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Better outcomes for hospitalized patients with TIA when in stroke units: an observational study

Dominique A. Cadilhac[1,2] PhD; Joosup Kim[1,2] PhD; Natasha A. Lannin[3] PhD; Chris Levi[4] MBBS; Helen M. Dewey[2,5] PhD; Kelvin Hill[6] BAppSci; Steven Faux[7] FAFRM (RACP); Nadine Andrew[1,2] PhD; Monique Kilkenny[1,2] PhD; Rohan Grimley[8] MBBS; Amanda G. Thrift[1] PhD; Brenda Grabsch[2] BSW; Sandy Middleton[7,9] PhD; Craig S Anderson[10,11] PhD; Geoffrey Donnan[2] MD on behalf of the Australian Stroke Clinical Registry Consortium

Affiliations:

1. Stroke and Ageing Research, School of Clinical Sciences at Monash Health, Monash University, Victoria, Australia
2. Stroke Division, Florey Institute of Neuroscience and Mental Health, Heidelberg, Victoria, Australia
3. La Trobe University, Victoria, Australia
4. University of Newcastle, New South Wales, Australia
5. Eastern Health Clinical School, Monash University, Victoria, Australia
6. National Stroke Foundation, Victoria, Australia
7. St Vincent's Health Australia (Sydney), New South Wales, Australia
8. Sunshine Coast Clinical School, The University of Queensland
9. Australian Catholic University, New South Wales, Australia
10. The George Institute for Global Health, Royal Prince Alfred Hospital, Camperdown, New South Wales, Australia
11. Central Clinical School, The University of Sydney, New South Wales, Australia

Supplemental data: Co-investigators and Contributors

Corresponding author:
Associate Professor Dominique Cadilhac
School of Clinical Sciences, Monash University, Monash Health Research Precinct Building, Level 1 43-51 Kanooka Grove, Clayton 3168.
Phone: +613 9594 7583
Fax: +613 9594 6258
E-mail: dominique.cadilhac@monash.edu

Other author email addresses: joosup.kim@monash.edu; n.lannin@latrobe.edu.au; christopher.levi@hnehealth.nsw.gov.au; nadine.andrew@monash.edu; monique.kilkenny@monash.edu; helen.dewey@easternhealth.org.au; khill@strokefoundation.com.au; sfaux@stvincents.com.au; rohan.grimley@health.qld.gov.au; amanda.thrift@monash.edu; brenda.grabsch@florey.edu.au; sandy.middleton@acu.edu.au; canderson@georgeinstitute.org.au; geoffrey.donnan@florey.edu.au.

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GD: as per DAC above regarding industry support for AuSCR

Authors and individual contributions

DC: conceptualisation and design of the study, drafting of the manuscript, supervision of analyses, interpretation of the data.

JK: drafting of the manuscript, literature review, analysis of data, interpretation of the data

NL: conceptualisation and design of the study, revisions and interpretation of the data

CL: conceptualisation and design of the study, revisions and, interpretation of the data

HMD: conceptualisation and design of the study, revisions and interpretation of the data

KH: conceptualisation and design of the study, revisions and interpretation of the data

SF: conceptualisation and design of the study, revisions and interpretation of the data

NA: revisions to the manuscript, contribution to data analysis methods, interpretation of the data

MK: revisions to the manuscript, contribution to data analysis methods, interpretation of the data

RG: conceptualisation and design of the study, revisions and interpretation of the data

AGT: conceptualisation and design of the study, revisions and interpretation of the data

BG: oversight of AuSCR operations including supervision of data management and data collection process, revisions to the manuscript

SM: conceptualisation and design of the study, revisions and interpretation of the data

CSA: conceptualisation and design of the study, revisions and interpretation of the data

GD: conceptualisation and design of the study, drafting of the manuscript, interpretation of the data

ABSTRACT:

Objectives: To investigate differences in management and outcomes for patients admitted to hospital with TIA according to care on a stroke unit (SU) or alternate ward setting up to 180-days post event.

Methods: TIA admissions from 40 hospitals participating in the Australian Stroke Clinical Registry during 2010-13 were assessed. Propensity score matching was used to assess outcomes by treatment group including Cox proportional hazards regression to compare survival differences and other appropriate multivariable regression models for outcomes including health-related quality of life and readmissions.

Results: Among 3007 patients with TIA (mean age 73 years, 54% male)**,** 1110 pairs could be matched. Compared to management elsewhere in hospitals, management in a SU was associated with improved cumulative survival at 180-days post-event (hazard ratio [HR] 0.57, 95% confidence interval [CI] 0.35 to 0.94; p=0.029), despite not being statistically significant at 90-days (HR 0.66, 95% CI 0.33 to 1.31; p=0.237). Overall, there were no differences for being discharged on antihypertensive medication or with a care plan; and the 90-180 day self-reported outcomes between these groups were similar. In subgroup analyses of 461 matched pairs treated in hospitals in one Australian state (Queensland), patients treated in a SU were more often prescribed aspirin within 48 hours (73% vs 62%, p<0.001) and discharged on antithrombotic medications (84% vs 71%, p<0.001) than those not treated in a SU.

Conclusion: Hospitalised patients with TIA managed in SUs had better survival at 180-days than those treated in alternate wards, potentially through better management, but further research is needed.

Words: 250

Introduction

Management in a stroke unit (SU) is recommended for patients with acute stroke,[1] reducing the odds of death or dependency by over 20% compared to alternate wards.[2] SU care involves management by clinicians with specialist training and expertise in stroke[3] who provide greater access to evidence-based care including acute interventions and secondary prevention.[4] In alternate wards, patients are managed by a range of health professionals who may not have specific expertise in stroke or transient ischemic attack (TIA).

Data are limited regarding the ideal care pathway for patients with TIA once a decision has been made to admit them to hospital.[5-8] Recent findings from 15 hospitals contributing to a German registry, provided evidence that management in a SU was associated with reduced risk of stroke or death at 90-days only in men with TIA.[5] In Australia, declining trends in the 90-day risk of stroke were observed in patients with an incident TIA if managed in hospitals with a SU.[8]

It remains unclear if patients with TIA have any longer-term benefits associated with management in an SU. In order to investigate this, we used data obtained prospectively by clinicians or directly from patients or outcome assessors from the Australian Stroke Clinical Registry (AuSCR).[9] We hypothesized that, among patients hospitalised for TIA, management in an SU would be associated with (1) fewer deaths within 180 days, and (2) greater utilisation of evidence-based processes of care, when compared to management in an alternate ward.

Methods

Patient population and procedures

The AuSCR was established in 2009 to routinely monitor processes of care and health outcomes between 90 to 180 days after symptom onset on consecutive, hospitalised cases of stroke or TIA (see protocol[9] and www.auscr.com.au). The AuSCR provides a minimum national dataset of process of care indicators that can be used to provide an assessment of differences in the quality of care and outcome of patients with TIA. Briefly, the AuSCR adheres to the Australian guidelines for best-practice in clinical quality registries.[10] The current analysis incorporates data from all 40 hospitals that contributed data during the period 2010 to 2013.

Within the AuSCR, TIA is defined using clinical criteria based on an adaption of the more classical epidemiological approach as a definitive or probable diagnosis at the time of discharge from hospital that is compatible with a TIA using symptoms of neurological deficits (persisting for <24 hours from onset) and/or neuroimaging evidence (no abnormalities detected). International classification of disease version 10 primary discharge codes are also obtained but were not used to classify patients in this study since coding is undertaken by administrative staff and not clinicians within Australia. All clinical staff who collect and enter the AuSCR data are provided with standardised training and a data dictionary. Random audits of medical records are also undertaken by external auditors to verify the quality of the AuSCR data including clinical diagnosis and additional training provided, if needed.[9]

The processes of care collected in the AuSCR by all hospitals include: management on a stroke unit; treatment with intravenous tissue plasminogen activator if an ischemic stroke;

provision of an antihypertensive agent at discharge; and provision of a discharge care plan developed with the patient or family. In hospitals located in one Australian state (Queensland), an additional four processes of care have been collected since 2012: mobilised during admission; aspirin administration within 48 hours; swallow assessment and formal speech pathologist review; and discharged on antithrombotic medications. Missing or unknown data were assumed to be negative for processes of care (ranged from 0% to 8%).

The AuSCR protocol incorporates an 'opt-out' approach whereby all eligible cases are registered unless the patient or family nominates to have their data excluded via simple, cost-free options (free-call telephone number or postage-paid). This approach ensures that selection bias is minimised.[11] To date, <3% of participants have opted out of the AuSCR.

Patients who were discharged from the participating hospitals, and who had not refused follow-up or 'opted-out' of the registry, were followed-up centrally by trained research staff between 90 to 180 days after symptom onset. A modified Dillman protocol was used, whereby two attempts by post were made prior to an attempt by telephone. Although multiple episodes of care are registered in the AuSCR, patients were only followed up after their first episode.[9] At follow-up, data on health-related quality of life (HRQoL) are collected using the EuroQoL-5 dimension-3 level (EQ-5D-3L) instrument.[12] Index-based values ('utilities') for the EQ-5D-3L have been reported using health values derived using Discrete Choice Experiment (DCE) methods in Australia.[13] A utility score of 0 corresponds to a HRQoL state equivalent to death, while a score of 1 represents perfect HRQoL. Patient report of subsequent readmission to hospital and stroke is also recorded.

Data linkage

Personal identifiers of all registrants in AuSCR were linked to the National Death Index (NDI) using probabilistic matching by the Australian Institute of Health and Welfare. For these analyses, mortality data in the NDI were used. We also report mortality to 90 days as this is common to other studies of TIA.

The socioeconomic status of participants was estimated using the Index of Relative Socioeconomic Disadvantage (IRSD) provided by the Australian Bureau of Statistics.[14] The IRSD is calculated for State Suburb Codes using national census data on people and households within those areas, including education, occupation, living conditions and income. Greater IRSD scores indicate lesser relative disadvantage.

Ethics

Appropriate ethics and/or governance approvals were obtained for all participating hospitals in AuSCR. Ethical approval was obtained from the Australian Institute of Health and Welfare to conduct data linkage to the National Death Index.

Statistical analysis

Kruskal-Wallis tests and chi^2 tests were used to assess differences in patient characteristics. Propensity score matching was used to isolate the influence of SU management and improve internal validity. A propensity score was calculated for all patients with TIA based on age, sex and ability to walk on admission (as a marker of symptom severity/co-morbidity at time of admission to hospital).[15] Each patient who did not receive treatment in a SU was matched to a similar patient with TIA who received treatment in a SU based on this propensity score and then processes of care and outcomes were compared.

Regression models for the analysis of outcomes using matched pairs were adjusted for age, sex, IRSD, ability to walk on admission, in-hospital TIA, history of stroke and transfer from another hospital. Outcome data were analysed by individual patient and not by episode. Cox proportional hazards regression analysis was conducted to assess rates of death within 90 and 180 days. Quantile regression analysis was also conducted to investigate differences in HRQoL utility scores. Random-effects logistic regression analysis was conducted to investigate re-hospitalization, and occurrence of stroke or recurrent TIA. To adjust for patient clustering by hospital we used multi-level analyses for logistic regression analyses, but when using Cox and quantile regression we adjusted for patient clustering directly. As a sensitivity analysis, regression analyses without propensity score matching were also undertaken. Data were analysed using StataIC 12.1 (StataCorp 2013).

Results

Among the 3007 registered episodes of TIA (median age 74, male 54%), 1997 were admitted to a SU. Overall, patients with TIA were less often managed in a SU than patients with confirmed stroke (66% vs ischemic stroke 83%, $p<0.001$) indicating that they more often received care elsewhere within a hospital. Patients treated in SUs were less disadvantaged, less often born in Australia, less often had an in-hospital event and were more often discharged home than those not treated in SUs (Table 1). In the subset of patients with TIA from Queensland hospitals, those treated in a SU were more often treated with aspirin within 48 hours of admission (73% vs 62%, $p<0.001$) and were more often discharged on antithrombotic medication (84% vs 71%, $p<0.001$) compared to those treated on an alternate ward (Table 2).

Few patients with TIA died in hospital (n=5). Using the propensity score matched sample, the number of deaths at 90 and 180 days after admission were similarly low for patients with TIA who were and were not admitted to a SU (90-days: no SU care n=21 [2.2%] and SU care n=17 [1.8%]; 180-days: no SU care n=49 [5.2%] and SU care n=30 [3.2%]). In Cox proportional hazards regression analysis, there were no differences in the hazard of death at 90 days after admission for TIA between those who were and were not admitted to a SU (Table 3 and Figure 1, hazard ratio [HR] 0.66, 95% confidence interval [CI]: 0.33 – 1.31; p=0.237). However, patients with TIA who were managed in a SU had a reduced hazard of death at 180-days after admission (HR 0.57, 95% CI: 0.35 – 0.94, p=0.029) when compared to patients not admitted to a SU.

A greater proportion of patients with TIA treated in a SU completed a follow-up interview than those not treated in a SU (SU 59% vs 48%, p<0.001). The median time to follow-up was 101 days (interquartile range 96 – 107). There was no statistical difference in proportion reporting readmission to hospital based on care setting (SU 22% vs non-SU 24%, p=0.432). Similarly, there were no detectable differences based on care setting in reports of new strokes since admission (8% in both groups, p=0.806). The median EQ-5D utility score was 0.79 for patients who were treated in a SU and 0.81 for those who were not treated in a SU. There were no detectable differences in these outcomes between groups after adjustment (Table 4).

The results from the propensity score matching methods were robust. Results were similar when the full sample of 3007 TIA patients were included in standard logistic regression multi-level models (e.g. difference in HRQoL β coefficient 0.03, 95% confidence interval

0.00 – 0.05, p=0.051), except that those managed in SUs were more often discharged on antihypertensive medications (70% vs 61%, p<0.001). The hazard of death was similar after exclusion of TIAs that occurred while in hospital for another condition and when adjusting for symptom-onset-to-arrival time (see online supplement).

Discussion

This is the largest reported study of outcomes after TIA according to the setting of management after admission to hospital. Compared to alternate wards, treatment in a SU was associated with a 45% reduced cumulative hazard of death at 180 days, but no difference was observed at 90 days. Our results were comparable to studies of the benefits of rapid access TIA clinics,[16-18] since our 90-day survival rates fell within their 95% confidence limits.

Our results may partly be explained by our low event rates. The proportion of patients in our study who reported having had a recurrent stroke at 90-180 days follow-up (8%) was less than that reported in a systematic review of 18 studies (average ~11% at 90-days, range 0.6% to 20.6%),[19] but appeared to be greater than those reported from studies on the benefits of rapid-access TIA clinics,[16-18] including the Australian M3T model.[20] It is possible that a different case-mix of patients may have contributed to this observed difference in outcome since patients seen in rapid-access TIA clinics tended to be younger (by up to 10 years) than in our hospitalized sample. Furthermore, the large proportion of patients with TIA in our sample who were unable to walk on admission suggests selection bias towards admission of those with more severe or persistent symptoms, and potentially greater co-morbidity or frailty, both of which may be associated with greater incidence of subsequent events.

A small proportion of patients with TIA were discharged to an aged care facility, and this was less often observed if they were managed in a SU.[4] This is consistent with the findings of another study in which patients with stroke receiving care in a SU were more often discharged directly to home when compared to those who received care on a general ward. It was anticipated that few patients with TIA would be discharged to aged care, but is difficult for us to reconcile. This is because the AuSCR does not collect pre-admission residence and so we were unable to identify patients who were living in an aged care facility prior to their TIA. We observed that patients who were treated in a SU were less often disadvantaged than those who were not. However, we found no association between socioeconomic status and outcomes. Nevertheless, this may point to a disparity in healthcare delivery, which warrants further investigation.

Processes of care that are characteristic of SUs that potentially improve outcomes include delivery of more appropriate early secondary prevention, assessment for etiology, early management and discharge care planning.[4] In this study, important processes of care, such as assessment of swallow function and hyper-acute aspirin therapy, differed between those treated in a SU compared to those who were not. However, commencement of early secondary prevention prior to discharge was mixed. There was no difference in antihypertensive medication prescription on discharge between groups overall, but a difference was observed in the Queensland subgroup. When compared to patients with TIA managed in an alternate ward, patients with TIA who were managed in a SU were more often treated with antithrombotic medications, which is a potential explanatory factor for the observed difference in survival. However, the use of antithrombotic medication was only captured in hospitals in Queensland (58% of total AuSCR hospitals and 45% of all TIA episodes in AuSCR) and these patients may not be representative of all patients from hospital

using AuSCR. Additionally, it remains unclear what happens in primary care or the outpatient setting post discharge, since only hospital discharge medications are captured in this study. It is possible that communication with primary care doctors or follow-up care is better for patients experiencing TIA who are treated in a SU than those who are not, potentially resulting in a longer term survival advantage.

Importantly, there are different models of care for patients with TIA in Australia.[21] Due to the milder symptoms associated with TIA, hospitals may have policies to admit these cases to short stay units, protocol based observation units, or out-patient clinics that provide a similar quality at a reduced cost to hospitals than using an admit-all approach.[22, 23] Patients with TIA who are admitted are likely to have different characteristics to patients with TIA seen in outpatient clinics. Several authors have developed algorithms to identify people with TIA who are at greatest risk of early stroke to help fast track the patients who require rapid investigation or admission to hospital.[24, 25] While some groups have demonstrated safe management of TIA without admission to hospital, this is still a specialized alternative.[20] Improving availability of specialised stroke care in Australia, and elsewhere, is likely to improve the management of patients hospitalized with TIA. Electronic clinical support tools to assist non-neurologists in providing appropriate outpatient care to patients with TIA may assist in locations where access to specialists is not feasible.[26]

The strengths of this study include the large sample size from all 40 hospitals participating in the AuSCR during the study period (21% of 195 hospitals known to admit people with acute stroke and TIA in Australia)[27] located in urban and rural locations; and the confirmation of death status in all patients using linked data from the National Death Index. In addition, appropriate statistical techniques for non-randomised data, including propensity score

matching, were used to maximize comparability between patients who were and were not managed in a SU. Therefore, the between-group imbalances in variables used to match are unlikely to account for these results. The results from this model were consistent with those found using standard analytic methods, thereby demonstrating the robustness of our findings.

There are some limitations to our study. In particular, there were limited covariates available in the AuSCR minimum dataset to use in the multivariable analyses, thereby raising the potential for residual confounding. For example, established prognostic factors such as hypertension, diabetes, TIA duration and clinical symptoms were unavailable. One complexity that arises with this, or other standard multivariable statistical approaches, is that we cannot accurately account for unmeasured confounding factors. For example, the more gradual accumulation of deaths in the non-SU group over time may have been due to greater pre-admission co-morbidity that we were unable to take into account. However, we have adjusted for a prognostic measure of severity of disease validated for stroke when investigating outcomes.[15] In future work we will be able to expand our registry variables through person-level linkage to other health datasets to enable our models to account for important pre-stroke co-morbidity.[28]

Another limitation is that those who were followed up were more often treated in a SU than those who were not. This response bias may explain why we did not observe differences in self-reported readmissions, recurrent stroke and HRQoL. In addition, because death, recurrent stroke and readmissions were relatively few within the follow-up time frame, we were likely underpowered to detect a difference in these outcomes at 90-day follow-up. Unfortunately, not all patients were able to be followed-up for HRQoL data due to resource constraints. In addition, it was also not possible to adjust for the different policies for management used by

hospitals to admit patients with TIA because information on this is not collected in the AuSCR. Lastly, duration of care in a SU was not recorded and therefore we were unable to investigate a dose-response.

Stroke unit management was associated with reduced mortality at 180 days after admission for TIA. Given the non-randomised study design, this finding requires confirmation. In addition, whether or not the benefit of SU care persists beyond 180 days after admission for TIA should be investigated. Furthermore, it will be important to determine the effect of SU care on other outcomes in these patients, such as the adherence to secondary prevention therapies and the frequency of future stroke and acute myocardial infarction. Linkage of AuSCR data to hospital administrative databases will enable better assessments of subsequent cardiovascular events in these patients.[28] These findings provide evidence which support the treatment of TIA in a SU, where admission to hospital is warranted, as this may improve longer-term survival outcomes for patients.

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Table 1. Demographic and clinical characteristics of patients with TIA according to management in a Stroke Unit

	SU N=1997 n (%)*	Non-SU N=1010 n (%)*	p-value
Median age in years (IQR)	75 (64 – 83)	74 (64 – 83)	0.622
Male	1082 (54)	545 (54)	0.909
IRSD			
Quintile 1 (most disadvantaged)	365 (18)	268 (27)	<0.001
Quintile 2	353 (18)	226 (22)	
Quintile 3	345 (17)	179 (18)	
Quintile 4	332 (17)	141 (14)	
Quintile 5 (least disadvantaged)	602 (30)	196 (19)	
Born in Australia	1318 (66)	710 (70)	0.018
Transferred from another hospital	183 (9)	80 (8)	0.259
Able to walk independently on admission‡	1394 (70)	668 (66)	0.041
Stroke/TIA occurred in hospital	33 (2)	35 (3)	0.002
Documented history of stroke	500 (25)	248 (25)	0.772
Median length of stay in days (IQR)	2 (1 – 4)	2 (1 – 4)	<0.001†
Discharge destination			
Home	1740 (87)	824 (82)	<0.001
Rehabilitation	84 (4)	19 (2)	
Aged care	74 (4)	58 (6)	
Other hospital	81 (4)	99 (10)	
Missing	16 (1)	7 (1)	
Died in hospital	2 (0)	3 (0)	0.207

TIA: transient ischemic attack, SU: Stroke unit, IRSD: Index of Relative Socioeconomic Disadvantage, IQR: interquartile range

* unless otherwise stated

† There was a greater proportion of outliers in regard to length of stay in patients with TIA managed in alternate wards than those managed in a SU (3% vs 2% greater than 45 days)

‡ as a marker of severity of symptoms on admission as per the Counsel et al prognostic model[15]

Table 2. Matched analysis of processes of care between patients with TIA managed and not managed in a Stroke Unit

	SU N=1010 n (%)	Non-SU N=1010 n (%)	p-value
Discharged on an antihypertensive medication	640 (64)	616 (62)	0.267
Patients in Queensland hospitals*	291 (64)	237 (52)	<0.001
Discharged to the community with a care plan	383 (42)	410 (46)	0.073
Patients in Queensland hospitals†	145 (37)	200 (51)	<0.001
Queensland-only processes of care‡			
Mobilised during admission	420 (91)	388 (84)	0.001
Swallow assessment	357 (77)	224 (49)	<0.001
Aspirin within 48 hours	337 (73)	285 (62)	<0.001
Discharged on antithrombotic medication§	375 (84)	319 (71)	<0.001

TIA: transient ischemic attack, SU: Stroke Unit, IQR: interquartile range
* 457 matched pairs of patients discharged
† 390 matched pairs of patients discharged to the community
‡ Variables collected in Queensland from 2012 onwards. In Queensland, there were 461 matched pairs
§ 449 matched pairs of patients who were discharged

Table 3. Survival analysis of patients with TIA based on treatment in Stroke Units

	Death to 90 days		Death to 180 days	
N=1890	**HR (95% CI)**	**p-value**	**HR (95% CI)**	**p-value**
Treated on a Stroke Unit				
No	1.00	–	1.00	–
Yes	0.66 (0.33 – 1.31)	0.237	0.57 (0.35 – 0.94)	0.029
Age*				
<65	1.00	–	1.00	–
65-74	2.49 (0.61 – 10.13)	0.202	2.04 (0.82 – 5.04)	0.123
75-84	3.31 (0.89 – 12.30)	0.073	3.02 (1.32 – 6.95)	0.009
>85	6.94 (1.93 – 24.98)	0.003	6.47 (2.87 – 14.56)	<0.001
Sex*				
Male	1.00	–	1.00	–
Female	0.95 (0.49 – 1.82)	0.874	1.02 (0.65 – 1.61)	0.922
IRSD quintiles				
1 (most disadvantaged)	1.00	–	1.00	–
2	1.11 (0.43 – 2.82)	0.834	0.61 (0.28 – 1.32)	0.207
3	0.52 (0.14 – 1.94)	0.331	1.13 (0.56 – 2.30)	0.725
4	0.81 (0.27 – 2.47)	0.717	0.86 (0.40 – 1.84)	0.703
5 (least disadvantaged)	1.16 (0.48 – 2.79)	0.737	1.25 (0.68 – 2.30)	0.471
Ability to walk on admission*				
No	1.00	–	1.00	–
Yes	0.30 (0.13 – 0.70)	0.006	0.50 (0.30 – 0.86)	0.011
In hospital TIA				
No	1.00	–	1.00	–
Yes	4.26 (1.12 – 16.20)	0.029	3.02 (1.10 – 8.26)	0.032
Transfer from another hospital				
No	1.00	–	1.00	–
Yes	0.32 (0.06 – 1.63)	0.171	0.28 (0.08 – 1.00)	0.049
Documented history of stroke				
No	1.00	–	1.00	–
Yes	1.07 (0.53 – 2.18)	0.845	1.45 (0.91 – 2.33)	0.119

949 matched pairs, eight patients with missing data not included TIA: transient ischemic attack, HR: hazard ratio, CI: confidence interval, IRSD: Index of Relative Socioeconomic Disadvantage
There were no differences to the model when age was included as a continuous variable.
*Used in propensity score matching procedure as a marker of severity of symptoms on admission

Figure 1: Cumulative hazard of death to 180 days after transient ischemic attack according to management in a Stroke Unit

Figure 1 legend:
N=1890 (945 matched pairs)
Adjusted for age, sex, place of birth, socioeconomic status, ability to walk on admission, in-hospital transient ischemic attack, history of stroke and transfer from another hospital using a matched 1:1 cohort based on propensity score methods.
Cumulative hazard is the number of events that would be expected for each individual in a group at a given time if the event were a repeated process.

Table 4. Health related quality of life and self-reported adverse events for patients with TIA according to treatment in a Stroke Unit or alternate ward

	OR* (95% CI)	p-value
Rehospitalisation	0.98 (0.64 – 1.49)	0.924
Recurrent stroke/TIA	1.18 (0.61 – 2.28)	0.624
EQ-5D-3L DCE method (β coefficient and 95% CI)	0.02 (-0.02 – 0.06)	0.392

OR: odds ratio unless otherwise stated, CI: confidence interval, TIA: transient ischemic attack, EQ-5D-3L: EuroQoL -5 dimension-3 level instrument[12], DCE: discrete choice experiment utilities determined by Viney et al[13]
N=914 (457 matched pairs) in analyses of rehospitalisation and recurrent stroke/TIA, N=888 (444 matched pairs) in analysis of EQ-5D-3L DCE
Outcomes at 90 to 180 days
Adjusted for age, sex, place of birth, socioeconomic status, ability to walk on admission, in-hospital TIA, history of stroke and transfer from another hospital using a matched 1:1 cohort based on propensity score methods.
*treated in a Stroke Unit (SU) vs not treated in a SU (reference category).

Co-investigators and contributors data supplement

James Hughes, BMed, FRACP (Tamworth Hospital New South Wales [NSW], site investigator); Martin Jude, MBBS, FRACP (Wagga Wagga Hospital NSW, site investigator); Fiona Ryan, BAppSc (SpPath), MHlthSc (Orange Hospital and Bathurst Hospitals NSW, site investigator); Melissa Gill, BAppSc (SpPath) (Armidale Hospital, NSW, site investigator); Geoffrey Herkes, MBBS, PhD, FRACP (Royal North Shore Hospital NSW, site investigator); Andrew Wong, MBBS, PhD (Royal Brisbane and Women's Hospital Queensland [QLD] site investigator); Noel Saines MBBS, FRACP (The Wesley Hospital QLD, site investigator); Richard Geraghty, MBBS, FRACP (Redcliffe Hospital QLD, site investigator); Pradeep Bambery, MD, FRCP(G), FRACP (Bundaberg Hospital QLD, site investigator); Christopher Staples, MD (Mater Adults QLD, site investigator); Amanda Siller, MBBS, FRACP (Queen Elizabeth II Jubilee Hospital QLD, site investigator); Richard White, MD, FRCP, FRACP. (Townsville Hospital QLD, site investigator); Arman Sabet, MD, FRACP, BSc (Gold Coast Hospital and Robina Hospital QLD, site investigator); Eva Salud, MD, AMC CERT (Gympie Hospital QLD, site investigator); Martin Dunlop, MBBS, FACRM (Cairns Base Hospital QLD, site investigator); Nisal Gange, MBBS, AMC CERT (Toowoomba Hospital QLD, site investigator); Paula Easton, BPhty (Hons) (Mackay Hospital QLD, site investigator); Graham Mahaffey, RN (Hervey Bay Hospital QLD, site investigator); Graham Hall, MBBS, FRACP (Princess Alexandra Hospital QLD, site investigator); Carolyn De Wytt, MRCP (UK), MB BCH DUBL, FRACP (Greenslopes Private Hospital QLD, site investigator); Sean Butler, FIMLS, BM Hons, MRCP(UK), FRACP (Prince Charles Hospital QLD, site investigator); Paul Laird, MBBS, FRACP (Rockhampton Hospital QLD, site investigator); Karen Hines, BHIM (Caboolture Hospital QLD, site investigator); David Douglas, MBBS, M Admin, FRACGP, FAFRM (RACP) (Ipswich Hospital QLD, site investigator); Suzana Milosevic, MD, FRACP, AMC CERT (Logan Hospital QLD, site investigator); Joel Iedema, MBBS, FRACP (Redland Hospital QLD, site investigator); Stephen Read, MBBS, PhD, FRACP (Royal Brisbane and Women's Hospital QLD, site investigator); Francis Hishon, RN (Redland Hospital QLD, site investigator); David Blacker MBBS, FRACP (Sir Charles Gairdner Hospital, Western Australia [WA], site investigator); Tim Bates MBBS, FRACP (Swan District Hospital WA, site investigator); Helen Castley, MBBS, (Royal Hobart Hospital Tasmania, site investigator and Steering Committee); Mark Mackay, MBBS, FRACP (Royal Children's Hospital Victoria [VIC], site investigator and Steering Committee); Christopher Bladin, MD, MBBS, FRACP (Box Hill Hospital VIC, site investigator and Steering Committee); Ernie Butler, MBBS FRACP (Peninsula Health VIC, site investigator); Peter O'Brien, MBBS, DIP RANZCOG, FRACMA, FACRRM (Warrnambool Hospital VIC, site investigator); Douglas Crompton, MA, PhD, MBBS, FRACP (Northern Hospital VIC, site investigator); Sharan Ermel, RN (Div1) (Bendigo Health VIC, site investigator); Michael Pollack MBBS, FAFRM (RACP), FACRM, FFPM (ANZCA), MMedSci (Clin Epi) (Hunter Stroke Service NSW, Steering Committee; Frances Simmonds MSc(Med), (Australasian Rehabilitation Outcomes Centre NSW, Steering Committee); Julie Bernhardt PhD (The Florey Institute of Neuroscience and Mental Health VIC, Steering Committee); Erin Lalor PhD (National Stroke Foundation VIC, Steering Committee); John McNeil PhD (Monash University VIC, Steering Committee); Mark Simcocks BSc (VIC, Consumer Representative Steering Committee); Andrew Lee MBBS FRACP (Flinders Medical Centre, South Australia, Steering Committee); Richard Lindley PhD (The George Institute for Global Health NSW, Steering Committee); Greg Cadigan, BN, (Queensland State-wide Stroke Clinical Network QLD, Steering Committee); Peter Hand MBBS, MD, FRACP (Royal Melbourne Hospital VIC, Steering Committee); Andrew Evans, MBBS (Hons), FRACP (Westmead Hospital NSW, Steering Committee); Andrew Wesseldine, MBBS, FRACP (St John of God Healthcare; Department of Health WA, Steering Committee); Susan Hillier, PhD (University of South Australia, Steering Committee).

ONLINE SUPPLEMENT

Better outcomes for hospitalized patients with TIA when in stroke units: an observational study

Dominique A. Cadilhac[1,2] PhD; Joosup Kim[1,2] PhD; Natasha A. Lannin[3] PhD; Chris Levi[4] MBBS; Helen M. Dewey[2,5] PhD; Kelvin Hill[6] BAppSci; Steven Faux[7] FAFRM (RACP); Nadine Andrew[1,2] PhD; Monique Kilkenny[1,2] PhD; Rohan Grimley[8] MBBS; Amanda G. Thrift[1] PhD; Brenda Grabsch[2] BSW; Sandy Middleton[7,9] PhD; Craig S Anderson[10,11] PhD; Geoffrey Donnan[2] MD on behalf of the Australian Stroke Clinical Registry Consortium

Affiliations:

1. Stroke and Ageing Research, School of Clinical Sciences at Monash Health, Monash University, Victoria, Australia
2. Stroke Division, Florey Institute of Neuroscience and Mental Health, Heidelberg, Victoria, Australia
3. La Trobe University, Victoria, Australia
4. University of Newcastle, New South Wales, Australia
5. Eastern Health Clinical School, Monash University, Victoria, Australia
6. National Stroke Foundation, Victoria, Australia
7. St Vincent's Health Australia (Sydney), New South Wales, Australia
8. Sunshine Coast Clinical School, The University of Queensland
9. Australian Catholic University, New South Wales, Australia
10. The George Institute for Global Health, Royal Prince Alfred Hospital, Camperdown, New South Wales, Australia
11. Central Clinical School, The University of Sydney, New South Wales, Australia

Supplemental tables

Table e-1. Survival analysis of patients with TIA based on treatment on a SU with additional adjustment for time from onset to arrival

N=1628	Death to 90 days		Death to 180 days	
	HR (95% CI)	**p-value**	**HR (95% CI)**	**p-value**
Treated on a Stroke Unit				
No	1.00	–	1.00	–
Yes	0.74 (0.33 – 1.65)	0.457	0.53 (0.30 – 0.94)	0.030
Age*				
<65	1.00	–	1.00	–
65-74	2.07 (0.52 – 8.31)	0.304	2.11 (0.79 – 5.64)	0.135
75-84	1.88 (0.46 – 7.67)	0.378	2.45 (0.94 – 6.39)	0.068
>85	5.21 (1.41 – 19.29)	0.013	6.86 (2.75 – 17.11)	<0.001
Sex*				
Male	1.00	–	1.00	–
Female	1.56 (0.70 – 3.47)	0.279	1.41 (0.84 – 2.38)	0.196
IRSD quintiles				
1 (most disadvantaged)	1.00	–	1.00	–
2	0.79 (0.27 – 2.28)	0.661	0.46 (0.19 – 1.11)	0.085
3	0.41 (0.09 – 1.95)	0.262	1.17 (0.55 – 2.49)	0.692
4	0.51 (0.13 – 1.97)	0.331	0.50 (0.19 – 1.28)	0.147
5 (least disadvantaged)	1.03 (0.39 – 2.74)	0.952	1.15 (0.59 – 2.23)	0.682
Ability to walk on admission*				
No	1.00	–	1.00	–
Yes	0.44 (0.18 – 1.11)	0.082	0.62 (0.35 – 1.11)	0.109
Transfer from another hospital				
No	1.00	–	1.00	–
Yes	0.82 (0.10 – 6.43)	0.848	0.39 (0.05 – 2.91)	0.359
Documented history of stroke				
No	1.00	–	1.00	–
Yes	1.19 (0.52 – 2.72)	0.684	1.82 (1.08 – 3.06)	0.025
Time from onset to arrival (hours)	0.96 (0.89 – 1.02)	0.192	0.99 (0.97 – 1.01)	0.399

816 matched pairs, four patients with missing data not included
TIA: transient ischemic attack, HR: hazard ratio, CI: confidence interval, IRSD: Index of Relative Socioeconomic Disadvantage
There were no differences to the model when age was included as a continuous variable.
*Used in propensity score matching procedure as a marker of severity of symptoms on admission

Table e-2. Survival analysis of patients with TIA based on treatment on a SU with exclusion of TIAs that occurred while in hospital for another condition

N=1827	Death to 90 days		Death to 180 days	
	HR (95% CI)	**p-value**	**HR (95% CI)**	**p-value**
Treated on a Stroke Unit				
No	1.00	–	1.00	–
Yes	0.87 (0.42 – 1.78)	0.695	0.65 (0.39 – 1.10)	0.028
Age*				
<65	1.00	–	1.00	–
65-74	3.64 (0.91 – 14.52)	0.067	3.03 (1.18 – 7.76)	0.021
75-84	3.57 (0.94 – 13.58)	0.062	3.62 (1.49 – 8.79)	0.005
>85	7.50 (2.03 – 27.80)	0.003	8.37 (3.52 – 19.92)	<0.001
Sex*				
Male	1.00	–	1.00	–
Female	1.08 (0.55 – 2.11)	0.828	1.04 (0.66 – 1.65)	0.859
IRSD quintiles				
1 (most disadvantaged)	1.00	–	1.00	–
2	1.30 (0.51 – 3.31)	0.582	0.69 (0.32 – 1.48)	0.340
3	0.57 (0.15 – 2.15)	0.405	1.23 (0.60 – 2.50)	0.576
4	0.85 (0.27 – 2.62)	0.773	0.72 (0.32 – 1.64)	0.437
5 (least disadvantaged)	1.07 (0.41 – 2.76)	0.894	1.22 (0.65 – 2.31)	0.532
Ability to walk on admission*				
No	1.00	–	1.00	–
Yes	0.39 (0.16 – 0.95)	0.038	0.59 (0.34 – 1.04)	0.066
Transfer from another hospital				
No	1.00	–	1.00	–
Yes	0.39 (0.05 – 2.95)	0.364	0.45 (0.11 – 1.88)	0.274
Documented history of stroke				
No	1.00	–	1.00	–
Yes	1.21 (0.59 – 2.48)	0.598	1.63 (1.01 – 2.63)	0.044

918 matched pairs, nine patients with missing data not included
TIA: transient ischemic attack, HR: hazard ratio, CI: confidence interval, IRSD: Index of Relative Socioeconomic Disadvantage
There were no differences to the model when age was included as a continuous variable.
*Used in propensity score matching procedure as a marker of severity of symptoms on admission