Title	**Understanding factors that influence pre-hospital and hospital patient care to improve access to high quality acute stroke care**
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AuSCR role	Data Provision
Approved	17 September 2018
Status	Completed
Summary	Acute stroke is complex and poor management, including delays in accessing treatment, can affect patient outcomes. Significant advances in treatments for patients with acute stroke have improved survival and reduced disability, with rapid diagnosis providing the best opportunity for clinicians to intervene early. Time-critical reperfusion therapies (i.e. intravenous thrombolysis or endovascular clot retrieval; ECR) and organised care in a stroke unit have the greatest potential to deliver the most benefit in achieving significant reductions in disability. In Australia, not all patients with stroke are admitted to hospitals within the time frames required for reperfusion treatments to be initiated. Our knowledge of pre-hospital factors that influence timely identification of stroke and arrival to appropriate hospitals is less well known, but may have important implications affecting access to high quality care. For example, current Ambulance Victoria policy implemented recently (October 2016), is that patients with stroke symptom onset over 6 hours be subject to secondary triage and triaged away from an emergency ambulance response (i.e. a non-emergency ambulance). In the recent DAWN clinical trial of ECR, disability was significantly prevented in patients with severe strokes treated between 6-24 hours from symptom onset where there was 'mismatch' on brain imaging. Therefore, there is an urgent need to reconsider who might be eligible for emergency stroke treatment. It is important to identify and assess a range of factors (patient, clinical, system) that may influence delays or appropriate triage to reperfusion capable hospitals. The objective of this proposal is to comprehensively assess the pre-hospital and hospital phases of acute stroke care in relation to 90-180 day patient outcomes to identify opportunities to improve access to high quality acute stroke care. This work will provide an evidence base to inform clinical practice and policy, and target quality improvement activities in the pre-hospital and hospital contexts, including the Statement of Priorities (2016-2017 Agreement between Minister for Health and Ambulance Victoria). Study Aims The overall objective is to understand the factors that influence pre-hospital and hospital management of stroke. The specific aims are to: a) Investigate the impact of Triple 0 and Ambulance Victoria (AV) triage of patients with stroke: i) whether any patients potentially missed out on time-critical treatments; and ii) if 90-180 day outcomes differ as a consequence of triage (e.g. modified Rankin Scale [for the years collected in AuSCR]), EQ5D quality of life outcomes, survival). b) Determine adherence to the national acute stroke care standards8 related to the pre-hospital and acute hospital phases of care including accuracy of first triage (000 call taker/paramedics), use of screening tools pre-hospital and reliability of paramedic diagnosis of stroke, percentage of adult stroke patients transported to definitive care within 60 minutes and overall access to stroke units and reperfusion therapies. c) Identify factors (patient, clinical and system) that may explain variances in acute management (paramedic and hospital interface) and subsequent differences in 90-180 day outcomes (survival and quality of life).
Outcomes	Data for patients with stroke or TIA registered in the AuSCR between January 2015 and December 2017 were linked with AV and hospital data (emergency and admitted episodes of care). We linked and merged data for 4569 patient episodes between the AuSCR and AV

(62% linkage rate). Lack of matching between the AuSCR and AV data may be due to cases being missed in the AuSCR, patients not using ambulance services to come to hospital, or misclassification where identifiers were unable to be used (e.g. when names or dates of birth not documented consistently).

A PhD student has been identified for the project, providing an important opportunity for building capacity in this field. We are currently analysing the data to describe pre-hospital factors that influence the provision of acute stroke care, including time-critical treatments for patients with ischaemic stroke.
The following are preliminary results:
• Identification of stroke by call takers increased the odds of receiving treatment in a stroke unit (OR 1.34 95%CI 1.17, 1.54) and receiving intravenous thrombolysis (OR 1.79 95%CI 1.47, 2.18). When paramedics correctly identified stroke there was a greater odds of receiving intravenous thrombolysis (OR 4.72 95%CI 3.51, 6.33).
• Identification of stroke by call takers was associated with a reduced hazard of death within 30-days (aHR: 0.58 95%CI 0.54, 0.64), 90-days (aHR: 0.60 95%CI 0.55, 0.64) and 180-days (aHR: 0.62 95%CI 0.55, 0.71) after admission when accounting for age, sex, type of stroke, stroke severity (ability to walk on admission), and a greater likelihood of being discharged home (aOR 1.57 95%CI 1.38, 1.79).

The dataset for this project will also be used as the control group for the evaluation of the Melbourne Mobile Stroke Unit as part of a different project approved by the RTG and Monash ethics, funded with a Heart Foundation Vanguard grant.

Publications

Published abstract Cadilhac D, Eliakundu A, Kim J, Bagot K, Andrew E, Bladin C, Smith K, Kilkenny M. **Feasibility of linking data from the Australian Stroke Clinical Registry and Ambulance Victoria: insights on pre-hospital diagnoses.** *International Journal of Stroke*. 2019; 14 (2S).

In preparation:
1. Determining the accuracy of dispatcher and paramedic suspicion of stroke
2. Identification of patients missing out on time-critical treatment for acute stroke
3. Impact of Ambulance Victoria policy change on identification of acute stroke patients in the pre-hospital setting.

PRESENTATIONS (International)
In numerous fora this work has been presented as part of the work program on advancing efforts in data linkage for stroke nationally and internationally.
Presented by Dr Kilkenny
• December 2019: Health Services and Policy Research Conference Use of big data to improve outcomes in stroke. Auckland, New Zealand
• October 2019: Australia Stroke Data Linkage Program, ZhuHai Campus, Zunyi Medical University, China
• October 2018: The value of data linkage for improving stroke care and outcomes in Australia, Institute for Clinical Evaluative Sciences, Canada Toronto
• October 2018: The value of data linkage for improving stroke care and outcomes in Australia, Michigan Stroke Initiative Fall Conference, Michigan State (USA)

INVITED PRESENTATIONS (National/State)
Presented by Professor Cadilhac
• November 2019: Innovations for capture and use of AuSCR data. The 7th Annual National Stroke Data and Quality Improvement Workshop, November 28 2019, Sydney.
• October 2019: How to use stroke data to translate best care into practice: from a clinical and health system perspective. The Third Western Australian Stroke Symposium Multidisciplinary Stroke Care in 2019: Where are we now? The University Club of Western Australia, Perth 20th October 2019
• December 2018: Keynote: Measuring the outcomes of a large scale program. Measuring Health Outcomes Conference, Melbourne 6th December 2018

	Presented by Dr Kilkenny • November 2019: Australian Stroke Clinical Registry – value of linking clinical registry data with administrative health data, Data Linkage Symposium; Queensland Health • October 2019: Monash Partners. Learning Health System Data Hubs. Stroke: A Learning Health System exemplar. Monash Children's Hospital. • September 2019: Towards an integrated national data platform (National Stroke Data Linkage Program), Webinar Population Health Research Network (PHRN) • June 2019: Towards an integrated national data platform (National Stroke Data Linkage Program), Hudson Institute of Medical Research Seminar Series, Clayton • May 2019: Using linked data for improving stroke outcomes: National Stroke Data Linkage Program. Linked Data in Action Celebrating 10 years of data linkage in Victoria 10 Year Anniversary Roadshow. System Intelligence and Analytics branch, Department of Health and Human Services, Melbourne • May 2019: Insights into the National Stroke Data Linkage Program. The Florey Institute of Neuroscience & Mental Health, Melbourne Brain Centre, Heidelberg