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**Stroke Clinical Coding and Documentation   
Education Program**

**PROTOCOL**

**Version 1.1**

**January 2022**

Translational Public Health and Evaluation Division, Stroke and Ageing Research Group, School of Clinical Sciences at Monash Health

**Monash University**

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*This protocol has been written by:*

A/Prof Monique Kilkenny: Head: National Stroke Data Linkage Program1,2

Dr Muideen Olaiya: Research Fellow1

Ms Ailie Sanders: Research Assistant1

Prof Dominique Cadilhac: Head: Translational Public Health Division 1,2

On behalf of the Australia and New Zealand Stroke Coding Working Group (Appendix A)

1Translational Public Health Division, Stroke and Ageing Research, Monash University, Clayton

2Florey Institute of Neuroscience and Mental Health, The University of Melbourne, Heidelberg

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**Any queries about this evaluation protocol should be directed to the Principal Investigator:**

A/Prof Monique Kilkenny

Translational Public Health and Evaluation Division

Stroke & Ageing Research

Department of Medicine

School of Clinical Sciences at Monash Health

Monash University

Level 3, Hudson Institute Building

27-31 Wright Street

Clayton VIC 3168

Phone: +61 8572 2663 email: [Monique.Kilkenny@monash.edu](mailto:Monique.Kilkenny@monash.edu)

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**Abbreviations**

DRG: Diagnosis Related Group

AuSCR: Australian Stroke Clinical Registry

ICD-10-AM: International Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification

TIA: Transient Ischaemic Attack

ICH: Intracerebral Haemorrhage

HIMs: Health Information Managers

CVD: Cardiovascular Disease

ACS: Australian Coding Standards

VICC: Victorian International Classification of Diseases Coding Committee

NHMRC: National Health and Medical Research Council

# Synopsis

Globally, stroke is a leading cause of death and disability. Despite the impact of stroke on public health, it is considered a lower priority for clinical services and research in many countries. This is possibly due to lack of readily available and accessible data on stroke care and outcomes to inform prevention strategies.

Routinely collected coded administrative data are increasingly being used to generate evidence for the prevention and management of stroke. However, accurate clinical coding is critical to ensure these data are valuable and reliable. To ensure and maintain accurate coding, complete and representative clinical documentations are required. Therefore, this project is focused on implementing and evaluating educational interventions for clinicians and coders, in the form of online education on stroke and coding for stroke, to improve documentations and coding for stroke.

# Background

Stroke is the second leading cause of death worldwide1 and in the top five leading causes of death in Australia.2 It was estimated that, in 2020, there were 27,428 new cases of stroke in Australia,3 of which 8,703 resulted in death.2 The estimated direct economic impact of stroke is $6 billion, with a further $26 billion lost indirectly through lost wellbeing and premature mortality.3 The health and economic burden of stroke is projected to increase as the global population continues to age.

Administrative coded data are increasingly being used in epidemiological and clinical research to classify stroke into pathological types, and monitor the incidence and the overall burden of stroke.4 However, accurate clinical coding is critical to ensure that these data are valuable and reliable. Coding errors and diagnosis related group (DRG) changes are potentially due to poor clinical documentation. It was reported that 57% of cases of DRG changes are due to poor quality clinical documentation.5 Therefore, continuous validation of clinical information contained within hospital administrative data is essential for improving the value of these data.5

In one study conducted in a large Victorian teaching hospital (752 episodes including stroke), about 42% of cases of DRG changes for a specialised surgical unit were due to incorrect principal diagnosis codes or missing codes.5 Ryan et al6 provided insights on the accuracy of coded data in their comparison of clinician-assigned stroke diagnoses in the Australian Stroke Clinical Registry (AuSCR) with ICD-10-AM (*International Classification of Diseases and Related Health Problems, 10th Revision*, *Australian Modification*) coded administrative data. They found that the identification of ischaemic stroke in administrative data may be optimised by using principal and additional diagnosis codes; and that over-assignment of the unspecified stroke code I64 could lead to the underestimation of diagnoses of cerebral infarction. Moreover, they observed variations, by stroke type, in the pattern of coding discrepancy.6 Concordance with ICD-10-AM codes was greatest for transient ischaemic attack (TIA; 80%) and intracerebral haemorrhage (ICH; 77%), and much less for ischaemic stroke (72%). Discordance was largely attributed to misclassification of unspecified stroke *[ICD-10-AM]* code I64 for records with a more specific diagnosis recorded in the AuSCR.6 Other authors have reported a good to excellent coding agreement between hospital and audit data for specific major and comorbid diagnoses or procedures.7 In an audit of 7631 episodes (excluding chemotherapy and dialysis cases) from Victorian public hospitals in 2000-01, the level of agreement for principal diagnoses was 81% (at the 4-digit level), and for principal procedures 80% (at the 7-digit level).7

Factors associated with the quality of coded data for stroke include over-assignment of the unspecified stroke I64 code,8,9 and incorrect interpretation of TIA as acute ischaemic stroke, and ICH as subarachnoid harmorrhage.10 Importantly, the presence of expert staff (clinicians and coders) in the clinical setting has been recognised as a major factor influencing accurate stroke coding.11,12 Therefore, to reduce errors in stroke coding, there is a need for specialised education programs targeted at clinical coders and clinicians.13 Coder education could be focused on understanding the different types of stroke, diagnostic tests, and strategies for managing stroke. This could increase clinical coder confidence to submit queries when documentation is imprecise. Clinician education could be focused on the importance of standardised documentation to impact uniform identification of stroke. It was recommended that such education programs would be more beneficial in settings where patients are not treated in a stroke unit or have a shorter length of stay.13

# Project aims

The overarching aim of this project is to evaluate the effectiveness of a targeted stroke coding education program for improving the knowledge of clinical coders/health information managers (HIMs) and clinicians about stroke coding.

The specific aims of this project include:

1. To assess the efficacy of the educational intervention for improving the short-term knowledge of stroke and related ICD-10-AM coding.
2. To monitor the assignment of I64 stroke, not specified as haemorrhage or infarction code over time.
3. To monitor the quality of stroke coding over time by comparing the clinical diagnosis in the AuSCR with coded diagnosis in administrative data.

# 4. Methods

## 4.1 Study design and setting

This will be a cluster randomised controlled trial, using the stepped wedge design, with the allocated states/country (Table 1) as the clustering unit. This approach involves the pre intervention and intervention periods being staggered across clusters. This also ensures that the intervention is available to all participants.

Table 1. Clusters for intervention

|  |
| --- |
| **Allocated states/country** |
| Queensland, New South Wales, Australian Capital Territory |
| Western Australia, South Australia, Northern Territory |
| Victoria, Tasmania |
| New Zealand |

***Participants***

Participants will be voluntary attendees of education sessions on the topic of stroke coding to be organised by Monash University. Participants must be HIMs/clinical coders or clinicians involved in stroke coding or stroke care. Hospital and health service staff not involved with stroke care, nursing and allied health staff, and HIMs not currently working in a clinical coding role, will be excluded.

## Stroke clinical coding and documentation education program

The education program will comprise eight modules aimed at improving the knowledge of clinical documentation for stroke and coding of stroke, and will take 60-90 minutes. Coders will complete all modules, while clinicians will complete modules 1 and 4 – 8 (see highlighted sections in Table 2).

Table 2. Components of the stroke clinical coding and documentation education program.

|  |  |  |
| --- | --- | --- |
|  | Section | Learning outcome(s) |
| 1 | *Rationale for coding of stroke* | To understand the importance of coding of stroke |
| 2 | *Understanding the brain and stroke* | To understand the types and signs of stroke, and differentiate stroke from other cardiovascular diseases (CVDs) |
| 3 | *Management of stroke* | To learn the treatment and care options available for the different types of stroke |
| 4 | *Australian Coding Standards (ACS) for stroke* | To understand how to apply general and stroke-specific ACS standards while coding stroke episodes. |
| 5 | *Good coding practices* | To learn coding tips and develop good coding skills |
| 6 | *Coding trees (index branching)* | To learn how to add specificity to stroke coding by understanding coding pathways for each stroke type |
| 7 | *Good clinical documentation* | To understand how documentation impacts the quality and specificity of coding in administrative data |
| 8 | *Scenarios* | To evaluate participants’ understanding and translation of knowledge acquired from the session using real-world coding examples |

The modules will incorporate information from the following resources:

* Stroke Foundation (Australia)
* Australian and New Zealand Coding Standards for stroke
* Australian Classification Exchange (Independent Hospital Pricing Authority) portal
* State/Territory coding advisory committee queries
* New Zealand Coding Authority (Coding Query Database)
* Good coding practices
* Understanding of coding trees

The education program will be delivered by A/Prof Monique Kilkenny, Ailie Sanders and Dr Lauren Sanders, and will be updated regularly as it evolves. Therefore, the modules will be structured such that they can accommodate future changes or updates in coding.

## Implementation of the education of program

The education program will be implemented by clusters (Table 3) in five stages:

1. *Feasibility stage (October, 2020)*

The feasibility program was undertaken to test the format and feasibility of the stroke coding education program. The pilot program involved 25 Health Information Management students from La Trobe University, Victoria, of which 23 completed the pre- and post-education knowledge assessment surveys. On the average, the proportion of correct responses to knowledge assessment questions increased from 50% for the pre-education survey to 73% for the post-education survey. However, for three questions, correct responses declined in the post-education survey.

The major feedback on the education session included insufficient time to cover the content of the education program. Given the 60-minute session also included the times taken to complete the knowledge assessment surveys, it was recommended that the time be increased to 90 minutes for future stroke coding education sessions. Alternatively, the question items in future surveys could be revised down from 17 to a maximum 12.

1. *Pilot stage*

This stage will involve testing of the education program with participating HIMs/clinical coders in Queensland Private Hospitals (with Jacquelyn Ellem) for additional qualitative feedback.

1. *Refinement stage*

This stage will involve refinement of the education program, based on the feedback from the pilot stage, and expansion of the study to all states in Australia and New Zealand. There will state-based rollout of the education program to ensure systematic capture and participation of HIMs/clinical coders.

1. *Monitoring stage*

At this stage, the program will be rolled out and the population reach expanded to other AuSCR-participating hospitals in Australia and New Zealand. We will identify hospitals with increased assignment of the I64 code, as well as undertake ongoing monitoring of differences between clinician assigned AuSCR diagnosis data and administrative coded data.

1. *Revision stage*

At this stage, we will undertake ongoing revision of the program to maintain currency as documentation requirements or coding standards change.

Table 3. Timeline of expected control, intervention, and post-intervention periods

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Cluster** | **State/Country** | **2021 – Feb 2022** | **March 2022** | **April**  **2022** | **May**  **2022** | **June**  **2022** | **July**  **2022** |
| **1** | **VIC, TAS** |  |  |  |  |  |  |
| **2** | **WA, SA, NT** |  |  |  |  |  |  |
| **3** | **NZ** |  |  |  |  |  |  |
| **4** | **QLD, NSW, ACT** |  |  |  |  |  |  |
|  |  | | | | | | |
|  | Control period (from January 2021 to the end of the control period for the cluster 30 May 2022) | | | | | | |
|  | Intervention period | | | | | | |
|  | Post-intervention period (from the end of the intervention period 30 June 2022 to 30 May 2023) | | | | | | |

## Sample size

Sample size is based on a pragmatic sampling strategy in order to capture a representative number of respondents to provide feedback on the design and delivery of the program. It is not an experimental design that requires a set sample size to be calculated. The sample size for each survey will vary depending on the number of attendees and the number of presentations.

## Outcome assessments

The primary outcome measure will be change in the knowledge of stroke coding after, compared to before, the education program.

The secondary outcomes will be:

* Change in the proportion of coding for unspecified stroke (I64) by state, region, and annualised number of episodes after the education program
* Change in the proportion of diagnoses that are false positives or false negative in coded administrative data when compared with AuSCR clinical diagnosis (reference standard).

The primary outcome will be assessed immediately after the education program via a survey comprising 12 multiple choice questions for coders (Appendix B), or 8 multiple choice questions for clinicians. These data will be collected online, via REDCap. Participants will be asked to enter their responses directly into the online survey form. Data collection forms may also include Likert scales or categorical options to obtain perceptions of the different aspects of the program. Programmed, data logic checks will also be implemented to ensure that responses to questions that were sub-categories of a primary question were consistent with the primary question (e.g. if an answer was ‘no’ then no further subcategories should have been completed).

## Program evaluation

The effectiveness of the education program will be evaluated through:

* A measurement of change in participant knowledge of stroke coding based on participant response to pre- and post-education survey.
* Qualitative feedback on the education sessions that will be obtained from participants via an evaluation survey that will be administered after the post-education survey. These data will also be collected via REDCap.
* Assessment of participation and refusal rates.

Table 4. Summary of Stroke Coding Education Program data collection

|  |  |  |
| --- | --- | --- |
| **Survey** | **Target audience** | **Data collected** |
| Pre-session  (Appendix B) | Clinicians and coders | 12 (for coders) or 8 (for clinicians) multiple choice questions re: knowledge of stroke and coding of stroke |
| Post-session  (Appendix B) | Clinicians and coders | 12 (for coders) or 8 (for clinicians) multiple choice questions re: knowledge of stroke and coding of stroke |
| Participant evaluation | Clinicians and coders | Questions will be Likert scale and free text |

# Data Analysis

All analyses will be undertaken using STATA 10.1. In order to minimise data wastage or exclusion of participants due to missing data, response will be assumed negative where data are missing or reported as unknown. Similarly, for derived variables, such as “Cause of stroke”, it will be assumed as “No” if the response was “Unknown”. However, for primary variables, such as “What best describes a stroke”, only valid data recorded as True=1 or False=0 will be used for analyses, while responses recorded as “Unknown” or left blank will be excluded.

Variables will be summarised using descriptive statistics and compared using Chi-Square test. Within-individual change in knowledge will be assessed using the McNemar’s test. A two-tailed p-value of <0.05 will be considered statistically significant.

# Significance

This study will provide stroke-specific clinical coding education for HIMs/clinical coders and clinicians. The impact of improving the accuracy of assigned codes for stroke is significant. Accurate identification of stroke or TIA in coded administrative data is essential for research purposes and for appropriate resource allocation, such as the development of specialised stroke units, funding for stroke, including neurologists and specialist nurses, as well as for research purposes. This study has the potential to influence future clinical coding education programs for a range of other diseases, such as cancers, and coronary heart disease. The methods and format for the education program could be adjusted to suit different conditions where there is an identified need to improve the quality of coded data.

# Ethical considerations

The current protocol and associated documents will be submitted to the Monash University Human Research Ethics Committee for approval. All participation is voluntary, and participants will be invited to complete the pre and post surveys.

# Privacy and confidentiality

The pre- and post-education surveys to be used for assessments and project evaluation will not include any personal or sensitive questions, and the only risk to participants is the inconvenience of completing the questionnaire. No identifying data will be provided to the research team undertaking the data analysis. All data will be reported in a de-identifiable and aggregated format so that individuals will not be able to be identified.

All data will be stored according to Monash University policy that complies with NHMRC guidelines for conduct of research. The research officers will be responsible for security of the data collected. All data collected will be de-identified. All data will use an identification number in the database which will link pre and post measure data for individuals.

# Reporting the project results

The project outcomes will be made public by Monash University or the Florey Institute of Neuroscience and Mental Health via online summaries, media releases, conference presentations, working papers and peer-reviewed journal articles. Release of evaluation results to the public may be dependent on copyright obligations with publishers accepting journal articles arising from this work.

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# Appendix A: Australia and New Zealand Stroke Coding Working Group members

#### (Current 24/11/21)

| Member name | Affiliation | Email |
| --- | --- | --- |
| A/Prof Monique Kilkenny (Chairperson) | Monash University | [Monique.kilkenny@monash.edu](mailto:Monique.kilkenny@monash.edu) |
| Prof Dominique Cadilhac | Monash University/Florey Institute | [Dominique.cadilhac@monash.edu](mailto:Dominique.cadilhac@monash.edu) |
| Ailie Sanders | Monash University | [ailie.sanders@monash.edu](mailto:ailie.sanders@monash.edu) |
| Helen Carter | Florey Institute | [helen.carter@florey.edu.au](mailto:helen.carter@florey.edu.au) |
| Merilyn Riley | La Trobe University | [Merilyn.Riley@latrobe.edu.au](mailto:Merilyn.Riley@latrobe.edu.au) |
| Muideen Olaiya | Monash University | muideen.olaiya@monash.edu |
| Stella Rowlands | Queensland Health | [Stella.Rowlands@health.qld.gov.au](mailto:Stella.Rowlands@health.qld.gov.au) |
| Carla Read | Department of Health (Victoria) | [Carla.Read@vahi.vic.gov.au](mailto:Carla.Read@vahi.vic.gov.au) |
| Nicola Hall | Logan Hospital | [nicola.hall@health.qld.gov.au](mailto:nicola.hall@health.qld.gov.au) |
| Linda Norrie | Townsville hospital | [Linda.Norrie@health.qld.gov.au](mailto:Linda.Norrie@health.qld.gov.au) |
| Dr Lauren Sanders | St Vincent’s Hospital | [Lauren.SANDERS@svha.org.au](mailto:Lauren.SANDERS@svha.org.au) |
| Dr Lee Nedkoff | UWA | [lee.nedkoff@uwa.edu.au](mailto:lee.nedkoff@uwa.edu.au) |
| A/Prof Seana Gall | UTAS | [seana.gall@utas.edu.au](mailto:seana.gall@utas.edu.au) |
| Miriam Lum On | AIHW | [miriam.lumon@aihw.gov.au](mailto:miriam.lumon@aihw.gov.au) |
| Sally Richardson | La Trobe University | S.Richardson@latrobe.edu.au |
| Ngoc Dang | St Vincent’s Hospital Melbourne | [Ngoc.Dang@svha.org.au](mailto:Ngoc.Dang@svha.org.au) |
| Prof Valery Feigin | National Institute for Stroke and Applied Neurosciences | [valery.feigin@aut.ac.nz](mailto:valery.feigin@aut.ac.nz) |
| A/Prof Rita Krishnamurthi | Auckland University of Technology | [rita.krishnamurthi@aut.ac.nz](mailto:rita.krishnamurthi@aut.ac.nz) |
| Prof Anna Ranta | University of Otago Wellington | [anna.ranta@otago.ac.nz](mailto:anna.ranta@otago.ac.nz) |
| Dr Alan Davis | Clinical Lead for Stroke - Northland DHB, (Whangarei), Northern Regional Alliance and Ministry of Health | [Alan.Davis@northlanddhb.org.nz](mailto:Alan.Davis@northlanddhb.org.nz) |
| Jennie Carson |  | [jennie.carson@gmail.com](mailto:jennie.carson@gmail.com) |
| Jacquelyn Ellem | Healthscope – QLD/NT/WA | [Jacquelyn.Ellem@healthscope.com.au](mailto:Jacquelyn.Ellem@healthscope.com.au) |
| Mary Kouvas | Northern Health | [mary.kouvas@nh.org.au](mailto:mary.kouvas@nh.org.au) |
| Lara Finlayson | Clinical Coding Services | [lfinlayson@optusnet.com.au](mailto:lfinlayson@optusnet.com.au) |
| Justan Banihashemi | Melbourne Health - RMH | [Justan.Banihashemi@mh.org.au](mailto:Justan.Banihashemi@mh.org.au) |
| Susan Doyle | Monash Health | [Susan.Doyle@monashhealth.org](mailto:Susan.Doyle@monashhealth.org) |

# Appendix B: Pre and post survey for clinical coders

**Participant Demographics**

Age group (years): 20-29 30-39 40-49 50-59 60+

Highest level of completed education:

* Postgraduate degree level
* Graduate diploma and graduate certificate level
* Bachelor degree level
* Advanced diploma and diploma level
* Certificate level
* Year 12 or Senior Secondary Certificate of Education
* Year 11 or below

Postcode: \_\_\_\_\_\_\_

**Knowledge evaluation survey**

1. Which of these describes an ischaemic stroke?

a) Rupture of cerebral vessel

b) Occlusion of a cerebral vessel

c) Aneurysm of a cerebral vessel

d) Temporary episode of neurological dysfunction

1. Is stroke a form of cardiovascular disease (ICD-10-AM stroke is classified as a cardiovascular disease)?

a) True

b) False

1. What are the main categories/classifications of stroke?  
   a) Ischaemic and Subarachnoid

b) Haemorrhagic and Transient Ischaemic Attack (TIA)

c) Haemorrhagic and Ischaemic

d) Transient Ischaemic Attack (TIA) and Subarachnoid

1. Which of the following procedures is/are used to manage ischaemic stroke?
2. Cerebral angiography
3. Surgical evacuation of Haematoma
4. Fresh frozen plasma
5. Intravenous thrombolysis
6. Which of the following procedures is/are used to manage haemorrhagic stroke? Please select all that apply
7. Endovascular clot retrieval
8. Ventricular drainage
9. Surgical evacuation of Haematoma
10. Tpa infusion
11. The clipping and coiling of an aneurysm is used to manage:
12. Subarachnoid haemorrhage
13. Cerebrovascular disease
14. Ischaemic stroke
15. Transient Ischaemic Attack (TIA)
16. Deficits of a ‘current’ stroke must meet ACS0002 to be assigned.
17. True
18. False
19. Which ACS standards do you use when coding stroke?
20. ACS0604, ACS0605
21. ACS0001, ACS0002, ACS0008, ACS0010, ACS0048, ACS0604, ACS0605, ACS0016, ACS0032
22. ACS0016, ACS0032, ACS0604, ACS0605
23. ACS0001, ACS0002, ACS0008, ACS0010, ACS0048, ACS0604, ACS0605
24. What would you look for to further specify an intracerebral haemorrhage?
25. Location
26. Artery or type of blockage
27. Cause
28. CT evidence of bleed
29. What should you look for to further specify an ischaemic stroke?
30. Brain location
31. Extent of brain damage
32. Type of blockage and type of artery
33. All of the above

11. If stroke or cerebrovascular accident is documented as the final diagnosis on the discharge summary. The following actions can be taken:

(A) Code I64 as principal/additional diagnosis;

(B) Send a query to the clinician if no further specifying documentation;

(C) Consult another experienced coder; and

(D) Check documentation for treatment type and imaging results.

In what order of priority should these actions be taken?  
a) (A), (D), (B), (C)  
b) (A), (B), (D), (C)  
c) (C), (A), (D), (B)  
d) (D), (C), (B), (A)

1. To further specifiy a stroke at the 3rd digit level, what documentation/result should a coder look for in the medical record?
2. OT
3. ECG
4. CT
5. White blood cell count