to the Follow-up Questionnaire to more directly record who the person was who provided the information (i.e. registrant or next-of-kin proxy)
- Added a new *Import Function for Follow up*, to enable batch data import to eliminate manual data entry for electronic follow-up data collected from other projects e.g. T^3 Trial
- Changed/added several follow-up functions which eliminated some previously labour intensive manual processes related to follow-up and opt-out procedures
- Added a new *Export Data* function, for Hospital Administrators, that links all relevant tables and compiles a single flat file to eliminate the need for the advanced technical skills previously required to join the tables
- Updated partner organisations' logos, and contact details for the AuSCR Office in Melbourne.

The AuSCR has now grown to a considerable size and each year there is an increase in the number of: ethics approved hospitals; registrants; and completed follow-up surveys. To ensure quality of services within our finite resources, it is important to make all processes as streamlined as possible. Our Data Manager (Francis Kung) and IT Project Officer (Gary Eaton) continually review and work to ensure data quality, integrity and security. There is regular communication with hospital staff regarding data queries and ensuring case ascertainment is optimised. Data analyses for the annual report or conference presentations and papers are conducted using de-identified data by experienced epidemiologists, Monique Kilkenny, Dr Nadine Andrew and Joosup Kim, from the Stroke and Ageing Research Centre, School of Clinical Sciences, Monash University under my supervision and, as required, Assoc Prof Leonid Churilov (Head of Statistics, The Florey) and Prof Amanda Thrift (AuSCR Steering Committee member and epidemiologist based at Monash University).

I wish to thank all the AuSCR and data analysis staff for their contribution to the AuSCR and this report.

Associate Professor Dominique Cadilhac
For The Florey Institute of Neuroscience and Mental Health

FUNDING 2013

In 2013, the AuSCR Office was supported by funds from The Florey, consumer donations, industry, and allocations from the NHMRC Stroke123 Partnership grant to support the AuSCR activities including expansion in Queensland. Support for senior researchers by the NHMRC, which provides salary via fellowship awards, has assisted with containing staff costs. Further, substantial savings to the AuSCR Office in staff resources have been made possible through the National Stroke Foundation (NSF) that provides significant in-kind support by collating and mailing the AuSCR follow-up questionnaires. The support from the NSF represents an in-kind contribution of approximately $12,000. Both the Stroke Society of Australasia (SSA) and Smart Strokes Conference organising committees generously provided exhibition display resources at their respective conferences. This support provided an important opportunity to promote the AuSCR and also to interact with participating hospital staff attending these conferences. Members of the Management Committee and Steering Committee and Research Task Group also provide their time 'in-kind'.

ORGANISATION	AMOUNT
Florey (via NHMRC grant)	$168,300
Florey (other)	$40,920
Queensland Health (Partnership grant)	$30,000
Monash University (Partnership grant contribution and analytic work towards annual report)	$29,019
National Stroke Foundation (Partnership Grant)	$13,300
Industry (Allergan, Ipsen and Boehringer Ingelheim)	$71,500
Consumer donations	$5,000
Other*	$255
Total Funding received	**$358,294**

*Includes income from projects approved by the Research Task Group to access the AuSCR data.

INTRODUCTION

The Australian Stroke Clinical Registry (AuSCR) Consortium and staff have great pleasure in presenting the 2013 Annual Report covering data collected for patients admitted to a participating hospital between 1 January 2013 and 31 December 2013.

The AuSCR was established in 2009 to provide national data on the process of care and outcomes for patients admitted to hospital with acute stroke or transient ischaemic attack (TIA).[1] The registry was designed to be used in public and private hospitals and is also applicable to adults and children. Therefore, follow-up data collection includes age-appropriate questionnaires for different age groups. Further information about the AuSCR and its development is available online at http://www.auscr.com.au, or in our publications (International Journal of Stroke; Journal of Clinical Epidemiology).[1, 2]

The purpose of clinical quality registries is to measure quality of care.[3] The AuSCR adheres to the national guidelines for best-practice in clinical quality registries.[4] The overall goal of the AuSCR is to provide reliable and representative data that can be used to improve the quality of stroke care nationally. Presently, very few registries in Australia have national coverage.[5] The primary aim of the AuSCR is to provide a mechanism to routinely and prospectively monitor the quality of acute stroke care in hospitals.[1] Fundamental to this aim, is the registration of all eligible stroke, or TIA, cases admitted to the participating hospitals. In this way, selection bias is minimised. A second aim of the AuSCR initiative is to provide a database that will enable future stroke research in large numbers of people, or in those with certain characteristics, which might otherwise have not been possible. Presently, each hospital has access to their own data and summary 'live' reports which the staff can download from the AuSCR to enable regular quality of care reviews.

In 2013, research to better understand the factors that impact on the quality of care and delivery of evidence-based stroke care through an NHMRC Partnerships for Better Health grant (Stroke123 Project) remained a major focus. Greater expansion of the AuSCR in Queensland continued because it is the main source of data for that project. For the hospitals in Queensland we were able to provide two new 'live reports' to summarise additional process of care data that are collected in that state. Other Stroke123-related achievements for the AuSCR included: successfully harmonising the National Stroke Foundation acute audit with the AuSCR where de-identified data could be uploaded to reduce data collection on the same patients eligible for audit; navigating the complexities of data linkage across multiple states to inform the development of a national algorithm for linking stroke data across Australia; initiating a small project focussed on secondary prevention and improved discharge care planning; and conducting a National Stroke Workshop to inform policy and practice translation in stroke. Importantly, we have also been able to leverage use of the AuSCR, or support for the AuSCR, where projects have aligned objectives and/or data collection variables (see *Partnerships and Collaborations*).

In this 2013 Annual Report, we provide information using data collected from 37 contributing hospitals for 7614 episodes of care; and the outcomes for 3620 registered patients who were eligible to be followed up 90 to 180 days after their first stroke was registered in the AuSCR. In addition to providing comprehensive graphs of performance and casemix adjusted comparisons of outcome for hospitals we also highlight issues related to stroke ICD10 discharge coding and also the common procedures used in hospitals. For the first time, we use data linked with the National Death Index to provide complete reporting of survival status.

PARTNERSHIPS AND COLLABORATIONS

The AuSCR initiative is undertaken by a consortium of two leading academic research institutes, The Florey Institute of Neuroscience and Mental Health (Stroke Division) and The George Institute for Global Health, and two leading non-government organisations, the National Stroke Foundation and the Stroke Society of Australasia. Collectively, these organisations represent a broad section of the Australian clinical and scientific stroke community.

Significant sanction from clinicians and professional associations for the AuSCR initiative has occurred through the AuSCR Consortium partners and the Australian Stroke Coalition (ASC), a network of clinicians and professional associations (www.australianstrokecoalition.com.au), as well as highly valued support from the various State Stroke Clinical Networks.

In 2013, our NHMRC Partnerships for Better Health grant collaborations through the Stroke123 project have continued with Monash University and Queensland Health contributing funding, along with our existing partner the National Stroke Foundation. Additionally, there is significant in-kind support from various State Stroke Clinical Networks to explore the potential to better understand the quality of care in hospitals using data linkage between the AuSCR and government data. Collaborations are continuing with staff from the Australian Institute of Health and Welfare, the Population Health Research Network and Data Linkage Units based in health departments within various states (including Victoria, Western Australia, Queensland and New South Wales) to work through the processes to enable the linking of the AuSCR data with government data such as the National Death Index and state level admitted episode data and emergency department admissions.

We are also collaborating with the Australian Catholic University through Professor Sandy Middleton to ensure that the AuSCR registrants are not followed up twice at 90 days when they are also part of a stroke clinical trial (the T^3 Trial) being conducted in several hospitals which also use the AuSCR. Furthermore, in Victoria, we have been able to commence a process to embed the AuSCR within a larger number of hospitals as part of the Victorian Stroke Telemedicine (VST) program. This approach is mutually beneficial since the VST is required to report to government funders on the rates of intravenous thrombolysis use, and the AuSCR provides a system that can be embedded as part of routine health care monitoring to reliably obtain these data. These examples highlight the close cooperation that exists within in the stroke community to build on existing infrastructure for data collection and also avoid any undue burden on patients by contacting them multiple times for the same information about their health status.

Importantly, in 2013, we were able to leverage further support from industry, which contributed to supporting a national workshop on stroke data in April that was co-convened with the National Stroke Foundation. We also welcomed new funding from Boehringer Ingelheim to support the development of a stroke telemedicine data spine, and live reports of these data, for the AuSCR which is the main data collection tool for the VST program led by Professor Chris Bladin and A/Prof Dominique Cadilhac. The VST program, coordinated by the Florey, is a 5-year initiative to expand telemedicine services for acute stroke to 16 rural and regional hospitals in Victoria. These partnerships and collaborations provide evidence of the strong support for the AuSCR and the efficiencies that can be gained from cooperating across programs that require standardised data monitoring.

GOVERNANCE STRUCTURE

Accountability and transparency are cornerstones for governance of a clinical registry program. This is particularly important when the dataset contains private and personal identifying information. The AuSCR has a Steering Committee whereby members agree to participate for a two-year period. The Steering Committee was chaired in 2013 by Professor Sandy Middleton. The members of the Steering Committee in 2013 are listed in Appendix A. The purpose of the Steering Committee is outlined in agreed Terms of Reference and its primary role is in providing the AuSCR governance, maintaining the confidence of all parties involved, and providing contributions to strategic direction. The committee has representatives from most states in Australia, as well as representation from clinicians, health informatics, epidemiology, consumers, the President of the SSA, the Chair of the Management Committee and the AuSCR Data Custodian. This committee meets three times per year including one joint face-to-face meeting with the Management Committee.

The Management Committee includes representatives from the consortium partner organisations, all members having clinical backgrounds in medicine, nursing or allied health. The Management Committee is responsible for the day-to-day operation of the AuSCR, with oversight from the Steering Committee, and works with the AuSCR Office to manage the ongoing operations of the registry. This committee meets monthly, including a joint face-to-face meeting with the Steering Committee. For 2013, the Management Committee membership was as follows:

Professor Craig Anderson **(Chair)**	The George Institute for Global Health
A/Professor Dominique Cadilhac	The Florey Institute of Neuroscience and Mental Health/ Monash University
Professor Geoffrey Donnan	The Florey Institute of Neuroscience and Mental Health
A/Professor Steven Faux	St Vincent's Hospital, Sydney
A/Professor Natasha Lannin	La Trobe University and Alfred Health
Professor Chris Levi	Hunter Medical Research Institute
Professor Helen Dewey	Stroke Society of Australasia
Mr Kelvin Hill	National Stroke Foundation

Research Task Group

The Research Task Group is independent of the AuSCR Management Committee. The primary purpose of this Research Task Group is to ensure appropriate use and protection of the Australian Stroke Clinical Registry data when it is to be used for research purposes by third parties. Review of applications is conducted via email. In 2013, the members of the Research Task Group were:

Chair:

Dr Sue Evans, Department of Epidemiology and Preventive Medicine, Monash University

Membership:

Professor Richard Lindley, The George Institute for Global Health, The University of Sydney
Professor Ian Cameron, Rehabilitation Studies Unit, The University of Sydney
Dr Coralie English, School of Health Sciences, University of South Australia
Professor Leeanne Carey, The Florey Institute of Neuroscience and Mental Health
Professor John McNeil, Department of Epidemiology and Preventive Medicine, Monash University
A/Professor Velandai Srikanth, School of Clinical Sciences at Monash Health, Monash University

METHODS

The AuSCR is a secure online database that enables the collection of a standardised dataset that can be used to describe stroke care and outcomes in Australia and permit comparisons of performance within, and between, hospitals (Box 1). The AuSCR is based on an 'opt-out' consent model, whereby patients are distributed information outlining the nature and purpose of the information collected, offered an opportunity to ask questions, and are provided with the various options available should they wish to withdraw all or part of their data. These options include: submission of an opt-out form to the AuSCR Office; calling the 1800 telephone number (free); emailing the AuSCR generic email; or directly via hospital staff who use the opt-out function in the AuSCR database. This approach is promoted for registries to reduce the likelihood of selection bias (see http://www.registries.org.au/reports-publications/guidelines-registries.pdf). To this end, the AuSCR Office has provided a Patient Information Sheet for each participating hospital to use (or a locally modified version to meet ethics committee requirements) to inform patients of their rights. Where patients may leave hospital before receiving the information sheet, the hospital has a specific letter that is posted with the information sheet. This Patient Information Sheet is also provided with the follow-up questionnaire at 90 days post-stroke/TIA. At the time of data collection, each hospital is asked to comply with the conditions of the ethical approval and relevant privacy guidelines for the project. As part of record management, the AuSCR Office staff also keeps records of all 'opt-out' consents to supplement information in the AuSCR database. Further information about the opt-out process in the AuSCR is available in the Hospital User Manual: (http://www.auscr.com.au/health-professionals/forms-manuals/hospital-user-manual/).

Staff from participating hospitals enter data on all eligible patients either manually via the web-tool, by using a data import process or a combination of both. The AuSCR Office staff, with the assistance of the National Stroke Foundation, are responsible for contacting patients who are discharged from the participating hospitals 90 to 180 days after stroke and who have not refused follow-up or 'opted-out' of the registry. For registrants who are unable to be contacted, survival status is determined using data linkage with National Death Index data made available, through an ethically approved process, by the Australian Institute of Health and Welfare. The AuSCR Office staff also provide: a five day helpdesk; support for completing ethics applications, amendments and annual ethics reporting; training for new hospital staff; quality control assessments to ensure hospital data are reliably obtained; as well as coordination of committee meetings necessary for the governance of the AuSCR.

The AuSCR database is available to contributing hospitals (via www.auscr.com.au). Clinical staff, who have user access privileges, can view and download standard performance reports for any specified date range.

Box 1. The AuSCR minimum variable dataset

Identifying information

- date of birth
- gender
- address
- telephone number
- hospital name
- contact details for next of kin (x 2) & general practitioner

Clinical information for risk adjustment and measuring timeliness of care delivery

- ICD10 codes (diagnosis, medical condition, complications and procedures)
- country of birth
- language spoken
- aboriginal and Torres Strait Islander status
- type of stroke
- date & time of stroke onset
- date & time of arrival to emergency department
- date of admission and inpatient stroke status
- transferred from another hospital status
- ability to walk independently on admission
- first-ever (incident) episode status

Process indicators of evidence based care

- use of intravenous thrombolysis (tPA) if an ischaemic stroke
- access to a stroke unit (geographically defined ward area)
- discharged on an antihypertensive agent
- care plan provided at discharge (any documentation in the medical record)

Hospital outcomes data

- date of discharge or
- date of death
- discharge destination

90 day outcome data

- survivor status
- place of residence
- living alone status
- recurrent stroke episodes since discharge
- readmission to hospital
- quality of life (EuroQoL5D adults/ PedsQoL children up to 18 years old)

Box 2. Additional quality indicators collected in Queensland as part of the AuSCR minimum dataset

Process indicators of evidence based care (Queensland only)

- mobilisation during admission
- swallow assessment and formal speech pathologist review
- aspirin administration <48 hours
- discharged on anti-platelets or antithrombotics

METHODS FOR ENSURING DATA QUALITY

In 2013, data quality in the AuSCR was assessed monthly and missing data reports were sent to hospitals by the AuSCR Office staff quarterly. The online AuSCR database has built-in logic checks and variable limits to reduce the likelihood of inaccurate data being entered. Mandatory fields have also been created to reduce missing data. In-built functions within the database are used to identify duplicate entries and multiple patient records, which may be merged if necessary (for example, if a patient had more than one admission in the same or different hospitals).

Each new site is also subjected to a 10% random audit of medical records conducted by the AuSCR Office staff after approximately 50 patients are entered in the registry. Following the audit, the site is given a data quality report and suggested ways of improving data quality are discussed with the AuSCR Office staff (this may also include additional training or amendments being made to data dictionary items which are found to be ambiguous). At the end of 2013, hospitals were requested to provide a list of all admissions based on the AuSCR's ICD10 stroke codes to enable a process of assessing case ascertainment by matching this list to the data in the AuSCR. This process also permits missing data in the AuSCR for ICD10 codes to be obtained.

RESEARCHERS REQUESTING TO USE DATA FROM THE AUSCR

In 2013, there were two applications submitted to the Research Task Group:

Sitting Time AfteR Stroke: a phase II safety and feasibility trial (PI: Dr Coralie English, Physiotherapy, School of Health Sciences, University of South Australia). This application was to recruit the AuSCR registrants to an intervention trial for reducing sitting time in community dwelling stroke survivors. The project was approved on 17/07/2013 but the mail out to the AuSCR registrants was not undertaken because these researchers decided not to proceed with this recruitment approach.

Exploring hospital and early discharge factors associated with long-term needs of stroke survivors and their carers (PI: Dr Nadine Andrew, Stroke and Ageing Research Centre, Monash University) The application was approved 16/10/2013 and the match of the AuSCR registrants for data linkage to Needs Survey results was completed by the AuSCR Office in early 2014.

2013 DATA ANALYSIS METHODS

The majority of data presented in this annual report includes all patients registered in the AuSCR database and admitted to the participating hospitals between ***1 January and 31 December, 2013***. Data entry for acute stroke/TIA episodes were closed off on the 30th March 2014. Follow-up assessments of 2013 registrants were closed off on 30 June 2014. Data for these analyses were extracted from the AuSCR database in July 2014.

Statistical analyses were performed using STATA software (version 12.1 for windows, Stata Corporation PL). The presentation of data was principally based on formats used in the 2009-2012 annual reports as developed by Natasha Lannin and Dominique Cadilhac and the AuSCR Management Committee.

For the purpose of data cleaning, duplicate data were checked by the AuSCR Data Manager using the registrants' identifiers (name, date of birth, Medicare number or hospital medical record number) and date of stroke onset, arrival, admission or discharge. Data cleaning was undertaken by the AuSCR Florey staff before the de-identified raw data were extracted. A second level of data checking was then performed by the Monash University analytic staff.

In the final raw data extracted on July, 2014, there were 7325 patient records and 7614 acute stroke/TIA episodes. A description of the methods for analysing adherence to the process of care (quality indicator) variables is provided in Appendix B. Compared to previous years, changes were made to how some of the variables were derived. The variables 'discharged on antiplatelets' and 'received aspirin within 48 hours' were derived so as to exclude those with intracerebral haemorrhage (ICH). The variable 'received a discharge care plan if discharged to the community' was derived to only include those discharged home or to an aged care facility. These changes were made to correct for discrepancies in hospital data entry not matching the criteria for the indicator. Hospital postcodes were mapped to the Accessibility/Remoteness Index for Australia 2011 (ARIA+). The ARIA+ is used to calculate remoteness as accessibility, based on road distance, to 'service centres' (defined as populated localities where the population is greater than 1,000 persons, of which there are 201). For this report ARIA+ category 1 was defined as a major city and ARIA categories 2 and 3 were combined to indicate a regional location. Paediatric cases were not included in the overall patient characteristic, clinical and outcome data analyses and are presented separately.

To evaluate the ***completeness of case ascertainment***, each 2013 participating hospital was requested to send us the hospital record of patients who were admitted to the hospital during 2013 with ICD10 codes

of stroke/TIA (i.e. I61.0-I61.9, I62.9, I63.0-I63.9, I64, G45.0 – G45.4, G45.8, G45.9)**.** Hospital records were then matched to the AuSCR database to detect *potentially missing* episodes of stroke or TIA.

Once the data verification was finalised following these reviews, the proportion of completeness for case ascertainment was estimated using the following formula A/(A+B) where 'A' was the number of episodes which were registered in the AuSCR and 'B' was the missed episodes in the AuSCR database. The proportion of completeness for case ascertainment did not differ between stroke and TIA.

Unless otherwise stipulated, the follow-up data were analysed using descriptive statistics and multi-variable logistic regression with adjustment for patient casemix using age, gender, stroke type, ability to walk on admission, inpatient stroke or patient transferred from another hospital as appropriate. Since each individual patient is only able to be followed-up once, based on their first registered episode of care, these analyses only include registrants eligible for follow-up in 2013. The registrants were required to have their data entered, by hospital staff, in the AuSCR within approximately 180 days of the index stroke onset.

Casemix adjusted survival analysis for deaths up to 180 days following admission was performed for those who had had their first ever registered episode in 2013. It was possible to undertake these analyses for the whole registrant cohort since we had access to NDI data. Cox proportional-hazards regression comparing survival status for those who did and did not receive stroke unit care, adjusted for age, gender, stroke type, inpatient stroke or transferred, was also performed.

FINDINGS FROM DATA COLLECTED IN 2013

HOSPITALS

In 2013, 37 hospitals provided data for the AuSCR, a 20% increase from 2012 (i.e. 6 additional hospitals). During 2013, 14 new hospitals joined the AuSCR and four hospitals stopped contributing data due to a lack of capacity. Four hospitals that received ethics approval in 2013 had not commenced data collection by December 2013. Figure 1 shows the incremental shift in numbers of hospitals participating in the AuSCR.

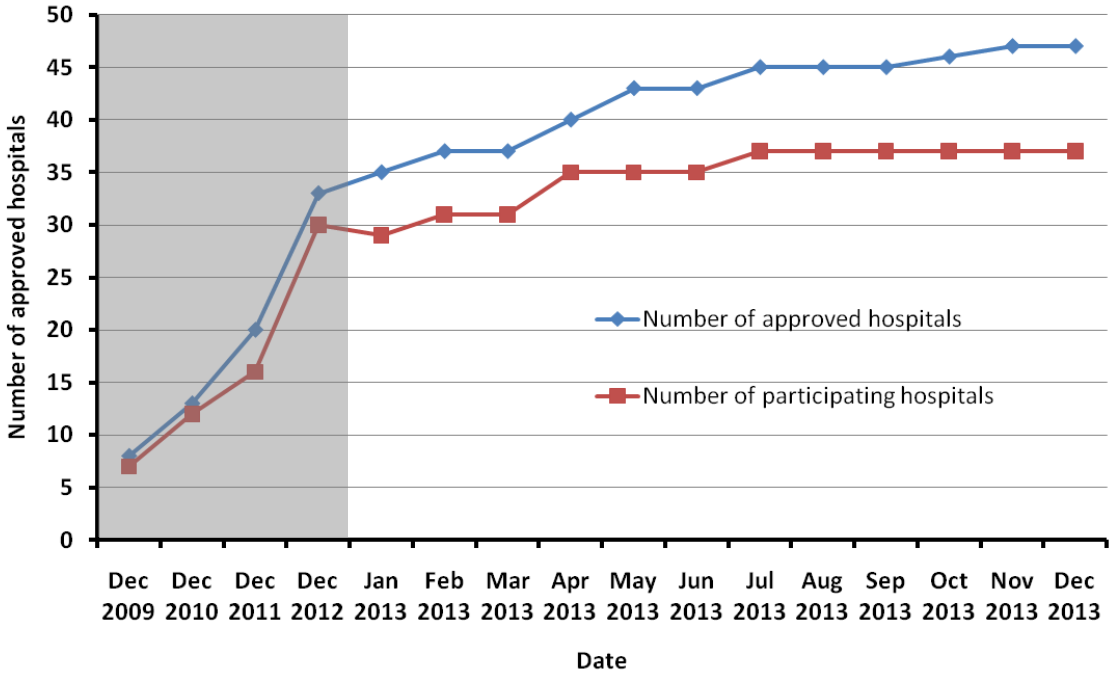

Figure 1: Number of participating hospitals in the AuSCR

The characteristics of the 2013 participating hospitals are shown in Table 1. In 2013, there were five hospitals located in New South Wales (NSW), 23 in Queensland (QLD), seven in Victoria (VIC), one in Western Australia (WA), and one in Tasmania (TAS). There were 27 hospitals that had 100 or more episodes of stroke/TIA registered during 2013. There were 28 hospitals located in a major city, 35 hospitals that had stroke units and 31 hospitals that provided thrombolytic therapy using tissue plasminogen activator (tPA). Three of the 37 hospitals were private hospitals and one was a children's hospital.

Table 1: Characteristics of participating hospitals

Year	2009	2010	2011	2012	2013					
	Total	Total	Total	Total	Total	*NSW*	*QLD*	*VIC*	*WA*	*TAS*
Number of hospitals	6	12	16	31	37	*5*	*23*	*7*	*1*	*1*
Annual number of episodes in the AuSCR*										
Low (<33 episodes)	-	1	4	11	2	*0*	*1*	*1*	*0*	*0*
…….Medium (33-99 episodes)	1	5	2	6	8	*2*	*6*	*0*	*0*	*0*
…….High (≥100 episodes)	5	6	10	14	27	*3*	*16*	*6*	*1*	*1*
Location[#]										
…….Major city (Metropolitan)	6	10	11	16	28	*5*	*15*	*6*	*1*	*1*
…….Regional (Rural)	-	2	5	15	9	*0*	*8*	*1*	*0*	*0*
Stroke unit	6	10	14	28	35	*4*	*23*	*6*	*1*	*1*
Intravenous thrombolysis (tPA) undertaken	6	9	10	22	31	*4*	*20*	*5*	*1*	*1*

**Hospital categories as per the definitions used in registry of the Canadian Stroke Network*

[#]Location categorised using Accessibility/Remoteness Index for Australia 2011 (ARIA+). Major city = category 1, Regional = categories 2 and 3

NUMBER OF REGISTRANTS

In 2013, there were 7325 patients registered in the AuSCR (Table 2). During a calendar year, patients may have multiple admissions for stroke or TIA that are also eligible to be included in the AuSCR. In 2013, there were 7614 episodes of acute hospital care entered in the AuSCR for the 7325 individuals registered. There were 289 patients (4%) who had multiple episodes registered in 2013. Among these, 272 had 2 episodes, 16 had 3 episodes and one had 4 episodes. Multiple episodes were recorded from all but one of the 37 hospitals. The minimum number of episodes registered for any particular site was five at a metropolitan Victorian hospital and the maximum number registered was at a metropolitan Victorian hospital (n=630). The median number of episodes per hospital was 150 (Q1, Q3: 77, 256).

Table 2: Number of hospitals, patients and episodes in 2013

Number of hospitals contributing data	37
Number of episodes submitted	7614
Number of patients	7325
Number and percentage of multiple episodes	289 (4%)

CASES REGISTERED PER MONTH

Figure 2 shows the number of episodes (including multiple episodes) per month. The median number was 645 per month. The minimum was 505 in February and the maximum was 723 in September.

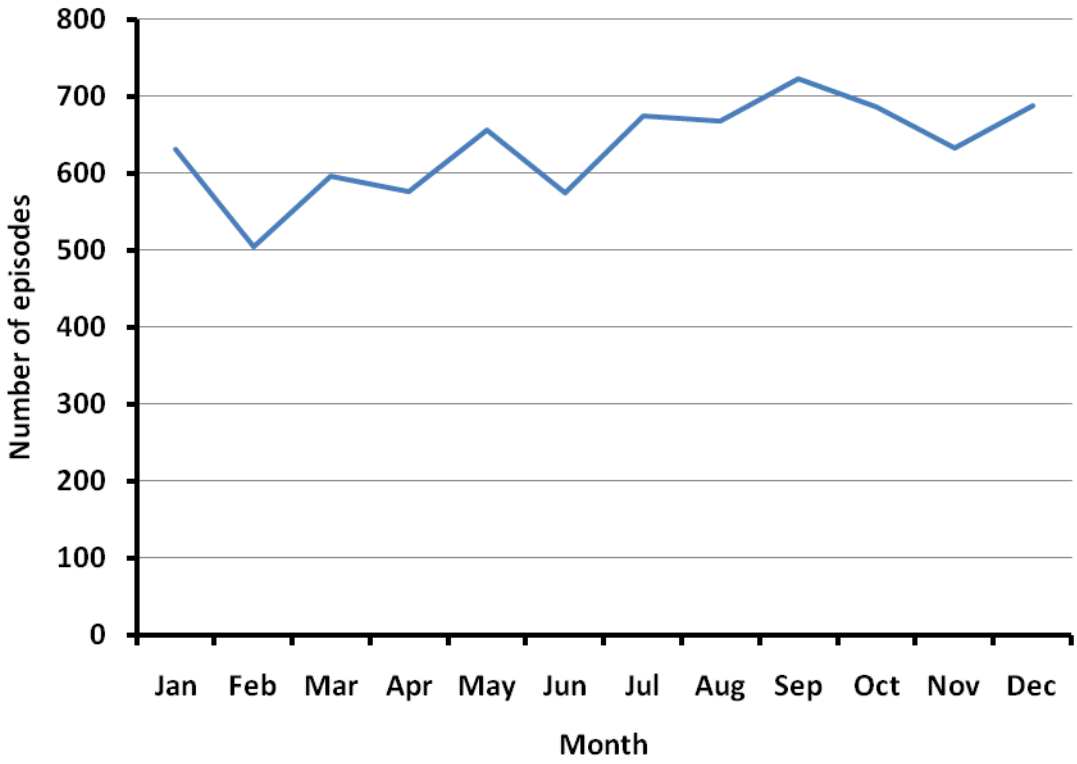

Figure 2: Number of episodes per month in 2013

TIME TO CREATION OF REGISTRANT RECORDS BY HOSPITALS

Among the 7614 episodes of care, the median number of days from the admission to the creation of the patient record in the AuSCR was 77 days (Q1 to Q3: 30 to 129 days). By hospital, the shortest median number of days was three days, and the largest median number of days was 339 days. These data at a hospital level may be influenced by several factors such as numbers of eligible admissions, as well as the method of data capture and entry.

REGISTRANTS WHO NOMINATED TO OPT-OUT OF THE AUSCR

As highlighted, registrants are informed by hospital staff that they are able to opt-out some, or all, of their data from the AuSCR database (e.g. personal identifying information). During 2013, 193 (2.9%) opt-out requests were received from hospital staff or patients (Table 3). The total number of opt-out requests varied, ranging from 0 to 27 per hospital. The breakdown of opt-outs for either personal or episode data or follow-up refusal is listed in Table 3. Overall, 139 (1.9%) of patients in 2013 wanted all of their personal information and data removed from the registry.

Table 3: Opt out Requests and Fields

Total opt-out cases	Complete episode and demographic data removed	Complete episode data only removed	Demographic data only removed	Refused follow-up at time of recruitment
193	139	8	46	136

DATA COMPLETENESS

A summary of the completeness of hospital collected data for the majority of fields within the registry for the 7614 episodes, from 7325 patients, in 2013 is presented below (Table 4). These figures represent the proportion of data completeness for applicable cases only, since not all variables are relevant to every patient (such as use of intravenous thrombolysis [tPA]).

Table 4: Completeness of fields in the AuSCR database by year of registry being operational

Field	2009# % complete	2010 % complete	2011 % complete	2012 % complete	2013 n (% complete)
Person details (n=7325)					
First name	100	100	100	100	7325/7325 (100%)
Surname	100	100	100	100	7325/7325 (100%)
Date of birth	100	100	100	99	7325/7325 (100%)
Medicare number	67	90	92	92	6686/7325 (91%)
Patient contact (n=7390)					
Available (complete or partial for street address, suburb and state)	95	99	99	100	7198/7325 (98%)
Complete (street address, suburb and state)	97	55	93	100	7130/7325 (97%)
Telephone for patient (landline or mobile)	90	96	94	95	6864/7325 (94%)
Emergency and alternate contacts (n=7390)					
Address for one or both of emergency and alternate contacts	71	47	78	75	5470/7325 (75%)
Address for one contact	62	40	69	66	4695/7325 (64%)
Address for both contacts	10	7	9	9	775/7325 (11%)
Telephone for emergency and/or alternate contact (landline or mobile)	92	94	90	54	5916/7325 (81%)
General practitioner contacts (n=7390)					
Address	73	46	84	65	5421/7325 (74%)
Telephone for general practitioner (landline or mobile)	75	71	82	63	4644/7325 (63%)
Patient characteristics (n=7390)					
Title	99	97	100	100	7325/7325 (100%)
Hospital medical record number	100	100	100	100	7325/7325 (100%)
Gender	99	98	100	100	7325/7325 (100%)
Country of birth	92	98	95	97	6882/7325 (94%)
Language spoken	97	84	96	86	6120/7325 (84%)
Indigenous status	100	100	100	99	7325/7325 (100%)
Interpreter needed	100	84	100	96	7146/7325 (98%)

Table 4, continued

Field	2009# % complete	2010 % complete	2011 % complete	2012 % complete	2013 n (% complete)
Episode data (including multiple episodes) (n=7614)					
Date of arrival	100	100	100	95	7199/7614 (95%)
Time of arrival	100	99	97	92	7068/7614 (93%)
Date of stroke onset	100	100	100	100	7610/7614 (99.9%)
Date of admission	100	100	100	100	7614/7614 (100%)
Transfer from another hospital	100	100	99	98	7428/7614 (98%)
Stroke occurs while in hospital	100	99	99	98	7419/7614 (97%)
Able to walk independently on admission	100	95	91	90	6726/7614 (88%)
Documented evidence of a previous stroke	100	98	92	92	7018/7614 (92%)
Treated in a stroke unit	100	99	100	99	7445/7614 (98%)
Type of stroke	100	100	100	100	7585/7614 (100%)
Use of intravenous thrombolysis (if ischaemic stroke)	100	98	97	95	4363/4588 (95%)
Cause of stroke	100	100	100	82**	7465/7614 (98%)
ICD10 coding (including multiple episodes) (n=7614)*					
Diagnosis code	63	66	96	95	7229/7614 (95%)
Medical conditions	1	14	36	40	3076/7614 (40%)
Complications	0	4	7	26	1010/7614 (13%)
Procedures	9	23	25	60	2700/7614 (35%)
Discharge information (including multiple episodes) (n=7614)					
Deceased status†	100	100	100	100	7613/7614 (100%)
Date of death (if deceased status is yes) †	100	100	100	100	866/866 (100%)
Date of discharge (if not deceased while in hospital) †	87	97	98	96	6409/6747 (95%)
Discharge destination (if not deceased while in hospital) †	87	97	97	97	6597/6747 (98%)
Discharge on antihypertensive agent (if not deceased while in hospital) †	87	92	90	97	5816/6747 (86%)
Evidence of care plan on discharge (if not deceased while in hospital) †	87	91	91	78**	5769/6747 (86%)

*Incomplete: coded as unknown or missing *Note that not every patient will have other medical conditions, complications and procedures coded, therefore the denominator is unknown #Only approximately six months of data were collected during 2009, the pilot year. †Deceased status and date of death determined using AuSCR data. **Data completeness was lower for these variables in 2012 compared to other years due to technical issues with the AuSCR database.*

COMPLETENESS OF CASE ASCERTAINMENT

Among the 37 participating hospitals, 23 (62%) hospitals sent us case ascertainment information for 2013 stroke and TIA admissions (methods described on page 16) and, 29 (78%) hospitals had participated in the AuSCR for a full year (Table 5). Table 5 shows the number of episodes that were registered (A) or missed (B) in the AuSCR database and the proportion of completeness for case ascertainment. From the hospitals that provided data for this review, case-ascertainment ranged from 13% to 100%. The case ascertainment results were partly influenced by data quality issues where manual data entry of names or unit record numbers by hospital staff are recorded incorrectly and then do not match to the data provided by hospitals for case ascertainment checking. Processes to improve this aspect of quality control for the registry continue to be a focus of the AuSCR Office. The other main reason for the low level of data completeness for some sites was that, due to resource limitations, only part of the data were entered into the AuSCR for the reporting period.

Table 5: Summary of the case ascertainment

Hospital	Episodes in the database (n)	Episodes missed in the database (n)	Completeness
9†	173	38	82%
10	49	Not provided	
11†	365	186	66%
12*†	591	155	79%
13*†	533	0	100%
15†	62	81	43%
16†	147	Not provided	
18†	122	Not provided	
19†	5	7	42%
20†	143	116	55%
21†	120	22	82%
22†	471	Not provided	
23*†	630	0	100%
2	77	219	26%
28†	375	0	100%
29*†	493	128	79%
30†	76	528	13%
31*†	193	Not provided	
32†	426	143	75%
34†	148	Not provided	
35†	123	243	34%
36†	127	Not provided	
37†	46	Not provided	
39†	58	Not provided	
40†	155	73	66%
41*†	256	0	100%
42†	172	Not provided	
43†	150	Not provided	
44*†	216	0	100%
45†	234	54	81%
46	150	245	38%
47	164	Not provided	
48	52	94	36%
49†	292	Not provided	
50*	153	688	18%
54	29	48	38%
55	38	Not provided	
Total	7614	-	-

Patients who opted out of participation in the AuSCR do not appear in the above table.
Not provided: data are not available as not provided by hospital
**These 8 hospitals use the data import function.*
†These 29 hospitals participated in the AuSCR for the full 2013 year.

REGISTRANT CHARACTERISTICS

Table 6 shows the baseline characteristics for patients and their episodes of care. Cases from adult hospitals and the paediatric hospital are presented separately.

Among the 7320 adult patients, the most common country of birth was Australia (70%) followed by the United Kingdom and Italy. The remainder were from a range of mainly European or Asian nations. There were 128 patients (2%) who identified as having an Aboriginal or Torres Strait Islander background. The majority of the registered patients spoke English (94%). The registrants comprised 3320 (46%) females and the mean age was 73 years. There were 820 patients (11%) aged less than 55 years and 1004 patients (14%) were aged between 55 and 64 years.

From the total 7614 episodes, the clinicians indicated that there were 4588 ischaemic strokes, 990 intracerebral haemorrhages (ICH), 1489 TIAs, 518 episodes of undetermined stroke type and 29 episodes with missing stroke type data. The proportion of stroke episodes, according to the clinician-based classification of stroke subtype for all episodes and first registered episodes, is provided in Figure 3. Stroke subtype according to gender and age is presented in Figure 4. Among the 7614 episodes, the patient was noted as being able to walk at the time of admission in about 45% of admissions.

Table 6: Baseline characteristics by patients (adults and paediatrics) and episodes

	Adults (n=7320)	**Paediatrics (n=5)**
Patients (n=7325)		
Age, mean (SD)	73 (14)	10 (9)
Age, median (Q1 to Q3)	76 (65 to 84)	14 (0.4 to 15)
Gender, female, n (%)	3320/7276 (46%)	3/5 (60%)
Country of birth, n (%)		
Australia	4714/6724 (70%)	5/5 (100%)
United Kingdom	590/6724 (9%)	0/5 (0%)
Italy	194/6724 (3%)	0/5 (0%)
Other European countries	574/6724 (9%)	0/5 (0%)
Asia	222/6724 (3%)	0/5 (0%)
Others	430/6724 (6%)	0/5 (0%)
Aboriginal and/or Torres Strait Islander, n (%)	128/7276 (2%)	0/5 (0%)
English spoken, n (%)	5677/6055 (94%)	5/5 (100%)
Episodes (including multiple episodes) (n=7614)	**Adult episodes (including multiple episodes) (n=7609)**	**Paediatric episodes (n=5)**
Type of stroke, n (%)		
Ischaemic	4583/7580 (60%)	5/5 (100%)
Haemorrhagic	990/7580 (13%)	0/5 (0%)
TIA	1489/7580 (20%)	0/5 (0%)
Undetermined	518/7580 (7%)	0/5 (0%)
Able to walk on admission^, n (%)	3008/6721 (45%)	1/5 (20%)
Length of hospital admission (days), median (Q1 to Q3)	4 (2 to 8)	11 (10 to 18)
Cause of stroke known, n (%)	3378/7460 (45%)	1/5 (20%)

Paediatric cases were those admitted to the participating paediatric hospital; ^used as an indicator of stroke severity

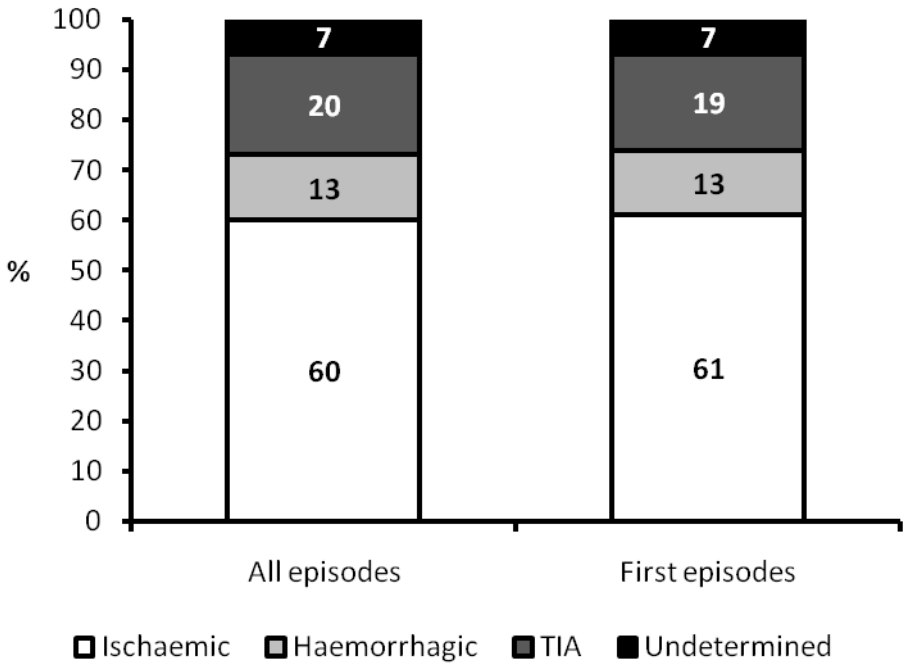

Figure 3: Distribution of stroke subtypes in all and the first episodes

Excludes cases admitted to the participating paediatric hospital

All episodes n=7609, First episodes n=7320

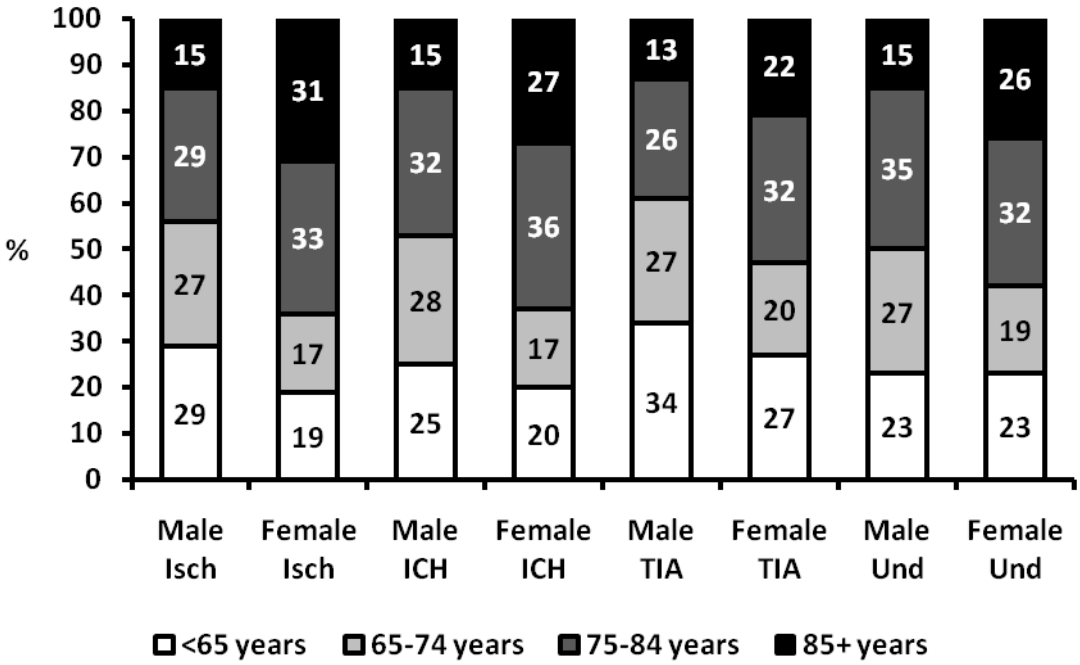

Figure 4: Distribution of stroke subtypes by sex and age groups (including multiple episodes)

Excludes cases admitted to the participating paediatric hospital

Isch: Ischaemic stroke, ICH: intracerebral haemorrhage, TIA: transient ischaemic attack, Und: undetermined stroke

Male Isch n=2513, Female Isch n=2045, Male ICH n=522, Female ICH n=460, Male TIA n=803, Female TIA n=675, Male Und n=273, Female Und n=244

PROCESSES OF HOSPITAL CARE

Of the 7614 episodes, there were 945 episodes (12%) transferred from another hospital and 376 episodes (5%) of inpatient stroke whilst patients were already in hospital for another condition. The majority of the inpatient strokes were ischaemic (n=253, 67%) and most of these (n=118, 31%) occurred among patients aged between 75 and 84 years. The median length of stay was longer for patients who had a stroke while already in hospital (inpatient median 11 days [Q1 to Q3: 5 to 19 days] vs. median 4 days [2 to 8 days] for non-inpatient stroke admissions, p<0.001).

OVERALL ADHERENCE TO QUALITY INDICATORS

Adherence to the process of care indicators collected nationally in the AuSCR is outlined in Table 7. Most patients registered in the AuSCR were treated in a stroke unit and about two-thirds received a care plan at time of discharge if they were discharged home or to an aged care facility. Adherence to each of these quality indicators by participating adult hospitals is presented in a de-identified format in Appendix C.

Table 7: Stroke evaluation and therapy (including multiple episodes)

Hospital Stroke Care	All episodes	Ischaemic	TIA
Patients admitted to a stroke unit	5847/7608 (77%)	3904/4583 (85%)	992/1489 (67%)
Patients who received intravenous thrombolysis (tPA) if an ischaemic stroke	n/a	476/4583 (10%)	n/a
Patients discharged (not deceased while in hospital)	6744/7400 (91%)	4115/4481 (92%)	1470/1474 (99.7%)
Patients discharged on an antihypertensive agent (if not deceased while in hospital)	4661/6555 (71%)	3044/4027 (76%)	969/1440 (67%)
Patients who received a care plan at discharge (if discharged home or to RACF)	2046/3713 (55%)	1122/1996 (56%)	651/1289 (51%)

n/a: not applicable, RACF: Residential Aged Care Facility

Unknowns coded as no, inpatient death determined using National Death Index (NDI) data, excludes cases admitted to the participating paediatric hospital

There was no difference in the age of patients admitted to stroke units among the hospitals (mean age if managed on a stroke unit 73 years (SD 14) and non-stroke unit mean age 73 years (SD 15) (p=0.98) (Figure 5). In addition, there were more patients with ischaemic stroke treated in a stroke unit than the other types of stroke (p<0.001) (Figure 6).

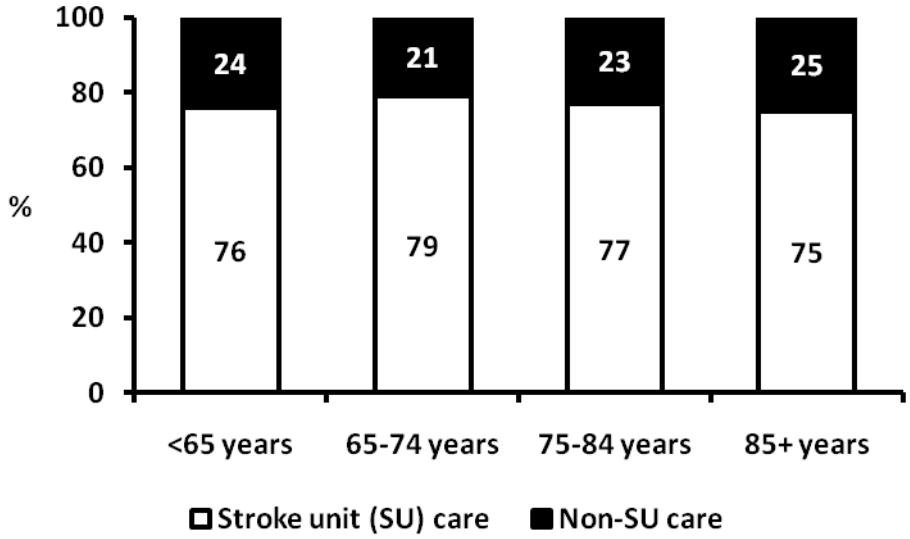

Figure 5: Management in a stroke unit according to age group (including multiple episodes)

Excludes cases admitted to the participating paediatric hospital

Age <65 n=1915, Age 65-74 n=1732, Age 75-84 n=2336, Age 85+ n=1580

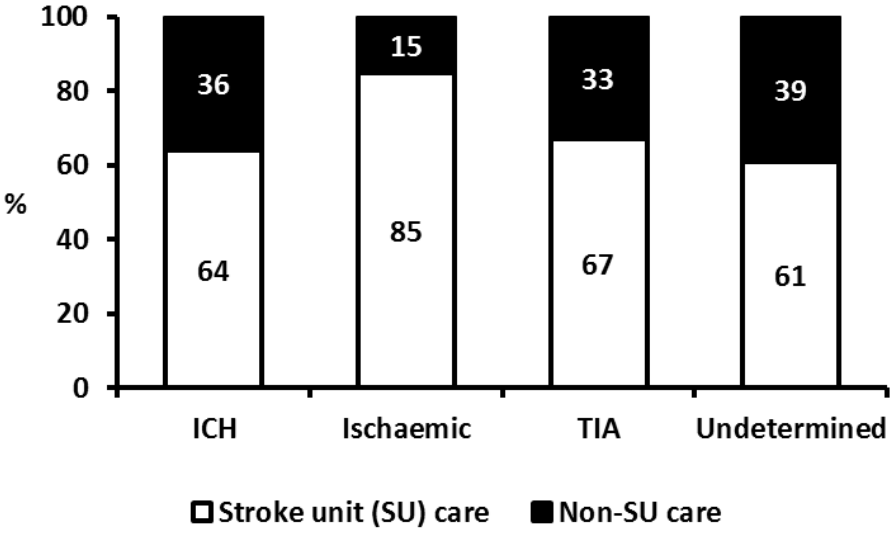

Figure 6: Management in a stroke unit according to stroke subtype (including multiple episodes)

Excludes cases admitted to the participating paediatric hospital

ICH n=990, Ischaemic n=4583, TIA n=1489, Undetermined n=518

ADHERENCE TO QUALITY INDICATORS BY SIZE OF HOSPITALS REGISTERED IN 2013

Adherence to quality indicators by number of episodes registered in 2013 for each hospital is shown in funnel charts in Figures 7-10. The summary data from each hospital used for these funnel charts are available in Appendix C.

Explanation of funnel charts

Funnel charts can be used to display deviations from the average achievement of quality of care.[6] The ***horizontal axis*** (line across the page from left to right) in these funnel charts indicates the number of episodes (volume) per hospital eligible to be included in the analysis. The larger number of episodes (volume) submitted to the AuSCR, the further to the right a hospital result will be as represented by circle. The smaller the patient admission volume, the further to the left a hospital's circle will be located. The ***vertical axis*** indicates the adherence to quality indicators, expressed as a proportion (%). The circles show each individual hospital's adherence; and the horizontal centre line shows the *overall* (all hospitals combined) average adherence.

Using Figure 7 as an example, the *overall* proportion of patients admitted to a stroke unit was 77%. The dashed lines constitute the funnel or 'control limits'. These represent the number of standard deviations (SD; either 2 or 3 SDs) from the overall average result. Hospitals within the 2 SD limits are considered to be within 'normal variation' while those outside are not within 'normal variation'. Those outside the 3 SD limits are considered to have 'special cause variation'. This means that hospitals above the 3 SD limits line may be considered as having 'good performance', while those below the 3 SD limits line may be considered as having 'poor performance'. Care must be taken in interpreting these data when they are skewed because the control limits rely on the assumption that the distribution of data follows a bell curve or '*normal distribution*'.

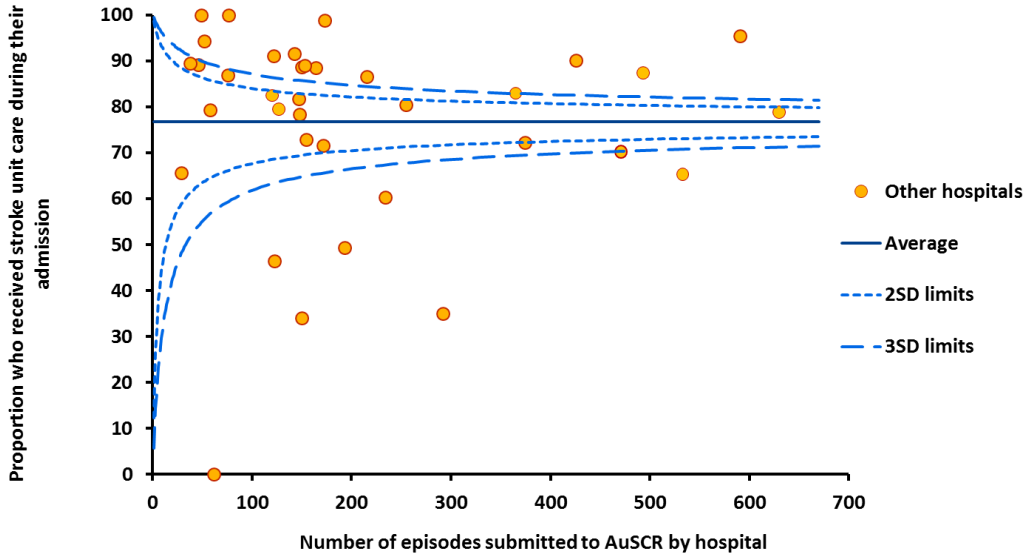

Figure 7: Management in a stroke unit by hospital

SD: standard deviation

Excludes cases admitted to the participating paediatric hospital

Variance existed in the proportion of patients who were managed on a stroke unit. The majority of hospitals where the proportion of patients admitted to a stroke unit was below the 3 SD limit were more often hospitals that submitted less than 300 episodes into the AuSCR in 2013. However, some of these hospitals may have introduced new stroke units throughout the year, especially in Queensland where incentive based funding attached to stroke unit development was provided in 2013. Therefore, for these hospitals, the data may not be representative of the number of patients managed on a stroke unit once their stroke unit was actually established. Only one of the hospitals included in the funnel plot did not have a stroke unit in 2013.

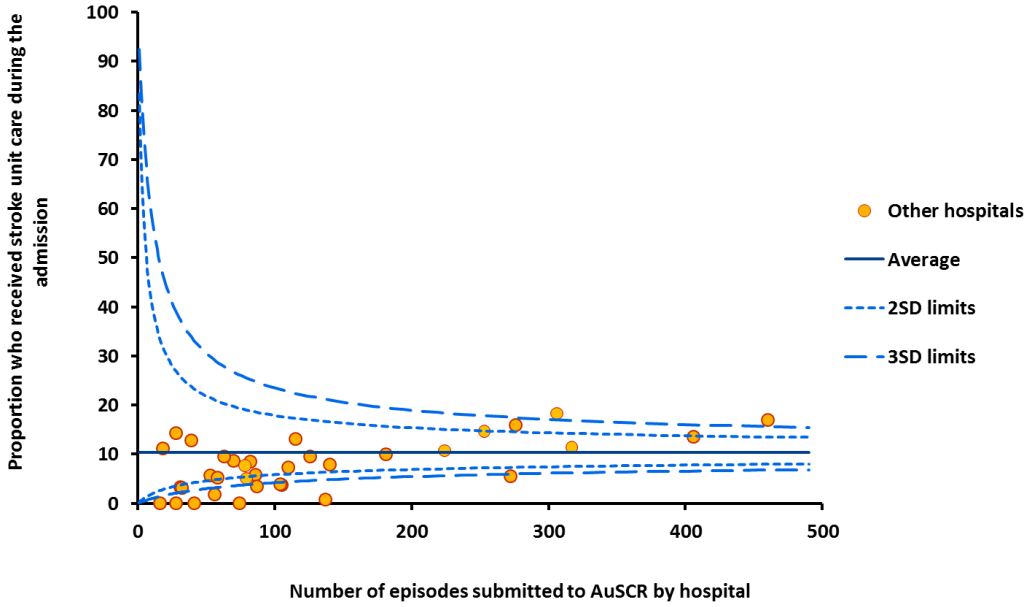

Figure 8: Received intravenous thrombolysis by hospital

SD: standard deviation

Excludes cases admitted to the participating paediatric hospital

Six sites were below the 3 SD limit for intravenous thrombolysis. Five of these six hospitals did not offer a thrombolysis service. Hospitals that did not offer thrombolysis had less than 100 stroke episodes recorded in the AuSCR for 2013. Large hospitals (i.e. those with more than 200 patients recorded in the AuSCR) were more frequently above average for this indicator.

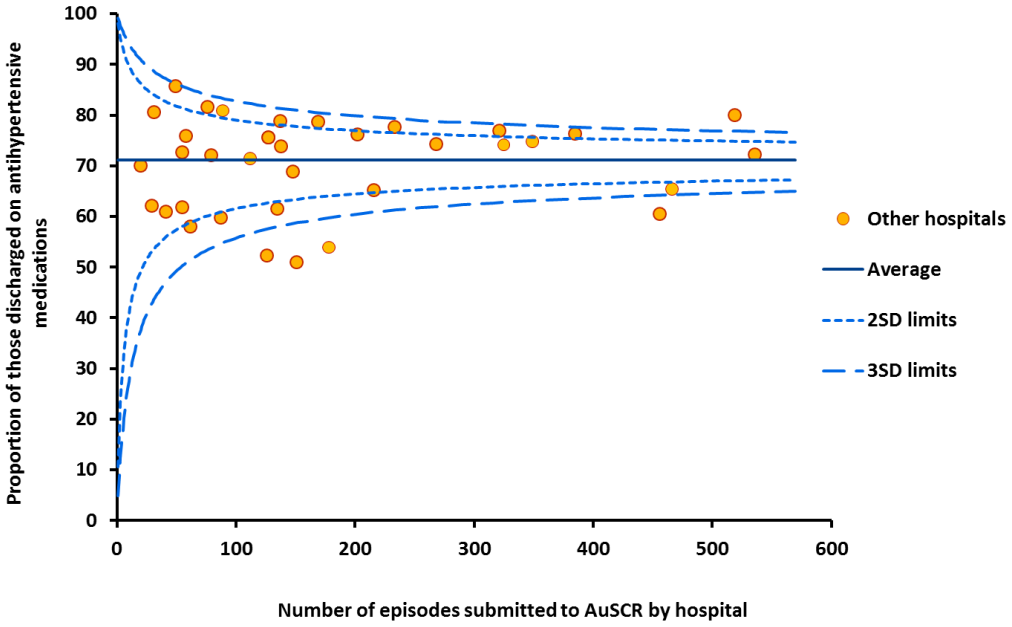

Figure 9: Discharged on antihypertensive medications by hospital

SD: standard deviation

Excludes cases admitted to the participating paediatric hospital

Being discharged on antihypertensive medication was the most consistently adhered to quality indicator. Only four sites were below the 3 SD limit for this indicator.

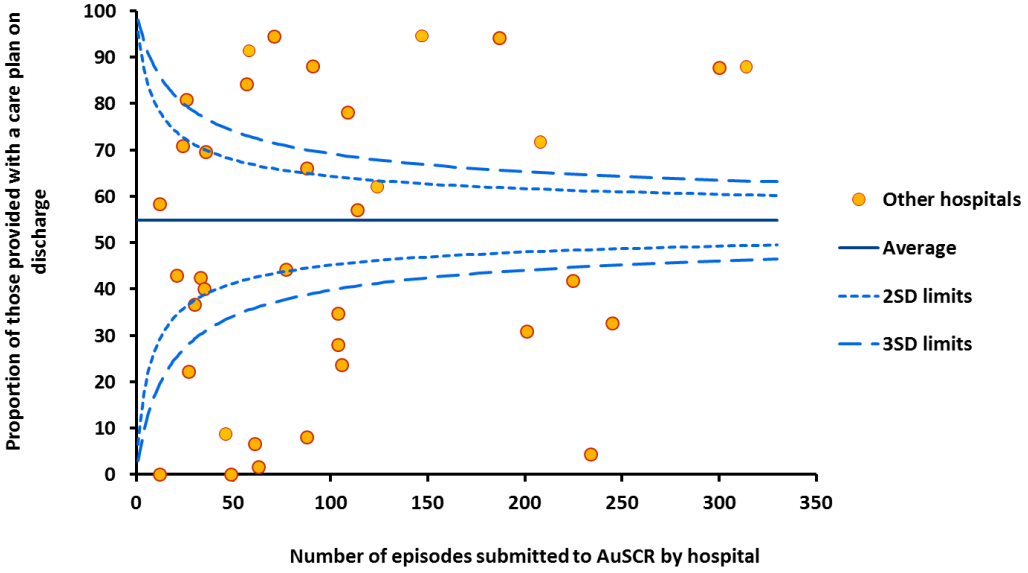

Figure 10: Care plan provided by hospital if discharged home or to a residential aged care facility by hospital

SD: standard deviation

Excludes cases admitted to the participating paediatric hospital

Adherence to receiving a care plan on discharge, if discharged home or to residential care, showed the greatest variation between hospitals. The majority of hospitals were not within 'normal variation'. There were many hospitals with good performance (above 'special cause variation') and poor performance (below 'special cause variation') in comparison to the overall average. However, these data need to be interpreted with caution. Recent data quality checking by the AuSCR Office and Monash University staff showed that this particular variable was often poorly recorded at the hospital level, with large variations in the quality of recording between hospitals. We found from the data quality review that many patients who were eligible for a care plan, based on the definition used by the AuSCR, were classified as being ineligible for a care plan by the hospital staff entering the data. For example there was a tendency for patients who were not considered to be significantly disabled to be recorded as ineligible, when in fact, all patients discharged home or to residential aged care should receive a comprehensive discharge care plan. Sites demonstrating poor data quality have been flagged and additional AuSCR training will be provided to these hospitals.

OVERALL ADHERENCE TO QUALITY INDICATORS SPECIFIC TO QUEENSLAND HOSPITALS

Adherence to the additional quality indicators collected in the AuSCR for Queensland is outlined in Table 8. The majority (86%) of Queensland patients registered in the AuSCR were mobilised during admission. Among the 1657 patients who were unable to walk independently, the method of mobilisation was either walking (43%), standing (23%) or sitting (34%). More than one-third (41%) were assessed for dysphagia, 72% received aspirin within 48 hours, and 85% with ischaemic stroke or TIA were discharged on anti-platelets or antithrombotic medication.

Table 8: Stroke evaluation and therapy (including multiple episodes): Queensland specific variables

Hospital Stroke Care	All episodes	Ischaemic	TIA
Mobilisation during admission	3107/3593 (86%)	1811/2002 (90%)	842/913 (92%)
Same day or day after admission	2648/3103 (85%)	1511/1809 (84%)	804/841 (96%)
If unable to walk independently, patient mobilised	1370/1657 (83%)	947/1088 (87%)	185/195 (95%)
Same day or day after admission	1084/1370 (79%)	751/947 (79%)	170/185 (92%)
Dysphagia screen tool used within 24 hours	1462/3593 (41%)	898/2002 (45%)	303/913 (33%)
Screen or swallow assessment undertaken	2957/3593 (82%)	1830/2002 (91%)	638/913 (70%)
Within 24 hours	2131/2957 (72%)	1332/1830 (73%)	489/638 (77%)
Aspirin administration within 48 hours (if not intracerebral haemorrhage)	2265/3157 (72%)	1499/2002 (75%)	636/913 (70%)
Discharged on antiplatelets or antithrombotics (if not intracerebral haemorrhage)	2338/2735 (85%)	1493/1722 (87%)	738/869 (85%)

Includes only Queensland patients

PATIENTS ADMITTED WITH TRANSIENT ISCHAEMIC ATTACK

Among the 1489 episodes of TIA, the mean age was 72 years (SD 14 years) and 46% were female. Four patients with TIA were reported to have died while in hospital. The median length of stay was two days (Q1 to Q3: 1 to 3 days). Among those alive at discharge, 67% were discharged on an antihypertensive agent. Among patients with TIA who were discharged home, or to a residential aged care facility, 61% received a care plan (Table 7). Most patients with TIA (86%, n=1265) were discharged to a home setting, 3% (n=47) went to rehabilitation and the remainder went to aged care, transitional care services or other hospitals. It is unclear whether these patients had already been in aged care prior to this event or had other co-morbidity or complications, while in hospital, which influenced their discharge destination.

DISCHARGE CODING OF STROKE TYPE

The AuSCR provides an important opportunity to review clinical classification of stroke or TIA against discharge coding which is often undertaken by health information managers in hospitals. Using the primary diagnosis discharge code compared with the stroke subtype provided by hospital clinicians, 88% of TIA episodes were coded as TIA, 5% of TIA episodes were coded with stroke codes and 6% were coded with non-stroke diagnostic codes (Table 9). Similarly, 79% of ischaemic stroke episodes were coded within the I63 range (Cerebral infarction: I63.0-I63.9), 10% of ischaemic stroke episodes were coded as I64 codes (stroke, not specified), and 7% were coded with non-stroke diagnostic codes.

Table 9: Comparison of clinical diagnosis and ICD10 primary diagnosis codes

	Clinical diagnosis			
	IS (N=4349)	**TIA (N=1386)**	**ICH (N=925)**	**Undetermined (N=483)**
ICD10 diagnosis code	**n (%)**	**n (%)**	**n (%)**	**n (%)**
I63: Cerebral infarction	3452 (79)	41 (3)	35 (4)	100 (21)
G45: Transient cerebral ischemic attacks and related syndromes	75 (2)	1224 (88)	3 (0)	42 (9)
I61 and I62: Nontraumatic ICH and Other and unspecified nontraumatic ICH	56 (1)	0 (0)	781 (84)	13 (3)
I64: Stroke, not specified ischaemic or haemorrhagic	435 (10)	27 (2)	4 (0)	242 (50)
I60: Non-traumatic SAH	1 (0)	0 (0)	38 (4)	3 (1)
I65-I69: other cerebrovascular diseases	48 (1)	4 (0)	4 (0)	1 (0)
G00-G44 and G46-G99: Other diseases of the nervous system	11 (0)	5 (0)	0 (0)	7 (1)
Other ICD10 diagnosis code	87 (2)	15 (1)	19 (2)	12 (2)
Missing ICD10 diagnosis code	184 (4)	70 (5)	41 (4)	63 (13)

Shaded cells indicate a matching clinical and primary ICD10 diagnosis code

IS: ischaemic stroke, TIA: transient ischaemic attack, ICH: intracerebral haemorrhage, SAH: subarachnoid haemorrhage

SUMMARY OF THE MOST COMMON PROCEDURE CODES ASSIGNED TO REGISTRANTS WHILE IN HOSPITAL

Multiple procedure codes can be assigned to patients while they are in hospital as part of the discharge coding process and this information may help show additional aspects of clinical care. From the data that were available to explore this information (as reported in Table 4) only 35% of these data were submitted; the 10 most common procedure codes assigned to the AuSCR registrants while in hospital, and their primary procedure codes received related to receipt of allied health interventions. These are outlined below in Tables 10 and 11.

Table 10: Ten most common procedure codes for all patients in the AuSCR

Codes	Description	Total	%
9555003	Allied health intervention physiotherapy	1114	25%
9555005	Allied health intervention speech pathology	988	22%
9555002	Allied health intervention occupational therapy	928	21%
9555000	Allied health intervention dietetics	407	9%
9555001	Allied health intervention social work	342	8%
9602700	Prescribed medication assessment	86	2%
9555014	Allied health intervention diabetes education	45	1%
9251599	Sedation, ASA 99*	40	1%
9555009	Allied health intervention pharmacy	38	1%
5511800	2D real time transoesophageal u/s heart	30	1%

**American Society of Anaesthesiologists classification*

Table 11: Ten most common primary procedure codes for all patients in the AuSCR

Codes	Description	Count	%
9555003	Allied health intervention physiotherapy	490	28%
9555001	Allied health intervention social work	311	18%
9555009	Allied health intervention pharmacy	242	14%
9555000	Allied health intervention dietetics	237	14%
9555002	AH intervention occupational therapy	159	9%
9555005	Allied health intervention speech pathology	146	8%
9206200	Transfusion of other serum	20	1%
3047301	Panendoscopy to duodenum with biopsy	15	1%
1370602	Transfusion of packed cells	12	1%
9251599	Sedation, ASA 99*	8	0%

**American Society of Anaesthesiologists classification*

DISCHARGE INFORMATION

Hospital outcome measures include length of stay, discharge destination and discharge status. In the case where data for an individual person is segregated across two hospitals for the same stroke episode, the discharge information is reported from the first hospital providing care. Unless otherwise stated, the data presented in this section relates to the hospital that provided the initial care.

LENGTH OF STAY

The median length of stay was four days (Q1 to Q3: 2 to 8 days). Of the 6759 patients who were discharged, 6547 had length of stay data. Among these registrants, 385 (6%) stayed 21 days or more. Similar to our findings in 2012, there was a statistically significant difference between the length of stay for episodes treated in stroke units (median 5 days, Q1 to Q3: 2 to 8 days) and those not managed in stroke units (median 3 days, Q1 to Q3: 1 to 7 days) ($p<0.001$). This finding may be due to more severe cases being treated in the stroke unit and requires further exploration. Regardless, these lengths of stay were very short (and three days shorter than the median length of stay for stroke unit care in 2011 which was seven days). This may indicate better transitions to the next phase of care at these hospitals. Patients with TIA were more likely to have a short length of stay (less than four days) compared to patients with stroke (52% TIA, stroke 47%, $p=0.003$).

DISCHARGE STATUS

In 2013, approximately half of the registered patients were discharged directly to a home environment following their episode of care (n=3517; 52%), (Figure 11). Patients managed in a stroke unit had a 2.4 fold increased odds of being discharged to a rehabilitation facility compared to those patients not managed on a stroke unit (95% confidence interval [CI] 2.0 to 3.0) when adjusted for age, gender, presence of ischaemic stroke, ability to walk on admission, whether an inpatient stroke and transferred from another hospital.

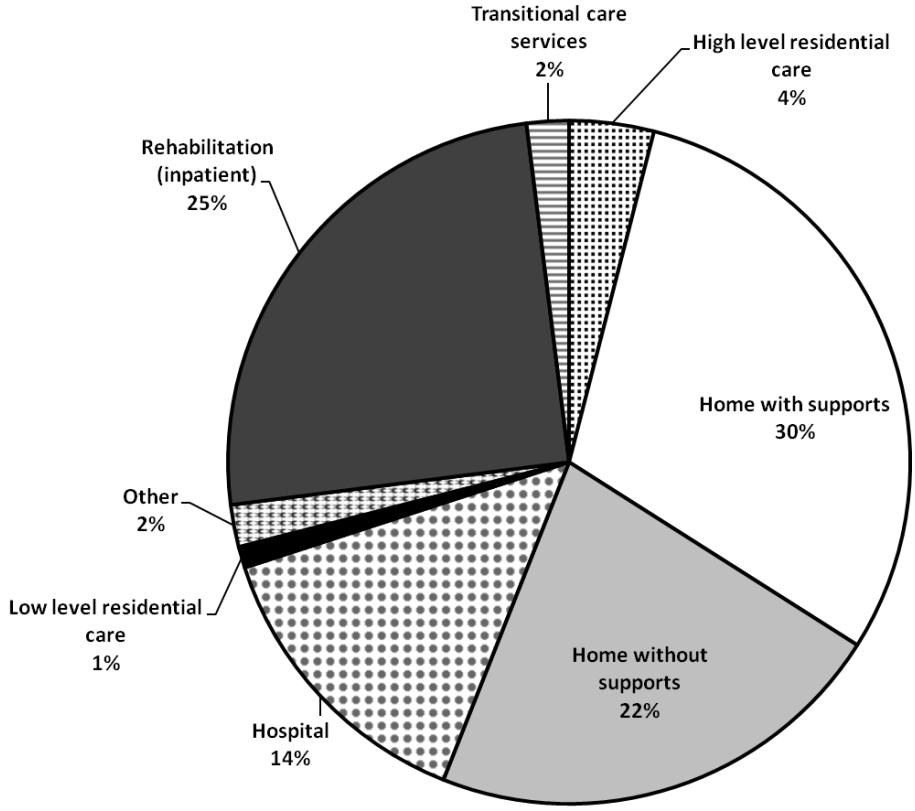

Figure 11: Discharge status including multiple episodes (excludes patients who died in hospital), n=6744

Excludes cases admitted to a paediatric hospital

Queensland registrants coded as sub or non-acute patients (SNAP) were included in the hospital category

SURVIVAL STATUS

Of the 7609 registered adult episodes of care (i.e. excludes cases from the paediatric hospital), 656 (9%) patients died whilst in hospital. Although case fatality in hospital was slightly greater for women, there were no gender differences in case fatality during hospitalisation after adjustment for age (p=0.11). Case fatality at 90 days after admission was 15%, and at 180 days this was 18% of all episodes. After adjustment for age, stroke subtype, ability to walk on admission, inpatient stroke and transfer from another hospital, there were no differences in mortality between males and females up to either 90 or 180 days after admission. There were no paediatric in-hospital deaths reported.

POST-DISCHARGE HEALTH OUTCOME INFORMATION

The following section provides the findings from the registrants who were eligible for follow-up in 2013.

MEDIAN TIME TO FOLLOW-UP

Excluding cases admitted to the children's hospital, there were 7320 patients registered in 2013 (Figure 12). Since 157 patients had a previous registration in 2009, 2010, 2011 or 2012 (including 42 patients who died during hospitalisation in 2013), there were 7163 (98%) registrants who had their first-ever stroke or TIA in the AuSCR in 2013. Of these 7163 registrants, 1098 (15%) registrants were known to have died within 90 days of their admission, leaving 6065 (85%) registrants who were alive at 90 days after their admission. No attempt for follow-up was made for 981 (16%) of these 6065 registrants who were ineligible for follow-up because: their primary data were entered into the AuSCR system after the 180 day limit; or they had opted out of follow-up; or because they were incorrectly classified as an in-hospital death. Out of the remaining 5084 registrants, 206 (4%) refused follow-up assessments, 95 (2%) were deceased when follow-up was attempted and a further 1163 (19%) registrants were lost to follow-up in relation to completing a survey. There were no follow-ups that remained in progress.

As of 21 June 2013, follow-up was completed for 3620 (77%) registrants eligible for follow-up and who were alive within 180 days of stroke onset. In 2013, median time from the stroke onset to the completion of follow-up for these 3620 patients was 100 days (IQR 95 to 105 days). As we are able to link the registrant data to the National Death Index, survival status in the community was known for all patients registered in 2013.

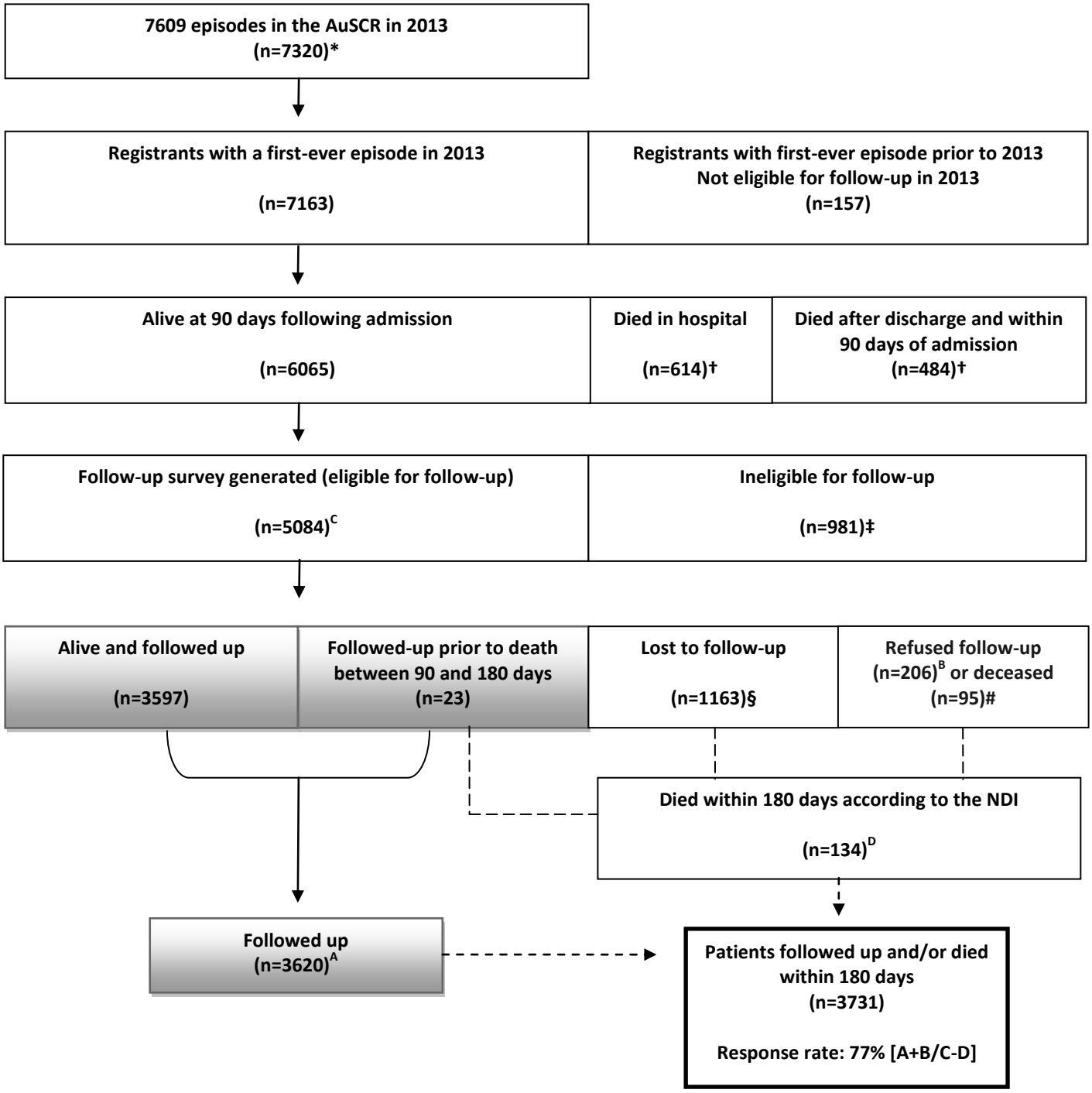

Figure 12: Flow diagram of the follow-up assessments for patients admitted in 2013

** Excludes cases admitted to the participating paediatric hospital.*

† There were 45 patients with a missing date of discharge who died within 90 days of their admission.

‡ There were 909 patients who had their data entered into the AuSCR database after 180 days of their admission, 37 patients who opted out of follow-up and 35 who were incorrectly classified as died in hospital. These patients were not followed up.

§ There were 32 patients in this group who died within 180 days of their admission.

 # There were 206 patients in this group who refused follow-up (one who died within 180 days of their admission) and 95 patients who were classified as 'deceased at follow-up' (78 who died within 180 days of their admission).

Characteristics of the 4865 registrants with any post-discharge information collected via survey are summarised in Table 12. The mean age was 75 years and 45% were female; 63% of them had an ischaemic stroke. Responders were older, were more likely to be treated in a stroke unit and had more severe stroke or a complete stroke, when they presented to hospital.

Table 12: Baseline characteristics for registrants with and without any post-discharge information

	Patients with any post-discharge information (complete follow-up or death) (n=4865)	**Patients without post-discharge information (refused, lost, after 180 days, or in progress) (n=2298)**	***p* value**
Age (years), mean (SD)	75 (13)	70 (15)	<0.001
Gender, female, n (%)	2200/4837 (45%)	1046/2282 (46%)	0.779
Aboriginal and/or Torres Strait Islander, n (%)			
Type of stroke, n (%)			<0.001
Ischaemic	3064/4853 (63%)	1280/2285 (56%)	
Haemorrhagic	644/4853 (13%)	281/2285 (12%)	
TIA	814/4853 (17%)	572/2285 (25%)	
Undetermined	331/4853 (7%)	152/2285 (7%)	
Able to walk on admission, n (%)	1856/4339 (43%)	994/2007 (50%)	<0.001
Length of hospital admission (days), median (IQR)	4 (2 to 8)	4 (2 to 8)	0.281
Treated in a stroke unit, n (%)	3875/4865 (80%)	1630/2297 (71%)	<0.001

Excludes cases admitted to the participating paediatric hospital

SURVIVAL AND THE INFLUENCE OF STROKE UNIT CARE

Of 4865 registrants with post-discharge information available, 1098 registrants (23%) had died within 90 days of admission (inclusive of the 614 inpatient deaths). After adjustment for age, case fatality within 90 days of stroke admission was not significantly different between males and females (p=0.234). At the time of the follow-up assessment (between 90 and 180 days after admission), a further 170 registrants were reported to have died.

We also found that those who were admitted to a stroke unit were much more likely to still be alive at 180 days following stroke (Figure 13). After adjusting for age, gender, stroke subtype, ability to walk on admission, inpatient stroke and transfer from another hospital, stroke unit care was associated with 51% reduced risk of death at 180 days compared to non-stroke unit care (adjusted mortality hazard ratio 0.49, 95% confidence interval: 0.43 - 0.56, p<0.001).

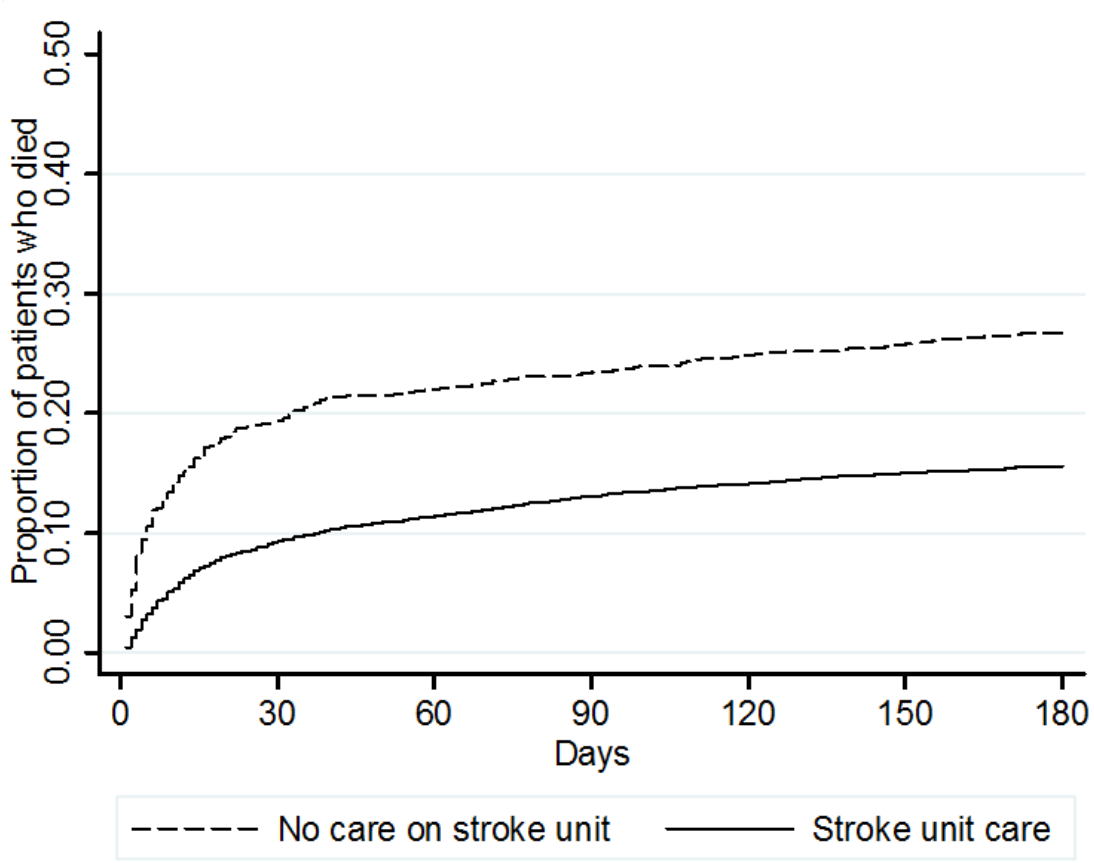

Figure 13: Mortality rates stratified by treatment in stroke unit

Adjusted for age, gender, stroke subtype, ability to walk on admission, in hospital stroke and transfer from another hospital.

FOLLOW-UP DATA

There were 3620 registrants who were able to answer all or some of the survey questions at follow-up. The main follow-up results are summarised in Table 13.

Table 13: Post-discharge information

Follow-up status	n/N (%)
Registrants who died within 180 days of admission	1268/7163 (18%)
Died during hospitalisation	614/7163 (9%)
Died after discharge and within 90 days of admission	484/7163 (7%)
Deaths registered between 90 a 180 days	170/7163 (2%)
Registrants who completed followed up	
Registrants who answered all questions	3519/3620 (97%)
Registrants who answered some questions	101/3620 (8%)
Registrants who had another stroke	194/3617 (5%)
Registrants who were readmitted to hospital	735/3620 (20%)
Reasons for readmission was a stroke/cardiovascular cause	216/735 (29%)
Location of stroke survivor at time of follow-up interview	
Home	
Living alone	690/2973 (23%)
Living at home	2973/3619 (82%)
With support	1747/2973 (59%)
Without support	1226/2973 (41%)
Institutional care or other setting	
In hospital	32/3619 (1%)
Transitional care service	50/3619 (1%)
Low level care (hostel care)	91/3619 (2%)
High level care (nursing home)	337/3619 (9%)
Inpatient rehabilitation	37/3619 (1%)
Other place	97/3619 (3%)

Excludes cases admitted to a paediatric hospital

READMISSIONS

There were 735 registrants (20%) who reported that they were readmitted to hospital and 216/735 (29%) of these were reported to be for a readmission related to a stroke or cardiovascular cause (Table 13).

HEALTH-RELATED QUALITY OF LIFE

In the AuSCR, we measure health-related quality of life (HRQoL) using the EQ-5D™ instrument. The EQ-5D is a standardised instrument for use as a measure of health outcome (see http://www.euroqol.org/). It provides a simple descriptive profile across five dimensions: mobility, self-care, usual activities, pain and discomfort, and anxiety and depression. Each of these profiles is divided into three levels: no problems (1), some or moderate problems (2) and extreme problems (3). In addition, the EQ-5D provides a single index value for health status using a visual analogue scale (VAS) (Figure 14). Possible

scores span a scale from 0% to 100%. An EQ-5D index score of zero corresponds to a HRQoL state that is all but death, while a score of 100% would represent perfect quality of life. Index-based values ('utilities') for the EQ-5D can also be reported using health values derived using Discrete Choice Experiment (DCE) methods.[7] The advantage of reporting the utility scores is that it enables death data to be incorporated into the values and allows for scores less than zero to be counted as these scores indicate a health state considered worse than death. A total of 244 registrants (7%) had a utility score of less than zero, based on their 90-180 day follow-up interview using the DCE method.

In 2013, the number of participants providing EQ-5D data was one and a half times greater than in 2012. Based on the various dimensions of the EQ-5D questionnaire, nearly half of the respondents reported problems in mobility and more than half reported problems in usual activities (Table 14). The summary score for overall HRQoL was well below the normal population measure for people aged 70 to 79 years (Figure 14: normative mean 83, 2013 mean 68, $p<0.001$) and was the same as the mean visual analogue scale obtained in 2012 (2012 mean 68).

Table 14: Quality of life assessment

EQ-5D dimensions		**n/N (%)**
Mobility	No problems (Level 1)	1833/3605 (51%)
	Problems (Levels 2 & 3)	1772/3605 (49%)
Self-care	No problems (Level 1)	2495/3604 (69%)
	Problems (Levels 2 & 3)	1109/3604 (31%)
Usual Activities	No problems (Level 1)	1576/3596 (44%)
	Problems (Levels 2 & 3)	2020/3596 (56%)
Pain/Discomfort	No problems (Level 1)	1796/3584 (50%)
	Problems (Levels 2 & 3)	1788/3584 (50%)
Anxiety/Depression	No problems (Level 1)	1981/3582 (55%)
	Problems (Levels 2 & 3)	1601/3582 (45%)
Visual Analogue Scale (0 – 100) reported by survivors		
Mean (SD)		68.4 (21.9)
Median (Q1, Q3)		74 (50 to 85)

Excludes cases admitted to a paediatric hospital.

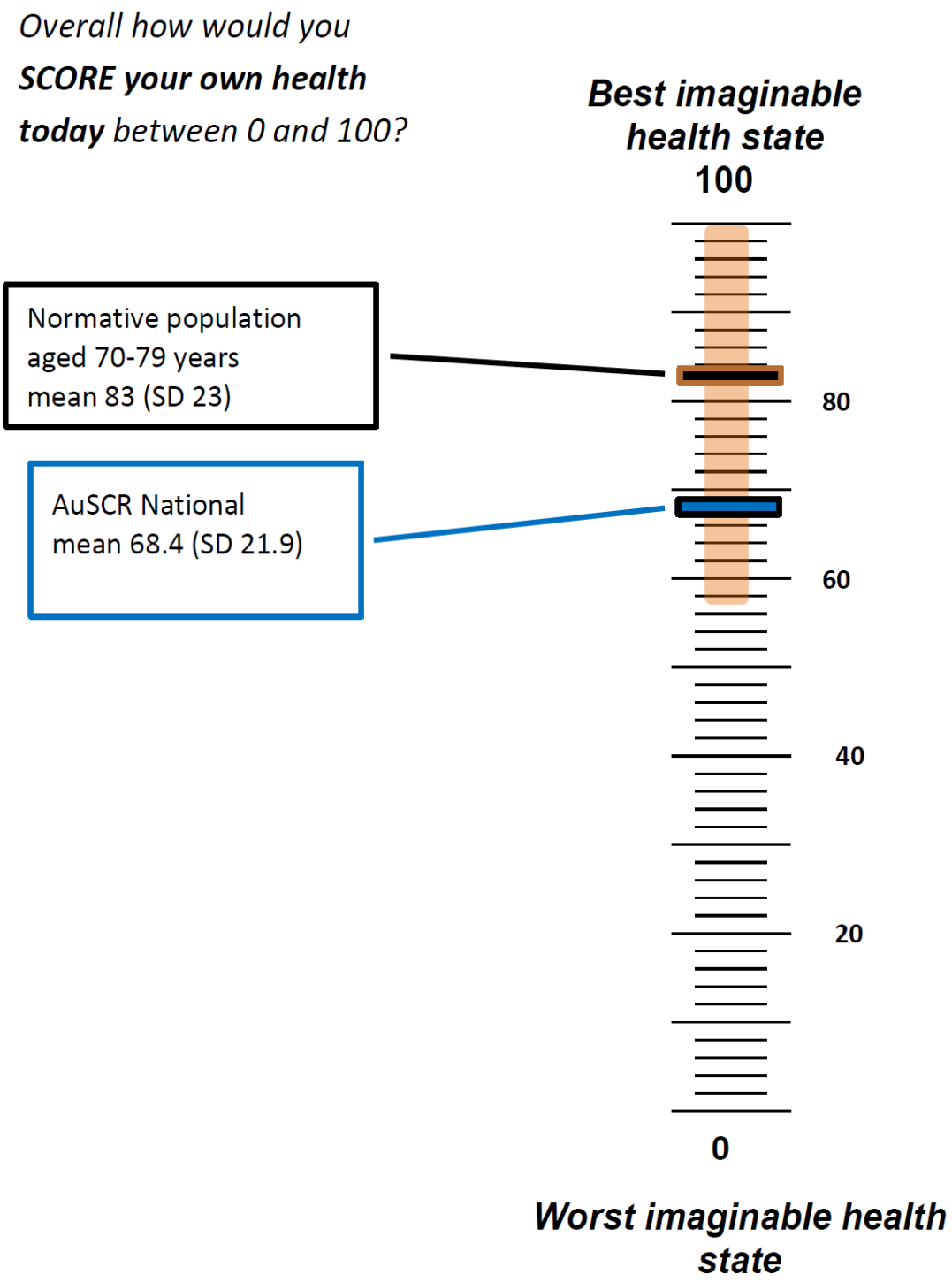

Figure 14: Summary of Visual Analogue Scale responses for the 2013 AuSCR registrants

Normative population Visual Analogue Scale responses obtained from Kind et al[8]

PAEDIATRIC OUTCOMES

There were seven registrants under the age of 18 years and six were followed up at 90 to 180 days following stroke. Four of these were admitted to the Children's Hospital and two were admitted to adult hospitals. Two were babies (aged less than 12 months) and the other four were aged between 14 and 16 years. All were living at home at the time of follow-up and all of these questionnaires were

completed by the child's mother. HRQoL was assessed for all four older children using the PedsQL and their VAS scores ranged from 43 to 88 on a scale of 0-100.

PARTICIPATION IN FUTURE RESEARCH

Among the 3389 registrants who answered the question about whether they would be willing to be contacted to participate in future research, 2276 registrants (67%) replied affirmatively.

UNMET INFORMATION NEEDS

Stroke can be a devastating and life changing event for people and there is a possibility that stroke survivors and their care providers have unmet care and information needs. Given that the AuSCR protocol includes a follow-up survey with survivors at 90 to 180 days post stroke or TIA, it presents an opportunity to ask registered patients whether they would like to receive further information about stroke from the National Stroke Foundation. In 2013, 29% (n=1054) of the 3620 registrants who completed a follow-up survey, indicated that they would like to receive information about stroke from the National Stroke Foundation.

DISCUSSION

This is the fifth annual report of the AuSCR. Since the release of the first annual report in 2009, use of the AuSCR registry has continued to grow with a six-fold increase in participating hospitals since 2009. In this 2013 report, we provide information contributed from 37 hospitals in Australia on 7614 episodes of stroke or TIA. This is almost a two-fold increase in the number of episodes from 2012. This increase is due to many of the hospitals that joined the AuSCR during the course of 2012 being able to provide a full year of data for the first time in 2013. The registry has not yet obtained complete coverage in any state or region and so these data have limited representativeness for providing: reliable death rates; stroke prevalence estimates; or information on the patterns of transfer across the system such as access to inpatient rehabilitation. However, the majority of hospitals that treat patients with stroke in Queensland (n=23) are now contributing data to the AuSCR. The high level of coverage in Queensland has meant that the AuSCR data have been able to be used to facilitate state-wide quality improvement activities including being used to inform peer-review discussions at the Queensland Stroke Clinical Network Forum.

Case ascertainment remains variable across the participating hospitals. Ongoing efforts to improve case ascertainment are needed through greater use of data uploads for demographic and admission variables. Hospitals that have been able to successfully and routinely create patient record files for importing into the AuSCR have the greatest case-ascertainment and this ensures their data are representative for their hospital.

There continues to be wide variability in adherence to the nationally endorsed quality indicators among different hospitals. We acknowledge that in our sample of participating hospitals there is a bias towards hospitals with stroke units. Therefore, the overall adherence to these quality indicators is anticipated to be greater than data reported in cross-sectional audits among hospitals with and without stroke units e.g. 79% of 2013 non-TIA AuSCR patients received their care within a stroke unit while in the National Stroke Audit of Acute Clinical Services (2013) only 58% of patients received care in a specialised stroke unit; 71% if stroke unit hospital are only considered (note the National Stroke Foundation audit does not sample TIA patients and this means it is not always possible to make direct comparisons between these data).[9] We found that only 77% of the AuSCR patients were managed on a stroke unit during 2013 which may indicate capacity issues within the hospitals that participate. Also in further comparing with the National Stroke Foundation audit, the AuSCR data for ICD procedure codes show low levels of allied health intervention (physiotherapy 25% for the AuSCR compared to 92% in the 2013 National Stroke Foundation audit).[9] There may be several reasons that explain these findings including whether hospitals consistently record and capture these data in their patient administration systems. Further these data are inconsistently provided to the AuSCR (completion of this field was 60% in 2012 and 35% in 2013).

The AuSCR data highlight important areas of focus for quality improvement based on a large representative sample of patients managed at each of the participating hospitals. It is therefore important that hospitals use the AuSCR to its full potential and regularly review their summary data that are available in 'on-demand' reports. To support hospitals in these efforts, the AuSCR Office provides a regular newsletter to: highlight ways in which the quality of the data could be improved; communicate progress being made; and share successes and learnings. Similar to last year, the proportions of missing data were minimal for the majority of non-mandatory variables, despite a large increase in the number of episodes entered into the AuSCR by participating hospitals.

The follow-up of patients at 90-180 days for those who are discharged from hospital is a unique attribute of the AuSCR registry in providing national data on stroke. At the time of follow-up, 14% of patients were living in institutionalised care or were in a hospital setting, and more than 82% were living at home. The 90-180 day outcomes data provide critical information about the overall quality of acute care received by people who have experienced stroke or TIA in Australia, and the capacity to monitor the burden of stroke post-discharge. This large sample provides the opportunity to assess health system and patient factors that may contribute to better or worse health outcomes after stroke or TIA. For example, these data show that one in five registrants were readmitted to hospital and in 29% of these cases this was due to a stroke or cardiovascular cause. Understanding the factors that influence readmissions to hospital is important.[10] These data also highlight that registrants who were still alive at follow-up were experiencing lower quality of life compared to age matched population normative data (15 points lower on the EQ5D VAS). The AuSCR data provide information, not available in current government data, on hospital readmissions and quality of life and can be explored to better understand factors that contribute to readmissions and quality of life within 180 days of stroke.

Analyses of the 2013 AuSCR data that are now linked to the National Death Index data provide evidence of the continued benefits of a system-based approach to assessing stroke care. The risk standardised survival estimates following stroke were illustrated for whether a patient had access to a stroke unit or not. All hospitals in 2013 using the AuSCR have a formalised stroke unit except two. We found that patients who were treated on a stroke unit had a 51% reduced risk of death at 180 days when compared to patients not treated on stroke units when we casemix adjusted for patient differences such as age, stroke severity and stroke subtype. This finding reinforces the need to ensure all Australians have access to stroke unit care. These data also highlight the potential opportunity to review clinical practice and understand the factors that may be contributing to variation amongst the hospitals in relation to survival. Further work is being completed to ensure appropriate comparisons of adjusted standardised mortality ratios to compare survival and quality of life outcomes between hospitals.

The AuSCR provides an important infrastructure for future research since about two-thirds of registrants indicate at the time of follow-up that they are willing to be contacted for future research projects if they are eligible. Several researchers have now requested and have been approved to use the data for related research purposes, and this shows the extended advantages of this data repository for building capacity to generate new knowledge efficiently.

FUTURE DIRECTIONS

At a national level, clinical registry development should be prioritised to target conditions or procedures that are suspected of being associated with large variations in processes or outcomes of care and that impact significantly on health care costs and patient morbidity.[5] The AuSCR provides these essential data for acute stroke care and continues to be strengthened (without creating further burden on clinicians and patients) since data linkage is now possible. There remains a continued need for ongoing and recurrent funding for such programs of work. Future goals and directions for the registry are outlined below.

ENSURING COMPLETE CASE ASCERTAINMENT FROM PARTICIPATING HOSPITALS

Case ascertainment should be assessed yearly in a registry. Feedback received in 2013 on the process has indicated that this is quite an onerous task for hospitals to verify potentially missed cases. As part of

the Stroke123 partnership project we plan to establish use of routine data linkage with hospital data at a state level to ensure this task can sit outside the role of individual hospitals to reduce the workload in sourcing these data.

TECHNOLOGY SOLUTIONS FOR SIMPLIFYING DATA COLLECTION FOR CLINICIANS

Data importing is the key to reducing the manual data collection required for the AuSCR. Without adequate resourcing of the AuSCR, use of the import function remains difficult to apply unless hospitals or state-based clinical networks support hospitals in establishing processes for data importing. Support in both Queensland and Victoria towards increasing the ability to import data into the AuSCR, has demonstrably advanced efforts to reduce the workload created by the AuSCR and also improved case ascertainment in 2013. We encourage all participating hospitals to investigate, with their Information and Communication Technology (ICT) departments, the possibility of establishing these data import solutions.

HARMONISATION OF THE NATIONAL STROKE FOUNDATION AUDIT PROCESS WITH THE AUSCR

There are variables in the AuSCR that overlap with items in the NSF Acute Services Audit. Through the NHMRC funded Partnerships for Better Health grant (the Stroke123 project), work to progress the harmonisation of the NSF Audit program and the AuSCR that commenced in 2012 was brought to fruition in 2013. A variable mapping process for the AuSCR and the NSF Acute Audit was conducted and an appropriate system for importing AuSCR into the NSF Acute Audit was developed. Following piloting, the data harmonisation process was implemented and eligible hospitals were able to have their AuSCR data exported and submitted into the NSF audit tool, using a secure and de-identified format for the data. Subsequently, hospital staff who took up this option were only required to enter additional information for the audit thereby reducing their data entry burden.

CLOSING THE QUALITY FEEDBACK LOOP

Efforts to ensure hospitals are continuing to use their AuSCR data effectively are being promoted in 2014. Importantly, greater capacity to work with hospitals and verify data and improve data quality will be possible with new funding from the Victorian government. Further as an ongoing part of the Stroke123 project, hospitals in Queensland will have additional support in reviewing and acting on their data. This work is being conducted in collaboration with the Queensland State-wide Stroke Clinical Network and the National Stroke Foundation who conduct the StrokeLink program in Queensland.

REDUCING THE DATA COLLECTION BURDEN ASSOCIATED WITH HEALTH SERVICES RESEARCH

In 2013, we have been able to use the AuSCR as important infrastructure to support further health services programs focused on improving the quality of care in regional and rural hospitals in Victoria. The Victorian Stroke Telemedicine (VST) program is an acute telestroke service designed to support 16 hospitals in rural and regional Victoria with around the clock neurologist consultations to improve access to thrombolysis and other evidence-based acute stroke treatments (www.vst.org.au). Over the duration of the VST Program, data are collected from the hospitals that are participating in the VST program in Barwon, South Western, Grampians, Loddon Mallee, Hume and Gippsland regions. Use of the AuSCR permits standardised data on the number of patients receiving intravenous thrombolysis to be captured as part of routine practice and also 90 day health outcomes. The VST program requires measurement of these indicators during and up to five years after the program has been implemented. To ensure responder burden is minimised and to avoid duplication of effort whilst maximising the available funds for both programs of work, it was agreed to: a) share data between the VST and the AuSCR program; b) include the AuSCR follow-up variables in the VST 90 day questionnaire and establish a process for the applicable data to be securely submitted to the AuSCR at regular intervals so that

patients will not be contacted twice for similar information; and c) create a telemedicine specific minimum data-spine that could provide additional needed data for VST, including whether a telemedicine consult was received and if a patient was treated with thrombolysis. Ethical approval has been obtained for this process in 2014. Achieving these solutions shows the importance of how collaboration can be achieved to ensure maximal use of limited resources, whilst placing the patient at the centre of our efforts to better understand and improve stroke care

MAXIMISING THE USE OF DATA THROUGH DATA LINKAGE

Data on patients in Australia are collected in various forms, but are limited in their use because there is no relationship between the different pieces of information held in different databases. In order to ensure that the AuSCR data are maximised to their full potential, and can be used to provide a greater understanding of the factors that influence patient outcome, a data linkage sub-study has been facilitated through the Stroke123 grant.[11] As part of the opt-out consent, patients who have their data registered in the AuSCR are made aware that their data may be linked to other sources of data to enable the collection of further information regarding their health care needs and how they have recovered. During 2013, considerable progress was made with regards to achieving cross-jurisdictional data linkage between the AuSCR and government held routinely collected health data. Data were successfully linked between the AuSCR and the NDI, the results of which have been utilised in this annual report. The inclusion of the NDI data means that we will now have reliable data on date of death for all registrants and also cause of death for all episodes up to 180 days following admission and beyond. In addition, approvals from Queensland, New South Wales and Victoria to link the AuSCR with hospital admission and emergency department data have been progressed. Once available, these data may be used to evaluate the case ascertainment of the AuSCR against hospital data (at a state-level and so avoid individual hospitals needing to spend time on this task), as well as exploring the quality of care in more detail. For example, these linked data may be used to explore: missed prevention opportunities preceding a stroke event; greater detail on why there may be hospital readmissions and frequency of recurrent events; and use of health care services e.g. number of Emergency Department presentations.

CONCLUDING COMMENTS

The purpose of the AuSCR is to provide high quality independent data on the quality of care and its relationship to health outcomes of acute stroke in Australia. The information provided by the AuSCR will continue to become increasingly valuable as time progresses and we continue to enhance the registry. Currently, the AuSCR registry provides the only infrastructure to enable the routine monitoring of the quality of care in all patients with stroke or TIA admitted to participating hospitals that has comprehensive assessment of survival status beyond the hospital. It is hoped that the information presented in this 2013 report is useful to clinicians, patients and policy makers. The dataset is now of a significant size to enable useful analyses that can inform health care practice and policy in stroke, albeit with some limitations in terms of generalisability. The ongoing support and development of the Registry, including the continued expansion of the number of participating sites and the further development of the database/upload data entry processes, will ensure continued, evidence-based improvements to stroke care in Australia. Identifying an adequate and reliable funding base remains critical to the sustainability and effectiveness of the AuSCR. Working with the Australian Stroke Coalition and the AuSCR consortium partners we are continuing to strive for standardised, mandated and funded

data collection and quality improvement in stroke. The data provided in this report support these endeavours and highlight that variability in care can influence patient outcome.

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Appendix A: Steering Committee membership

Steering Committee Membership 2013			
Name	**Position**	**Organisation**	**State**
Prof Sandy Middleton	AuSCR Steering Committee, Chair Director, Nursing Research Institute Director, National Centre for Clinical Outcomes Research (NaCCOR)	St Vincent's and Mater Health, Sydney Australian Catholic University	NSW
Prof Craig Anderson	Senior Director, Neurological & Mental Health Division Professor of Stroke Medicine and Clinical Neuroscience Head, Neurology Department, Royal Prince Alfred Hospital NHMRC Senior Principal Research Fellow	The George Institute for Global Health, affiliated with the Royal Prince Alfred Hospital and University of Sydney	NSW
Dr Michael Pollack	Director, Rehabilitation Medicine Chairman, Hunter Stroke Service Chairman, GMCT NSW	John Hunter Hospital	NSW
Ms Frances Simmonds	Director, Australasian Rehabilitation Outcomes Centre (AROC)	Australian Health Services Research Institute (AHSRI), University of Wollongong	NSW
A/Prof Julie Bernhardt	Co-Head, Stroke Division Director AVERT, Very Early Rehabilitation Research Trial	The Florey Institute of Neuroscience and Mental Health	VIC
Prof Christopher Bladin	Director, Victorian Stroke Telemedicine Program Neurologist, Eastern Health	The Florey Institute of Neuroscience and Mental Health Eastern Health (Monash University)	VIC
Prof Geoffrey Donnan	Director Professor of Neurology	The Florey Institute of Neuroscience and Mental Health University of Melbourne	VIC
Dr Mark Mackay	Paediatric Neurologist	Royal Children's Hospital, Melbourne	VIC
Dr Erin Lalor	Chief Executive Officer	National Stroke Foundation	VIC
Prof John McNeil	Head, Department of Epidemiology and Preventive Medicine	Monash University	VIC
Mr Mark Simcocks	Consumer Representative	Self employed	VIC
A/Prof Amanda Thrift	Head, Epidemiology and Prevention Unit NHMRC Senior Research Fellow	Monash University	VIC
Dr Andrew Lee	Neurologist & Stroke Physician NHMRC - NICS Fellow	Flinders Comprehensive Stroke Centre, Flinders Medical Centre	SA
Dr Helen Castley	Neurologist & Head of Stroke Unit Chair, Tasmania Stroke Unit Network	Royal Hobart Hospital	TAS
Mr Greg Cadigan	Principal Project Officer	Queensland Statewide Stroke Clinical Network	QLD
Dr Rohan Grimley	Director Geriatrics and Rehabilitation SCWBDHS Southern Cluster Clinical Chair	Nambour Hospital Queensland Statewide Stroke Clinical Network	QLD
Prof Richard Lindley	Professorial Fellow Professor of Geriatric Medicine	The George Institute for Global Health Sydney Medical School University of Sydney.	NSW
A/Prof Dominique Cadilhac	Head, Public Health, Stroke Division NHMRC/NSF Fellow	The Florey Institute of Neuroscience and Mental Health	VIC

APPENDIX B: DESCRIPTION OF HOW RESULTS FOR PARTICULAR VARIABLES WERE CALCULATED IN THIS REPORT

Indicator	Numerator	Denominator	Comments
Gender - Male	Yes	Yes + No + Intersex/indeterminate	Excludes **Not stated / Inadequately described**
Transferred from another hospital	Yes	Yes + No	Excludes **Unknown**
In-hospital stroke	Yes	Yes + No	Excludes **Unknown**
Able to walk independently on admission	Yes	Yes + No	Excludes **Not documented**
Received care in stroke unit	Yes	Yes + No + Unknown	Include **missing**
Type of stroke	Yes	Yes + No	Excludes missing
Received intravenous thrombolysis if ischaemic stroke	Yes	Yes + No + Unknown	Includes ischaemic strokes only
Mobilisation during admission	Yes	Yes +No + Unknown	Includes **Queensland** patients only
If patient unable to walk, patient mobilised	Yes	Yes +No + Unknown	Includes **Queensland** patients only Includes only patients who were not able to walk independently on admission
Dysphagia screen tool used	Yes	Yes +No + Unknown	Includes **Queensland** patients only
Screen or swallow assessment undertaken	Yes	Yes +No + Unknown	Includes **Queensland** patients only
Aspirin administration within 48 hours	Yes	Yes +No + Unknown	Includes **Queensland** patients only Excludes patients with haemorrhagic stroke or if contraindicated
Died	Yes	Yes + No	Excludes **missing**
Discharged home	Yes	Yes + No	Excludes **deaths** Excludes **missing**
Care plan, outlining post-discharge care in the community, developed with the team and the patient and/or family.	Yes	Yes +No + Unknown	Includes patients discharged home or to a residential aged care facility
Discharged on antihypertensive	Yes	Yes +No + Unknown	Includes patients discharged only
Discharged on antiplatelets or antithrombotics	Yes	Yes +No + Unknown	Includes **Queensland** patients only Excludes patients with haemorrhagic stroke

APPENDIX C: ADHERENCE DATA BY PARTICIPATING HOSPITAL

Treated on a stroke unit

Hospital (coded)	All episodes, n/N (%)	Ischaemic, n/N (%)	TIA, n/N (%)
9	171/173 (99)	108/110 (98)	38/38 (100)
10	49/49 (100)	39/39 (100)	3/3 (100)
11	303/365 (83)	199/224 (89)	41/56 (73)
12	564/591 (95)	389/406 (96)	104/106 (98)
13	348/533 (65)	254/306 (83)	85/106 (80)
15	0/62 (0)	0/41 (0)	0/14 (0)
16	120/147 (82)	63/70 (90)	25/30 (83)
18	111/122 (91)	71/74 (96)	19/22 (86)
20	131/143 (92)	78/86 (91)	32/32 (100)
21	99/120 (83)	69/79 (87)	28/36 (78)
22	331/471 (70)	213/253 (84)	1/2 (50)
23	497/630 (79)	373/460 (81)	48/66 (73)
25	77/77 (100)	53/53 (100)	17/17 (100)
28	271/375 (72)	215/272 (79)	25/48 (52)
29	431/493 (87)	296/317 (93)	78/102 (76)
30	66/76 (87)	56/63 (89)	3/5 (60)
31	95/193 (49)	45/58 (78)	27/65 (42)
32	384/426 (90)	260/276 (94)	84/102 (82)
34	116/148 (78)	74/87 (85)	33/46 (72)
35	57/123 (46)	33/56 (59)	11/26 (42)
36	101/127 (80)	68/78 (87)	19/25 (76)
37	41/46 (89)	30/32 (94)	8/11 (73)
39	46/58 (79)	27/31 (87)	11/19 (58)
40	113/155 (73)	70/82 (86)	30/56 (54)
41	205/255 (80)	151/181 (83)	24/33 (73)
42	123/172 (72)	26/28 (93)	49/72 (68)
43	51/150 (34)	13/28 (46)	5/49 (10)
44	187/216 (87)	107/126 (85)	17/24 (71)
45	141/234 (60)	111/137 (81)	13/63 (21)
46	133/150 (89)	106/115 (92)	7/10 (70)
47	145/164 (88)	96/105 (91)	25/31 (81)
48	49/52 (94)	30/32 (94)	16/16 (100)
49	102/292 (35)	62/140 (44)	29/115 (25)
50	136/153 (89)	91/104 (88)	26/27 (96)
54	19/29 (66)	12/16 (75)	1/5 (20)
55	34/38 (89)	16/18 (89)	10/11 (91)

Treated with intravenous thrombolysis (i.e. tPA), if an ischaemic stroke

Hospital (coded)	All episodes, n/N (%)	Ischaemic, n/N (%)	TIA, n/N (%)
9		8/110 (7)	
10		5/39 (13)	
11		24/224 (11)	
12		55/406 (14)	
13		56/306 (18)	
15		0/41 (0)	
16		6/70 (9)	
18		0/74 (0)	
20		5/86 (6)	
21		4/79 (5)	
22		37/253 (15)	
23		78/460 (17)	
25		3/53 (6)	
28		15/272 (6)	
29		36/317 (11)	
30		6/63 (10)	
31		3/58 (5)	
32		44/276 (16)	
34		3/87 (3)	
35		1/56 (2)	
36		6/78 (8)	
37		1/32 (3)	
39		1/31 (3)	
40		7/82 (9)	
41		18/181 (10)	
42		3/28 (14)	
43		0/28 (0)	
44		12/126 (10)	
45		1/137 (1)	
46		15/115 (13)	
47		4/105 (4)	
48		1/32 (3)	
49		11/140 (8)	
50		3/104 (4)	
54		0/16 (0)	
55		2/18 (11)	

Discharged on an antihypertensive agent

Hospital (coded)	All episodes, n/N (%)	Ischaemic, n/N (%)	TIA, n/N (%)
9	133/169 (79)	86/108 (80)	29/38 (76)
10	25/41 (61)	19/33 (58)	3/3 (100)
11	241/325 (74)	161/206 (78)	45/54 (83)
12	415/519 (80)	290/358 (81)	85/106 (80)
13	305/466 (65)	191/272 (70)	63/106 (59)
15	40/55 (73)	26/35 (74)	10/14 (71)
16	66/126 (52)	32/62 (52)	17/28 (61)
18	57/79 (72)	33/49 (67)	15/18 (83)
20	83/135 (61)	53/81 (65)	17/32 (53)
21	80/112 (71)	57/72 (79)	21/36 (58)
22	261/349 (75)	191/214 (89)	2/2 (100)
23	387/536 (72)	298/399 (75)	53/66 (80)
25	62/76 (82)	43/52 (83)	12/17 (71)
28	247/321 (77)	183/240 (76)	38/48 (79)
29	276/456 (61)	191/292 (65)	54/102 (53)
30	36/62 (58)	30/50 (60)	2/5 (40)
31	96/178 (54)	40/53 (76)	39/65 (60)
32	294/385 (76)	200/246 (81)	65/101 (64)
34	108/137 (79)	61/79 (77)	38/46 (83)
35	44/58 (76)	20/23 (87)	9/16 (56)
36	72/89 (81)	45/58 (78)	16/19 (84)
37	18/29 (62)	11/18 (61)	6/9 (67)
39	34/55 (62)	16/29 (55)	13/19 (68)
40	102/148 (69)	59/76 (78)	34/56 (61)
41	181/233 (78)	130/170 (76)	26/33 (79)
42	77/151 (51)	16/25 (64)	40/71 (56)
43	52/87 (60)	18/25 (72)	23/44 (52)
44	154/202 (76)	93/117 (79)	31/42 (74)
45	141/216 (65)	93/128 (73)	31/63 (49)
46	102/138 (74)	82/107 (77)	8/10 (80)
47	96/127 (76)	62/83 (75)	21/25 (84)
48	42/49 (86)	25/29 (86)	14/16 (88)
49	199/268 (74)	103/130 (79)	75/110 (68)
50	96/127 (76)	66/84 (79)	18/24 (75)
54	14/20 (70)	8/10 (80)	1/4 (25)
55	25/31 (81)	12/14 (86)	9/10 (90)

Care plan outlining post discharge care in the community developed with the team and the patient and/or family

Hospital (coded)	All episodes, n/N (%)	Ischaemic, n/N (%)	TIA, n/N (%)
9	65/114 (57)	37/59 (63)	17/38 (45)
10	7/12 (58)	4/7 (57)	2/3 (67)
11	149/208 (72)	81/127 (64)	34/44 (77)
12	94/225 (42)	47/119 (40)	41/94 (44)
13	276/314 (88)	170/192 (89)	81/94 (86)
15	14/33 (42)	7/16 (44)	5/13 (38)
16	7/88 (8)	5/38 (13)	0/27 (0)
18	1/63 (2)	0/37 (0)	0/18 (0)
20	29/104 (28)	19/61 (31)	5/28 (18)
21	53/58 (91)	23/23 (100)	29/33 (88)
22	139/147 (95)	99/103 (96)	2/2 (100)
23	263/300 (88)	182/214 (85)	55/56 (98)
25	25/36 (69)	14/21 (67)	10/14 (71)
28	62/201 (31)	50/141 (35)	7/46 (15)
29	80/245 (33)	51/132 (39)	23/98 (23)
30	14/35 (40)	13/27 (48)	1/5 (20)
31	77/124 (62)	19/25 (76)	40/64 (63)
32	10/234 (4)	6/124 (5)	3/96 (3)
34	36/104 (35)	20/53 (38)	14/44 (32)
35	11/30 (37)	6/10 (60)	2/13 (15)
36	4/46 (9)	3/23 (13)	1/16 (6)
37	9/21 (43)	5/11 (45)	3/9 (33)
39	21/26 (81)	7/10 (70)	11/13 (85)
40	34/77 (44)	14/26 (54)	18/46 (39)
41	85/109 (78)	54/67 (81)	22/30 (73)
42	80/91 (88)	14/16 (88)	47/56 (84)
43	48/57 (84)	15/15 (100)	25/34 (74)
44	58/88 (66)	28/40 (70)	15/23 (65)
45	25/106 (24)	13/48 (27)	12/56 (21)
46	0/49 (0)	0/36 (0)	0/10 (0)
47	4/61 (7)	3/35 (9)	0/19 (0)
48	6/27 (22)	2/10 (2)	3/15 (20)
49	176/187 (94)	65/71 (92)	96/100 (96)
50	67/71 (94)	40/43 (93)	19/19(100)
54	0/12 (0)	0/6 (0)	0/4 (0)
55	17/24 (71)	6/10 (60)	8/9 (89)